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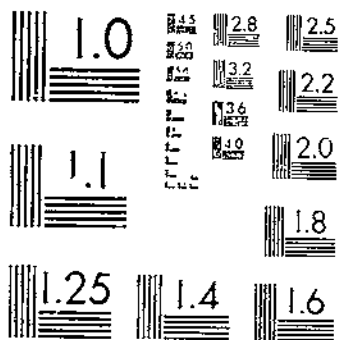
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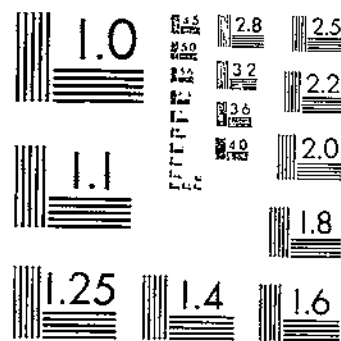
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TECHNICAL BULLETIN No. 459

APRIL 1935

# CLASSIFICATION OF WHEAT VARIETIES GROWN IN THE UNITED STATES

By

J. ALLEN CLARK  
Senior Agronomist

and

B. R. BAYLES  
Associate Agronomist  
Division of Cereal Crops and Diseases  
Bureau of Plant Industry



SEP 4 - 1935

UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.





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WASHINGTON, D. C.

# CLASSIFICATION OF WHEAT VARIETIES GROWN IN THE UNITED STATES<sup>1</sup>

By J. ALLEN CLARK, senior agronomist, and B. B. BAYLES, associate agronomist,  
Division of Cereal Crops and Diseases, Bureau of Plant Industry

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## NEED FOR CLASSIFICATION

The varieties of wheat grown in the United States show a great diversity of type. This diversity is natural, as wheat is produced commercially in most of the 48 States of the Union under a wide range of environmental conditions. More than 200 distinct varieties are grown. Many of these are adapted only locally, while others are well adapted to a wide range of varying conditions. Adaptation of varieties is an important factor, as it affects the yield and profitability of the crop and the standardization of varieties. The choice of varieties for given conditions and purposes is therefore usually given careful consideration by growers. The choice is partly dependent, however, upon the determination of identity.

The identification of varieties requires some knowledge of the appearance of plant and kernel and is assisted by information regarding history or distribution. Wheat varieties are most generally designated by names, which are established through publication and usage. The association of a name with a recognized type of wheat enables identification. Confusion in names is frequent in the United States, where the number of varieties is very large. This confusion occurs in two principal ways: (1) The same name is applied to distinctly different varieties in different parts of the country, and

<sup>1</sup> This bulletin is a revision of and supersedes Department Bulletin 1074, Classification of American Wheat Varieties.

(2) the same variety is grown under several different names in different parts of the country or even in the same part. Identification is difficult in cases of similar or closely related varieties and is confused by the multiplicity of names. Inability to identify varieties leads to duplication in varietal experiments and the fraudulent or unknowing exploitation of old varieties under new names.

There is need, therefore, for a practical and usable system of classification that will standardize the varietal nomenclature and enable growers to identify varieties with which they are concerned. The purpose of this bulletin is to provide such a classification of the wheat varieties that are grown commercially in the United States or may be so grown soon. The classification has been made by using only such characters as can be distinguished by the naked eye, no instrument other than a measuring rule having been used in the investigations. The names of varieties have been standardized in accordance with a code of nomenclature.

### PREVIOUS INVESTIGATIONS

More systematic study of wheat varieties has been done by foreign investigators than by workers in the United States.

### FOREIGN CLASSIFICATIONS

The existence of many different varieties of wheat has been recognized for more than 2,300 years. Theophrastus (307),<sup>2</sup> a pupil of Plato, in his Enquiry into Plants, written about 300 B.C., states:

There are also many kinds of wheat which take their names simply from the places where they grow, as Libyan, Pontic, Thracian, Assyrian, Egyptian, Sicilian. They show differences in color, size, form, and individual character, and also as regards their capacities in general and especially their value as food.

Theophrastus mentioned many of the differences between these kinds of wheat. In the writings of Varro, Pliny, and Columella, in the first century B.C. and the first century A.D., the observations of Theophrastus were repeated, rearranged, and amplified. Columella, who wrote about 55 A.D. (72, translated 1745), presents these previous observations and his own, as follows:

*Triticum*, common bare wheat, which has little husk upon it, was, according to Varro, a name given formerly to all sorts of grain beaten or bruised out of ears by trituration or threshing; but afterwards it was given to a peculiar species of grain, of which there are many sorts, which take their name from the places where they grow; as *African*, *Pontic*, *Assyriac*, *Thracian*, *Egyptian*, *Sicilian*, etc., which differ from one another in color, bigness, and other properties, too tedious to relate. One sort has its ears without beards, and is either of winter or summer. Another sort is armed with long beards, and grows up sometimes with one, sometimes with more ears. Of these the grains are of different sorts: some of them are white, some reddish, some round, others oblong, some large, others small. Some sorts are early ripe, others late in ripening; some yield a great increase, some are hungry, and yield little; some put forth a great ear, others a small. One sort stays long in the hose (*folliculo*); another frees itself very soon out of it. Some have a small stalk or straw; others have a thick one, as the *African*. Some are clothed with few coats, some with many, as the *Thracian*. Some grains put forth only one stalk, some many stalks. Some require more, some less time to bring them to maturity. For

<sup>2</sup> Italic numbers in parentheses refer to Literature Cited, p. 147.

which reason some are called *trimestrian*, some *bimestrian*; and they say, that, in *Euboea*, there is a sort, which may be brought to perfection in 40 days; but most of these sorts, which ripen in a short time, are light, unfruitful, and yield very little, though they are sweet and agreeable to the taste and of easy digestion.

In the early Roman literature mentioned reference is found to two groups of wheat, namely, *triticeum* and *adoreum*, or *far*. Columella referred to the *far* as bearded wheat. The grain of *triticeum* was separated from the chaff in threshing, while that of *far* was not, indicating that the former consisted of true wheats, while the latter was emmer or spelt.

Columella himself recognized three types of *Triticum*, *robustus* (red), *silago* (white), and *trimestrian* (spring), and in addition four types of bearded wheat (spelt or emmer), viz:

*Clusianum*, of a shining, bright, white colour; a bearded wheat, which is called *veniculum*. One sort of it is of a fiery red colour and another sort of it is white; \* \* \*. The *trimestrian seed*, or that of 3 months growth, which is called *halicacrum* \* \* \*.

It is evident from these quotations that many of the leading characters of the wheat plant were recognized in this early period. What attention was given to studies of wheat during the Dark Ages no one can say. With the revival of learning the botanists and medical men began the publication of the folio and royal octavo herbals, many of them illustrated with woodcuts. In these, wheat species were included, the forms mostly being those described by Theophrastus, Pliny, and Varro, but from time to time new ones were added. There is little advantage in trying to guess what particular form of common wheat each so-called species represented. More recent botanical writers described species that can now be recognized. Principal among these writers was Tournefort (212), who in 1719 listed 14 species of *Triticum*.

The classification of wheat practically began with the work of Linnaeus (Linné) in 1753. In his *Species Plantarum* (148) he described seven species of *Triticum*, viz: *T. aestivum*, *T. hybernum*, *T. turgidum*, *T. spelta*, *T. monococcum*, *T. repens*, and *T. caninum*. The two latter species have since been included in another genus. In the second edition of the *Species Plantarum*, published in 1764, he described six species that are still included in the genus *Triticum*, viz: *T. aestivum*, *T. hybernum*, *T. turgidum*, *T. polonicum*, *T. spelta*, and *T. monococcum*, the species *T. polonicum* having been added. Linnaeus divided the common wheat into two species, *T. aestivum*, awned spring, and *T. hybernum*, awnless winter, apparently believing that all spring wheats were awned and all winter wheats awnless. Writers who followed him usually have not recognized these distinctions.

Lamarek, in 1786 (136), created the species *Triticum sativum* to include both the species *T. aestivum* and *T. hybernum* that Linnaeus had adopted. Each species and subspecies was described according to the presence or absence of awns, the color and covering of the glumes, the color, size, and density of the kernels, the solidity of the stem, and several other characters.

Villars, in 1787 (217), divided the common wheats into two species, *Triticum vulgare* and *T. touzelle*. The latter consisted of awnless wheat having white kernels.

Schrank, in 1789 (186, v. 1, pp. 387-389), arranged the cultivated wheats in three species. For common wheat he established the name "*Triticum cereale*" and placed *T. aestivum* L. and *T. hybernum* L. under it as varieties. The second species was *T. spelta* L. and the third *T. dicoccum* Schrank, the cultivated emmer.

Desfontaines, in 1800 (75), established the species *Triticum durum* for the group of wheats having long awns and long vitreous kernels.

Kost, in 1805 (119), described and named the species *Triticum compactum* to include the club wheats and in addition recognized 10 other species of the genus *Triticum*.

Seringe, in 1819 (190), arranged the common and club wheats together into 10 groups based on lax or dense and awned or awnless spikes, white or brownish kernels, and glabrous or pubescent glumes. He listed varieties from Switzerland, France, Germany, and England.

Metzger, in 1824 (146), at Heidelberg, followed essentially the same system as Seringe, but in addition considered winter or spring habit of growth. The 10 groups of Seringe were further subdivided, making 18 groups. The kernels were described as white, yellow, and reddish.

Metzger, in 1841 (147), reedited his classification of 1824, making some changes and adding more varieties.

Seringe, in 1841 (191), published a revision of his previous work of 1818, in which he classified and partly described a large number of varieties of wheat.

Alefeld, in 1866 (27), classified the wheats into two genera and species, *Triticum vulgare* and *Dein polonica*. The latter contained four subspecies or varieties of Polish wheats, *T. polonicum*, while the former was divided into many subspecies and varietal groups containing all other species of *Triticum*. Each of these was described in detail.

Heuzé, in 1872 (112), grouped the wheats into seven species. He listed 700 varietal names of wheat, 602 of which belonged to the species *Triticum sativum*, which included both common and club wheats. He described 47 varieties in this species, while the remaining 555 names were considered as synonyms.

Koernicke, in 1873 (134), and Koernicke and Werner, in 1885 (135), prepared the most complete classification of wheat yet published. They followed Alefeld's system of applying Latin names to the botanical groups. The groups keyed by them included 22 of *vulgare*, 21 of *compactum*, 26 of *turgidum*, 24 of *durum*, 12 of *spelta*, 20 of *dicoccum*, 21 of *polonicum*, and 4 of *monococcum*. Named varieties included in each botanical group were described in detail, and the history, synonyms, and source of each were given. Much of this latter information had been published in the works of Alefeld and Heuzé.

Harz, in 1885 (105), classified and described a large number of wheats in a manner similar to that of Koernicke and Werner. The common and club wheats were considered as a single species.

Hackel, in 1887 (102), classified the genus *Triticum* according to a key very similar to the one adopted by Koernicke and Werner. Hackel recognized three species, *sativum* Lam., *monococcum* L., and *polonicum* L.; and three races of *sativum*, namely, *spelta*, *dicoccum*, and *tenax*. In the latter he included *vulgare*, *compactum*, *turgidum*, and *durum* as subraces.

Vilmorin, in 1889 (218), grouped the wheats into 50 sections, according to their leading characters. Each section was briefly described and the synonyms were given. The common and club wheats were considered as one species.

Eriksson, in 1895 (87), subdivided the botanical groups of Koernicke and Werner into smaller groups, which he called subvarieties, based chiefly on the density of the spike, the thickness of the kernel, and the length of the rachis. He also gave an excellent review of the literature on wheat classification.

Heuzé, in 1896 (119), published a second edition of his *Les Plantes Céréales*, in which were included rather complete histories and descriptions of the varieties of wheat.

Cobb, in 1896 (67), keyed 54 varieties of wheat that he was growing in New South Wales, Australia, using the leading plant, spike, and kernel characters. In 1905 (70) he proposed to classify wheat varieties by a microscopic examination of the aleurone layer.

Howard and Howard, in 1909 (121), classified the wheats of India largely according to the methods of Koernicke and Werner and of Eriksson. They (120) also considered in detail the characters used in classification.

Richardson, in 1913 (170), described many of the wheats of Australia and gave the history of each variety. He did not arrange them in a classified order.

Flaksberger, in 1915 (89), published extensive treatises on the taxonomy of Russian wheat forms.

The Union of South Africa in 1919 (197) published descriptions and synonyms of the wheat varieties of South Africa and also designated the areas where the varieties should be grown in that country.

Ducellier, in 1920 (82), published a classification and description of the wheats of the Hoggar and oasis regions of Algeria. Only a few varieties were fully described.

The Institute of Science and Industry, of Australia, in 1920 (30), classified and described 48 of the leading wheats of Australia in a manner similar to that used by the writers.

Percival, in 1921 (161), described and classified a large number of wheat varieties of the world and discussed fully the morphology of the wheat plant.

The Institute of Science and Industry, of Australia, in 1923 (31), revised and extended the classification of 1920 to include 82 varieties. Data were also presented on the agricultural characters of these varieties.

Newman, in 1928 (159), discussed the value of characters used by Clark, Martin, and Ball (59) for classifying Canadian varieties and reported extensive studies on the effect of environment on glume characters and on variability in Marquis seed stocks.

Papadakis, in 1929 (159), published a classification of the wheats grown in Greece.

Vavilov et al., in 1931 (216), published a "contribution to the knowledge of the 28 chromosomes group of cultivated wheats."

Gurney, in 1932 (101), published a key and detailed descriptions for the wheat varieties grown in South Australia.

McMillan, in 1933 (145), presented a genealogical chart showing the history of Australian wheat varieties.

Voss, in 1933 (219), described and grouped the wheat varieties of Germany.

Zhukovsky, in 1933 (232), published a botanical classification of the wheat varieties of Anatolia.

Hudson, in 1933-34 (122), described and classified the wheat varieties of England.

#### DOMESTIC CLASSIFICATIONS

Harmon, in 1844 (105), published descriptions and histories of about 30 varieties of wheat that he had grown in Monroe County, N.Y.

Klippart, in 1858 (133), described a large number of wheat varieties grown in Ohio and grouped them into a partly classified order.

Todd, in 1868 (211), described a number of wheat varieties, most of the descriptions, however, being obtained from agricultural literature of the time. He suggested that the Government "take hold of this subject [the nomenclature of wheat] in a proper manner and establish a common standard of merit and an intelligible description of each variety \* \* \*"

Killebrew, in 1877 (132), described a number of American wheats, most of which had been described previously by Klippart or Todd. He grouped the varieties into two families, winter wheats and spring wheats. The winter wheats were divided into six classes based upon their kernel characters, white, amber, and red, and upon the awned or awnless character. The spring wheats, which were all regarded as being awned, were placed in three classes, with white, amber, or red kernels.

Tracy, in 1881 (213), listed a number of wheat varieties grown by him at the Missouri Agricultural Experiment Station. The varieties were partly described, showing the "bearded" or "smooth" heads and the color and size of the kernels. He mentions several varietal names as being synonyms.

Devol, in 1887 (76) and in 1888 (77), published a classification of the wheat varieties being grown at the Ohio Agricultural Experiment Station. This classification was further developed by Hickman (114), who in 1889 divided the varieties into eight morphological groups.

Plumb, in 1889 (162), described a large number of wheat varieties, chiefly American, and gave the histories of many of them.

Blount, in 1892 (40), listed 478 varieties of wheat that he was growing experimentally in New Mexico. Histories of some of these were given.

Carleton, in 1900 (50), summarized the varietal information of that time, listed about 350 varieties, gave their source by countries and their principal characters, and grouped them by districts of the United States to which they are best adapted.

Scofield, in 1902 (137), classified and described a large number of durum wheats grown in Algeria, many of which were introduced into the United States about 1901. He also described the characters used in classification. In 1903 Scofield (138) prepared a detailed list of characters to be used in the description of wheat varieties. He did not publish the descriptions of any varieties at that time.

The application of the terminology was partly illustrated by plates accompanying the article.

Williams, in 1905 (229), listed and partly described about 60 varieties of wheat that were under experiment at the Ohio Agricultural Experiment Station at that time.

Hume, Center, and Hegnauer, in 1908 (123), briefly classified the wheat varieties grown in experiments in Illinois and gave the history and partial descriptions of some of the Russian and American varieties.

Scherffius and Woosley, in 1903 (185), published illustrations of 36 varieties of wheat grown by the Kentucky Agricultural Experiment Station.

Noll, in 1913 (155), presented a tabular description of varieties grown by the Pennsylvania Agricultural Experiment Station.

Leighty, in 1914 (140), gave a list of the leading varieties of wheat grown in the eastern half of the United States, arranging them in classified groups by kernel and spike characters.

Schafer and Gaines, in 1915 (183), recorded brief descriptions of the principal wheat varieties of Washington, together with their histories.

Nelson and Osborn, in 1915 (152), gave a brief tabular description of the wheat varieties grown at the Arkansas Agricultural Experiment Station during the period from 1908 to 1914.

Reisner,<sup>2</sup> in 1915, compiled much valuable information on the description and history of New York varieties.

Ball and Clark, in 1915 (32), presented keys to the groups of hard red spring wheat and the durum wheats grown in the United States and described and gave the histories of the more important varieties.

Carleton, in 1916 (52), listed the leading wheat varieties of the world, including American varieties. They were grouped into the botanical groups used by Koernicke and Werner. No attempt was made to distinguish between the closely related agricultural varieties.

Stanton, in 1916 (201), grouped a large collection of wheat varieties grown in experiments in Maryland and Virginia in accordance with some of the most obvious taxonomic characters.

Jones, in 1916 (128), presented a brief key to the groups of common spring and durum wheats grown in experiments in Wyoming.

Ball and Clark, in 1918 (35), published a key to the groups and varieties of durum wheat grown in the United States.

Grantham, in 1918 (99), listed a large number of varieties that were being grown at the Delaware Agricultural Experiment Station and stated whether they were bearded or smooth, the color of the grain and chaff, the height of the plant, and the weight of the kernels.

Clark, Stephens, and Florell, in 1920 (65), gave a tabular description of over 150 samples of Australian wheat varieties grown in experiments in the Pacific coast area of the United States.

Clark, Martin, and Smith, in 1920 (62), keyed the groups of common spring and durum wheat grown in experiments in the northern

<sup>2</sup> REISNER, JOHN H. WHEAT IN NEW YORK, 1915. Unpublished thesis, Cornell University. The writers wish to acknowledge here the use of this manuscript, credit being due to both the author and the Farm-Crops Department of Cornell University.

Great Plains area of the United States and gave the histories of the principal varieties.

Stewart, in 1920 (204), presented keys and brief descriptions of the commercial wheat varieties grown in Utah.

Clark, Martin, and Ball, in 1922 (59), presented detailed keys, descriptions, histories, distributions, and synonyms of the wheat varieties grown commercially in the United States.

Schafer, Gaines, and Barbee, in 1926 (184), keyed and presented tabular descriptions of the wheat varieties of Washington.

Hill, in 1930 (117), presented the results of a survey showing the percentage of the total production for the wheat varieties grown in each county in Oregon in 1929.

Gaines and Schafer, in 1931 (94), presented results of a similar survey for Washington, giving the percentages of the total acreage and production for the varieties in each county in that State in 1929.

The Northwest Crop Improvement Association of Minneapolis, Minn. (H. R. Sumner, secretary), issued a Dictionary of Spring Wheat Varieties in the United States in 1933 (156).

#### SUMMARY OF PREVIOUS CLASSIFICATIONS

From the beginning of botanical classification there was a tendency to regard the different forms of wheat as distinct species. Toward the end of the eighteenth century, there became evident a tendency toward the more reasonable view that comparatively few species were involved and that the evident major groups were mostly to be regarded as subdivisions of the species *sativum* of Lamarck or *vulgare* of Villars.

The making of botanic species of wheat was carried to great lengths by the botanists of 100 to 200 years ago, who did not recognize that the characters sufficient to separate species of wild plants were sufficient to separate only agronomic and horticultural varieties of domesticated plants. Before this fact was recognized and botanists very largely had ceased to deal with the forms of cultivated plants, some 50 or 60 supposed species of wheat had been described.

In the works of most of the botanists there was little effort to study and describe the farm varieties of wheat. However, Heuzé, Koernicke and Werner, Eriksson, Richardson, and others described many varieties, and some of their descriptions were fairly complete. No attempt had been made, however, to show by detailed keys and by uniform descriptions the minor differences that separate closely related varieties.

There has been wide diversity among botanists in the taxonomic use of the various morphological characters of the wheat plant and seed. Only a few authors have given attention to the winter or spring habit of growth in wheat varieties. Some, as Eriksson, have placed undue importance on differences in spike density. Many writers have made no use of the colors of the seed coat in separating varieties.

The classification of Koernicke and Werner is the most extensive and the first one that made a definite attempt to describe and classify foreign and domestic farm varieties. While conservative as to the extent of reduction of the number of species, these authors still



maintained a complete Latin nomenclature for forms as far as the fifth rank. In their discussions they, as well as other investigators named, were handicapped through making their studies in only one locality. In the present work, the varietal descriptions are based on the expression of each variety under widely varying conditions of environment in the United States.

### PRESENT INVESTIGATIONS

The present investigations were started in 1915<sup>4</sup> with the object of making a classification of the wheats of the world. During the first 2 years much time was devoted to a study of foreign varieties and several hundred introductions were added to the large collection of foreign wheats previously obtained. In the third year the study was devoted largely to diverse botanical types obtained from hybrids or distinct types found as mixtures in wheat fields in the western part of the United States. It was soon found, however, that if the studies were to be of economic value they must be limited to the principal cultivated varieties. All available domestic varieties were first grown in classification nurseries, where they were studied, described, and classified, and herbarium specimens were prepared and preserved in a classified order. New varieties were added from time to time as soon as they became known, and each year varieties studied during the preceding season, together with the new ones, were grown to allow comparisons. By this means the classification became more complete each year.

Clark, Martin, and Ball, in 1922 (59), presented descriptions, histories, distributions, and synonyms of 230 varieties grown up to 1919. The present publication includes 77 new varieties, and 68 of the 230 varieties are omitted.

### CLASSIFICATION NURSERIES

The classification nurseries were grown in widely separated sections of the United States. This was necessary in order to determine the expression of varietal differences under many environments and thus provide a classification that would be usable wherever the varieties happened to be grown. It also guarded against the loss of certain varieties. During the 10 years 1915 to 1920 and 1930 to 1933 more than 30,000 separate sowings were made. Most of these were made at experiment stations in the western part of the United States. Nearly all nurseries grown from 1930 to 1933 preparatory to the revision of Department Bulletin 1074 (59) were sown at the Pendleton Field Station, Pendleton, Oreg., and at the Idaho Agricultural Experiment Station, Moscow, Idaho. Smaller sowings were made at Stillwater, Okla.; Davis, Calif.; and New Brunswick, N.J. At western points weather conditions are much better for classification purposes than at eastern points. The absence of summer rains in the Western States is the principal reason for this, as plant characters and colors are more distinctly developed. The nurseries

<sup>4</sup>The plan to classify wheat varieties was evolved by Carleton R. Ball, then agronomist in charge of western wheat investigations, Office of Cereal Investigations, Bureau of Plant Industry.

were sown in short rows, usually not exceeding 5 feet in length and a foot or 18 inches apart. At the stations where all varieties were grown from both fall and spring sowing, each variety was seeded in the spring on one end of the row sown in the fall. Plate 1 shows portions of the classification nurseries at Corvallis, Oreg.

#### ASSISTANCE RECEIVED

The first important task was to obtain samples of the different wheat varieties. This was accomplished with the assistance of many individuals and institutions.

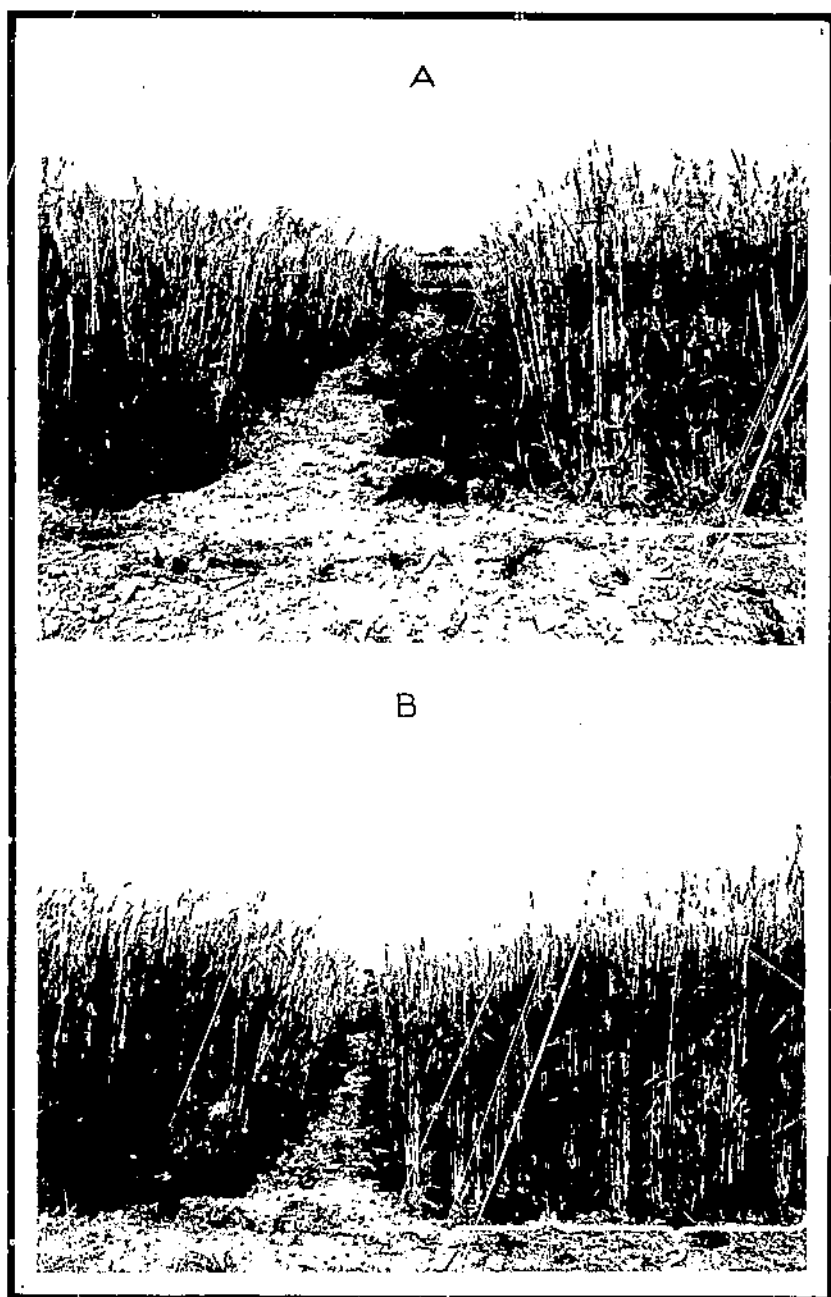
The classification nurseries at the various stations usually were sown by local representatives. The local men also took notes on emergence, heading, ripening, and height of the many varieties. During the summer the writers visited the various points and took additional notes on the characters of the varieties. The descriptions of the varieties were written largely in the field, and from these descriptions keys were designed to distinguish the different varieties. The descriptions were checked and rechecked at the various points, and the different descriptive classes were established on a basis that is believed to be broad enough to include the varieties wherever grown.

#### NATURE OF THE MATERIAL

The early studies showed the necessity of working with spike or plant selections. When bulk seed was used it often consisted of mixed varieties, and a wrong description might easily become applied to a variety. The same variety often was represented by different lots of seed obtained from different sources. These were distinguished by different C.I. numbers, which are accession numbers of the Division of Cereal Crops and Diseases. The varieties, however, have always been known by names rather than by numbers. The nursery outlines also contained columns showing the source of the seed sown and the original source of the variety. In addition, they showed whether the seed sown was bulk grain or a selection, and, if a selection, whether the same selection was sown at all stations or whether different selections were used. In this way it was easily possible to compare field notes accurately with those of the previous year or to account for differences that existed in material of the same name at different stations in the same year. This latter condition often occurred when bulk grain or different selections were used. Natural hybrids also thus were easily distinguished from mixtures.

After growing different seed lots of the same variety for a few years, one was selected as the standard for the variety. The descriptions here recorded, therefore, should represent the true type of the variety. In certain cases, however, material was limited to samples obtained from only one or two sources, and in these cases the judgment of the writers in selecting the strain to represent the variety may not be so accurate as where more samples of the same variety were available.

Many varieties here described are badly mixed in commercial fields wherever they are grown. Mention of this sometimes is made



Wheat-classification nursery at Corvallis, Oreg., in 1929. *A*, Varieties of winter wheat grown from spring (1) and fall (2) sowing. *B*, Varieties of spring wheat grown from spring (1) and fall (2) sowing.

in the descriptions. In many cases this will account for differences observed between a variety as commonly grown and its description as here recorded. In other cases, all the characters here recorded may not become apparent in some localities, and this may cause some confusion. The failure of stem and glume colors to develop in some sections is an example of this.

Natural crossing between wheat plants occurs quite commonly in some sections of the United States. This natural crossing has caused some difficulty in describing varieties, especially because hybridization between closely related varieties could not always be detected.

Several hundred mixtures obtained from experimental plots and commercial fields were grown in the classification nurseries for identification. A few proved to be mechanical mixtures of varieties grown in the locality, but most of these were new types. These probably originated, for the most part, from natural hybrids, with possibly an occasional mutation. Many of the types continued to segregate, thus proving their hybrid origin. Many of them closely resembled commercial varieties but were not identical in all characters.

Nearly every field of wheat contains some plants that cannot be identified. Many of these, in all probability, are natural hybrids or mutations.

### DESCRIPTIONS, HISTORIES, AND DISTRIBUTIONS

For each variety there are given the description, the history so far as known, the distribution in the United States, and the synonymy.

#### DESCRIPTION

The detailed descriptions, which include the more important taxonomic characters, contain much more information than do the keys. They are not complete, however, as several of the characters of the wheat plant are omitted because they are of little or no value in classification. The descriptions are thought to be sufficiently inclusive to provide a comprehensive knowledge of the different varieties.

Following the description of many varieties is a paragraph showing the chief characters that distinguish the variety from closely related ones, and in some cases mention is made of known resistance to diseases and of high or low baking properties or other qualities.

#### HISTORY

The history of the origin of varieties cannot be neglected in a classification, as many varieties are scarcely or not at all distinguishable from similar or closely related varieties and differ only in their origin and qualities. In this study much attention has been given to the history of varieties, and to many readers it probably will be the most interesting and valuable part of the classification. The compiling of these histories has required a review of the literature on wheat varieties written during a period of more than 200 years. The sources of this information are varied. Introductions of foreign varieties have been recorded by the Division of Plant Exploration and Introduction, Bureau of Plant Industry. Frequent refer-

ence is made to the accession numbers and published inventories of that Division. Many bulletins of the State agricultural experiment stations contain valuable information on the origin of domestic varieties. Agricultural papers have been reviewed, and much information as to the origin of varieties has been obtained from that source. There is still much to learn concerning the origin of cultivated varieties. The origin of many probably has never been recorded, but of some for which the origin has not been determined there probably is a recorded history somewhere.

#### DISTRIBUTION

The commercial distribution and production of different varieties are the economic factors with which this classification is concerned. Those varieties that are most widely grown usually are the most valuable. Varieties that are more productive may be in existence, but until they become known and widely grown they are of little value. New varieties are being continually produced. Some are of little or no value. Others are an improvement over the older standard varieties, as their use improves the quality or increases the efficiency of production.

To determine the acreage and distribution of the commercial varieties of wheat in the United States, surveys have been made in co-operation with the Bureau of Agricultural Economics. By means of these surveys a record of the increase of new varieties and the decrease of old varieties is made possible.

The first varietal survey was made in 1919 on the basis of the preliminary wheat acreage figures reported in the Fourteenth United States Census (1920) and was published in Department Bulletin 1074 (59). A second survey, made in 1924, was based on the wheat-acreage figures reported in the special agricultural census of 1925, and the results were published in Department Bulletin 1498 (61). Circular 283 (64) gives information obtained from a third survey, made in 1929, which was based on the wheat-acreage figures reported in the Fifteenth United States Census (1930).

In 1919, 1924, and 1929, respectively, 139, 152, and 190 distinct varieties were reported. Two hundred and twenty-three varieties were reported in the three surveys, the lists not being identical. In the 1929 survey 46 new varieties were reported for the first time and 33 varieties reported in previous surveys were dropped. A few additional varieties are here included that are known to have been grown on small acreages since 1929, although they were not reported.

The acreage and distribution of the various wheat varieties were determined by means of questionnaires or schedules sent to crop correspondents of the Division of Crop and Livestock Estimates, Bureau of Agricultural Economics. The method of conducting the surveys is described by Clark and Quisenberry (64).

Maps have been made to show the acreage distribution of the more important varieties, the county acreage having been used as a basis. The scale used on the varietal maps is 1 dot for 1,000 acres or less per county. The complete distribution of a given variety is shown by a dot in each county from which the variety was reported, even though less than 500 acres were grown in a county.

## VARIETAL NOMENCLATURE

A standardized nomenclature is important because names are frequently used by agronomic workers, growers, seedsmen, and the grain trade. The form and appropriateness of these names, therefore, are of general interest. It is desirable that they be short, simple, and appropriate, easily spelled and pronounced. It also is desirable that, as far as possible, a single name be accepted and used for each recognized variety.

The multiplication of names and other designations for crop varieties has sometimes been carried to extremes, resulting in great confusion. Some varietal designations are merely descriptive phrases that are often long and cumbersome. Others are only numbers, which sometimes are equally long and cumbersome or are easily confused. Because of this condition, a code of nomenclature was proposed by Ball and Clark (36) and presented to the American Society of Agronomy at its annual business meeting on November 13, 1917. With a few minor changes, the code was adopted as follows:

## CODE OF NOMENCLATURE

1. **ELIGIBILITY TO NAMING.**—No variety shall be named unless (a) distinctly different from existing varieties in one or more recognizable characters, or (b) distinctly superior to them in some character or qualities, and (c) unless it is to be placed in commercial culture.
2. **PRIORITY.**—No two varieties of the same crop plant shall bear the same name. The name published (see par. 4) for a variety shall be the accepted and recognized name except in cases where it has been applied in violation of this code.
  - A. The term "crop plant", as used herein, shall be understood to mean those general classes of crops which are grouped together in common usage without regard to their exact botanical relationship, as corn, wheat, sorghum, cotton, potato, etc.
  - B. The paramount right of the originator, discoverer, or introducer of a new variety to name it, within the limitations of this code, shall be recognized.
  - C. Where the same varietal name has become thoroughly established for two or more varieties, through long usage in agronomic literature, it should not be displaced or radically modified for either one, except where a well-known synonym can be substituted. Otherwise the varieties bearing the same name should be distinguished by adding some suitable term which will insure their identity.
  - D. Where several well-established names are used for the same variety the list of synonyms shall be submitted to some committee of the American Society of Agronomy. This committee shall choose the name which it deems most suitable, observing the established Code of Nomenclature.
  - E. Existing American varietal names which conflict with earlier published foreign names for the same or different varieties but which have been thoroughly established through long usage shall not be displaced unless long-used and available synonyms exist.
  - F. It is recognized that certain strains of varieties may occur which do not differ from a standard variety in recognizable characters, but may differ in yield, adaptation, or quality and are entitled to recognition by a distinct name. Such strain shall be given a new name, but the name of the type variety in parentheses should follow.
3. **FORM OF NAMES.**—The name of a variety shall consist of a single word, except where it conflicts with rule 2, C or E.
  - A. Varietal names shall be short, simple, distinctive, and easily spelled and pronounced.

- B. A varietal name derived from a personal or geographical name should be spelled and pronounced in accordance with the rules governing in the case of the original name.
- C. The name borne by an imported foreign variety should be retained, subject only to such a modification as is necessary to conform it to this code.
- D. The name of a person should not be used as a varietal name during his lifetime. The name of a deceased person should not be so used except by the official action of this or other competent agronomic bodies. Personal names in the possessive form are inadmissible.
- E. Names of stations, States, or countries, in either the noun or adjective form, should not be used as varietal names, except in unusual cases where the name is well established.
- F. Such general terms as hybrid, selection, seedling, etc., should not be used as varietal names.
- G. A number, either alone or attached to a word, should not be used as a varietal name, but considered as a temporary designation while the variety is undergoing preliminary testing.
- H. Names which palpably exaggerate the merits of a variety shall be inadmissible.
- I. In applying the provisions of this rule to varietal names which have become firmly established in agronomic literature through long usage, no change shall be made which will involve loss of identity.
4. PUBLICATION.—A varietal name is established by publication. Publication consists (1) in the distribution of a printed description of the variety named, giving its distinguishing characters; or (2) in the publication of a new name for a variety properly described elsewhere, such publication to be made in any book, bulletin, circular, report, trade catalog, or periodical, provided the same bears the date of issue and is distributed generally among agronomists and crop growers; or (3) in certain cases the general recognition of the name for a commercial variety in a community for a number of years may be held to constitute publication.
- A. Where two or more admissible names are given to the same variety, in the same publication, that which stands first shall have precedence.
5. REGISTRATION.—After a classification is made, and names assigned according to the code, and the same has been officially adopted by this society, no new names shall be recognized by the society except by registration. Registration shall consist in the introducer submitting to the secretary of the American Society of Agronomy, or some properly authorized committee, a sample of seed, together with a full statement and evidence setting forth reasons why the variety is entitled to a new name. The society (or committee) shall then have sufficient time in which to grow the crop in trial grounds and thoroughly examine the claims before reporting on the new name.
6. CITATION.—In the full and formal citation of a varietal name, the name of the author who first published it shall be given when the same can be determined.
7. REVISION.—No properly published varietal name shall be changed for any reason except conflict with this code, nor shall another variety be substituted for that originally described thereunder.

Since the adoption of this code simple names have been given to most of the new American varieties. Examples are Ashland, Ceres, Forward, Honor, Kota, Komar, Minturki, Nodak, Oro, Reward, and Redit.

#### VARIETAL NAMES CHANGED

Many changes were made in the nomenclature of wheat varieties in Department Bulletin 1074 (59). Principal among these are Turkey for Turkey Red, Preston for Velvet Chaff, Dixon for Humpback II, and Pentad for D-5. The code provides that, if desirable, revision should be done, but without losing the identity of the name of the variety. Revision was absolutely necessary in some cases, in order to avoid duplication of names and confusion; and in other cases it was desirable to simplify and standardize the nomenclature.

In the present classification the following changes seem necessary: Oregon Zimmerman for Zimmerman, and Powerclub for Power Club.

#### REGISTERED VARIETIES

Through a cooperative agreement between the Bureau of Plant Industry and the American Society of Agronomy, the 230 varieties described in Department Bulletin 1074 (59) were registered (57) as standard varieties, and 43 additional varieties originated since, through introduction, selection, or hybridization, have been registered as improved varieties (56, 58, 63). These are mentioned in the history of all registered varieties.

#### SYNONYMY

Many varieties are known by several names. The names here used for the recognized varieties are the original names or the names now most commonly used or are the new or simplified names, as provided for by the code of nomenclature. All other names used for the varieties here described are considered synonyms.

### THE WHEAT PLANT

The different cultivated varieties of wheat vary greatly in their habit, form, and structure, but all are annual grasses. The principal parts are the roots, culms, leaves, and spikes. There are two sets of roots, the first or seminal or seed roots, and the second or coronal roots, the latter rising from the crown of the stem. The culm usually is a hollow, jointed cylinder comprising 3 to 6 nodes and internodes. The upper internode of the culm, which bears the spike, is called the peduncle. The leaves are composed of the sheath, blade, ligule, and auricle. The spike is made up of the rachis and spikelets, the latter in turn comprising the rachillas, glumes, lemmas, paleas, and the sexual organs (the three stamens and the single ovary with its style and stigma). Each of these parts may show distinct characters in different varieties. Those characters that do not vary in different varieties or are not readily observed are of little value in classification. The root characters, for example, which are not apparent, cannot be conveniently used, and no attention has been given to them in this work. Other characters, such as those of the sheaths, ligules, and auricles, are not generally used because they show very slight differences in different varieties.

The keys and descriptions used here to distinguish and identify varieties are based on characters that show considerable variation and therefore are of value.

#### TAXONOMIC CHARACTERS

The following pages present in detail such taxonomic characters of the wheat plant as have been found in the present study to be most useful. The characters used to distinguish the different species, subspecies, and lesser groups in the genus *Triticum* are often of no higher rank than the characters used to distinguish the cultivated varieties.



In the preparation of the key certain primary characters have been used in a regular sequence. These are designated as major characters and are printed in capitals. Certain other characters are used to separate further the closely related varieties. For this purpose any character is used that serves to distinguish the varieties under discussion. The same characters may not be used in two successive cases, and they are not used in any definite order. These minor characters are printed in ordinary type. The general principle followed in the choice of characters was to progress from those most easily observed and most often occurring to those least easily observed or least often occurring. The principle governing the sequence of characters is to progress from the absence of the character, as awnlessness, to the presence of the character, and from the smaller size to the greater.

The descriptions of the wheat varieties are arranged in a logical order of plant development. The major and minor characters used in the key are included in their proper places in the descriptions, as are many minor characters not used in the keys.

All the characters used in the keys and the descriptions of cultivated varieties are considered in the following paragraphs in the order of their appearance in the descriptions.

#### PLANT CHARACTERS

Certain plant characters that are genetically different in the several varieties are of value for classification purposes. These are the habit of growth, the period of growth, and the height of the plant.

#### HABIT OF GROWTH

All wheat varieties are here classified as having winter habit, intermediate habit, or spring habit of growth. In the keys to the cultivated varieties they occupy the seventh and last major position.

Varro (in Columella, 72), writing before the beginning of the Christian era, called the spring wheats *trimestrian*, because they matured in 3 months from sowing. Linnaeus (142) treated them as separate species in his *Species Plantarum*, but combined the awned factor with the spring habit in his species *aestivum* and the winter habit with the awnless factor in his species *hybernium*. Few agronomic writers have recognized these forms as distinct species. The existence of winter and spring forms has been recognized by most authors, but has not recently been used as a character for separating species or even as an important character for separating varieties. The writers consider these distinctions to be of less value for classification purposes than several spike and kernel characters, when the whole country is considered, although it is a very important separation in some areas. In the southern part of the United States, both east and west, several varieties of spring wheat are fall sown, and growers do not know whether they have a spring wheat or a fall wheat. The Purplestraw variety of the Southeastern States has a spring intermediate habit, although it has been grown from fall sowing in that section for more than 100 years. Nearly all the varieties grown in Arizona and California are spring wheats, but they are fall sown.

Hunt (194, p. 54) as late as 1909 claimed that winter and spring wheats can be changed from one form to the other.

Winter, intermediate, and spring habits of growth are now known to be inherited characters. They are the characters first shown in the descriptions, as they are first apparent in the growth of the plant. In the key the wheats having a winter habit are listed before those having a spring habit, because there are more fall wheats than spring wheats and because fall wheat is of much greater importance in this country than spring wheat.

The intermediate types retain a prostrate habit of growth in most localities when sown late in the spring, but will head normally when sown early. Early winter-wheat varieties also have a short prostrate or dormant period and, when early spring sown, begin heading soon after intermediate wheats have headed. There are also certain varieties of wheat commercially grown that are mixtures of growth-habit characters. These characters are not clear cut, as their expression depends upon temperature and date of seeding, but for the varieties reported in this bulletin the differences have been carefully determined by sowing varieties on one or more dates in the spring and observing their behavior. Varieties classified as winter wheats do not produce seed when sown at normal dates for spring seeding. Winter wheats can be successfully produced in the principal wheat areas of this country only from fall sowing. When spring sown they usually remain prostrate on the ground throughout the growing season and produce no culms or spikes. In some sections, or in some years, or when sown very early, winter-wheat varieties when spring sown will head and produce seed, but heading in such cases is often irregular and usually occurs very late in the season.

All varieties of wheat classified as spring wheats can be successfully grown from fall sowing only in mild climates, such as the southern parts of the United States and in the Pacific Coast States. In parts of this territory they will sometimes winter-kill. When spring sown their early growth usually is erect, and culms and spikes are produced during the early part of the growing season.

#### TIME OF HEADING AND RIPENING

The relative dates on which varieties head and ripen when sown at the normal time in regions where they are adapted are useful in identifying varieties. The heading date ordinarily is more useful than the ripening date. The relative order of maturity is indicated by classing varieties as early, midseason, or late. The relative time of heading and ripening is somewhat dependent on time of seeding and also varies somewhat in different areas. More than usual caution must therefore be exercised in making use of these characters.

#### HEIGHT

The height of the plant also is often an important factor in wheat production, because it may determine the method or ease of harvesting and the susceptibility of varieties to lodging. Height is measured from the surface of the ground to the tip of the spike, not including the awns of awned varieties. All varieties of wheat have been placed in three classes—short, mid-tall, and tall. These are characters of

minor value for classification and are used only for separating or distinguishing otherwise closely related varieties. The principles governing the grouping of varieties as early, midseason, and late apply here also. As an example, under California conditions wheats from 12 to 36 inches in height would be classed as short, wheats from 24 to 48 inches in height would be called mid-tall, and wheats from 36 to 60 inches high would be considered tall. In most other sections of the country these differences would not be so great. In order to use the height of the plant for classification, the height of certain varieties must be determined and used for comparison. There are also cases where the relative height is changed when the varieties are grown in different sections of the country; for example, some of the club wheats are usually short when grown east of the Rocky Mountains but relatively tall when grown west of these mountains.

#### STEM CHARACTERS

There are two characters of the stem of wheat varieties that are useful in classification, namely, color and strength.

#### COLOR

All varieties of wheat are here classified as having white or purple stems. These characters are of minor importance in classification, for in many localities and in some seasons the purple color common to a large number of wheat varieties does not become apparent. This often is the case under conditions of extreme drought and also under conditions of excessive moisture. Under favorable conditions, however, this stem color is very apparent during a week or 10 days in the ripening period. When apparent, the color differences are very useful in distinguishing varieties. The color is usually most apparent on the peduncle, or uppermost internode supporting the spikes, but often continues downward to the sheaths of the lower leaves.

Those varieties here described as having white stems may have a stem color ranging from a cream to a golden yellow. Few, if any, have stems that are truly white or with an absence of color.

The varieties classed as having purple stems may have a stem ranging in color from a pale violet to a dark purple. In some varieties this coloring may occur only in a short portion of the peduncle. It sometimes does not occur in the peduncle and is present only in the sheaths. Koernicke and Werner (195) used color differences in describing many of the varieties with which they worked. Heuzé (113, p. 54) pointed out the two contrasting characters, which he called "white" and "reddish."

#### STRENGTH

The strength of the stem usually is an important character. In many localities lodging is one of the most serious problems in wheat production, as many varieties lodge under conditions of excessive moisture. All varieties here discussed are classified into three groups, having weak, mid-strong, or strong stems, respectively. Stems classed as weak are also usually slender, with very thin walls.

Varieties with such stems have a greater tendency to lodge, which in turn causes harvest losses and increases the cost of harvesting. The successful cultivation of weak-stemmed varieties usually is limited to semiarid or arid regions.

The varieties classed as having mid-strong stems usually will not lodge under conditions where wheat is grown extensively. In this class are included the greatest number of varieties. A considerable variation exists within this group, and in humid or irrigated sections varieties here described as having mid-strong stems might more properly be classed as weak. In dry-farming sections certain of these stems might more properly be classed as strong.

The varieties here described as having strong stems are those that will not lodge readily under excessively humid conditions. Only by a severe rain, hail, or wind storm can the stems of these varieties be bent or broken down. Comparatively few of the cultivated wheats come in this class.

#### LEAF CHARACTERS

The principal parts of the leaves of wheat plants are the sheath, blade, ligule, and auricle. None of these parts usually show differences that are of even minor value for distinguishing cultivated varieties.

The blades of wheat varieties vary considerably in their dimensions, in the shade of green color, and in the angle to the culm maintained during the successive periods of growth. These differences, however, are apparent during only a short period. As the plant matures, the blades dry and frequently break off. In this bulletin very little use is made of leaf characters. A few varieties are noted as having especially broad or narrow blades or as being pubescent.

Koernicke and Werner (1935) and others have described the color of the blades of both the seedlings and the partly grown plants. This also was attempted in the present studies, but the differences were found to be so slight and undependable that no definite classes could be established by using the character. No two persons can agree as to the various shades of green shown by the blades of wheat, even when a standard color chart is used. The color varies with the condition of the plant as affected by the temperature, the soil moisture, and the soil solution. The appearance of the color is changed by the character of the venation and of the blade surface. The plants appear to have a different color in the sunlight from that in the shade, and the value changes also according to the position of the observer with regard to the direction of the rays of the sun. In general, the hard red winter wheats have dark-green blades, while all durum varieties have blades with a light-green color.

The blade widths are mentioned in describing only a few varieties, because nearly all varieties are very much alike in this character. The hard red winter wheats are distinctly narrow-leaved, while soft varieties, like Sol and Red Russian, have wide leaf blades. Winter varieties having the narrowest blades usually are most winter-hardy. The length of the blade has not shown sufficient constant differences for taxonomic purposes.

The terminal leaf of different varieties of wheat is sometimes quite erect and sometimes drooping at various angles. These differences are greatest just previous to the heading period, but frequently are not apparent a few days later. Chiefly because of the instability of this character, it is not used in this classification. In some varieties like Hard Federation and White Federation the flag leaf is curled or twisted, whereas in most varieties it is flat.

The sheaths normally enclose about the lower two-thirds of the culm, although in dry seasons the spike sometimes is not entirely exerted. The edges of the sheath overlap on the side opposite the blade. The sheaths may be either white or purple. During early growth they usually are quite scabrous, but they become smoother at maturity. There are some differences in these characters in the cultivated varieties, but they are few and minute. After a careful study the writers decided not to include any sheath characters in the descriptions.

The same decision was reached in regard to the minute differences observed in the ligules and auricles. The ligules usually are short, varying from 1 to 2 mm long and becoming lacerate as the plant matures. Auricles always are present on wheat leaves. They are narrow to mid-wide, usually strongly curved, with a few long strigose hairs on the outer margin. The auricles often are purple in the young stage, sometimes changing to white as the plant matures.

#### SPIKE CHARACTERS

The entire inflorescence on one culm is called the spike. It is made up of separate groups of flowers known as "spikelets." These are borne singly on alternate sides of a zigzag, flattened, channeled, jointed rachis, parallel to its flat surface. At the base of each spikelet, on the apex of each rachis joint, a tuft of short hairs usually occurs. These hairs may be white or brown in color, but the differences are difficult to distinguish, partly because the hairs frequently are discolored.

Spikes differ greatly in form and degree of compactness. Club wheats (*Triticum compactum*) have been separated from common wheats (*T. vulgare*) principally because of their distinctly compact or dense spikes.

In distinguishing the cultivated varieties, five spike characters are used. These are awnedness, shape, density, position, and shattering of the spikes.

#### AWNEDNESS

Awns are sometimes of importance agriculturally and usually the character most readily apparent. For these reasons this character is given precedence over all others in preparing the keys. Some earlier writers, as previously stated, used this character for separating so-called species.

Varieties are separated into two major groups on the basis of the awnedness character, namely, awnless to awnleted, and awned. As a minor character in the key and in the descriptions the awnless to awnleted group is subdivided into awnless, apically awnleted, and awnleted. Awnless varieties have no awnlets or short apical awns. Apically awnleted varieties have short awnlets 1 to 15 mm long at

the apex of the spike. Awnleted varieties have awnlets 3 to 40 mm long, the shorter ones occurring near the base of the spike and the length increasing toward the apex.

Awned varieties are those that have an awn or beard that terminates the lemmas on all spikelets. These awns usually increase in length from the basal part of the spike upward. In the common wheats, awns seldom, if ever, exceed 10 cm in length. In durum and poulard wheats, however, they usually range from 10 to 20 cm in length.

#### SHAPE

Spikes differ greatly in shape, length, and width. They may be flattened parallel or at right angles to the plane of the face of the spikelets. Those flattened parallel to this plane are widest when seen in face view and can be said to be dorsoventrally compressed. All varieties of common wheat have spikes thus formed, except those that are clubbed at the tip, in which case they are only partly so. Spikes that are flattened at right angles to the plane of the face of the spikelets are narrow when seen in face view and may be described as laterally compressed. The club, durum, and poulard wheats are separated from the common wheats partly on the basis of having such spikes.

In general, spikes vary in length from 5 to 15 cm but are usually 8 to 12 cm long. They vary in width or thickness from 1 to 3 cm. The differences in length and width are not used in themselves, but are often combined with the spike shape in a compound descriptive word.

Whether dorsoventrally or laterally compressed, whether long or short, or narrow or wide, spikes are classified in the keys as having the following four general shapes—fusiform, oblong, clavate, and elliptical. These shapes are shown in plate 2. For all common wheats these shapes are determined from a face view of the spikelets and for all club, durum, and poulard wheats from an edge view of the spikelets.

Heuzé (113) used several different spike shapes as the leading characters in separating varieties within the species. The shapes mentioned, however, are here considered only as minor characters, though nevertheless they are very useful in distinguishing varieties.

Spikes classed as fusiform taper toward the apex or from the middle toward both base and apex. The larger number of varieties of common wheat have spikes of this shape.

Spikes described as oblong are usually uniform in width and thickness throughout the length of the spike, but are always several times longer than wide.

Varieties classed as having clavate spikes are clubbed, that is, distinctly larger and more dense at the apex. This is due to a shortening of the rachis internodes in that part of the spike, which results in a change from dorsoventral to lateral flattening and a broadening of the upper portion of the spike.

Elliptical spikes are short and quite uniformly rounded at both the base and apex, but are flattened on the sides. Most varieties of club wheat have spikes of this shape.

In the descriptions of varieties these designations of spike shapes have sometimes been modified to take into account the length and

width of the spikes and the overlapping of shapes that occurs in some varieties.

Spikes that are unusually long are described as linear-fusiform, linear-clavate, etc. If spikes are unusually short, that fact is included in the description. Broad spikes may be described as broadly fusiform or broadly oblong and narrow spikes as narrowly fusiform, etc.

Varieties that are nearly intermediate between any of the shapes are sometimes described as oblong-fusiform or oblong to subclavate. By the use of these compound descriptive terms spike shapes are more accurately presented in the description than they can be in the keys, where brevity is imperative.

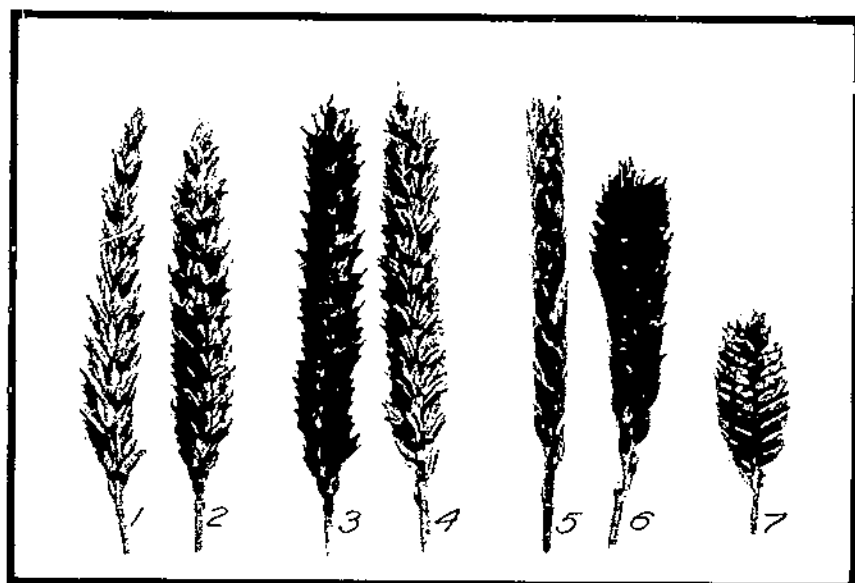
#### DENSITY

The differences in shape of spikes shown above are due in part to differences in density. All spikes are described as of three density classes, viz, lax, mid-dense, and dense. These are minor differences that are used to advantage in distinguishing varieties. Seringe (190) separated the common wheats into two groups, having lax and dense spikes, respectively. Koernicke and Werner (185) described the spikes of many varieties according to different degrees of density. Neergaard (150) suggested a formula for use in measuring the density of the spike. Eriksson (87) subdivided the botanical groups of Koernicke and Werner on the basis of density into sub-varieties called *laxum*, *densum*, and *capitatum*. He measured the density of spikes by determining the number of spikelets in 100 mm of rachis length. Heuzé (113) used the spike density along with spike shape as the leading character in separating varieties. Boshnakian (41) described means of measuring density and suggested the name *Triticum compacto-capitatum* for varieties of club wheat having clavate heads.

Many measurements have been made by the writers to determine the difference in density of the spikes of the varieties here described. The most definite were found comparable at one station for 1 year, but otherwise were of little value. It was found necessary to establish density classes of rather indefinite limits. In this way allowance was made for the varying conditions. The density classes were fixed as lax, mid-dense, and dense by determining the number of millimeters occupied by 10 internodes of the rachis measured in the center of the spikes. By this method spikes are classed as lax when 10 internodes occupy from 50 to 75 mm, as mid-dense when 10 internodes occupy from 35 to 60 mm, and as dense when 10 internodes occupy from 20 to 45 mm. The greater number of varieties are included in the mid-dense class, which, according to the above measurements, overlaps both the dense and lax classes by two-fifths of their entire range.

#### POSITION

The position of the spike at maturity is often distinctly different in different varieties. Spikes are here described as erect, inclined, or nodding. Heuzé (113) used essentially these same distinctions in describing his varieties.



Spike shapes of wheat varieties. Funiform (1 and 2); oblong (3 and 4); clavate (5 and 6); elliptical (7).



Those varieties described as having erect spikes mature with the spike in an approximately vertical position. The spikes of these varieties seldom, if ever, are inclined more than  $15^{\circ}$  from the vertical at maturity. Spikes of varieties that are described as inclined usually mature at an angle of approximately  $15^{\circ}$  to  $45^{\circ}$  from the vertical, but sometimes are nearly erect and under some conditions will become slightly nodding. The majority of wheat varieties come within this class. Varieties that are described as having nodding spikes usually mature with the spike in a drooping position, the apex of the spike being lower than the base. Spikes of such varieties sometimes are only inclined if they are not well filled with grain when ripe.

#### SHATTERING

Glumes of different varieties vary in the tenacity or firmness of attachment to the rachis. This and possibly other characters cause varieties to differ greatly in their resistance to shattering. The durum and club varieties usually do not shatter easily. Most commercial varieties of common wheat are resistant, but some varieties are subject to loss of grain by shattering if allowed to stand in the field after they reach maturity. Such varieties are not adapted for harvesting with the combine. This character is mentioned only for the varieties that shatter easily.

#### GLUME CHARACTERS

The unit of the spike is the spikelet. It consists of several flowers or florets attached alternately to opposite sides of a central axis or rachilla. These flowers, 2 to 5 in number, are subtended by two empty scales, called the glumes, the keel of which terminates in a tooth or beak. Each floret consists of a flowering glume, called the lemma, and a thin two-keeled glume, called the palea. These two glumes enclose the sexual organs. The lemma encloses the back, dorsal, or outer portion of the mature kernel and in the awned varieties terminates in an awn. The lemma itself is of little or no use in classification. The palea protects the inner or crease side of the kernel. It differs from the lemmas in having its back instead of its face toward the rachilla or axis of the spikelet. Like the lemmas, it is not used in distinguishing varieties. The outer glumes, however, are much used.

The covering and coloring of the glumes are major characters of the second and third place, respectively. The length and width of the glumes also are used, but are of only minor importance.

#### COVERING

Glumes of all varieties here discussed are described as glabrous or pubescent (fig. 1). Host (119) placed the pubescent-glumed wheats in a separate species called *Triticum villosum*. Several later authors also considered pubescent wheats as different species. This character is used here, however, only as a major one in separating varieties, but is given the second place in the keys because of the definite and striking contrast between absence and presence. This is in accordance with the usage of Koernicke and Werner (135).

Glumes described as glabrous are without any covering of hairs. Those described as pubescent are more or less covered with hairs of varying length. Pubescence usually is readily apparent. The degree of pubescence varies in the different varieties. On some the hairs are much longer and more numerous than on others. Glumes of some durum varieties are partly glabrous and partly pubescent, but are classed as pubescent. In such varieties the pubescence is most often found on the edge of the glumes.

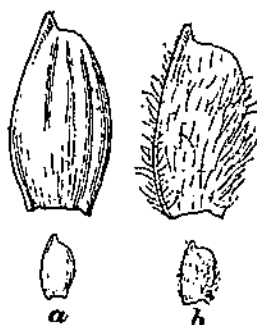


FIGURE 1.—Glume covering:  
a, Glabrous; b, pubescent.  
(Natural size and enlarged  
3 diameters.)

#### COLOR

Differences in glume color were early recognized. Lamarck (136) used these distinctions in classifying varieties. Glume color is here used as a major character and occupies third position in the key because of the distinct differences that are readily apparent when the plants are mature. This is also

in accordance with the usage of Koernicke and Werner (135). All glumes are classed as white, yellowish, brown, or black.

Glumes classed as white may vary in color from a cream or pale-straw color to a dark yellow. Practically no glumes are without color. Within the class, however, there are two rather distinct shades. Some taxonomists have classified them separately as white and yellowish. In the present bulletin, however, both shades are placed in the same class and described only by the one term "white" except in the case of the durums, which are classed separately as white and yellowish. In the descriptions the glumes of some varieties of common wheat are described as being yellowish white, indicating a darker glume than those described as white. A few varieties have white or yellowish glumes with brown or black stripes or nerves, or the glumes are sometimes tinged on the edges with brown or black. Such varieties are placed in the white-glumed class and the peculiar markings are indicated in the descriptions. The Blackhull variety has glumes that usually are tinged with black but sometimes are almost entirely black. The Rudy variety has black stripes along the edges of the glumes.

Glumes of durum varieties classed as yellowish are much darker than those of the common wheats classed as white but similar to those described as yellowish white. This yellowish class, therefore, is quite distinct. It may range in color from yellow to buff.

The brown-glumed class usually is still darker than this yellowish class and may vary in shade from light to dark brown and bluish brown, and in some varieties there is a reddish or mahogany tinge. For the latter reason some taxonomists have used the term "red", but in the present work the writers prefer the term "brown", as it more accurately describes the glume color of the class as a whole.

Wheats having entirely black glumes are rare in the United States, the few exceptions being among the durums and emmers. Among the common wheats there are no commercial varieties having glumes that are entirely black.

## LENGTH

Glume lengths are described as short, mid-long, and long and are used as minor characters in the varietal descriptions. These length differences are illustrated in figure 2. Usually small-kerneled varieties have short glumes and large-kerneled varieties long glumes, but there are exceptions to this. The glumes are usually about three-fourths the length of the lemmas, although in some long-glumed varieties the glumes and lemmas more nearly approach the same length. Polish wheat (*Triticum polonicum*) has glumes as long as or longer than the lemmas and is separated from the other species principally on this distinction. The length of the glume is here described as short, mid-long, or long. Heuzé (113) and Scofield (188) used essentially these same terms. Most varieties of wheat have mid-long glumes. A few varieties, however, are distinct in having either short or long glumes. Short glumes may have lengths varying from 6 to 10 mm. Mid-long glumes may vary from 8.5 to 12.5 mm and long glumes from 11 to 15 mm. The glumes of Polish wheat exceed this latter measurement and are described as very long.

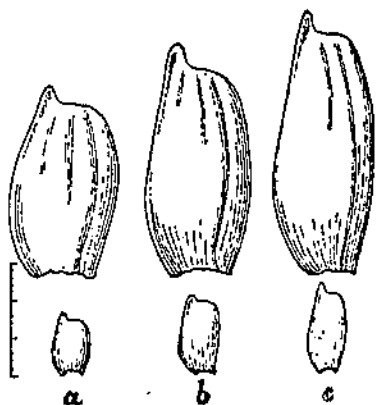


FIGURE 2.—Glume length: a, Short; b, mid-long; c, long. (Natural size and enlarged 3 diameters.)

## WIDTH

The width of glumes is used in the same manner as the length. All glumes are described as being narrow, mid-wide, or wide (fig. 3).

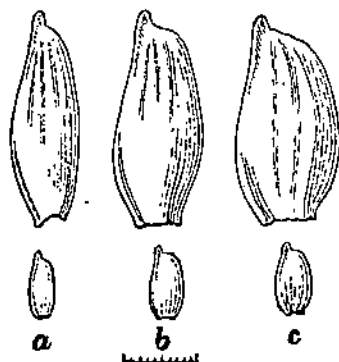


FIGURE 3.—Glume widths: a, Narrow; b, mid-wide; c, wide. (Natural size and enlarged 3 diameters.)

These differences were pointed out by Scofield (188). The width of the glume is here determined across its center from the keel to the margin of the outer side. Narrow glumes may vary in width from 2 to 4 mm, mid-wide ones from 3 to 5 mm, and wide ones from 4 to 6 mm. The differences are small and much overlapping of the classes occurs. Wide glumes nearly cover the lemma at the point of measurement, while narrow glumes usually cover less than a third of it.

## SHOULDER CHARACTERS

The shoulder as here considered is the more or less rounded end of the glume from the beak to the lateral margin, including the part referred to by Koernicka and Werner (135), Hackel (102), and others as side teeth. Scofield (188) applied the name shoulder to this portion of the glumes.

Considerable variation exists in shoulder width and shape in different varieties and also in different spikes of the same variety and even among the glumes on a single spike. Although variable, they are of some value in classification.

## WIDTH

The shoulder widths often differ from the glume widths. For this reason they are described separately, but on the same basis of measurement and by the use of the same terms, narrow, mid-wide, and wide (fig. 4).

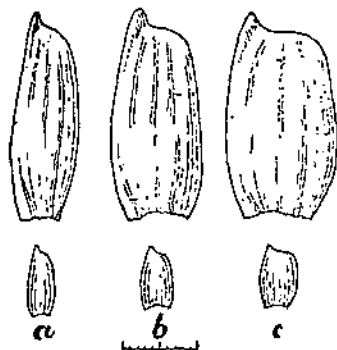


FIGURE 4.—Shoulder widths: *a*, narrow; *b*, mid-wide; *c*, wide. (Natural size and enlarged 3 diameters.)

## SHAPE

Shoulder shapes are described in overlapping terms that allow for a considerable variation, which is nearly always present in the same spike. The terms used are wanting, oblique, rounded, square, elevated, and apiculate. These shapes are shown in figure 5.

## BEAK CHARACTERS

The word "beak" is used here for the short projection that terminates the keel of the outer glume. In some varieties it approaches an awn in appearance. Scofield (188) first used the term "beak", previous authors having referred to it as a tooth or point. The beaks vary in width, shape, and length. These characters are of considerable importance in identification and are used in the descriptions of the varieties.

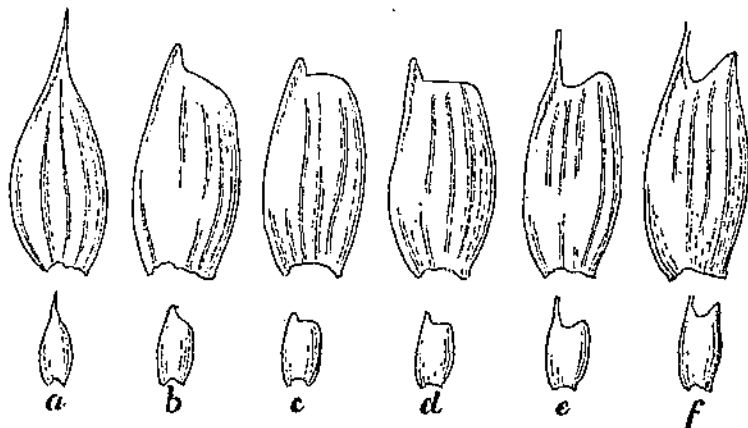


FIGURE 5.—Shoulder shapes: *a*, wanting; *b*, oblique; *c*, rounded; *d*, square; *e*, elevated; *f*, apiculate. (Natural size and enlarged 3 diameters.)

## WIDTH

Beak widths are described as narrow, mid-wide, and wide (fig. 6). The average beak is only 1 mm wide, so the variations are very small, and general observation is the only basis for describing them.

Those that are wider than the average are called wide and those that are narrower are called narrow.

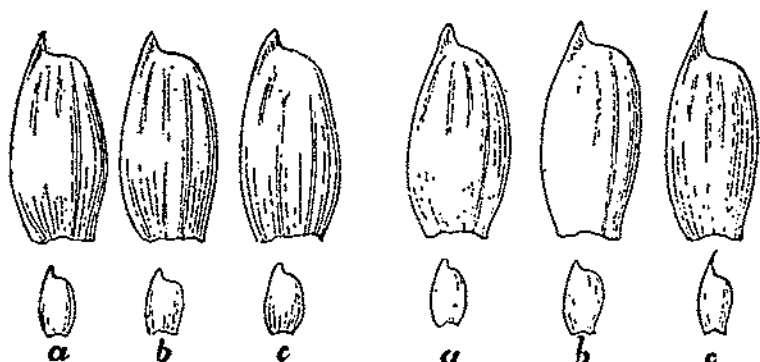


FIGURE 6.—Beak widths: a, Narrow; b, mid-wide; c, wide. (Natural size and enlarged 3 diameters.)

FIGURE 7.—Beak shapes: a, Obtuse; b, acute; c, acuminate. (Natural size and enlarged 3 diameters.)

#### SHAPE

The apex of the beak varies considerably in shape. It is described as obtuse, acute, and acuminate. Obtuse beaks are blunt at the apex. Acute beaks come to a point at the apex. Acuminate beaks are narrowly and very sharply pointed. All awned spikes have acuminate beaks. These shapes are shown in figure 7.

#### LENGTH

Beak lengths are quite variable, especially in the awned varieties, and are considerably influenced by environment. In general, conditions that increase or decrease the length of the beak affect nearly all varieties to a similar degree. In the awnless, apically awnleted, and awnleted wheats the differences in length are not great, but in many varieties they are quite distinct. The length of the beak is measured from the shoulder of the glume upward. On most awned wheats the length increases from the base of the spike to its apex. The range of difference varies greatly with the variety. For this reason no single measurement is used in describing the lengths, but instead the average maximum and minimum lengths are given. None of the awnless varieties here described has beaks longer than 3 mm. Variations in beak lengths are shown in figure 8.

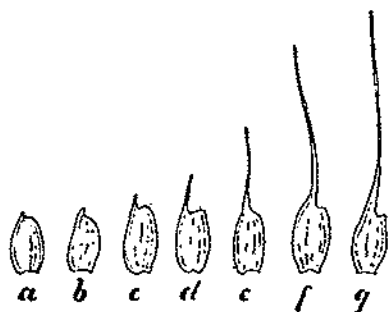


FIGURE 8.—Beak lengths, showing seven variations. (Natural size.)

#### AWN CHARACTERS

Certain characters of the awn are distinct. Some of these are important in classification, while others are not. The divergence of the awn from the vertical is one of the latter. The awns of some

varieties are all nearly vertical or appressed, while others are spreading. These characters are affected by drought or other abnormal conditions and usually are not sufficiently constant for classification purposes. The awns of some varieties sometimes are deciduous, dropping off at maturity. This occurs so rarely, however, that it is of little or no use in classification. The color and length of the awns, however, are factors of some importance in this classification.

#### COLOR

In the key to the varieties of durum wheat the awn color is used as the fourth major character. This method was followed by Koernicke and Werner (135). For the other species and subspecies the awn color is used only as a minor character. All awns are described as white or black. The white class may include yellowish shades, and the black class may include shades of brown and blue. Few varieties of common wheat have really black awns.

#### LENGTH

The length of the awn in awned varieties is of slight value in classification. No attempt has been made in these studies to separate these varieties into classes with respect to awn length. In all descriptions, however, the average extreme lengths are recorded in centimeters.

#### KERNEL CHARACTERS

The kernel color, length, and texture are the most constant of all the kernel characters. These are used as major distinctions. The shape of the kernel is considered of only minor importance, as are certain differences of the germ, crease, cheeks, and brush.

#### COLOR

Kernel colors were early recognized as important characters in separating varieties. Most varieties were observed to have either white or red kernels but were sometimes regarded as being yellow or brown. The kernel color was used by Koernicke and Werner (135) and by Vilmorin (218) as one of the leading taxonomic characters of wheat. Heuzé (113) and Koernicke and Werner have indicated various shades of white or yellow and of red in the descriptions of the kernel color. Eriksson (87) believed that white wheat becomes red and states that the color of grain is useless in distinguishing a variety. Cobb (67) arranged the wheats he was growing according to the color tint from lightest to darkest. Howard and Howard (121, p. 238) regard the wheat kernel as being either white or red. They state that "the particular tone or color depends partly on the consistency of the grain." Hayes, Bailey, Arny, and Olson (190) proposed the use of the terms "red" and "white" in describing the presence and absence of a brownish-red pigment in the bran layer. The use of the modification "light red" was suggested where the degree of pigmentation was less than usual in the red wheats. Three varieties of Abyssinian wheat having violet-colored kernels were mentioned by Koernicke and Werner (135). The writers have grown some purple-kerneled wheats from Abyssinia (Ethiopia), but they are not considered in the present classification.

Kernels of all varieties are here grouped into two classes, described as white and red. Here, as in the glume colors, many different shades are present. In general, however, the two classes distinctly separate all wheats.

Kernels of the white class may vary from cream to yellowish, or they may be white, without pigment. White or faintly pigmented kernels may appear to have different shades of yellow color because of differences in texture of the endosperm.

Kernels of the red class may vary from light brown to the darker shades of red. The variations are due to varietal differences and environment. Differences in texture, due to varying conditions, may cause "yellow berries", which sometimes give the kernels a mottled appearance. Some samples have been received for identification in which kernels appeared to be partly red and partly white. This condition has been found to be the result of environment, as such kernels produce plants with only red kernels.

Many writers have classed some varieties as "amber." This usually refers to a white kernel having a translucent or vitreous endosperm. The term "amber" is used to designate a certain subclass of durum wheat in the United States official grain standards. Until recent years hard red kernels sometimes were referred to as amber colored. The word "amber" also has been used as a part of a varietal name, such as Martin Amber, which is a soft white wheat, and Michigan Amber, which is a soft red wheat. Because of this ambiguity and because wheats usually are either red or white, the word "amber" is not here used in describing wheat kernels.

#### LENGTH

The length of the kernel is used here as a major character in distinguishing varieties.

Koernicke and Werner (135), in their descriptions of wheat varieties, indicated the average length and width of the kernels in millimeters and the average number of kernels in 10 g. The kernels were described as very small, small, large, and long. Huezé (113) described the kernels as short, medium, or long. The size of the kernels of any variety varies when grown in different sections or in different years in the same section. From necessity, therefore, the limits of the classes in which varieties are placed must be overlapping. A kernel of wheat reaches its maximum length several days before ripening. The length, therefore, is fairly constant, even when it is considerably shrunken, and is the most valuable of the kernel dimensions for taxonomic purposes. In making measurements only the normal kernels should be used. The kernels from the tip spikelets on a spike and from the upper florets in the spikelet are below average length.

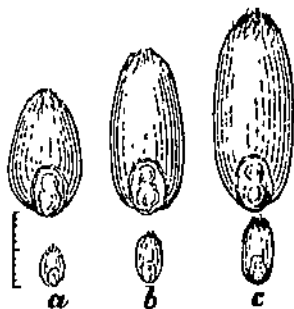


FIGURE 9.—Kernel lengths: a, short; b, mid-long; c, long. (Natural size and enlarged 3 diameters.)

In the keys two classes are made, namely, kernels short to mid-long and kernels mid-long to long. In the descriptions three classes—short, mid-long, and long—sometimes are mentioned separately. These kernel lengths are shown in figure 9.

The short to mid-long class includes varieties the kernels of which measure within the limits of 4 to 7.5 mm in length. The mid-long to long class includes varieties the kernels of which come within the limits of 6.5 to 10 mm. For individual samples more definite limitation is possible. For this purpose the term "short" is used for kernels ranging from 4 to 6 mm in length, "mid-long" for those ranging from 6 to 8 mm, and "long" for those ranging from 8 to 10 mm. These latter measurements are considered as minor characters and are occasionally used in descriptions either alone or usually following the adjective. The measurements, enlarged 10 times, are illustrated in figure 10.

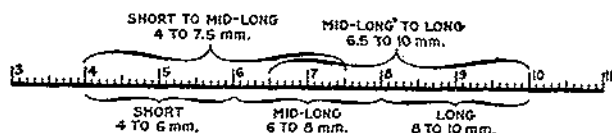


FIGURE 10.—Diagram showing measurements of kernel lengths: Above, major characters; below, minor characters. (Enlarged 10 diameters.)

#### TEXTURE

The texture of wheat kernels is an important character in classification. It has an economic value, as most wheat is marketed in commercial classes which are fixed largely on a basis of texture, because hard wheats generally are better for breadmaking than soft wheats.

Two texture classes are used—kernels soft to semihard and kernels semihard to hard. Here, as with size, overlapping class limits were found necessary. In general, all wheat varieties can be classed readily in one or the other of these two groupings. In describing specific samples and in individual description of varieties, three classes are used separately, as soft, semihard, and hard. A soft kernel is one that, when normally developed, has an endosperm entirely soft, mealy, or starchy. A hard kernel, when normally developed, has a corneous, horny, or vitreous endosperm throughout. A semihard kernel has an endosperm that is intermediate between the other two.

The species *Triticum durum* was so named by Desfontaines (75) because of the hardness of the kernels. Metzger (146) divided the white-kerneled wheats into two groups on the basis of texture, the starchy ones being considered as yellow. Koernicke and Werner (135) described the kernels of different varieties as being entirely mealy, nearly entirely mealy, mostly mealy, partly mealy, partly glassy, mostly glassy, nearly entirely glassy, and entirely glassy. The texture of the same variety varied in different seasons. These authors, as well as Eriksson (87), Fruwirth (92), and Howard and Howard (121, p. 232), conclude that kernel texture is useless as a varietal character and that it depends on environment. Hayes, Bailey, Arny, and Olson (106) suggest the terms corneous, sub-



corneous, substarchy, and starchy for describing the texture of the wheat kernel. The writers have concluded that because of the variability in texture under different environments one can separate varieties of wheat accurately into only 2 classes and fairly accurately into 3 classes. Soft-kerneled varieties grown under very dry conditions will sometimes become brittle and slightly subcorneous. When hard-kerneled varieties are grown under humid conditions or in soil deficient in nitrogen they sometimes become starchy, semistarchy, or mottled, the condition being designated as "yellow berry", and the kernels are then rather soft.

The difficulty of the numerous investigators in determining the kernel texture has been due to the failure to dissociate softness from starchiness or yellow berry. Freeman (91) has shown the nature of hardness in the wheat kernel. The following is quoted from his conclusions:

1. The hardness of a wheat is determined by the solidity of the grain, and this, in turn, by the nature and relative proportions of gluten and starch in the endosperm.

2. When the ratio of gluten to starch is sufficiently high, the entire cell contents are cemented together solidly as the grain dries out in ripening. It, therefore, takes on a hard, glassy, semitranslucent texture. In the absence of a sufficient proportion of gluten to hold the cell contents together, the shrinkage in drying does not fully compensate for the loss of water, and air spaces appear within the cells. These open spaces render the grain soft and, also, since they serve as refracting surfaces, make it opaque. We are, therefore, accustomed to associate softness, opaqueness, and low gluten content in wheats.

3. There are two types of soft grains among the wheats included in these experiments.

- (a) A type designated by the writer as "true softness", in which the air spaces in the endosperm are diffuse and finely scattered. This type of softness is only slightly affected by environic conditions.

- (b) A type commonly called "yellow berry", in which the air spaces within the endosperm occur in flakelike groups with quite definite margins. The opaqueness thus arising may be confined to a small spot only or may include the entire endosperm. This type of softness is very sensitive of environic conditions.

In this bulletin soft texture refers to the condition designated above as "true softness" and must not be confused with yellow berry.

True kernel texture, therefore, cannot be determined on yellow-berry kernels, because they always are soft. It usually is possible, however, to select from a sample a few kernels that are not wholly starchy and that can be accurately used for texture determinations. Roberts (171) has attempted to measure hardness mechanically by determining the crushing strength. This is not entirely accurate, as the shape of the kernel influences its crushing strength and, in addition, soft-wheat varieties grown under dry-land conditions are quite brittle and difficult to crush. Texture is determined by cutting kernels that are not affected by yellow berry and examining the endosperm.

#### SHAPE

The shape of kernel outline is described as ovate, elliptical, or oval. These terms refer only to the outline of the kernel as viewed from the dorsal surface, and not to the kernel as a whole. When egg-shaped in outline, the germ end being the broader, it is described as ovate. An elliptical kernel outline is one the length of which is

more than twice the width and that has sides somewhat curved and both ends rounded. An oval kernel outline is broader, like the ovate, but with both ends of nearly equal width. The three shapes, ovate, elliptical, and oval, are shown in figure 11. Modifications of these shapes are indicated by describing kernels as narrowly or broadly elliptical, ovate, or oval, as the case may be. A few varieties, as Baart, show other characteristic shapes, which are given in the descriptions of these varieties.



FIGURE 11.—Kernel shapes: a, Ovate; b, elliptical; c, oval. (Natural size and enlarged 3 diameters.)

Most kernels are classified as ovate, but in a few varieties a considerable portion of the kernels may have one or the other of the shapes just noted. The shape of the wheat kernel is influenced by the position in the spikelet, the position in the spike, and the degree of plumpness. Boshnakian (49) has shown that spikelet characters that affect the shape of the wheat kernel are mainly—

(1) The stiffness of the glumes, (2) the size and shape of the space in which the grain develops, (3) the number of grains in the spikelet and their position, (4) the density of the head, (5) the pressure caused by the growth of different parts of the head, and (6) the species which produces the kernel.

The kernels from the base or tip spikelets on the spike are shorter in proportion to width than the others. The kernels from club wheat or from the tip spikelets of clavate spikes of common wheats are usually laterally compressed or "pinched." Shrunken kernels usually have an elliptical shape because of being narrow. As the width of a kernel of wheat depends largely upon the degree of development of plumpness, this character has very little taxonomic value.

The tip or brush end of nearly all varieties is rounded, but the kernels of a few varieties, in which the tips are square rather than rounded, as seen from the dorsal view, are described as truncate. Kernels of a few varieties have acute or pointed tips, as seen in both dorsal and lateral views, and such tips are described as acute.

The shape of the kernel as seen in the lateral view is important in only a few varieties. Many varieties, especially durum and emmers, are more or less keeled on the dorsal surface. Normally the kernels of wheat, in dorsoventral diameter, are thickest near the base, just above the germ. In a few varieties the kernels are strongly elevated on the dorsal side of this basal portion and then are popularly known as "humped." That term is used in describing such kernels. When the dorsal portion is less keeled than normal the kernel is described as flattened. Where only the tip of the kernel is thus flattened it is described as having a flattened tip.

The shape of the kernel has been used as a distinguishing character by only a few authors. Koernicke and Werner (135) recorded the lengths and widths of the kernels and referred to some as roundish or elongated. Eriksson (87) used the number of kernels in 100 mm, placed side by side, to indicate the width of the kernel.

This character is, however, of value only in comparing varieties grown under identical conditions. Heuzé (113) described the shape of kernels of each variety, using such terms as elongated, short, angular, compressed, ovoid, oblong, and swollen. Scofield (188) suggested 16 descriptive terms to be applied to the shape of wheat kernels. Wheat kernels cannot be accurately described according to shape unless they are nearly normally developed, that is, neither shrunken nor excessively plump.

#### GERM CHARACTERS

The size and shape of the germ or embryo of the wheat kernel have seldom been used as characters in classification. After examining thousands of samples, the writers have concluded that the size of the germ is one of the most constant of minor kernel characters. There is considerable variation among the individual kernels of a bulk sample, but typical kernels of a pure variety have a characteristic size of germ. The germ is developed earlier than the endosperm and consequently is of almost normal size even in shrunken grain.

The germ is here described as small, mid-sized, or large, as shown in figure 12. A small germ is one that occupies less than one-sixth of the area of the dorsal surface of the kernel or the area visible in dorsal view. A mid-size germ occupies from one-sixth to one-fourth of the dorsal area of the kernel. A large germ occupies one-fourth or more of the dorsal area.

The limits of the three size groups overlap. Most kernels have a mid-sized germ, so these characters are not much used in distinguishing varieties. For some varieties, however, they can be used to advantage.

#### CREASE CHARACTERS

The crease or sulcus on the ventral side of the wheat kernel is rather variable, but is of value in distinguishing a few varieties. The chief taxonomic characters are the width and the depth. Shrunken kernels nearly always have a relatively wide and deep crease, while in extremely plump or yellow-berry kernels the crease is narrow and shallow because the space beneath the bran is occupied by large starch cells and air spaces.

#### WIDTH

The width of the crease is determined by the distance between the crests of the cheeks on each side of the crease. Creases are described as narrow, mid-wide, and wide. These differences are illustrated in the cross sections of kernels shown in figure 13. A narrow crease is about two-thirds or less of the total width of the kernel in ventral

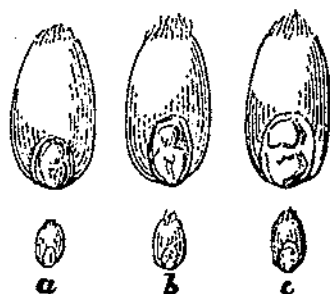


FIGURE 12.--Germ sizes: a, Small; b, mid-sized; c, large. (Natural size and enlarged 2 diameters.)

view. The mid-wide crease, which is typical of most varieties, is usually about four-fifths of the total kernel width. A wide crease is almost the total width of the kernel.

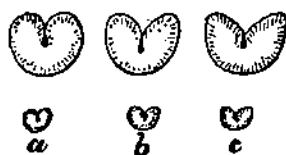


FIGURE 13.—Crease widths: a, Narrow; b, mid-wide; c, wide. (Natural size and enlarged 3 diameters.)



FIGURE 14.—Crease depths: a, Shallow; b, mid-deep; c, deep; d, pitted. (Natural size and enlarged 3 diameters.)

#### DEPTH

The depth of the crease in this classification has been determined by an external examination rather than by a cross section of the kernel. The depth, therefore, is judged from the crest of the cheeks to the position where the crease is closed. No measurements of the portion of the crease below the surface of the kernel have been considered. Crease depths are described as shallow, mid-deep, and deep. These differences are shown by cross sections of kernels in figure 14. A shallow crease has a depth of 20 percent or less of the dorsoventral thickness of the kernel. A mid-deep crease has a depth of from 15 to 35 percent of the thickness of the kernel, and a deep crease has a depth of 30 to 50 percent of the thickness of the kernel.

The depth of the crease is of taxonomic value only when the kernels are normally developed and is a distinguishing character in only a few varieties. It is sufficiently constant, however, to be of use in describing varieties grown under identical and normal conditions. Nearly all of the durum and club wheats have a shallow crease. A few varieties of common wheat have been described as having a "pitted" crease. This is characterized by having a distinct opening near the center of the crease (fig. 14, d). The sides of the opening usually are wrinkled. The pitted character is most marked on the kernels of the Humpback and Huston varieties.

#### CHEEK CHARACTERS

The cheeks of a kernel are the ridges along each side of the crease on the ventral surface of the kernel. The most distinguishing character of the cheek is the outline of the crest in cross section.



FIGURE 15.—Cheek shapes: a, Rounded; b, angular. (Natural size and enlarged 3 diameters.)

This is rounded or angular. These shapes and some of the variations in each are shown in figure 15. Extremely starchy (yellow berry) kernels always have rounded cheeks, while the cheeks of shrunken kernels are always angular. It is necessary,

therefore, to examine normally developed kernels in order to recognize the differences. All of the durum wheats have angular cheeks. Most of the common wheats have cheeks that are more or less angular, but a few varieties, such as China and Turkey, consistently have

rounded cheeks. There is no sharp distinction between the angular and the rounded cheeks.

#### BRUSH CHARACTERS

The brush of the kernel is the hair at the tip or the end opposite the germ. Cobb (69) described in detail the brush of 50 varieties of wheat grown in Australia.

#### SIZE

The size of brush refers to the area that it occupies on the kernel. It is described as small, mid-sized, and large. These differences are shown in figure 16, *a*, *b*, and *c*. A small brush occupies only a portion of the tip of the kernel. In kernels that are distinctly pointed at the tip, however, it may cover all of the end. A mid-sized brush covers the tip of the kernel. Nearly all varieties of wheat come within this class. A large brush is one that extends partly over the sides of the kernel, chiefly along the crease.

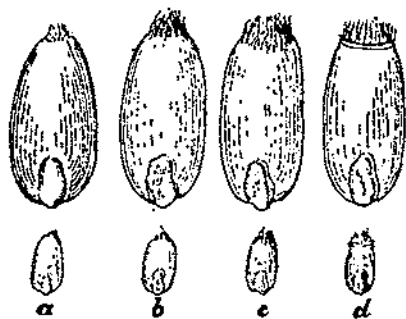


FIGURE 16.—Brush sizes: *a*, Small; *b*, mid-sized; *c*, large; *d*, collared brush. (Natural size and enlarged 3 diameters.)

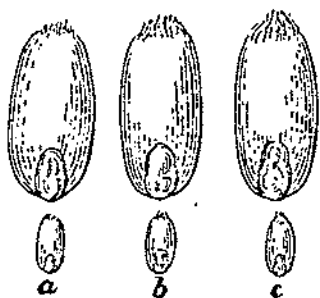


FIGURE 17.—Brush lengths: *a*, Short; *b*, mid-long; *c*, long. (Natural size and enlarged 3 diameters.)

#### LENGTH

The length of brush refers to the average length of hairs, which are described as short, mid-long, and long. These lengths are shown in figure 17. In short brush the hairs are less than 0.5 mm long, in mid-long brush from 0.5 to 1 mm long, and in long brush more than 1 mm long. A few very long hairs may be present in a short brush.

All durum wheats and some varieties of common wheat, such as Red Bobs and Prelude, have a short brush. Humpback and Mealy are varieties of common wheat having a long brush. Both size and length of brush are very constant characters, probably the most constant kernel characters aside from color and size. In machine threshing, part of the hairs of the brush frequently are removed.

The brush area of some varieties is here described as "collared" (fig. 16, *d*). Cobb (69) referred to this as an abrupt margin. This refers to the presence of a distinct raised collar or flange of bran along the margin of the brush area. This is most noticeable on shrunken kernels, but is very distinct on normal kernels of a few varieties, such as Goldecoin and Champlain.

## OTHER CHARACTERS

Several characters of wheat varieties of interest to growers cannot be observed in a morphological examination. These differences often are of great economic importance but are of little value in classification. Following the descriptions of many of the varieties, therefore, other characters of importance in wheat varieties, such as productivity, quality, resistance to low temperatures, and resistance to diseases, are mentioned.

## PRODUCTIVITY

A comparison of yield of different varieties of wheat is of value only when the varieties are grown under identical conditions, as side by side, on identical soil, or in one locality in the same season. Under certain conditions it is possible for almost any variety to outyield all others, and consequently an expression of yield is of little taxonomic importance. Koernicke and Werner (135) recorded the yields of the varieties grown at Poppelsdorf in the description of each variety. In the present work the writers have mentioned productivity or yield of only those varieties that experiments have shown to be distinctly high or low in yield in certain areas.

## QUALITY

Next to productivity, the value of wheat varieties for milling and for making bread, cake, pastries, and macaroni is of the greatest economic importance, as these are the principal uses for wheat. Flour from hard red winter, hard red spring, and hard white varieties is used for breadmaking. The soft white, common, club, and soft red common varieties are used mostly for the manufacture of pastry, biscuit, and cracker flour and for breakfast cereal products. Durum varieties are used for macaroni. Varieties differ greatly in their usefulness for these various products. As with yield, these differences can be accurately determined only by careful experiments, identically conducted with comparable samples. Where such differences are definitely known to exist they are pointed out, following the descriptions.

## HARDINESS

Hardiness is the ability of the plant to resist low temperature, heaving, winter drought, and many other factors that may cause injury or death to the plant. In the case of winter wheats, resistance to low temperatures consists of the ability to survive low winter temperatures; in the case of spring wheats, it is the ability to resist injury from spring, summer, or fall frosts. Very little is known concerning the latter characters. The winter hardiness of several varieties was recorded for 3 years by Eriksson (87), and the relative hardiness of many varieties was given by Koernicke and Werner (135). Clark, Martin, and Parker (60) and Quisenberry and Clark (167) have published the results from extensive tests on the hardiness of winter varieties in the United States and Canada. Following the varietal descriptions, the writers have indicated a few varieties that are known to be especially winter hardy, but otherwise the character is not mentioned.

## RESISTANCE TO DISEASE

Wheat varieties are known that have more or less resistance to each of the various diseases of wheat. Nearly all varieties of wheat herein considered have been grown in nurseries where they were inoculated either naturally or artificially with stem rust (*Puccinia graminis*), leaf rust (*P. triticea*), stripe rust (*P. glumarum*), bunt or stinking smut (*Tilletia tritici* and *T. levis*), loose smut (*Ustilago tritici*), and flag smut (*Urocystis tritici*). Immunity and resistance can be determined when varieties and hybrids are equally exposed to forms of a disease under conditions favorable for their development. A few varieties are known to be immune from or resistant to leaf and stem rust, bunt, loose smut, mosaic, and flag smut, and, when known, this fact is noted following the varietal descriptions.

## CLASSIFICATION OF THE GENUS TRITICUM

Wheat belongs to the grass family, Poaceae (Gramineae), and to the tribe Hordeae, in which the 1- to 8-flowered spikelets are sessile and alternate on opposite sides of the rachis, forming a true spike. Wheat is located in the subtribe Triticeae and in the genus *Triticum*, where the solitary two- to many-flowered spikelets are placed sidewise against the curved channeled joints of the rachis.

There are two sections of the genus *Triticum*, one including the old genus *Aegilops*, in which the glumes are flat or rounded on the back, and the other including *Sitopyrus*, in which the glumes are sharply keeled and in which are found all cultivated forms. This bulletin is concerned only with the latter section.

There are many forms of einkorn, spelt, and emmer (including the so-called "wild wheat" of Palestine) that are not cultivated in the United States and therefore are not considered in these pages.

Wheat is characterized as a mid-tall annual grass with flat blades and a terminal spike. The spikelets are solitary, 1- to 5-flowered, sessile, arranged alternately on the nodes of a zigzag, channeled, articulate rachis; the rachilla of the spikelets disarticulating above the glumes and between the florets, or continuous; the glumes keeled, rigid, three- to several-nerved, obtuse, acute, or acuminate; the lemmas keeled or rounded on the back, many-nerved, ending in a single tooth or awn.

The following eight divisions of the genus *Triticum* were used by Hackel (102, pp. 180-187) and have been recognized by others:

Triticum.....	sativum.....	tenax.....	vulgare Vill.....	Common wheat.
			compactum Host.....	Club wheat.
			turgidum L.....	Poulard wheat.
			durum Desf.....	Durum wheat.
	polonicum L.....	dicoccum Schrank.....		Emmer.
			spelta L.....	Spelt.
	monococcum L.....			Polish wheat.
				Einkorn.

Only three of these divisions were considered by Hackel as valid and distinct species, namely, *sativum*, *polonicum*, and *monococcum*. The other divisions he called races and subraces. The term "race" is now more properly used for a strain within a variety, and these ranks probably would be better designated as subspecies and

varieties. As previously pointed out, other authors have considered these divisions as distinct species or subspecies.

In recent years the species of wheat have been classified on the basis of chromosome numbers. Sakamura, in 1918 (174), reported the following haploid numbers for each of the above species or subspecies:

<i>Triticum vulgare</i> , common wheat.....	21
<i>T. compactum</i> , club wheat.....	21
<i>T. spelta</i> , spelt.....	21
<i>T. durum</i> , durum wheat.....	14
<i>T. turgidum</i> , poulard wheat.....	14
<i>T. dicoccum</i> , emmer.....	14
<i>T. polonicum</i> , Polish wheat.....	14
<i>T. monococcum</i> , einkorn.....	7

These counts have since been verified by Sax (182) Kihara (129, 130, 131), Watkins (222), and others.

In the present work it seems best to maintain the old-established divisions, but at the same time to rearrange them in order of chromosome number. The writers make no attempt to assign definite rank to the different divisions, as they have not made a genetic study of crosses between the different divisions nor have they made an exhaustive study of existing varieties or strains of a type intermediate between any of the eight divisions. The divisions established or recognized as species or subspecies by different authors, however, may be distinguished by the accompanying key.

### KEY TO THE SPECIES OR SUBSPECIES

- 1a. Chromosome number 21 in haploid division.
  - 2a. Terminal spikelets fertile; palea remaining entire at maturity; spikelets with 2 to 5 fertile florets.
    - 3a. Glumes shorter than the lemmas, firm; palea as long as the lemmas. (*Triticum sativum* Lam.)
      - 4a. Rachis tenacious; kernels separating from the chaff when threshed.
        - 5a. Glumes distinctly keeled only in the upper half; lemmas awnless or awns less than 10 cm long; straw hollow.
          - 6a. Spikes usually long, dense to lax, somewhat dorsally compressed. (*T. aestivum* L., *T. vulgare* Vill.)..... COMMON WHEAT.... 39
          - 6b. Spikes short, dense, laterally compressed. (*T. compactum* Host)..... CLUB WHEAT..... 128
        - 4b. Rachis fragile; kernels enclosed in glumes when threshed.
          - 5b. Spikes lax, narrow; pedicel long, wide, attached to face of spikelet below; shoulders wide, square. (*T. spelta* L.)..... SPELT..... 136
  - 1b. Chromosome number 14 in haploid division.
    - 2a. Terminal spikelets fertile; palea remaining entire at maturity; spikelets with 2 to 5 fertile florets.
      - 3a. Glumes shorter than the lemmas, firm; palea as long as the lemmas. (*Triticum sativum* Lam.)
        - 4a. Rachis tenacious; kernels separating from the chaff when threshed.
          - 5b. Glumes sharply keeled at the base; lemmas usually awned; awns 10 to 20 cm long; straw usually solid.
            - 6a. Glumes and kernels short; kernels ovate, with truncate tips. (*T. turgidum* L.)..... POULARD WHEAT.... 136
            - 6b. Glumes and kernels longer; kernels usually elliptical. (*T. durum* Desf.)..... DURUM WHEAT.... 137
          - 4b. Rachis fragile; kernels enclosed in glumes when threshed.
            - 5a. Spikes dense, laterally compressed; pedicel short, slender, usually attached to base of spikelet; shoulders wanting to narrow, usually oblique. (*T. dicoccum* Schrank)..... EMMER..... 144
        - 3b. Glumes as long as or longer than the lemmas, papery, lanceolate; palea of lower flowers half as long as their lemmas. (*T. polonicum* L.)..... POLISH WHEAT.... 140
  - 1c. Chromosome number 7 in haploid division.
    - 2b. Terminal spikelets sterile, often scarcely visible; palea falling into 2 parts at maturity; spikelets usually with only 1 fertile floret.
      - 3a. (*T. monococcum* L.)..... EINKORN..... 147



## COMMON WHEAT

In the Species Plantarum, Linnaeus, in 1753 (142), first used the name *Triticum aestivum* for a part of the common and club wheats. This name originally referred to the awned spring forms. It has been given priority use by botanists for the name of the subspecies more commonly recognized as *Triticum vulgare*. This name was applied to the common wheats by Villars in 1787, after it was pointed out that Linnaeus' separations were not logical or correct. According to the rules of botanical nomenclature the name of this species is *Triticum aestivum* L., but as *T. vulgare* is in general use among cereal agronomists, the writers give preference to that form.

Common wheat has 21 chromosomes and is distinguished from the club wheat subspecies by a spike long in proportion to its thickness. The spike is usually dorsally compressed and is thus wide when seen in face view of the spikelets instead of narrow, as with those of some other divisions. The spikelets are 2 to 5 flowered, far apart, only slightly overlapping, pressed close to the rachis, and nearly erect. The glumes are keeled only in the upper half, shorter than the lemmas, firm, and either glabrous or pubescent. The lemmas are awnless or have awns less than 10 cm long. The palea is as long as the lemmas and remains entire at maturity. The culm of the plant usually is hollow, but occasionally is pithy within, and varies in strength and height. The blades of the leaves are usually narrower than those of the durum and poulard wheats. The kernels may be either soft or hard and white or red.

The characteristic of common wheat of greatest economic value is its well-known quality for breadmaking, as common wheat excels all the other divisions of the genus in this respect. It is also the best known and most widely cultivated of all the divisions, and it comprises more than four-fifths of the total number of varieties grown in the United States. Two hundred and one are distinguished by the following key. The varieties are most nearly related to the club wheats (*Triticum compactum*). These two divisions have the same chromosome number and cross readily. There are intermediate types that resemble both common and club wheats.

Common wheat is adapted to widely varying climatic conditions and possesses more diverse characteristics than any of the other divisions. The cultivated varieties are distinguished by the accompanying key.

## KEY TO THE VARIETIES OF COMMON WHEAT

## 1a. SPIKE AWNLESS TO AWNLETTED.

## 2a. GLUMES GLABROUS.

## 3a. GLUMES WHITE.

4a. KERNELS WHITE (*Triticum vulgare albidum* Al.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMI-HARD.

## WINTER HABIT.

## Spike fusiform.....

## Spike oblong.....

## Spike erect.....

## Keel straight above.....

## Shoulders narrow, oblique to square.....

## Shoulders wide, square to elevated.....

## Keel incurved above.....

## Spike blunt at apex.....

## Spike sometimes slightly clavate.....

## Spike clavate.....

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## 2a. GLUMES GLABROUS.—Continued.

## 3a. GLUMES WHITE.—Continued.

## 4a. KERNELS WHITE.—Continued.

## KERNELS SHORT TO MID-LONG.—Continued.

## KERNELS SOFT TO SEMIHARD.—Continued.

## SPRING HABIT.

## Spike fusiform.

## Plant early, short.

## Awnlets wanting

## Awnlets several, 5-15 mm long.

## Plant midseason, mid-tall.

## Awnlets wanting

## Awnlets few, straight

## Awnlets many, incurved

## Spike oblong.

## Plant early to midseason.

## Spike apically awnleted

## Spike awnleted

## Plant late

## Spike clavate.

## Plant midseason.

## Plant mid-tall

## Plant tall

## Plant late.

## Culm and spike slightly glaucous

## Culm and spike very glaucous.

## KERNELS SEMIHARD TO HARD.

## SPRING HABIT.

## Spike fusiform.

## Plant early

## Spike oblong.

## Plant early

## Plant late

## KERNELS MID-LONG TO LONG.

## KERNELS SOFT TO SEMIHARD.

## SPRING HABIT.

## Spike clavate.

## Plant early

## Plant midseason.

4b. KERNELS RED (*T. vulgare fuscus* Al.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## Stem white.

## Spike fusiform.

## Spike erect.

## Plant early

## Plant midseason

## Spike inclined.

## Plant midseason.

## Spike nodding.

## Plant early, mid-tall

## Plant midseason, tall

## Spike oblong.

## Spike erect to inclined.

## Plant early, mid-tall.

## Glumes mid-wide

## Glumes wide

## Plant midseason, tall

## Spike nodding; plant midseason, mid-tall.

## Awnlets straight, 3-10 mm long

## Awnlets incurved, 5-15 mm long

## Spike clavate.

## Blades mid-long, mid-wide

## Blades long, wide

## Stem purple.

## Spike fusiform

## Spike oblong-fusiform.

## Plant mid-tall, stem mid-strong

## Plant tall, stem strong

## Spike clavate.

## INTERMEDIATE HABIT.

## Stem white.

## Spike fusiform.

## Spike oblong.

## Stem purple.

## Spike fusiform.

## Plant early.

## Spike erect

## Spike inclined to nodding

## Plant midseason

## Spike oblong

## SPRING HABIT.

## Stem purple.

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## 2a. GLUMES GLABROUS.—Continued.

## 3a. GLUMES WHITE.—Continued.

## 4b. KERNELS RED.—Continued.

## KERNELS SHORT TO MID-LONG.—Continued.

## KERNELS SEMIHARD TO HARD.

## WINTER HABIT.

## Spike fusiform.

Kernels ovate, germ small.

Culm and spike slightly glaucous.

Culm and spike very glaucous.

Kernels elliptical, germ mid-sized.

## Spike oblong.

Awnlets 3-12 mm long.

Awnlets 5-25 mm long.

## SPRING HABIT.

## Stem white.

## Spike fusiform.

## Plant early.

## Spike awnless.

## Spike awnleted.

## Plant midseason.

## Plant short, stem strong.

## Plant mid-tall, stem mid-strong.

## Plant late, mid-tall to tall.

## Spike mid-dense.

## Spike erect.

## Spike inclined.

## Spike lax.

## Spike oblong-fusiform.

## Stem purple.

## Spike fusiform.

## Spike oblong.

## Plant early, short.

## Plant midseason, mid-tall.

## KERNELS MID-LONG TO LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## 2b. GLUMES BROWN.

4a. KERNELS WHITE (*T. vulgare albarubrum* Koern.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## Stem white.

## Spike fusiform.

## Spike oblong.

## Spike clavate.

## Stem purple.

## Spike fusiform, nodding.

## Spike clavate.

## Spike erect.

## Spike erect to inclined.

## INTERMEDIATE HABIT.

## SPRING HABIT.

## Spike fusiform.

## Plant midseason.

## Spike oblong.

## Plant early to midseason.

## Plant late.

## Spike clavate.

## KERNELS SEMIHARD TO HARD.

## SPRING HABIT.

## Plant early.

## Plant midseason.

4b. KERNELS RED (*T. vulgare mitura* Al.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## Stem white.

## Spike fusiform.

## Plant early.

## Plant midseason.

## Plant late.

## Spike oblong.

## Spike erect to inclined.

## Spike nodding.

## Spike clavate.

## Stem purple.

## Spike fusiform.

## Plant early to midseason.

## Spike inclined.

## Spike nodding, wide.

## Plant mid-tall.

Beaks 0.5 mm long.

Awnlets 3-12 mm long.

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## 3b. GLUMES BROWN.—Continued.

## 4b. KERNELS RED.—Continued.

## KERNELS SHORT TO MID-LONG.—Continued.

## KERNELS SOFT TO SEMIHARD.—Continued.

## WINTER HABIT.—Continued.

## Stem purple.—Continued.

## Spike fusiform.—Continued.

## Plant early to midseason.—Continued.

## Spike nodding, wide.—Continued.

## Plant mid-tall.—Continued.

## Beaks 0-6 mm long.—Continued.

## Awnlets 5-20 mm long.

## Stem mid-strong.

## Stem mid-strong to strong.

## Beaks 1-1.5 mm long.

## Plant late, tall.

## Spike oblong, erect.

## Shoulders wanting to narrow, oblique.

## Shoulders wide, square.

## Plant midseason.

## Spike oblong-fusiform.

## Spike oblong.

## Plant late.

## Spike clavate.

## Spike mid-dense, inclined.

## Spike dense, erect.

## KERNELS SEMIHARD TO HARD.

## SPRING HABIT.

## Awnlets 3-10 mm long.

## Awnlets 5-20 mm long.

## 2b. GLUMES PUBESCENT.

## 3a. GLUMES WHITE.

4a. KERNELS WHITE (*T. vulgare leucospermum* Koern.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## SPRING HABIT.

## KERNELS SEMIHARD TO HARD.

## SPRING HABIT.

4b. KERNELS RED (*T. vulgare villosum* Al.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## Spike inclined; kernels semihard.

## Plant mid-tall, stem mid-strong.

## Plant tall, stem strong.

## Spike nodding; kernels soft.

## KERNELS SEMIHARD TO HARD.

## SPRING HABIT.

## Spike awnless.

## Spike awnleted.

## Plant early, short.

## Plant late, tall.

## 2b. GLUMES BROWN.

4a. KERNELS WHITE (*T. vulgare drifii* Koern.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## SPRING HABIT.

## Spike fusiform, beaks obtuse.

## Spike oblong, beaks acuminate.

4b. KERNELS RED (*T. vulgare pyrothrix* Al.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## Spike clavate.

## 1b. SPIKE AWNED.

## 2a. GLUMES GLABROUS.

## 3a. GLUMES WHITE.

4a. KERNELS WHITE (*T. vulgare graecum* Koern.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## SPRING HABIT.

## Stem white.

## Stem purple.

## KERNELS MID-LONG TO LONG.

## KERNELS SEMIHARD TO HARD.

## SPRING HABIT.

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## 3a. GLUMES WHITE—Continued.

4b. KERNELS RED (*T. vulgare erythraspermum* Koern.).

## KERNELS SHORT TO MID-LONG.

## KERNELS SOFT TO SEMIHARD.

## WINTER HABIT.

## Stem white.

## Plant midseason.

## Plant mid-tall.

## Beaks 1-3 mm long.

## Beaks 2-10 mm long.

## Plant tall.

## Stem purple.

## Spike fusiform.

## Beaks 1-3 mm long.

## Beaks 2-8 mm long.

## Plant mid-tall.

## Plant midseason.

## Plant late.

## Plant tall.

## Spike oblong.

## Spike clavate.

## Spring Habit.

## Beaks 1-3 mm long.

## Beaks 2-20 mm long.

## Plant mid-tall, early.

## Plant tall, midseason.

## KERNELS SEMIHARD TO HARD.

## WINTER HABIT.

## Kernels semihard.

## Stem white.

## Glumes white to yellowish.

## Beaks 1-5 mm long.

## Beaks 3-30 mm long.

## Glumes black striped.

## Plant early.

## Plant midseason.

## Stem purple.

## Beaks 1-2 mm long.

## Beaks 2-10 mm long.

## Beaks 5-25 mm long.

## Kernels hard.

## Glumes white.

## Beaks 1-3 mm long.

## Shoulders wanting.

## Shoulders mid-wide.

## Beaks 2-8 mm long.

## Stem weak.

## Stem strong.

## Plant mid-tall.

## Beaks 3-30 mm long.

## Plant early to midseason.

## Plant midseason.

## Glumes yellowish with brown stripes.

## Beaks 1-3 mm long.

## Beaks 3-25 mm long.

## Spring Habit.

## Stem white.

## Plant midseason.

## Stem weak.

## Beaks 1-3 mm long.

## Beaks 3-20 mm long.

## Stem mid-strong.

## Beaks 2-10 mm long.

## Plant late.

## Beaks 1-3 mm long.

## Kernels short.

## Kernels mid-long.

## Beaks 3-15 mm long.

## Stem purple.

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## DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF COMMON WHEAT VARIETIES

## MARTIN

*Description.*—Plant winter habit, midseason, tall; stem white, strong; spike awnleted, linear-fusiform, lax, nodding, easily shattered; glumes glabrous, white, long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, acute, triangular, 1 mm long; awnlets few, 5 to 25 mm long; kernels white, mid-long, soft, ovate; germ small; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

This variety is distinguished from other winter varieties of the group by its long, lax, tapering spike. A selection (C.I.<sup>6</sup> 4463) has been isolated that is immune from some forms of bunt.

*History.*—Martin (reg.<sup>6</sup> no. 2) was originated from a single plant found as a mixture in a field of Clawson by Henry S. Bunnell, of Junius, Seneca County, N.Y., about 1875 (160). Several names were early applied to it. It was called Armstrong by R. T. Halloway, of Penn Yan, Yates County, N.Y., who first distributed it in 1880 (11, p. 666). The variety never became widely grown, however, under that name. In 1882 J. A. Everitt, seedsman, of Watertown, Pa., named it Martin Amber and distributed it widely (11, p. 666). The variety became commercially established under that name. It was also distributed in 1882 as Landreth, by David Landreth & Son, seedsmen, of Philadelphia, Pa. (160). Satisfaction is the name under which a similar wheat was obtained by the United States Department of Agriculture, but this evidently was wrongly labeled and the name should not be used for this variety. Silver Chaff is an old name for the variety used in Ohio (10) and was early recognized by the Ohio Agricultural Experiment Station as a synonym for Martin (116).

*Distribution.*—The estimated area of Martin decreased from 37,800 acres in 1919 to 1,504 acres in 1929. The latter acreage was reported from Idaho, Ohio, and Washington.

*Synonyms.*—Amber, Armstrong, Landreth, Martin Amber, Satisfaction, Silver Chaff, White Amber.

## PROHIBITION

*Description.*—Plant winter habit, midseason to late, mid-tall to tall; stem glaucous, white, strong; spike awnleted, linear-oblong to subclavate, mid-dense, erect to inclined; glumes glabrous, white, mid-long, wide; shoulders narrow to mid-wide, oblique to rounded; beaks wide, obtuse, 0.5 to 1 mm long; awnlets few, 1 to 15 mm long; kernels white, mid-long, soft, ovate, humped; germ small; crease wide, mid-deep; cheeks rounded; brush small, mid-long.

The distinctly humped kernel is a character that can be used to distinguish this variety from the other soft white wheats of the Pacific Northwest. Spikes, glumes, and kernels of this variety are shown in plate 3, A.

*History.*—R. H. Irvine, a pioneer in the Willamette Valley of Oregon, distributed Prohibition (reg. no. 3) in that State. He obtained, through a Dr. Crawford, several varieties from the Commissioner of Agriculture for trial, about 1885, and grew them on his farm about 9 miles northeast of Scio, in Linn County. One variety proved superior to anything then grown in the vicinity. Having forgotten the name of the variety, he called it Prohibition, as he had just become an ardent member of that political party. Later he found the description sheet which accompanied the original seed and learned that the name was "Rickenbrode." A Rickenbrode wheat was reported as a new variety tested at Mount Pleasant, Ontario County, N.Y., in 1883 (157). It was distributed in the Western States by the Commissioner of Agriculture about 1885 and is without doubt the wheat referred to. Nothing further is known concerning its origin.

*Distribution.*—The estimated area of Prohibition decreased from 24,600 acres in 1919 to 5,928 in 1929. The latter acreage is all in Oregon, principally in the Red Hills section of the Willamette Valley.

*Synonyms.*—Prohi and Rickenbrode. Prohi is a colloquial shortening of the name of the variety, which came into use in the Pacific Northwest.

<sup>6</sup> C.I. refers to accession number of the Division of Cereal Crops and Diseases.

<sup>6</sup> Reg. refers to registration number, explained on p. 15.

## GREESON

*Description.*—Plant winter habit, midseason, mid-tall; stem glaucous, white, mid-strong to strong; spike awnleted, oblong-fusiform, mid-dense, erect to inclined; glumes glabrous, white, mid-long, wide; shoulders wide, square to elevated; beaks wide, obtuse, 1 mm long; awnlets few, 2 to 20 mm long, somewhat incurved; kernels white, mid-long, soft, ovate, acute; germ mid-sized; crease mid-wide, deep; cheeks rounded; brush small, mid-long.

The variety differs principally from Prohibition in being slightly earlier and shorter, and in having slightly longer and laxer spikes and wider glumes and shoulders.

*History.*—According to W. H. McLean, of Whitsett, N.C., Greeson (reg. no. 4) was "originated by a man whose name was Greeson, and has been grown in this country for a number of years and is very popular." He reported that it constituted 40 percent of the wheat grown near Whitsett, Guilford County, N.C., in 1919.

*Distribution.*—Estimated area in 1929, 9,912 acres, grown principally in Chatham, Randolph, and Guilford Counties, N.C.

*Synonym.*—Greensboro. Because the seed was obtained at a fair held at Greensboro, N.C., this name is used for the variety in Randolph County, N.C.

## WHITE WINTER

*Description.*—Plant winter habit, late, mid-tall; stem white, strong; spike awnleted, oblong, blunt, dense, erect; glumes glabrous, white, mid-long, broad at base; shoulders wanting to oblique; keel incurved above; beaks wide, obtuse, 1 mm long; awnlets few, 3 to 20 mm long; kernels white, short to mid-long, soft, ovate, slightly humped; germ small; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

The variety differs from Prohibition principally in being later and less hardy and in having a distinctly incurved keel, smaller germ, and blunter kernel tip. Spikes, glumes, and kernels of this variety are shown in plate 3, B.

*History.*—White Winter (reg. no. 5) is one of the oldest wheats in western Oregon. It is reported to have been one of the principal wheats raised in Oregon Territory in 1855 (98). Joseph Connell, of Hillsboro, Oreg., reported in the wheat varietal survey of 1917 that Wold's White Winter, a synonym for White Winter, originated in Kent County, England, and had been grown in Washington County for about 40 years. W. L. Bishop, of Dundee, Yamhill County, Oreg., claims that he originated it as a result of a hybrid obtained by sowing several varieties in a field and letting them cross naturally. Names other than White Winter have been applied to the variety at times, but none has become generally used.

*Distribution.*—Estimated area in 1929, 26,710 acres, grown in western Oregon and in Siskiyou County, Calif. It is one of the principal varieties grown in the Willamette Valley of Oregon.

*Synonyms.*—Bishop's Pride, Oregon White, Wold's White Winter.

## EATON

*Description.*—This variety is similar to White Winter, differing only in being shorter and in having the spike slightly clavate rather than oblong. Spikes, glumes, and kernels of Eaton are shown in plate 4, A.

*History.*—The origin of Eaton (reg. no. 7) is undetermined. It is thought by the writers to be an old variety of English origin. It has been grown by the Oregon Agricultural Experiment Station since 1894.

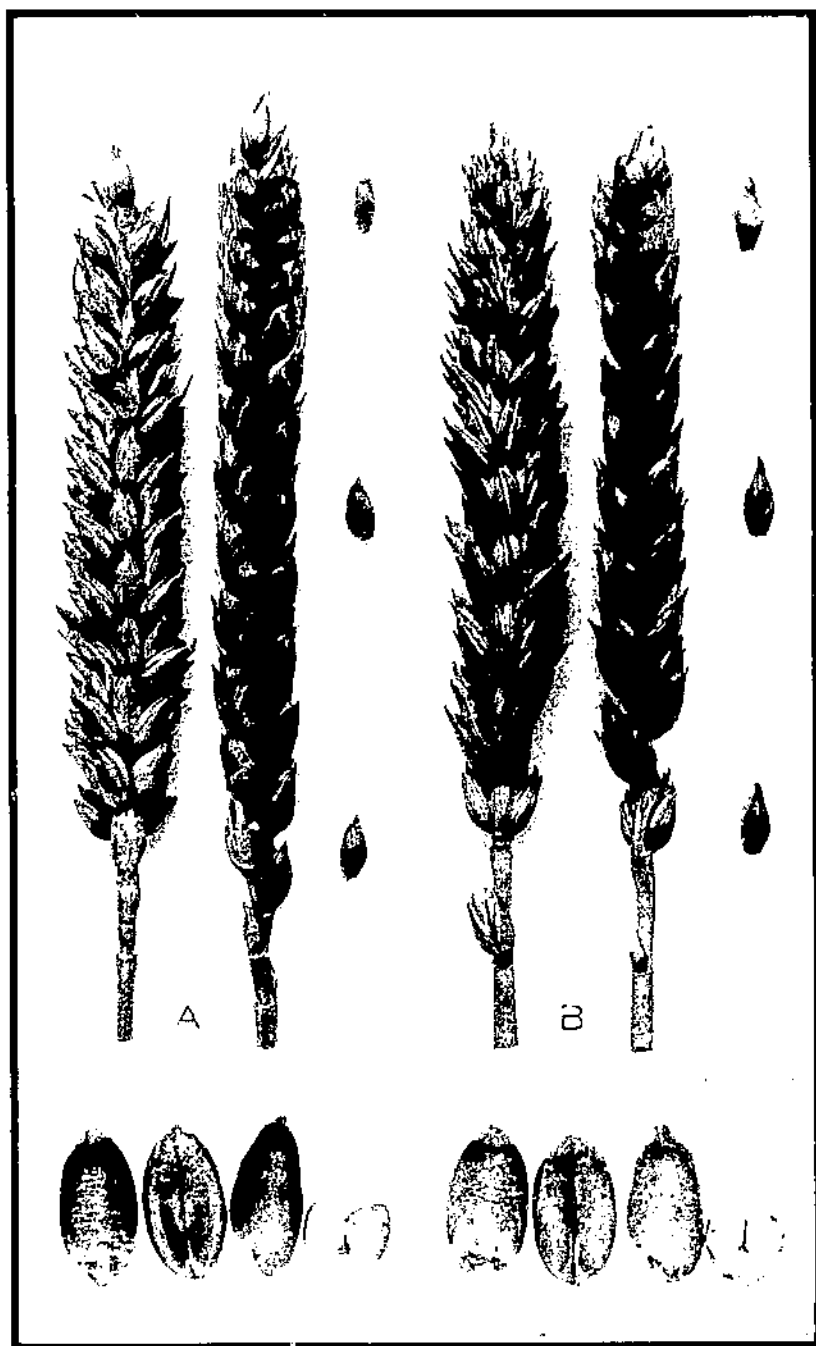
*Distribution.*—Estimated area in 1929, 9,996 acres, grown in Clackamas, Marion, and Multnomah Counties, Oreg.

## WILHELMINA (HOLLAND)

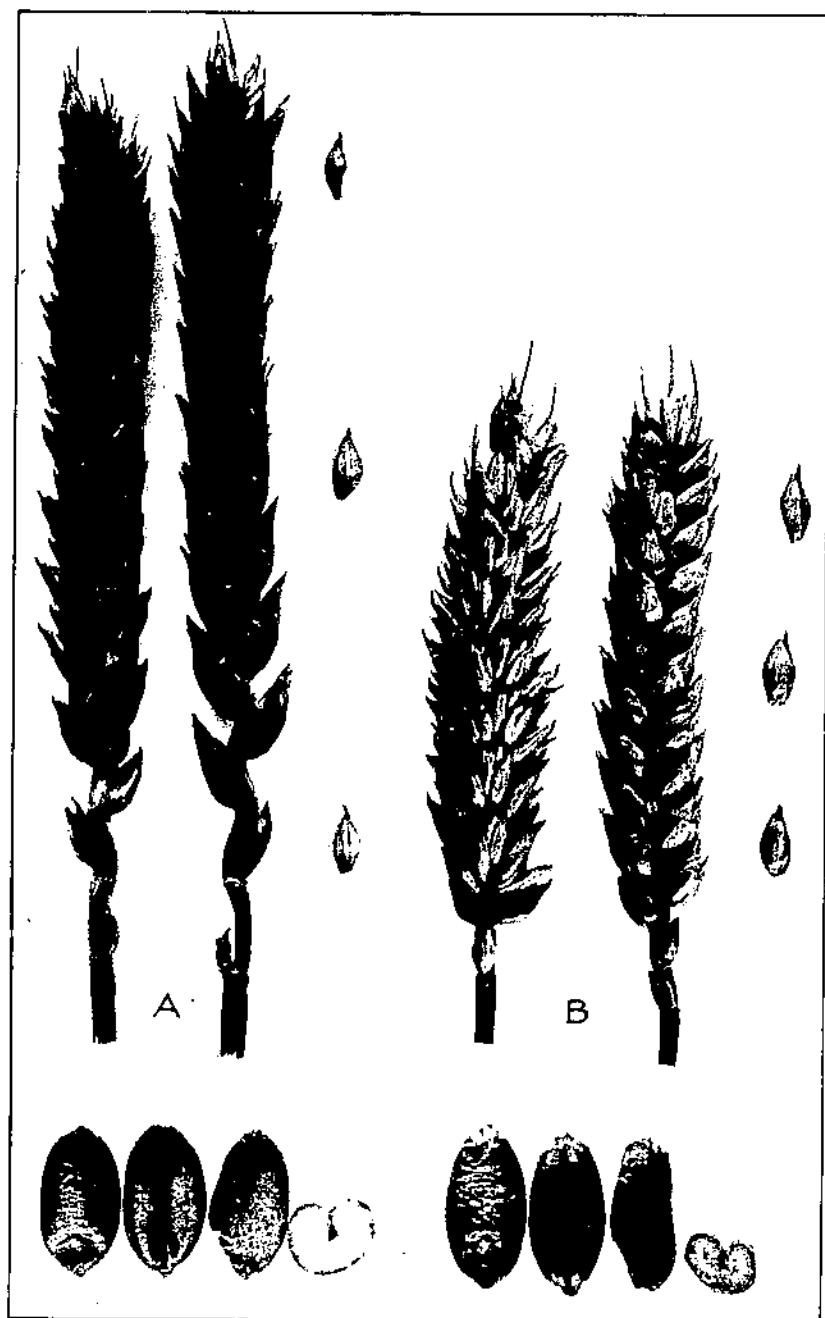
*Description.*—Plant winter habit, late, mid-tall; stem white, strong; spike awnleted, clavate, dense, erect; glumes glabrous, white, short to mid-long, mid-wide; shoulders narrow, wanting to round; beaks broad, obtuse, 0.5 mm long;

\* Letter from W. H. McLean, dated July 19, 1919.

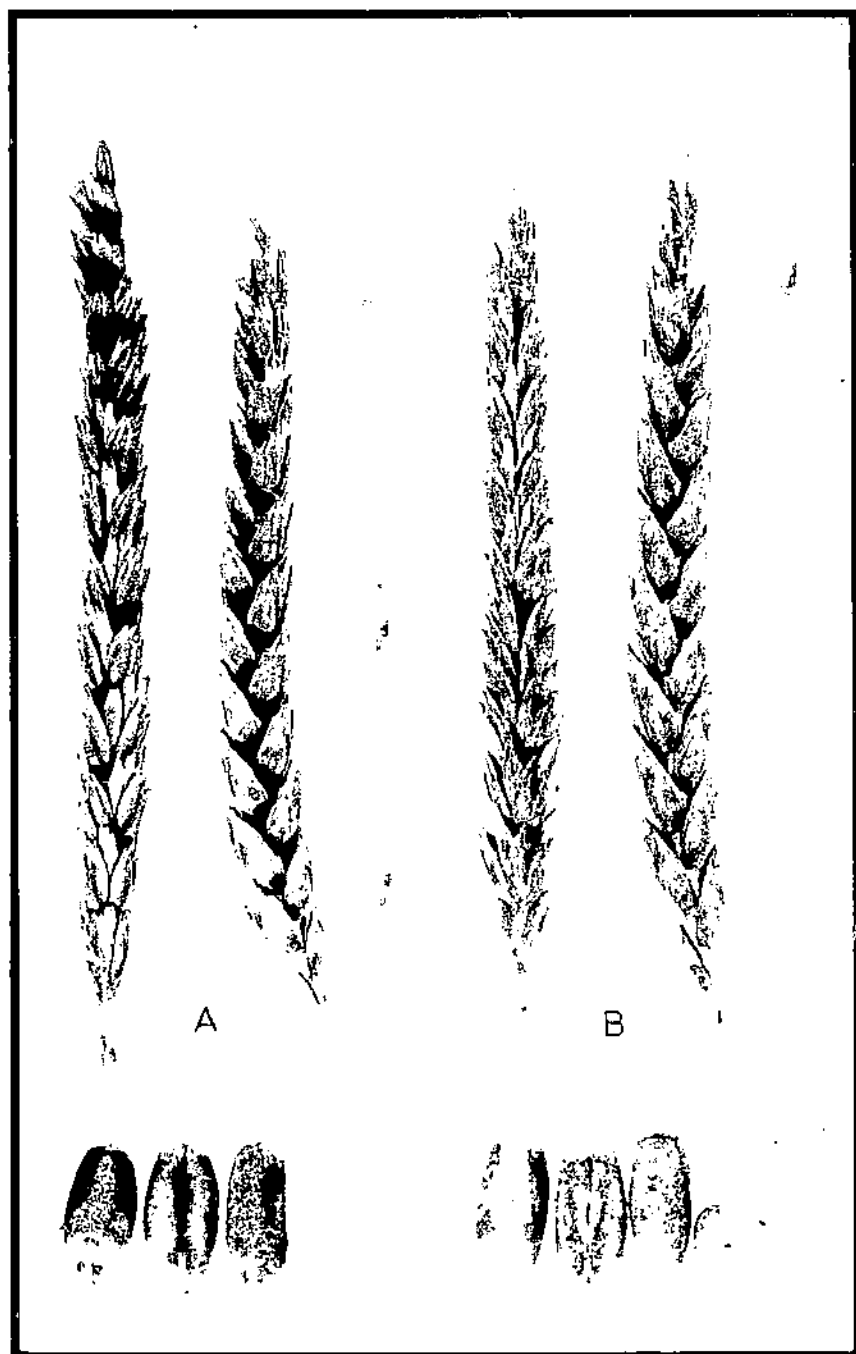




Prohibition (A) and White Winter (B) wheats. Spikes and glumes natural size, kernels  $\times 2$ .



Eaton (A) and Wilhelmina (B) wheats. Spikes and glumes natural size. Kernel  $\times 10$ .



Thrust (A) and Detached (B) wheat spikes and kernels (natural size, kernels x 4).

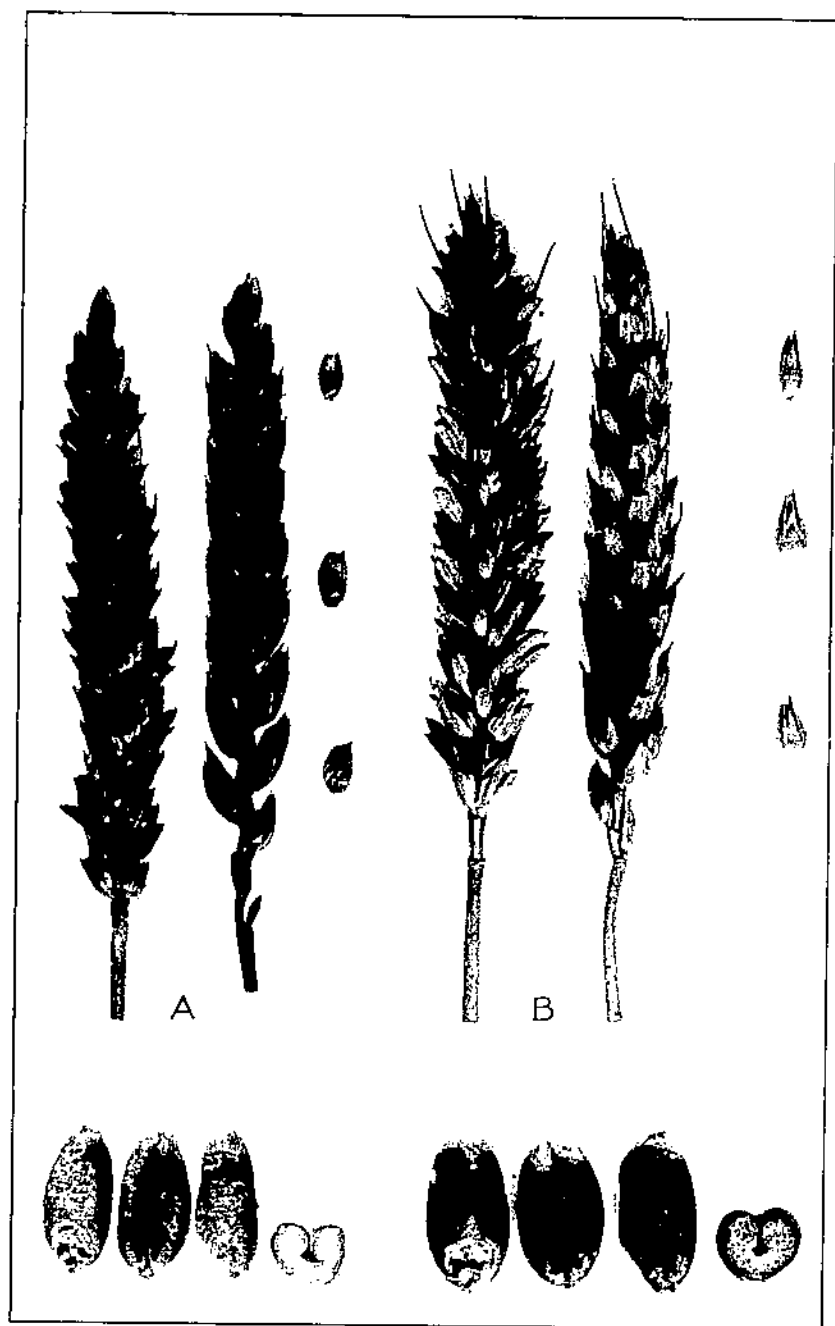


FIG. 1. *A.* and *B.* wheat. *A.* spikes and kernels natural size. *B.* kernels  $\times 10$ .

awnlets few, 3 to 10 mm; kernels white, short to mid-long, soft, ovate, slightly humped; germ small; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. *Wilhelmina* is slightly later and shorter and has a more dense, erect and blockier spike than *White Winter*. Spikes, glumes, and kernels of *Wilhelmina* are shown in plate 4, B.

*History*.—*Wilhelmina*, or *Queen Wilhelmina*, was developed by Emeritus Prof. L. Broekema (43), of the agricultural high school, Wageningen, the Netherlands, by back-crossing a selection from Squarehead X Zeeuwsche on Squarehead. Zeeuwsche was grown extensively in the Netherlands about 1890. The original cross was made in 1885. *Wilhelmina* is now one of the most prolific and most widely grown varieties in that country.

It was introduced under the name of *Queen Wilhelmina* from the Netherlands by the Oregon Agricultural Experiment Station about 1914 and distributed as *Holland* in the Willamette Valley of western Oregon, where it has partly replaced such varieties as *White Winter*.

*Distribution*.—The estimated area of *Wilhelmina* in 1929 was 23,004 acres, grown in Yamhill, Polk, Linn, Washington, Benton, and Marion Counties in western Oregon. No acreage was reported in 1919 or 1924.

*Synonyms*.—*Holland*, *White Holland*. The variety is known in the United States only under these names.

#### EARLY DEFIANCE

*Description*.—Plant spring habit, early, short to mid-tall; stem white, mid-strong; spike awnless, fusiform to oblong, mid-dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders narrow to mid-wide, oblique to square; beaks wide, triangular, acute, 0.5 to 1.5 mm long; apical awnlets usually wanting; kernels white, mid-long, semihard, ovate to elliptical; germ usually small; crease mid-wide, mid-deep; cheeks usually rounded; brush mid-sized, mid-long.

The variety differs from *Defiance* in being a week to 10 days earlier and in having harder kernels that are slightly longer and more pointed.

*History*.—*Early Defiance* (reg. no. 10) is a strain of *Defiance* wheat distributed by the Germain Seed Co., of Los Angeles, Calif.

*Distribution*.—Estimated area in 1924, 1,037 acres, grown in San Diego County, Calif. It was not reported in 1929.

#### ESCONDIDO

*Description*.—Plant spring habit, early, short to mid-tall; stem white, mid-strong; spike awnleted, fusiform, lax, erect to inclined; glumes glabrous, white, mid-wide, mid-long; shoulders wide, oblique to square; beaks broad, obtuse, 1 mm long; awnlets few, 5 to 15 mm long; kernels white, mid-long, semihard, ovate; germ mid-sized; crease wide, mid-deep; cheeks angular; brush mid-sized, short.

*History*.—*Escondido* was selected from *Defiance* at Davis, Calif., by the California Agricultural Experiment Station in cooperation with the Division of Cereal Crops and Diseases, United States Department of Agriculture. It produced good yields in cooperative tests in the more humid valleys along the coast of southern California because it is somewhat resistant to rust. It was first distributed for commercial growing in southern California in 1928.

*Distribution*.—Estimated area in 1929, 2,125 acres, grown in southern California.

#### TOUSE

*Description*.—Plant spring habit, midseason, mid-tall; stem white, slender, weak; apically awnleted, fusiform, mid-dense, erect to inclined; glumes glabrous, white, mid-long, narrow to mid-wide; shoulders narrow, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; apical awnlets wanting to few; kernels white, mid-long, soft, ovate to nearly elliptical; germ usually small; crease narrow to mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

This variety is not vigorous, has a very weak stem, and shatters readily. It has continued in cultivation partly as a mixture with club wheat, which prevents lodging, many growers stating they grow *Club* and *Touse*. Spikes, glumes, and kernels of *Touse* wheat are shown in plate 5, A.

*History.*—Touse (reg. no. 12) is an old wheat of Idaho and Utah. It was reported grown in Utah as early as 1870. Its origin is not definitely determined, but it is thought by the writers to be the Touzele wheat which was introduced by the Federal Government from Marseille, France, the record of which was as follows:

"There have been two importations—one of 140 bushels in August 1860 and one of 123 bushels in January 1870. A small distribution was made in September 1869 chiefly through Senators and Representatives in Congress" (79, pp. 128-129).

Distribution of this variety by the Federal Government continued for several years. In the early seventies reports of the variety were received from several sections of the United States. It was distributed as a winter wheat, and reports from the Eastern States show that it did not prove sufficiently hardy for those sections, while in California, Colorado, and Oregon it was grown successfully.

*Distribution.*—The estimated area of Touse decreased from 22,800 acres in 1910 to 4,977 acres in 1929, limited in the latter year to Utah and Wyoming.

*Synonym.*—White Touse.

#### DEFIANCE

*Description.*—Plant spring habit, midseason, mid-tall to tall; stem white, weak to mid-strong; spike awnleted, fusiform, mid-dense, erect to inclined; glumes glabrous, white, mid-long, narrow; shoulders narrow, oblique to square; beaks wide, obtuse, somewhat incurved, 1 mm long; awnlets few, 5 to 20 mm long; kernels white, mid-long, soft, ovate; germ usually small; crease wide, mid-deep; cheeks usually angular; brush mid-sized, mid-long.

Defiance wheat is variable in many of the characters above described, indicating that there are several different strains within the variety. Spikes and kernels of this wheat are shown in plate 5, B.

*History.*—Defiance (reg. no. 13) is the result of a cross of White Hamburg as the male parent and Golden Drop as the female parent, which was made by Cyrus G. Pringle, in the Champlain Valley, near Charlotte, Vt., in 1871. It was first distributed in 1878 by B. C. Bliss & Sons, as Pringle's Defiance. It showed three distinct types of grain. A. E. Blount took some of this wheat to the Colorado Agricultural Experiment Station, where he grew it during a number of years and made careful selections. Three other commercial varieties have been developed from it, viz, Early Defiance, Escudido, and Regenerated Defiance. A. H. Danielson, who succeeded Professor Blount at the Colorado station, has recorded the following interesting history of the origin of Defiance wheat:

"Before closing I want to give a little résumé of the history of Colorado's most famous wheat. The mother of Defiance traces back to southern England and was originated by F. F. Hallett, of Brighton, in the sixties. He is the man who first used the word 'pedigree' as applied to wheat. The mother was a bearded club-shaped type with pretty red grain, somewhat soft, and Hallett called it the Golden Drop. It was quite popular in England, but never amounted much either in this country or Australia. From England it went to Canada, where a man named Pringle got it as the Canada Club. The father of Defiance was a Dutchman from Germany, and rather soft at that, but white. It came from Hamburg, from whence lots of wheat emigrated in those days. It had a long, coarse broad head, a big white berry, and a rank-growing constitution with good ability to stand on its feet. Good old White Hamburg has long since been dead and buried to cultivation, at least under that name, but was largely grown on the Pacific slope during the early days of cereal culture there" (73).

Much of the former acreage of Defiance has been replaced with the more productive varieties Dicklow and Federation.

*Distribution.*—The estimated area of Defiance decreased from 194,400 acres in 1910 to 40,920 acres in 1929. The latter acreage was grown from spring sowing, mostly on irrigated land in Colorado, Idaho, New Mexico, and Utah, and from fall sowing in western Oregon and in California.

*Synonym.*—Pringle's Defiance.

#### HUNK

*Description.*—Plant spring habit, midseason, mid-tall; stem white, strong; spike awnleted, broadly fusiform, mid-dense to dense, inclined; glumes glabrous, yellowish white, mid-long, mid-wide; shoulders wide, usually square;

beaks wide, acute, curved 1 to 1.5 mm long; awnlets many, 2 to 10 mm long, occurring throughout the spike and distinctly incurved; kernels white, short to mid-long, soft, ovate, slightly humped; germ usually small; crease mid-wide, deep; cheeks rounded; brush mid-sized, mid-long to long.

This variety is distinct in having incurved awnlets throughout the entire length of the spike.

*History.*—The origin of Rink (reg. no. 14) is undetermined. It was reported to have been grown in Washington County, Oreg., since 1909.

*Distribution.*—The estimated area of Rink increased from 14,400 acres in 1919 to 30,053 acres in 1929. The latter acreage was reported from Benton, Clackamas, Linn, Marion, Multnomah, Polk, Washington, and Yamhill Counties, Oreg.

#### ONAS

*Description.*—Plant spring habit, early to midseason, short to mid-tall; stem white, strong; spike apically awnleted, oblong, dense, erect; glumes glabrous, white, short, wide; shoulders wide, oblique to square; beaks mid-wide to wide, obtuse, 0.5 mm long; apical awnlets few, 0.5 to 5 mm long; kernels white, short to mid-long, soft, ovate; germ mid-sized; crease wide, mid-deep; cheeks rounded; brush small, mid-long. Spikes, glumes, and kernels of Onas are shown in plate 6, A.

*History.*—Onas (reg. no. 252) was developed (165) by F. Coleman of Toela, Saddleworth, South Australia, from a cross between Federation and Tarragon, the latter in turn from a cross between Improved Fife and Tardent's Blue. Onas was introduced from Australia by the United States Department of Agriculture (F.P.I.<sup>2</sup> 46796) in 1918. After having been tested in cooperative experiments in the Pacific Coast States seed was distributed from the University Farm at Davis, Calif., in 1923. It was registered as an improved variety in 1926 (58), its superior characters being high yielding capacity and strong stems. It has produced good yields on farms in Monterey and adjacent counties in southern California and in the Sacramento Valley. It yields about the same as Federation in the more humid sections and under irrigation in the Intermountain and Coast States. It has yielded about the same as Baart in experiments under extremely dry conditions at Lind, Wash. The variety seems to have an unusually wide adaptation in the Intermountain and Pacific Coast States.

*Distribution.*—Estimated area in 1929, 17,330 acres, grown in California, Oregon, and Washington.

#### BUNYIP

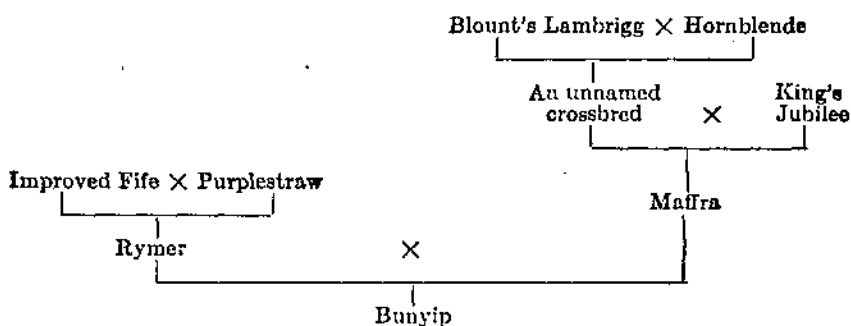
*Description.*—Plant spring habit, early, mid-tall; stem white, strong; spike awnleted, oblong, dense, erect; glumes glabrous, yellowish white (brown striped), mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks narrow to mid-wide, acute, 0.5 mm long; awnlets few, 3 to 12 mm long; kernels white, mid-long, soft to semihard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-long, mid-sized to large. Spikes, glumes, and kernels of Bunyip are shown in plate 6, B.

The glumes of this variety are distinctly brown striped, which sometimes gives it the appearance of a brown-glumed variety.

*History.*—Bunyip (reg. no. 15) is an Australian variety originated by William Farrer, the well-known plant breeder of New South Wales, Australia. Its origin has been recorded as follows:

"It is a crossbred, produced as the result of mating two other crossbreds, Rymer and Maffra, together. Rymer, the mother plant, was produced as the result of crossing Purplestraw [a white grain Australian variety] on to Improved Fife, the latter being a Manitoba variety. Maffra was the product of King's Jubilee, mated with an unnamed crossbred (Blount's Lambrigg × Horablende). Its pedigree is, therefore, as follows:

<sup>2</sup> F.P.I. refers to accession number of the Division of Plant Exploration and Introduction (formerly Foreign Plant Introduction).



"The cross was made in 1897 and named in 1901" (205, p. 189).

Bunyip was first introduced into the United States (F.P.I. 38345) in May 1914 by the United States Department of Agriculture (215). In 1915 a sample of the variety was included in the Australian exhibit at the Panama-Pacific International Exposition at San Francisco, Calif. A part of this seed was obtained, together with that of several other varieties, by the Sperry Flour Co. and grown on their experiment station near Stockton, Calif. Of several varieties grown, Bunyip was selected as the most promising and was increased and distributed for commercial growing in California. It has partly replaced such varieties as Pacific Bluestem and Baart.

**Distribution.**—The estimated acreage of Bunyip increased from a few experimental acres in 1919 to 39,508 acres in 1924 and to 116,435 acres in 1929. The latter acreage was reported from California, Washington, and Idaho, as shown in figure 15.

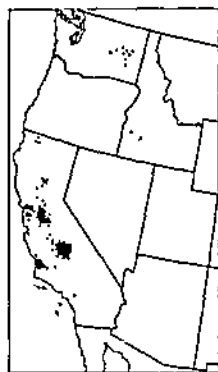


FIGURE 15.—Distribution of Bunyip wheat in 1929. Estimated area, 116,435 acres.

#### PACIFIC BLUESTEM

**Description.**—Plant spring habit, late, tall; stem white, mid-strong; spike awnleted, linear-oblong, dense, erect to inclined; glumes glabrous, yellowish white, sometimes becoming a light brown, mid-long, wide; shoulders wide, square to elevated; beaks wide, oblong, obtuse to truncate, 0.5 to 1 mm long; awnlets several, 8 to 20 mm long; kernels white, mid-long, soft to semihard, ovate,

sometimes becoming oval; germ mid-sized; crease wide, mid-deep; cheeks usually angular; brush mid-sized, mid-long.

This variety can be easily identified by its broad, square to elevated shoulders and broad, blunt beaks. The variety is adapted to favorable climatic conditions, and the grain is considered above the average in quality for breadmaking among the white-kerneled wheats grown in the Pacific Coast States. Spikes, glumes, and kernels of Pacific Bluestem are shown in plate 7, A.

**History.**—Pacific Bluestem (reg. no. 16) is an old wheat of the Pacific coast area, most commonly known as "Bluestem and White Australian." The variety came to North America from Australia. White Lammas was the leading wheat variety of Australia during the earliest years of wheat production in that country. According to Cobb (68, p. 9), White Australian of California is identical with White Lammas of Australia. It apparently was introduced into the United States in the early fifties as White Australian or Australian. During the period from 1852 to 1866 (195, p. 176; 29, p. 138; 83, p. 586) its culture became established in California under the name White Australian. Bluestem is the name under which the variety became established in Washington and Oregon. According to W. P. Church, of Walla Walla, Wash., the wheat known as "Bluestem" in that section came from two introductions, the first from Australia in 1882 and the second from New Zealand in 1896. The following item was recorded concerning the first introduction:



"Most of the wheat raised in that locality (Walla Walla County) is what is known as the Bluestem variety. It is an Australian wheat, introduced in this country by Sibson, Church & Co. George Delancy was the first to sow the wheat in this country in 1882, but W. H. Reed, of the firm of Reed & Co., grain merchants, was the first to bring it into general use" (14).

Concerning the second introduction, Mr. Church has stated that "it consisted of 14 sacks and contained a mixture of 10 to 15 percent of red kernels contained in bearded heads." Mr. Church stated further that the introductions came under the name of Purplestraw Tuscan. This name, however, was never used for the wheat in the United States. The wheat is not similar to the Purplestraw Tuscan wheat of Australia, but is somewhat similar to, but not identical with, the White Tuscan and Silver King varieties.

It is not known how the name "Bluestem" came to be applied to the variety, as it does not have the purple stem common to many varieties of wheat and is not similar to any of the other five varieties grown in the United States under that name. To distinguish this Bluestem wheat from the others it has been called Pacific Bluestem. In Washington and Oregon, Pacific Bluestem became as popular as White Australian did in California. A large part of the acreage of Pacific Bluestem has been replaced by Baart and Federation in recent years.

**Distribution.**—The estimated acreage of Pacific Bluestem decreased from 1,363,400 acres in 1919 to 363,955 acres in 1929. The latter acreage was reported from eight States, as shown in figure 19.

**Synonyms.**—Australian, Bluestem, Chile, Palouse Bluestem, White Australian, White Bluestem, White Chile, White Elliott, White Lammas.

#### GYPSUM

**Description.**—Plant spring habit, midseason, mid-tall; stem glaucous, white, strong; spike awnleted, subclavate, mid-dense, inclined; glumes glabrous, white, mid-long, wide; shoulders wide, oblique to square; beaks wide, triangular, acute, 0.7 to 1.2 mm long; awnlets several, 5 to 15 mm long; kernels white, mid-long, soft to semi-hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks usually angular; brush mid-sized, mid-long.

This variety differs principally from Defiance in having shorter and broader subclavate spikes and broader glumes with squarer shoulders and longer beaks. The kernels have a distinctly rough coat.

**History.**—Gypsum (reg. no. 19) is recorded by Carleton (50, p. 83) as of hybrid origin. It was developed at the Colorado Agricultural Experiment Station, Fort Collins, Colo., during the eighties, by A. E. Blount. The variety became known in Australia as Blount's Lambrigg (70, p. 4; 52, p. 219). During recent years, in the United States, the variety has been grown as Colorado Special, that name having been in use as early as 1912 on the Rexburg Bench, in southeastern Idaho.

**Distribution.**—The estimated acreage of Gypsum decreased from 9,600 acres in 1919 to 1,520 acres in 1924, and it was not reported in 1929. It was formerly grown as Colorado Special in southeastern Idaho.

**Synonyms.**—Blount's Lambrigg, Colorado Special.

#### OREGON ZIMMERMAN (ZIMMERMAN)

**Description.**—Plant spring habit, midseason, tall; stem white, strong; spike awnleted, clavate, mid-dense to dense at apex, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders narrow, oblique; beaks mid-wide, obtuse, 1 mm long; awnlets several, 5 to 25 mm long; kernels white, mid-long to long, soft; germ elliptical, mid-sized; crease wide, deep; cheeks angular; brush mid-long.

**History.**—Ed. Zimmerman, of Shedd, Oreg., developed this variety from a single plant and first distributed it about 1921. As the Surprise variety has been grown in this locality, it is probable that Oregon Zimmerman is a selection from it. This variety grown in Oregon under the name "Zimmerman" has

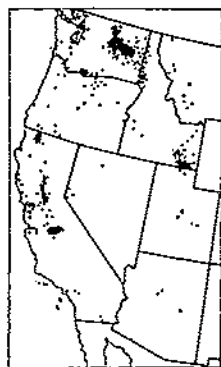


FIGURE 19.—Distribution of Pacific Bluestem wheat in 1929. Estimated area, 363,955 acres.

white kernels and should not be confused with the soft red winter variety bearing this name.

*Distribution*.—Estimated area in 1929, 3,474 acres, grown in the Willamette Valley of Oregon.

*Synonym*.—Zimmerman.

#### SURPRISE

*Description*.—Plant spring habit, late, mid-tall to tall; stem slightly glaucous before maturity, white, mid-strong to strong, coarse; leaves broad; spike awnleted, clavate, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 1 mm long; awnlets several, 3 to 15 mm long; kernels white, short to mid-long, soft, oval to ovate; germ small to mid-sized; crease wide, deep; cheeks rounded to angular; brush mid-sized, mid-long.

This wheat varies somewhat from the preceding description. Several distinct types have been selected from it, and many more could be. Like Defiance, the variety was not pure when first distributed. It is a high-yielding wheat when grown under very favorable conditions and is well adapted for growing under irrigation.

*History*.—Surprise (reg. no. 20) was originated by Cyrus G. Pringle, in the Champlain Valley, near Charlotte, Vt., in the late seventies. Concerning the origin of the variety, Mr. Pringle wrote the Rural New Yorker as follows:

"My No. 4 (thus numbered only in samples of wheat sent to Prof. Blount for trial) is a cross between the Chile Club, the soft, white variety, widely grown in the Pacific coast, and the Michigan Club, once common over our Northwestern States. Under the name of Pringle's Surprise, the entire stock was sold two or three years ago by my agent to the Commissioner of Agriculture, Le Duc, for distribution" (12).

It evidently was widely distributed in several Western States in the eighties. It was advertised in California farm papers at that time, but with the decline of the wheat industry in that State the identity of the variety became lost. It later became known by several different names. In California it has been called California Gem, Bay, Golden Gate Club, Smith Club, and Pride of California. In Utah it has been grown as California Club, Imperial Club, Silver Club, Excelsior, and Silver Chaff. The name Pringle's Surprise continued in use in Grays Harbor County, Wash., where it was introduced about 1883. Australian Club is the name under which the variety is grown in Lane County, Oreg. California Gem is the name under which the variety was grown and distributed by the California Agricultural Experiment Station beginning about 1899 (20). University Gem has also been used by the California Agricultural Experiment Station. White Russian was used for the variety by the Washington Agricultural Experiment Station.

*Distribution*.—Estimated area in 1929, 24,071 acres, grown in California, Colorado, Oregon, Utah, Washington, and Wyoming, mostly under the synonyms here recorded.

*Synonyms*.—Australian Club, Bay, California Club, California Gem, California Glory, Excelsior, Golden Gate Club, Imperial Club, Pride of California, Pringle's Surprise, Silver Chaff, Silver Club, Smith Club, University Gem, White Russian.

#### DICKLOW

*Description*.—Dicklow differs from Surprise in having spikes slightly longer and laxer and stems and leaves much more glaucous during the heading and blossoming stages of growth. It is a high-yielding variety under irrigation, but will shatter badly if allowed to become overripe before harvest. Spikes, glumes, and kernels are shown in plate T, B.

*History*.—Dicklow (reg. no. 21) was developed by selection and is much more uniform than Surprise. The origin of this strain of Surprise wheat has been recorded by Aicher (26, p. 26) as follows:

"Mr. James Holly, of Utah County, Utah, obtained some California Club wheat from northern California and seeded it on his farm. Excellent results were obtained, and he called the attention of his neighbor, Mr. Richard Low, to his new wheat. Mr. Low obtained some and grew it. He noticed that the

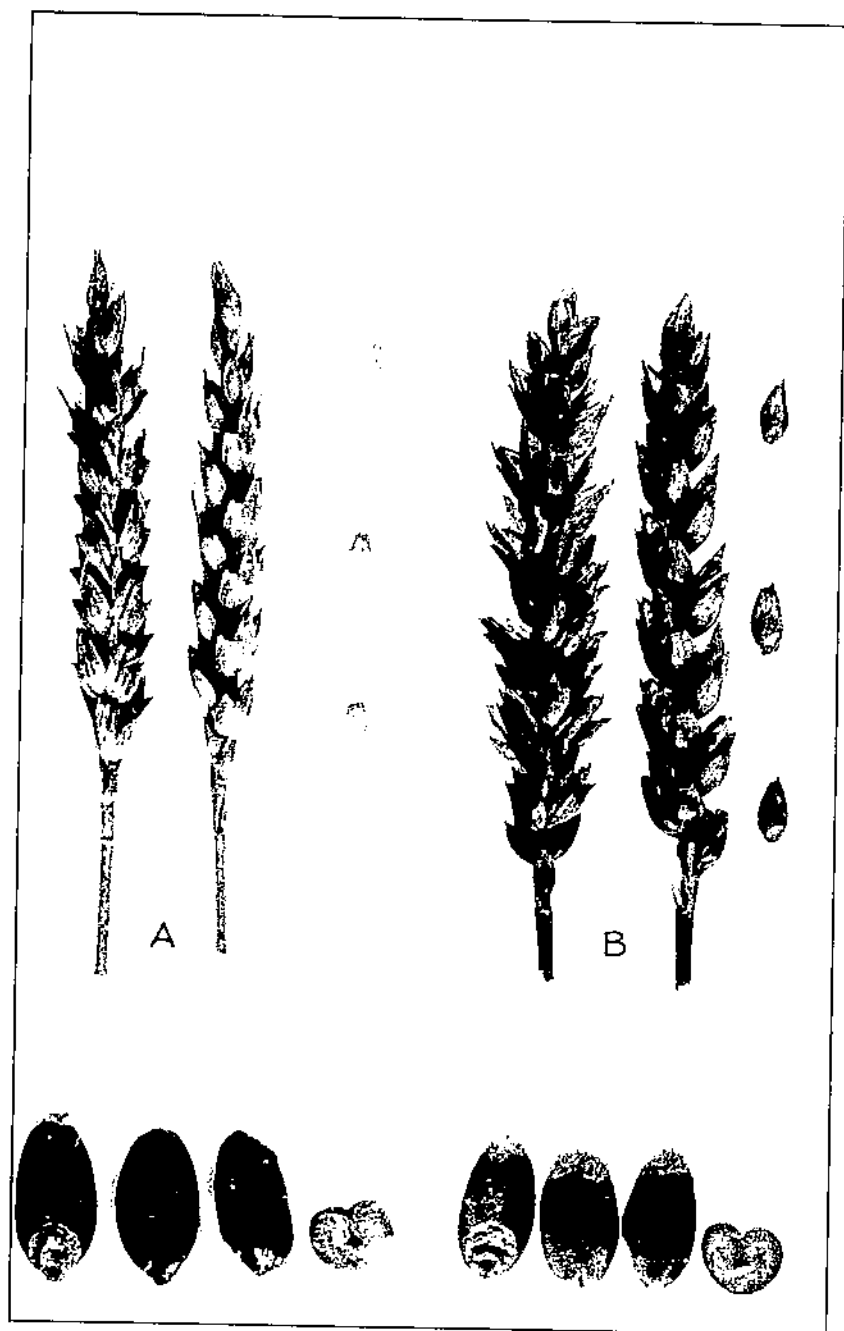


A

B



Public Range (A) and Dicklow (B) wheats. Spikes not in true natural size, kernels 3/4



Quality C-1 and White Moderate n. 7c wheat. Spikes in 1.0 inch; natural size, kernels  $\times 2$ .

wheat contained different types and proceeded to select the type which he liked best. He grew this selection for several years, and the neighbors soon began clamoring for 'Dick' Low's wheat. As the wheat became spread over that section of Utah, it lost its personal connection with 'Dick' Low and became known simply as Dicklow wheat."

Irwin Dicklow is the name used for a selection of Dicklow developed by Carl D. Irwin, Twin Falls, Idaho, and is even more uniform than Dicklow itself.

In southern Idaho the millers prefer Dicklow to other varieties for the soft-wheat flour trade because it produces a low-protein, very white flour.

Dicklow has replaced such varieties as Defiance and Colorado Special under irrigation.

**Distribution.**—The estimated acreage of Dicklow decreased from 164,600 acres in 1919 to 115,947 acres in 1924 but increased to 253,421 acres in 1929. The latter acreage was reported from 10 States, as shown in figure 20. Dicklow is most widely grown under irrigation in southern Idaho, where it was introduced in 1912 and 1913.

**Synonyms.**—Irwin Dicklow, Jim Holly.

#### QUALITY

**Description.**—Plant spring habit, early, short to mid-tall; stem white, strong; spike awnleted, fusiform, mid-dense, erect to inclined, easily shattered; glumes glabrous, yellowish white, short, wide; shoulders wide, oblique to square; beaks wide, acute, 0.5 mm long; awnlets several, 5 to 25 mm long; kernels white, short to mid-long, hard, oval; germ mid-sized; crease mid-wide, mid-deep to deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of Quality are shown in plate 8, A.

Quality is a spring wheat and is not winter hardy when fall sown. It is resistant to some forms of bunt and shatters very badly in dry climates.

**History.**—Quality (reg. no. 23) was first distributed by Luther Burbank, of Santa Rosa, Calif., in 1918. In his catalog of New Standard Grains (45) in 1918, Mr. Burbank's first published statement concerning Quality wheat is as follows:

"This season I offer a superior early hard white wheat suited to all climates wherever wheat can be grown; as a summer wheat in the cold far northern climates and as a winter crop in the United States and most wheat-growing countries. It is especially adapted also to short seasons and soils and dry climates. A superior white milling wheat which makes the best light, sweet, nutritious bread and pastry. \* \* \* This early, hardy 'Quality' wheat which I offer this season will not yield as much as some of the coarse macaroni wheats in some warm, dry sections, but for general culture, with its unusual hardiness and extreme earliness, uniformity, superior milling and bread-making qualities, it stands alone. It most resembles in all these respects the hard northern wheat 'Prize Marquis', but has a vitreous white berry of quite different appearance and quality and of about the same specific gravity as granite."

The seed was originally sold at \$5 per pound, or \$45 for 10 pounds, i.e., at the rate of \$270 a bushel. Concerning these extravagant claims and prices, Buller (44, p. 235) has made the following comment:

"But Mr. Burbank is only just beginning his work as an introducer of new wheats, and the writer cannot help feeling that in penning his advertisement of Quality he allowed his enthusiasm for his new cereal to be mixed a little too freely with his ink. \* \* \* When Mr. Burbank tells us that Quality \* \* \* has kernels with about the same specific gravity as granite, surely he is addressing us in the language of hyperbole."

The Pillsbury Flour Mills Co., of Minneapolis, Minn., distributed seed of Quality wheat in North Dakota, South Dakota, and Minnesota about 1923.

**Distribution.**—The estimated acreage of Quality increased from a few experimental acres in 1920 to 11,870 acres in 1924 and to 131,842 acres in 1929. It is grown principally in North Dakota, South Dakota, Minnesota, and Idaho,

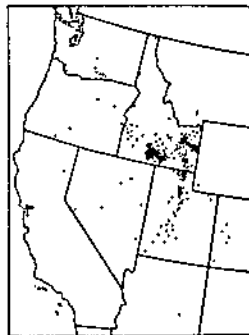


FIGURE 20.—Distribution of Dicklow wheat in 1929. Estimated area, 253,421 acres.

although it was reported in 11 States. The 1929 distribution is shown in figure 21.

*Synonyms.*—Burbank's Quality, Qualintine, Russian Qualintine, Siberian, Sommer's Triple Cross.

#### WHITE FEDERATION

*Description.*—Plant spring habit, early, short to mid-tall; stem white, strong, spike awnless, oblong, mid-dense, erect; glumes glabrous, white, short, wide; shoulders wide, square; beaks narrow, acute, 0.5 mm long; awnlets wanting or nearly so; kernels white, short, semilard to hard, ovate, with truncate tip; germ mid-large; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of White Federation are shown in plate 8, B.

This variety is very similar to Hard Federation, except that it has white instead of brown glumes and is taller and more uniform in height. The kernels are not quite so hard. It has proved to be a high-yielding wheat in some sections of California, Oregon, and Washington.

*History.*—White Federation (reg. no. 25) is a selection from Federation (145). The following sentence indicates its origin:

"The seed (hard kernels selected from Federation by Mr. J. T. Priddham, from which Hard Federation originated) was propagated, and in 1910 the

occurrence of white heads was noticed and from then until 1912 distinctly white heads were common among the brown" (22, p. 664).

The name "White Federation" has been used for the wheat at the Cowra Experiment Farm, New South Wales, Australia, since 1915, when a field of 3 acres of the variety was grown (164).

It was introduced into the United States by the United States Department

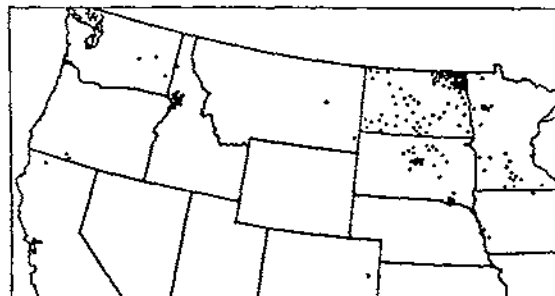


FIGURE 21.—Distribution of Quality wheat in 1929. Estimated area, 131,842 acres.

of Agriculture (215) in 1916 (F.P.I. 42104), when 5 ounces of seed were presented by A. E. V. Richardson, agricultural superintendent of the Department of Agriculture at Melbourne, Victoria, Australia. It was first grown in a 5-foot row at the Sherman County Branch Station, Moro, Oreg., in 1916. In 1918 it was first grown at the United States Plant Introduction Garden, Chico, Calif., and because of its high yield at that point it was increased and distributed in 1920 for commercial growing in California (65, p. 24).

*Distribution.*—The estimated area of White Federation was 1,311 acres in 1924 and 88,401 acres in 1929, grown in California and Nevada.

#### REGENERATED DEFLANCE

*Description.*—Plant spring habit, late, tall; stem glaucous when green; white, mid-strong; spike awnleted, linear-oblong, mid-dense, erect to inclined; glumes glabrous, white, mid-long, narrow; shoulders narrow, oblique to square; beaks narrow, triangular, acute, 0.8 to 1.5 mm long; awnlets several, 3 to 15 mm long; kernels white, short, hard, broadly oval to ovate; germ mid-sized; crease wide, deep; cheeks usually angular; brush mid-sized, mid-long, sometimes collared.

This variety differs from Defiance in being later and taller and in having a longer and broader spike and a shorter and harder kernel. The kernel differs from Dicklow in being shorter and harder and in having a deeper crease.

*History.*—Regenerated Defiance (reg. no. 27) is one of several selections of Defiance wheat made by A. E. Blount at the Colorado Agricultural Experiment Station. In 1903 A. H. Danielson found this particular selection in a bottle marked Defiance, which Professor Blount had left some 12 years previously.

He sowed all of the seed found, about 50 kernels, but only 3 produced seed. This seed was grown and further selected and increased until 1907, when it was distributed as "Regenerated Defiance."

*Distribution.*—Grown mostly under irrigation in Colorado and Utah. The distribution of this strain of Defiance cannot be separated from Defiance itself.

#### NEW ZEALAND

*Description.*—Plant spring habit, midseason to late, tall; stem white, strong; spike awnleted, linear-oblong, mid-dense, inclined; glumes glabrous, white, mid-long, narrow; shoulders mid-wide, oblique to elevated; beaks mid-wide, obtuse, 0.5 to 1 mm long; awnlets few, 3 to 30 mm long; kernels white, mid-long to long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

This variety is very similar to Pacific Bluestem, but it differs principally in having a longer and laxer spike, narrower shoulders, and larger kernels.

*History.*—The origin of New Zealand (reg. no. 28) is undetermined. It is possibly the Blé de Zéland of France, described by Heuzé (113, p. 79). According to J. H. Wittner, county agent, Vernal, Utah, New Zealand wheat was introduced into Utah about 1890, where it has been grown sparingly until the present time.

*Distribution.*—The estimated area of New Zealand decreased from 4,630 acres in 1924 to 881 acres in 1929, grown in Idaho and Utah.

*Synonyms.*—Ninety-Day, Ruby.

#### CURRAWA

*Description.*—Plant spring habit, early, short to mid-tall; stem white, strong; spike awnleted, clavate, dense, erect; glumes glabrous, yellowish white, short, wide; shoulders wide, oblique to square; beaks broad, obtuse, 0.5 mm long; awnlets several, 5 to 20 mm long; kernels white, mid-long to long, soft, ovate; germ mid-sized; crease wide, deep; cheeks angular; brush small, short.

The kernels of Currawa are softer than those of Baart, the spring variety most extensively grown in central Washington.

*History.*—According to Scott (189), Currawa was bred by H. Pye, at Dookie Agricultural College, Victoria, Australia, by crossing an unnamed hybrid between Northern Champion and Cretan with Little Club. Cretan is a durum wheat. Currawa (F.P.I. 42105) was first introduced into the United States by the United States Department of Agriculture from seed furnished by A. E. V. Richardson of Melbourne, Victoria, Australia, in 1916. It was tested at several experiment stations in the western part of the United States and was distributed from the experiment station at Waterville, Wash., in 1928.

*Distribution.*—Since 1930 Currawa has been grown commercially in Douglas County, Wash., where it is liked because of its earliness and stiff straw.

#### PILCRAW (THOMPSON CLUB)

*Description.*—Plant spring habit, midseason, mid-tall, stem white, strong; spike awnleted, clavate, dense, erect; glumes glabrous, white to yellowish, short, wide; shoulders mid-wide to wide, square to elevated; beaks narrow, acute, 0.5 to 1 mm long; awnlets several, 8 to 40 mm long; kernels white, mid-long to long, soft, ovate, distinctly humped; germ mid-sized; crease mid-wide, mid-deep to deep, pitted; cheeks rounded; brush large, mid-long to long.

This variety is very similar to Surprise, but differs principally in being earlier and shorter and in having more numerous and longer awnlets and longer and humped kernels.

*History.*—Hugh A. Crawford, Napa, Calif., obtained Pilcraw (reg. no. 29) from a neighbor who said he had noticed an unusual stool of wheat near an unfrequented road and who cut it when ripe and started experimenting with it. Mr. Crawford bought the original seed in 1913 and increased it until in 1917 he had 360 acres growing at Winters, Calif. He named it Pilcraw Enormous and distributed it.

*Distribution.*—Estimated area in 1929, 13,408 acres. Grown as Thompson Club in the Yakima Valley of Washington.

*Synonyms.*—Pilcraw Enormous, Thompson, Thompson Club, White Russian.

# RICE

*Description.*—Plant winter habit, early, mid-tall; stem white, mid-strong; spike awnleted, fusiform, dense, erect; glumes glabrous, white, short, mid-wide; shoulders mid-wide, oblique to square; beaks nearly wanting; awnlets few, 1 to 10 mm long; kernels pale red, short to mid-long, soft, ovate; germ small to mid-sized; crease mid-wide, shallow to mid-deep; cheeks angular; brush mid-sized, mid-long.

This variety is very similar to Zimmerman but differs principally in having a more fusiform although denser spike and harder kernels.

*History.*—The origin of Rice (reg. no. 30) is undetermined, although it is known to be an old variety in the United States. In 1883 it was first reported as a "new variety tested by M.F.P., Mount Pleasant, Ontario County, N.Y." (157, p. 657), and it also was mentioned in that year by C. S. Plumb (162, p. 310) in a paper entitled "The Wheats of the World", read at the Batavia Institute. In the Southern States the name Red May is applied to a variety apparently identical with Rice.

*Distribution.*—Estimated area in 1929, 5,693 acres, grown in Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and West Virginia.

*Synonyms.*—Early Rice, Red May, Red Rice, White Rice.

# MINHARDI

*Description.*—Plant winter habit, midseason, mid-tall; stem white, slender, mid-strong; spike awnleted, fusiform, mid-dense, erect; glumes glabrous, white, mid-long, narrow; shoulders narrow, wanting to oblique; beaks wide, obtuse, 1 mm long; awnlets several, those on the upper third of spike usually incurved, 2 to 15 mm long; kernels red, short to mid-long, soft to semihard, ovate; germ small; crease mid-wide, mid-deep; cheeks usually rounded; brush mid-sized, mid-long. This is one of the most winter hardy wheats grown.

*History.*—Minhardi (reg. no. 31) was originated at the Minnesota Agricultural Experiment Station. It is one of the progeny of a cross made between Odessa (female) and Turkey (male) in 1902, when W. M. Hays was in charge of the plant breeding. Several selections from this cross grown in 1915 showed unusual promise for winter hardiness, and, after further experiments reported by Hayes and Garber (107, pp. 17-28), the most hardy strain (Min. No. 1505) was named Minhardi and distributed.

*Distribution.*—Estimated area in 1929, 886 acres grown in Minnesota.

*Synonym.*—Minnesota No. 1505. This is the Minnesota accession number under which Minhardi was grown until it was named.

# LOFTHOUSE

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 1 mm long; awnlets several, 5 to 30 mm long; kernels red, mid-long, soft, ovate; germ small; crease mid-wide, mid-deep; cheeks usually angular; brush small, mid-long.

There is some confusion as to the identity of this variety. It frequently has been referred to as whitekerneled and often is confused with the Kofod variety.

*History.*—A wheat by the name of Lofthouse has been grown in Utah since about 1890. The sample from which were grown the plants described above was obtained by the Nephi substation, Nephi, Utah, from the State agricultural experiment station at Logan in 1904. The origin of Lofthouse (reg. no. 32) cannot be accurately traced, and considerable confusion exists as to whether the variety originally was a whitekerneled or redkerneled wheat. According to J. B. Nelson, the variety became established in Utah from seed distributed by a Mr. Lofthouse, a farmer at Paradise, Utah, about 10 miles south of Logan. Mr. Nelson states that in 1893 or 1894, in a conversation with Mr. Lofthouse regarding the best varieties of wheat for dry farming, he was told that Mr. Lofthouse had received a sample of soft white winter wheat from the United States Department of Agriculture a year or two previously, which



promised to produce large yields and was a good milling wheat. He stated that he had sufficient seed on hand at that time to sow a good acreage, that he was going to sell it to the dry farmers at market value, and that he had named the wheat Lofthouse. The wheat was hardy, standing the winter better than other varieties, and soon became the most extensively grown winter wheat in northern Utah and southern Idaho. While the above statement shows that the wheat originally was whitekerneled, the wheat grown at Nephi, Utah, since 1904 is redkerneled.

**Distribution.**—Estimated area in 1929, 5,639 acres, grown in Utah and Idaho. Part of this distribution was reported as whitekerneled.

**Synonyms.**—Winter La Salle, Winter Nellis. Winter La Salle is thought to be the name under which the wheat later named Lofthouse was sent to Utah by the United States Department of Agriculture.

#### LEAP

**Description.**—Plant winter habit, early, mid-tall; stem white, mid-strong; spike awnleted, fusiform, mid-dense to lax, inclined to nodding, easily shattered; glumes glabrous, yellowish white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, acute, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels red, mid-long, soft, ovate; germ small; crease mid-wide to wide, mid-deep; cheeks usually angular; brush small, mid-long. Spikes, glumes, and kernels of Leap wheat are shown in plate 9, A.

**History.**—Leap (reg. no. 35) is reported to have originated from a single plant found in a field of Mediterranean by a son of J. S. Leap, of Virginia. From the five heads gathered in 1901, Mr. Leap increased the wheat until 1905, when he threshed 190 bushels grown from 10 bushels of seed. T. W. Wood & Sons, seedsmen, of Richmond, Va., first distributed the variety as Leap's Prolific. General distribution of the wheat started about 1907, and it since has become very popular (138, p. 44).

**Distribution.**—Estimated area in 1929, 673,613 acres, grown in 12 States, as shown in figure 22.

**Synonyms.**—Hastings Prolific, Leap's Prolific, Woods Prolific, Woolf.

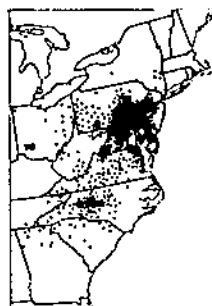


FIGURE 22.—Distribution of Leap wheat in 1929. Estimated area, 673,613 acres.

#### PURKOF

**Description.**—Plant winter habit, midseason, mid-tall to tall; stem white, mid-strong; spike awnleted, fusiform, mid-dense, nodding; glumes glabrous, white, short, wide; shoulders wide, oblique to square; beaks mid-wide, obtuse, 1 mm long; awnlets several, 5 to 25 mm long; kernels red, short to mid-long, semihard, ovate to elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

Purkof is a soft red winter wheat with a semihard tendency. It usually shows some hard kernels and is often graded mixed on the market. Spikes, glumes, and kernels of Purkof are shown in plate 9, B.

**History.**—Purkof (reg. no. 263) was produced from a hybrid between Michigan Amber and Malakof made in 1912, and last selected in 1915, at the Purdue University Agricultural Experiment Station. It was distributed about 1924 and registered (63) as an improved variety in 1929. Its superior characters are high yield under Indiana conditions, outstanding winter

hardiness, stiff straw, resistance to shattering, and ability to stand in the field without loss for a long time after the crop is ripe.

**Distribution.**—Estimated area in 1929, 199,816 acres, grown in 4 States, as shown in figure 23.

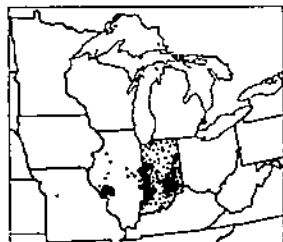


FIGURE 23.—Distribution of Purkof wheat in 1929. Estimated area, 199,816 acres.

## ZIMMERMAN

**Description.**—Plant winter habit, early, mid-tall; stem white, mid-strong; spikes awnleted, oblong-fusiform, mid-dense, erect to inclined; glumes glabrous, white, short, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels pale red, usually short, soft, ovate; germ small to mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

Zimmerman is similar to Fultz, but differs principally in being earlier and having white straw and a smaller kernel.

**History.**—Zimmerman (reg. no. 37) is reported to have been originated about 1837 near Frederick, Md., by Henry Zimmerman, who noticed three heads of singular appearance near the edge of one of his wheat fields. They were saved, the seed sown and increased, and at the end of the sixth year he had over 60 bushels; in the seventh year the wheat was sold to the public (118). The kernel is described as "of a rich yellow." This might indicate that it was a white-kernelled wheat. From 1847 to 1850 the name "Zimmerman" was applied in literature to both a white and a red wheat. References to red-kernelled Zimmerman wheat in the fifties show it was widely grown in Maryland, Virginia, and Pennsylvania, and by the early sixties it was an important wheat in eastern Kansas.

**Distribution.**—The estimated area of Zimmerman decreased from 12,600 acres in 1919 to 196 acres in 1924, and the variety was not reported in 1929. It was formerly grown in Kansas and Missouri.

## WALKER

**Description.**—Plant winter habit, early to midseason, mid-tall to tall; stem white, strong; spike awnleted, oblong-fusiform, mid-dense, inclined; glumes glabrous, white, short, wide; shoulders mid-wide, oblique to rounding; beaks wide, obtuse, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels pale red, mid-long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

Walker differs from Zimmerman in being slightly later and taller and has a more inclined spike, wider glumes, and larger kernels and germ.

**History.**—The origin of Walker (reg. no. 38) is undetermined. It is known to be an old variety of the eastern United States and was being replaced by Tappahannock in Jackson County, N.C., in 1871 (79, p. 131).

**Distribution.**—Estimated area in 1929, 1,143 acres, grown in Tennessee, Oklahoma, Kentucky, and North Carolina.

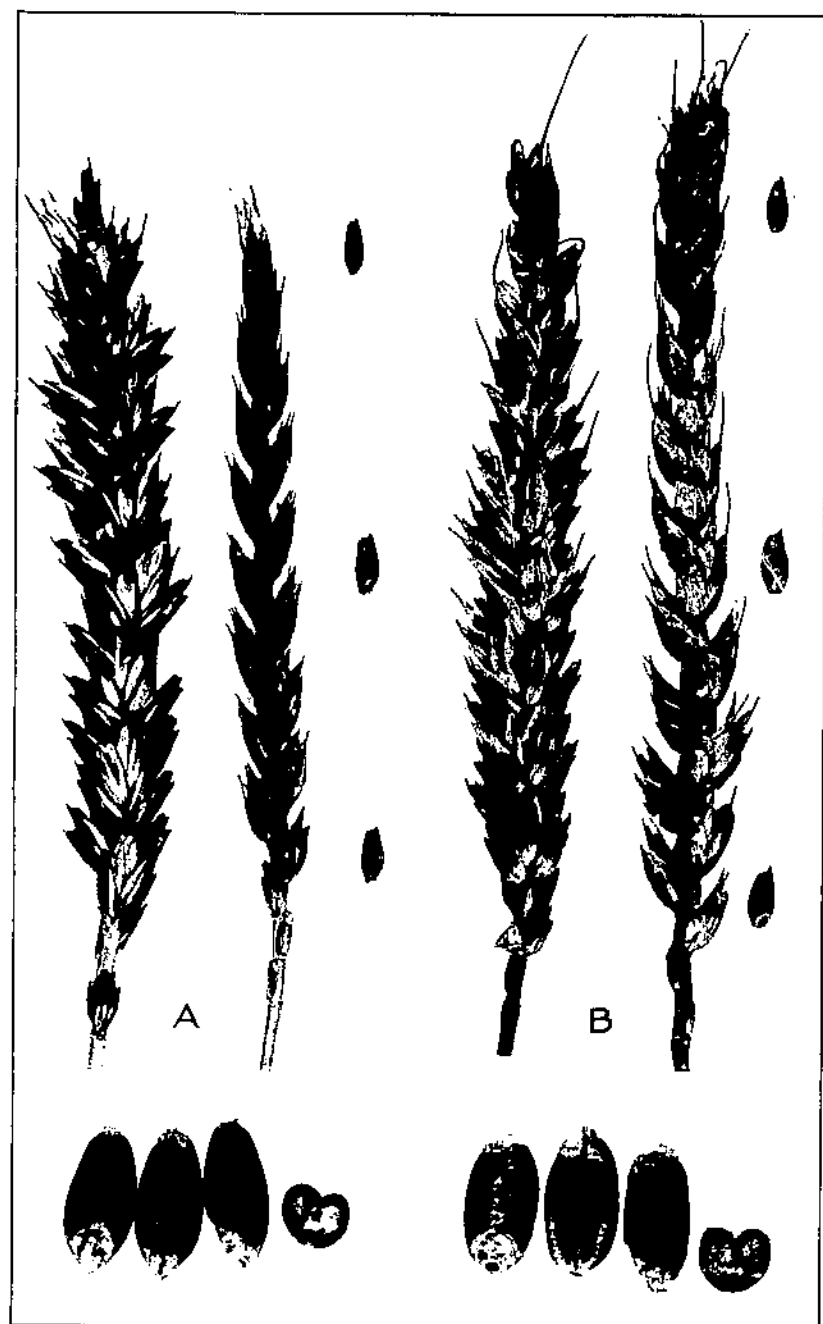
## HARVEST QUEEN

**Description.**—Plant winter habit, midseason, tall; stem white, strong; spike awnleted, oblong, dense, erect to inclined; glumes glabrous, white, mid-long, mid-wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels dull red, mid-long, soft, ovate; germ mid-sized; crease mid-wide to wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

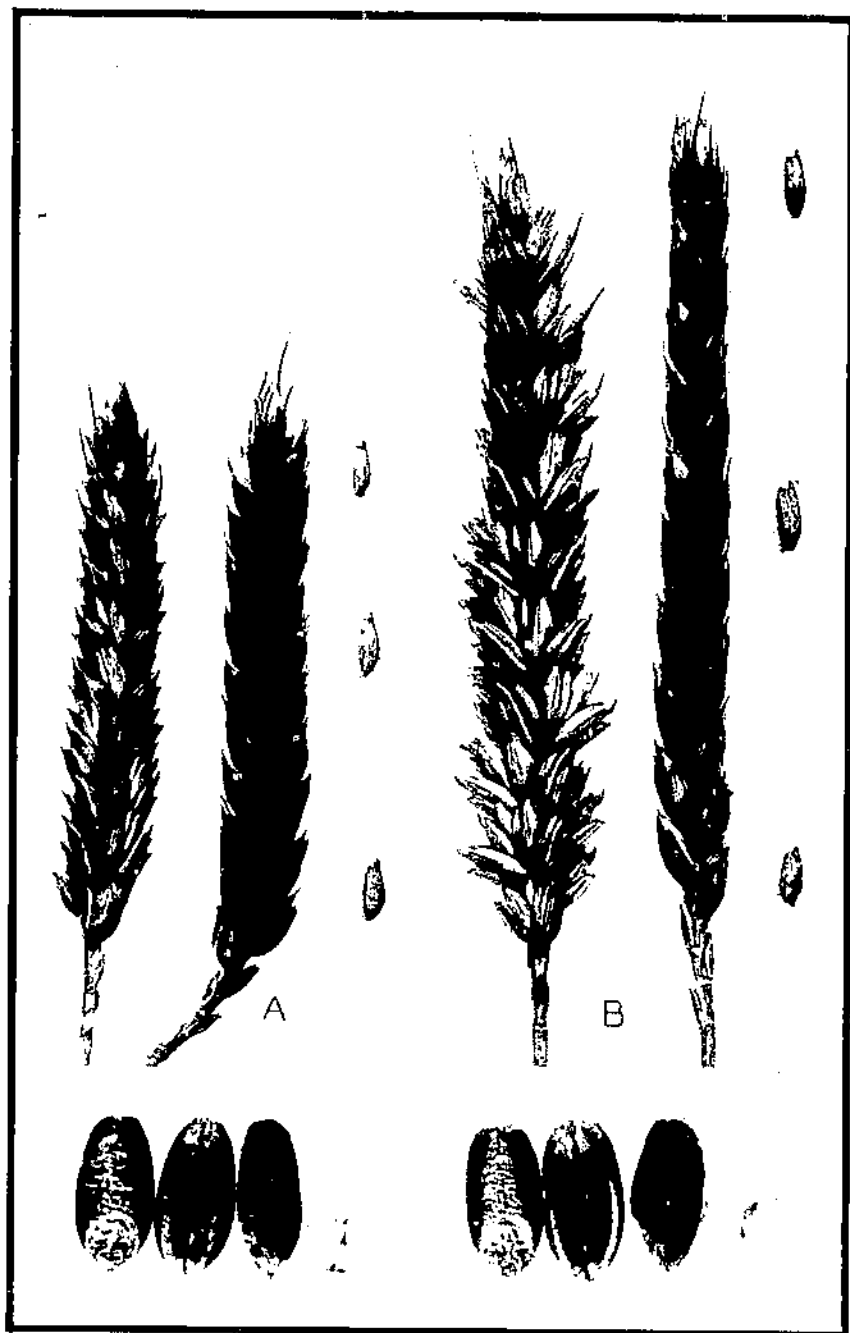
Harvest Queen is distinct in having tall, bright, strong straw and a thick oblong spike. Spikes, glumes, and kernels of this variety are shown in plate 10, A.

**History.**—The history of Harvest Queen (reg. no. 39) is not definitely known. The name "Harvest Queen" was used early for a white wheat, but this use apparently has been discontinued. The earlier names under which the wheat described above was known were Black Sea and Red Cross. The name Harvest Queen is claimed by E. S. Marshall,\* of De Soto, Kans., to have been applied to the variety by him. He selected a tall, promising stool of the wheat from some other variety in 1895, increased it in 1896, and named it in 1897. Mr. Marshall stated that he selected the name Harvest Queen because he thought he had a better wheat than Harvest King, which was then being widely advertised by the J. A. Everitt Seed Co., of Indianapolis, Ind. For several years he and his father, Conrad Marshall, continued to select the variety. Most of the Harvest Queen grown in Johnson County, Kans., and vicinity apparently is

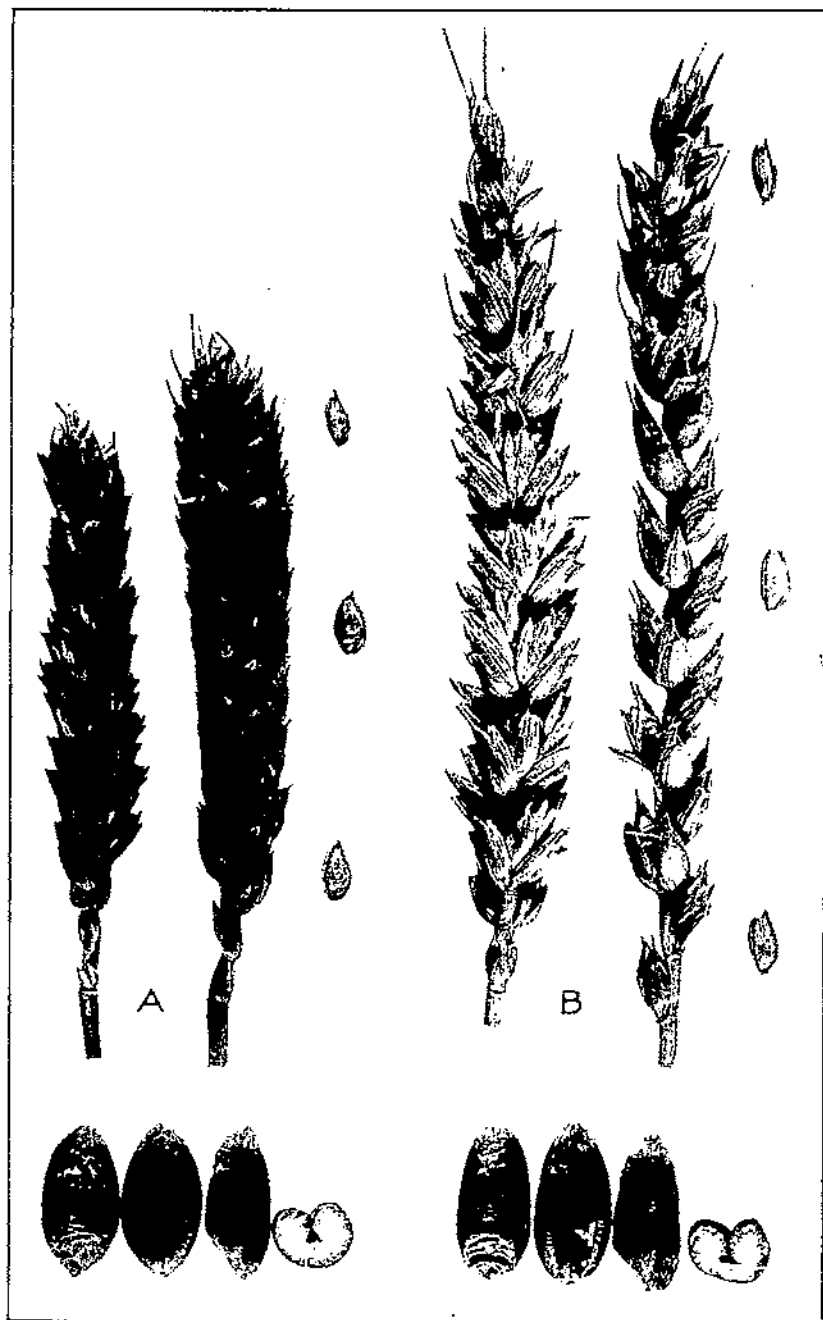
\* Interview by J. A. Clark, S. C. Salmon, and C. E. Graves, June 6, 1921.



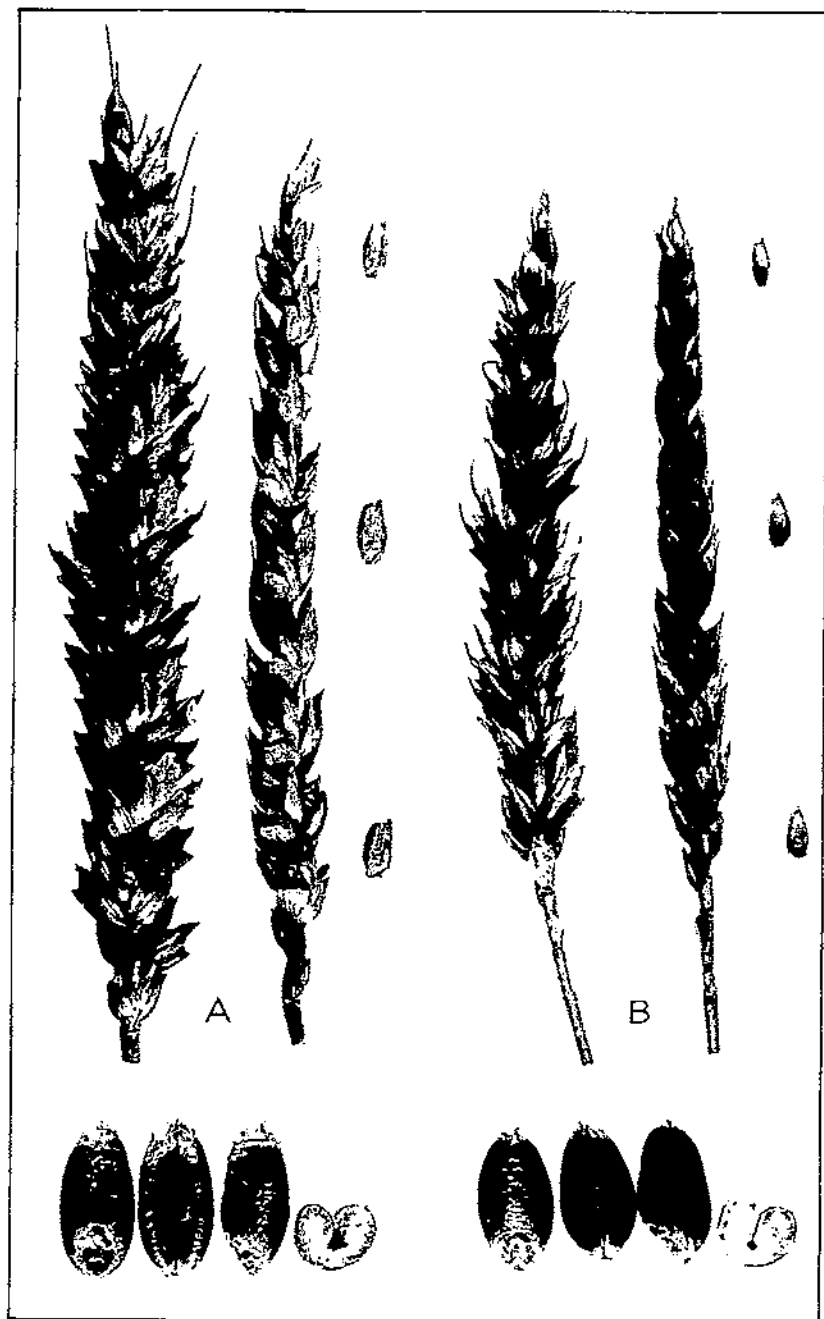
Leupold (A) and Purkoff (B) wheats. Spikes in full bloom natural size; kernels  $\times 3$ .



Harvest Queen (A) and Prosperity (B) wheats. Spikes and three kernels.



Red Russian (A) and Forward (B) wheats: Spikes and glumes natural size; kernels X3.



Fullig (A) and Fulliz (B) wheats. Spikes and glumes natural size; kernels X3.

from seed originally distributed from the Marshall farm. Harvest Queen wheat was advertised and distributed by the Barteldes Seed Co., of Lawrence, Kans., and by the J. A. Everitt Seed Co., of Indianapolis, Ind. The latter firm (88) claims to have distributed it first in 1896, which scarcely could be possible if Mr. Marshall is correct in his dates.

Black Sea is a name used for the variety in Doniphan County, Kans. Another variety known by this name was an important winter wheat in Wisconsin in 1849 (53, p. 205). This name also has long been used in the United States for a bearded spring wheat.

Red Cross is another name under which the above-described wheat has been grown in Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, and Nebraska. The name has been commonly used for the Harvest Queen variety in Missouri since about 1897. It may be an earlier name for the variety than Harvest Queen, but as the name "Red Cross" has been applied to other varieties as well as to Harvest Queen, the latter name is used here.

**Distribution.**—The estimated area of Harvest Queen decreased from 1,007,600 acres in 1919 to 359,857 acres in 1929. This latter acreage was grown in 10 States, as shown in figure 24.

**Synonyms.**—Black Sea, Canadiab, Canadian Fife, Golden Van, Imported Scotch, Italian Wonder, Kansas Queen, May Queen, New 100, Oregon Red, Prairie Queen, Prizetaker, Red Cross, Salzer's Prizetaker, Virginia Reel, Winter Queen.

#### PROSPERITY

**Description.**—Plant winter habit, midseason, mid-tall; stem glaucous when green, white, strong, coarse; spike awnleted, linear-oblong, broad, mid-dense, nodding; glumes glabrous, white, mid-long, wide; shoulders wide, oblique to square; beaks wide, obtuse, 1 mm long; awnlets few, 3 to 10 mm long; kernels red, mid-long, soft, ovate, germ mid-sized; crease wide, deep; cheeks angular; brush mid-sized, mid-long.

This variety is marked by its broad, nodding spike and the very glaucous appearance of the entire plant while immature. Plate 10, B, shows spikes, glumes, and kernels of this variety.

**History.**—Prosperity (reg. no. 40) was originated by A. N. Jones, of Newark, Wayne County, N.Y. Mr. Jones first called it No. 8, but later named it American Bronze.<sup>10</sup> It was first advertised and distributed in 1890 by Peter Henderson & Co., seedsmen, of New York City, and was said by them to be the result of a cross between Martin and Fultz (110). The name "Prosperity" came into use for the variety about 1895 (19). The origin of the name is undetermined, but the variety is now grown more widely as Prosperity than as American Bronze, and as the former is a more desirable name it is here used.

**Distribution.**—The distribution of Prosperity decreased from 46,000 acres in 1919 to 4,275 acres in 1929, grown in Indiana, Missouri, Ohio, and Pennsylvania.

**Synonyms.**—American Bronze, Dutch, Hundred Mark, International No. 8, Invincible, Michigan Red, No Name, No. 8, Red Victory, Silver Chaff, Twentieth Century, Zinn's Golden.

#### FORWARD

**Description.**—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, oblong-fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders oblique to square; beaks wide, obtuse, 0.2 mm long; awnlets few, 5 to 15 mm long, sometimes incurved; kernels red, mid-long, soft, elliptical; germ mid-sized; crease mid-wide, deep; cheeks angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of Forward are shown in plate 11, B.

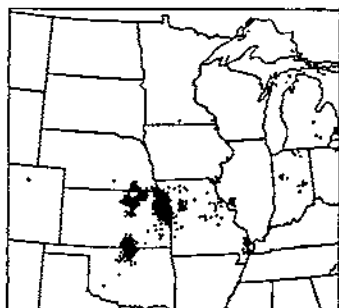


FIGURE 24.—Distribution of Harvest Queen wheat in 1929. Estimated area, 359,857 acres.

<sup>10</sup> Printed letterheads of Mr. Jones.

Forward differs from Prosperity in being earlier and in having shorter beaks and longer awnlets, sometimes incurved.

**History.**—Forward (reg. no. 41) was originated by the department of plant breeding of the Cornell University Agricultural Experiment Station, Ithaca, N.Y., in cooperation with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. During the experimental stages it was known as Cornell Selection 123-32. Concerning the variety, Doctor Love, who was in charge of the cooperative experiments at Cornell, wrote as follows:—

"The Forward is a white chaff, beardless, red-kerneled wheat selected out of a commercial lot of Fulcaster and under test has proved to be winter hardy and a good yielder. It has outyielded Fulcaster and bids fair to be one of our best red-kerneled sorts."

Forward is very different from Fulcaster from which it was selected and may have been a mixture or the result of a natural cross.

Forward was first distributed for commercial growing in New York in the fall of 1920.

**Distribution.**—The estimated area of Forward in 1924 was 4,987 acres and in 1929, 155,172 acres, grown in 7 States, as shown in figure 25.

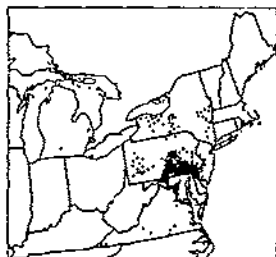


FIGURE 25.—Distribution of Forward wheat in 1929. Estimated area, 155,172 acres.

#### RED RUSSIAN

**Description.**—Plant winter habit, late, tall; stem white, coarse, strong; spike awnleted, clavate, dense, erect to inclined; glumes glabrous, white, mid-long, wide; shoulders mid-wide, oblique to square; keel incurved above; beaks wide, obtuse, 1 mm long; awnlets few, 1 to 10 mm long; kernels red, mid-long, soft, ovate, sometimes broadly ovate; germ small to mid-sized; crease wide, deep; cheeks usually rounded; brush mid-sized, mid-long to long.

Spikes, glumes, and kernels of Red Russian are shown in plate 11, A.

**History.**—Red Russian (reg. no. 43) undoubtedly is of English origin and is, or is derived from, the old Squarehead wheat. The origin of the variety,

however, is undetermined. The name "Red Russian" seems to be used for the variety only in the Pacific Northwest section of the United States. The variety was introduced into the Palouse section of Washington about 1890 and has always been best known there under the name "Red Russian" (93, p. 5). Because of lack of winter hardiness, susceptibility to bunt, and poor grain quality, the acreage of Red Russian is decreasing and being replaced by Albit and Hybrid 128.

**Distribution.**—The estimated area of Red Russian decreased from 154,900 acres in 1919 to 57,653 acres in 1929. The latter acreage was in Idaho, Washington, and Oregon and is shown in figure 26.

**Synonyms.**—Australian Club, Early Sunrise, German Red, Montana Deal, Red Walls, Squarehead.

#### SOL

**Description.**—Sol differs only slightly from Red Russian, but has a slightly less clavate spike and longer and wider leaf blades, which are of a darker green shade.

**History.**—Sol (reg. no. 44) was originated at the Svalöf Plant-Breeding Station, Svalöf, Sweden, and is said to have been derived from natural crossing, the parents probably being Swedish Island and English Stand-Up (84, p. 13). It was first put on the market by the Svalöf Seed-Breeding Association in 1911. In the United States the variety was distributed as Sun by Charles H. Lilly & Co., seedsmen, of Seattle, Wash. This is the English translation of the Swedish name "Sol" and is sometimes used for the variety.



FIGURE 26.—Distribution of Red Russian wheat in 1929. Estimated area, 57,653 acres.

<sup>1</sup> Correspondence of the Division of Cereal Crops and Diseases dated Mar. 19, 1921.



**Distribution.**—Estimated acreage in 1929, 1,067 acres, grown in western Washington and western Oregon.

**Synonym.**—Sun.

#### FULHIO

**Description.**—Plant winter habit, midseason, mid-tall; stem purple, mid-strong; spike awnleted, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, round to square; beaks mid-wide, obtuse, 0.5 mm long; awnlets few, 5 to 15 mm long; kernels red, mid-sized, soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of Fulhio are shown in plate 12, A.

**History.**—Fulhio (reg. no. 231) was developed at the Ohio Agricultural Experiment Station (206) from a plant selected from Fultz. The selection was made at Wooster, Ohio, in 1912, by C. G. Williams. The variety has been commercially grown in Ohio since 1920. It was first distributed as Ohio No. 127 and later named "Fulhio." It was registered (58) as an improved variety in 1926. Its superior characters are high yield, good tillering capacity, winter hardiness, fairly stiff straw, and somewhat greater resistance to loose smut than Fultz.

**Distribution.**—The estimated area of Fulhio was 82,201 acres in 1924. It increased to 254,086 acres in 1929 in eight States, as shown in figure 27.

**Synonym.**—Ohio No. 127.

#### FULTZ

**Description.**—Plant winter habit, midseason, mid-tall; stem purple, mid-strong; spike awnleted, oblong-fusiform, mid-dense, inclined to nodding; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square, beaks narrow to mid-wide, obtuse, 0.5 mm long; awnlets few, 3 to 15 mm long; kernels pale red, usually short, ovate; germ mid-sized; crease usually mid-wide, shallow to mid-deep; cheeks rounded to angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of this wheat are shown in plate 12, B.

Fultz does not appear pure for winter habit of growth, as some plants in it will head from early spring seeding, while selections from it such as Ashland and Trumbull are uniform for winter habit.

**History.**—The origin of Fultz (reg. no. 48) wheat has been recorded by Carleton (52, pp. 199-206), as follows:

"In 1862, in Mifflin County, Pa., Abraham Fultz, while passing through a field of Lancaster wheat, which is an awned variety, found three spikes of awnless wheat. He sowed the seed from these spikes the same year and continued sowing a larger amount each year until he obtained sufficient seed to distribute it pretty well over the country. It soon became a well-marked and popular variety called Fultz, from the name of the breeder. In 1871 the United States Department of Agriculture distributed 200 bushels of the wheat for seed."

**Distribution.**—Fultz was grown on about 4,801,100 acres in 1919, but decreased to 1,446,830 acres in 1929, when it was grown in 22 States, as shown in figure 28.

**Synonyms.**—Ber Ban, Bluestem, Bluestem Fultz, Economy, Everitt's High Grade, Grains o' Gold, Halver, Hickman, High Grade, Improved English, Improved Fultz, Jersey Fultz, Little Red Jersey, McKennon, New Economy, Nixon, Perpetuated Fultz, Roosevelt, Rust Proof, Shamrock, Slickhead, Tennessee Fultz, Tipton Fultz, Winter Pearl.

#### TRUMBULL

**Description.**—Trumbull differs from Fultz in being pure for winter habit; it is taller and later, and has stronger and less purple stems and more erect spikes. Spikes, glumes, and kernels of Trumbull are shown in plate 13, A.

**History.**—Trumbull (reg. no. 50) was developed at the Ohio Agricultural Experiment Station, Wooster, Ohio, from a plant selected from Fultz. The

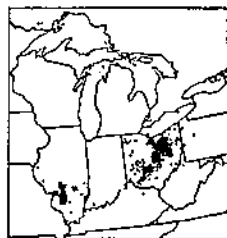


FIGURE 27.—Distribution of Fulhio wheat in 1929. Estimated area, 254,086 acres.

selection was grown at the Ohio Agricultural Experiment Station as early as 1908. After 8 years of experiments with the variety at Wooster, O. G. Williams wrote as follows regarding it:

"The other new introduction is the Trumbull, a pure-line selection of the Fultz. Wherever the Fultz wheat is found satisfactory, the Trumbull should succeed. It may be expected to yield 2 to 4 bushels per acre more than the Fultz. It possesses the quality of all pure lines—greater uniformity than the bulk seed, is fair in bread making, and among the good ones in stiffness of straw" (231, p. 466).

Beginning about 1919 the acreage of Trumbull increased rapidly, replacing Fultz.

**Distribution.**—The estimated area of Trumbull was 1,900 acres in 1919.

This was increased to 902,609 acres in 1929, when it was grown in 8 States, as shown in figure 29.

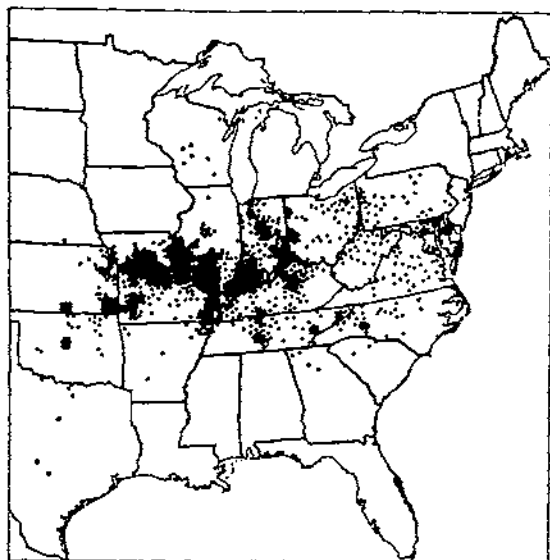


FIGURE 28.—Distribution of Fultz wheat in 1929. Estimated area, 1,446,830 acres.

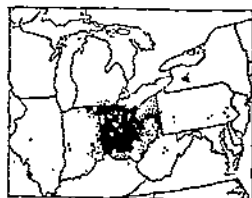


FIGURE 29.—Distribution of Trumbull wheat in 1929. Estimated area, 902,609 acres.

#### ASHLAND

**Description.**—According to the Kentucky Agricultural Experiment Station (24), "Ashland is very similar in character to ordinary Fultz. It has the good milling qualities of Fultz, and in addition yields better, with better straw, and is fairly resistant to scab and other diseases." It resembles Trumbull in winter habit.

**History.**—Ashland (reg. no. 40) was developed from a plant selected from Fultz at the Kentucky Agricultural Experiment Station, Lexington, Ky., and was distributed to farmers in 1919 and 1920.

**Distribution.**—The estimated area of Ashland was 2,415 acres in 1924. By 1929 it had increased to 8,753 acres, all in Kentucky.

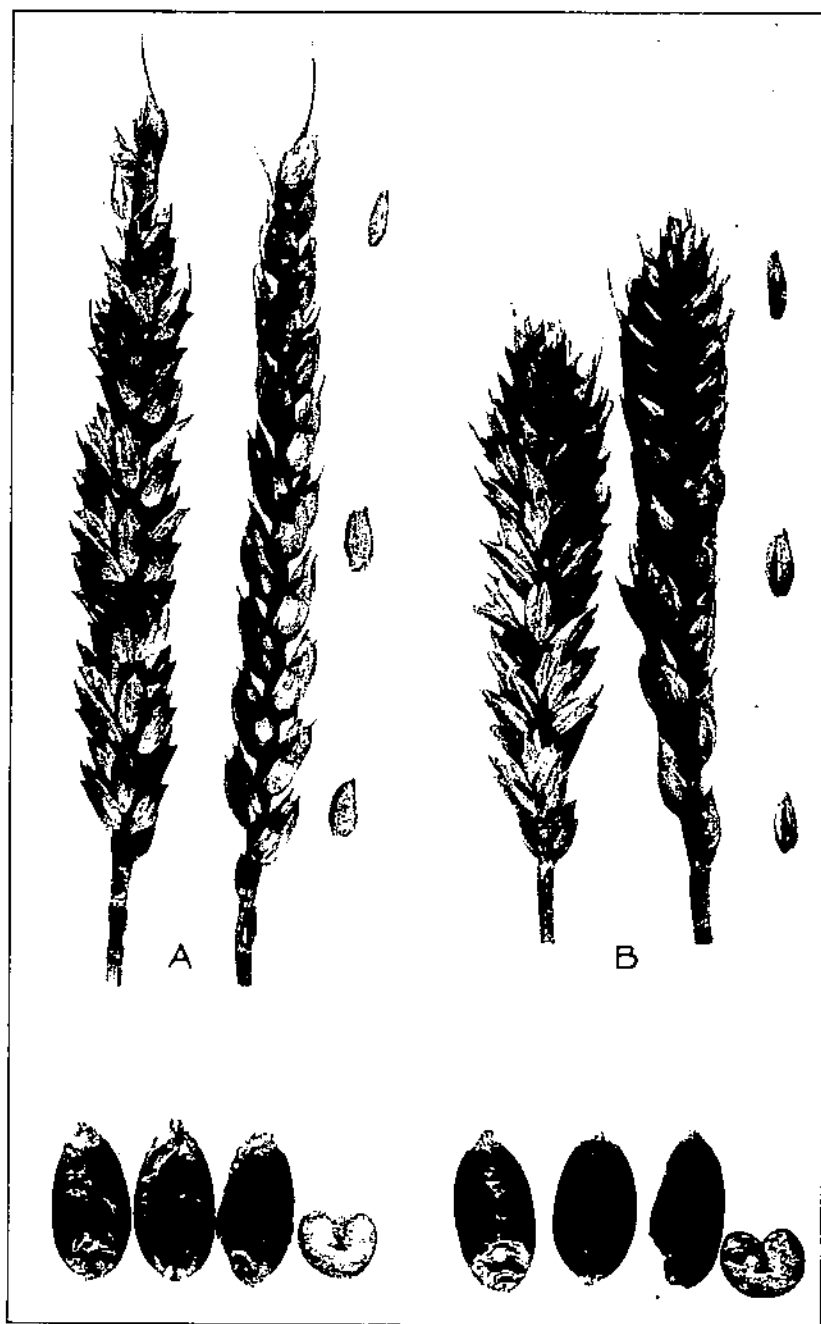
#### FULTZO-MEDITERRANEAN

**Description.**—Plant winter habit, midseason, mid-tall; stem purple, strong; spike awnleted, clavate, dense, erect, easily shattered; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 1 mm long; awnlets several, 1 to 10 mm long; kernels red, short to mid-long, soft, ovate; germ mid-sized; crease narrow to mid-wide, shallow to mid-deep; cheeks usually rounded; brush mid-sized, mid-long.

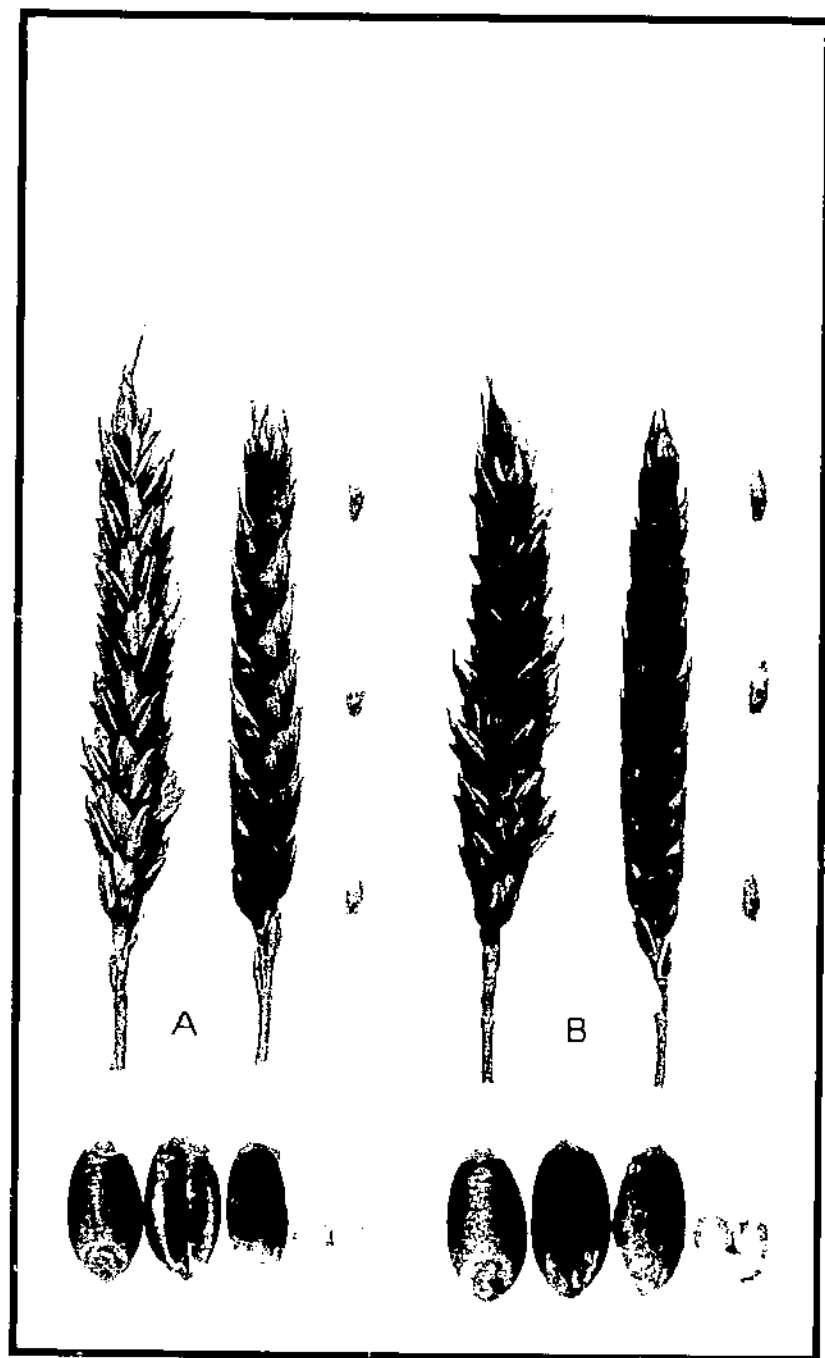
Fultz-Mediterranean is very distinct from Fultz in having very strong stems and erect, dense, clavate spikes.

Spikes, glumes, and kernels are shown in plate 13, B.

**History.**—The origin of Fultz-Mediterranean (reg. no. 51) is not definitely known. Many synonyms are used for the variety, one of which may be the original name. The variety was first distributed as Fultz-Mediterranean by Everitt's O. K. Seed Store, Indianapolis, Ind., in 1898. The variety was evi-



*Triticum aestivum* (A) and *Triticum monanthemum* (B). Wheat. Spikes and awns natural size; kernels  $\frac{1}{2}$  natural size.



Flint (A) and Purple straw (B) wheats. Spikes and similar lateral side; kernels - 5/8.

dently named by that firm, and it is claimed by them to have originated from a cross between Fultz and Mediterranean. The following statement concerning its origin was made in their catalog in 1899 (88, p. 8):

"**MARRIED.**—Two Noble Old Families Joined in Wedlock—Mr. Fultz to Miss Mediterranean. Their first-born is well named, Fultz-Mediterranean, and is a worthy offspring from Noble Stock."

Fultz-Mediterranean shows no indication of having been derived from Mediterranean, although it has many of the characters of Fultz. Neither of the alleged parents has the clavate spike of the Fultz-Mediterranean. The names Columbia and New Columbia are known to be old names for the variety. In fact, the latter name was used for the variety by Everitt in the same year he first distributed it as Fultz-Mediterranean and evidently also before that time, as the following quotation is from the same catalog as the quotation given above:

"An Illinois production and first made public the year of the great World's Fair. Too much cannot be said in its praise for hardiness, vigorous growth, and productiveness. In short, it has great merit and is entitled to be called our national wheat, as it bears our national name. Smooth head, white chaff, plump red grains. Wherever sown it makes friends" (88, p. 11).

*Distribution.*—The estimated acreage of Fultz-Mediterranean decreased from 305,900 acres in 1919 to 41,037 acres in 1929. The latter acreage was in Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Missouri, North Carolina, Ohio, Pennsylvania, Tennessee, and Virginia.

*Synonyms.*—Burrhead, Club, Club Head, Columbia, Double Head, Duck Bill, Early Ontario, Economy, Farmers Pride, Flat Top, Four-Row Fultz, Harper, New Columbia, Scott's Squarehead, Square Head, Square Top, Stub Head.

#### REDHART

*Description.*—Plant spring intermediate habit, midseason, mid-tall; stem white, strong; spike awnleted, fusiform, mid-dense, erect to inclined; glumes glabrous, white, mid-long to long, narrow to mid-wide; shoulders narrow, wanting to oblique; beaks narrow, obtuse, 1 mm long; awnlets several, 5 to 20 mm long; kernels red, mid-long, soft, elliptical; germ mid-sized; crease mid-wide, deep; cheeks angular; brush mid-sized, mid-long.

This variety is fairly hardy and is grown from fall seedling.

*History.*—Redhart was selected from the southern Flint or Red May wheat by Coker's Pedigreed Seed Co., Hartsville, S.C.

*Distribution.*—The estimated area in 1929 was 2,310 acres, all in North Carolina.

#### KINNEY

*Description.*—Plant spring intermediate habit, late, mid-tall; stem very glaucous before maturity, white, strong; spike awnleted, oblong, mid-dense, erect to inclined; glumes glabrous, white, mid-long, wide; shoulders mid-wide, oblique to square; beaks wide, acute, 1 mm long; awnlets several, 3 to 12 mm long; kernels red, usually short, soft, broadly ovate, humped; germ mid-sized; crease mid-wide to wide, shallow to mid-deep; cheeks usually angular; brush mid-sized, mid-long.

This variety is distinct from most others in being very glaucous during its growing period. It is a hardy spring wheat and is grown from both fall and spring seedling in the Willamette Valley of Oregon.

*History.*—According to H. Barendrick, of the Albina Fuel Co., Portland, Oreg., Kinney (reg. no. 52) wheat was introduced into the Willamette Valley of Oregon from France in the late sixties or early seventies by Albert Kinney, son of Robert Kinney, who operated a flour mill in that section. Albert Kinney was selling flour for his father in France, and introduced the wheat, which later became known as "Kinney", because he thought that it would be a better milling wheat than the varieties then grown in the Willamette Valley. This did not prove to be the case, however, and many people found fault with the miller later when the wheat was found to be of rather inferior milling quality and brought a slightly lower price than White Winter, the variety most commonly grown. Nothing is known concerning the French name for the Kinney variety.

*Distribution.*—Estimated area in 1929, 9,865 acres, grown in western Oregon.

*Synonyms.*—Nouh Island, Odessa, Surprise.

## OAKLEY

**Description.**—Plant winter intermediate habit, early, mid-tall; stem faintly purple, mid-strong; spike awnleted, fusiform, mid-dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 15 mm long; kernels red, mid-long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

Oakley differs from Fultz in having an intermediate habit, in being earlier, and in having a more erect spike.

**History.**—The origin of Oakley (reg. no. 45) is undetermined. The variety was grown by the Kentucky Agricultural Experiment Station as early as 1891 (95, p. 112). It was reported to have been in high favor in Kentucky in the late nineties and always rated well by millers.

**Distribution.**—Estimated area in 1929, 485 acres, all in North Carolina.

**Synonyms.**—Early Oakley, Extra Early Oakley, Neverfail, Norwood.

## PURPLESTRAW

**Description.**—Plant spring intermediate habit, early, mid-tall; stem purple, mid-strong; spike awnleted, fusiform, mid-dense, inclined to nodding; glumes glabrous, white, short to mid-long, mid-wide; shoulders narrow to mid-wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets several, 3 to 10 mm long; kernels red, short to mid-long, soft, ovate or sometimes nearly oval; germ mid-sized; crease mid-wide, shallow to mid-deep; cheeks usually rounded; brush small to mid-sized, mid-long.

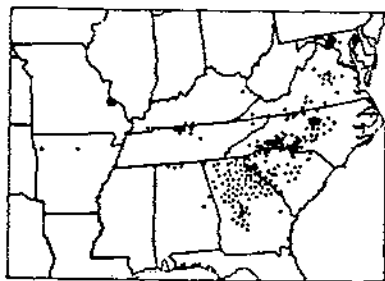


FIGURE 30.—Distribution of Purplestraw wheat in 1929. Estimated area, 150,014 acres.

This variety is fairly hardy and has been grown from fall sowing in the Southeastern States for many years. Its principal advantage over other varieties in that section is its early maturity, which in part is due to its spring intermediate habit. Plate 14, B, shows spikes, glumes, and kernels of this variety.

**History.**—The origin of Purplestraw (reg. no. 53) wheat is undetermined. It is, however, one of the earlier varieties of wheat grown in the United States. (Concerning its early culture, the following information has been recorded by Edmund Ruffin:

"From 1822 to the present time the same kind of wheat has been cultivated, first known as Mountain Purplestraw and more lately designated Early Purplestraw" (173, p. 193).

It has been an important wheat in the southeastern United States for more than 100 years.

**Distribution.**—The estimated area of Purplestraw decreased from 273,810 acres in 1919 to 150,014 acres in 1929. This acreage was grown in 10 States, as shown in figure 30.

**Synonyms.**—Alabama Bluestem, Bluestem, Early Purplestraw, Georgia Bluestem, Georgia Red, Mountain Purplestraw, Ripley.

## GASTA

**Description.**—Gasta is similar to Purplestraw except in being later and having a more winter habit of growth. It is a higher yielding wheat and more resistant to loose smut than Purplestraw at Experiment, Ga.

**History.**—According to Bloesch (38), Gasta (reg. no. 268) was developed from a head selected from Purplestraw at the Georgia Agricultural Experiment Station, Experiment, Ga. The selection was made in 1921 and was first distributed for commercial growing in 1931. It was registered (56) as an improved variety in 1931 because of its higher yields and greater resistance to loose smut as compared with Purplestraw.

**Distribution.**—Grown in Georgia since 1931.

## FLINT (RED MAY)

*Description.*—Plant winter intermediate habit, early to midseason, mid-tall; stem purple, mid-strong; spike awnleted, oblong, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders narrow, oblique to square; beaks mid-wide, obtuse, 0.5 to 1 mm long; awnlets few, 2 to 40 mm long; kernels pale red, short to mid-long, soft, ovate; germ small; crease mid-wide, mid-deep; cheeks angular to rounded; brush mid-sized, mid-long.

Flint differs from Fultz in having an intermediate habit, in being slightly earlier and shorter and in having more erect and oblong spikes, longer glumes, narrower shoulders, and longer awnlets. Spikes, glumes, and kernels of Flint wheat are shown in plate 14, A.

*History.*—The origin of Flint (reg. no. 47) wheat is undetermined. It is known to be an old wheat of the eastern United States. The early names for the variety and the literature concerning them are very confusing. A White Flint, claimed to have been introduced from Spain in 1814 (103, p. 217), which became widely grown in the Eastern States from 1830 to 1850, was described by Harmon as awnless, with white glumes and hard white kernels. There seems to be no winter wheat of that description now grown, and the Flint wheat now in cultivation undoubtedly has red kernels, as described above, and is similar to wheat known as Little Red May, Early May, and Rappahannock. These are all old names in American wheat literature. Little Red May is listed by Killebrew (132, p. 56) as a variety of the above description which "was brought into Tennessee by Joseph Jacobs from Missouri, no doubt having been taken there from Kentucky or Virginia. It had, however, improved by its visit, and is a very prolific and, in some sections, a very popular variety." The names Little Red May, Little Red, Little May, May, and Red May are still in use for this variety.

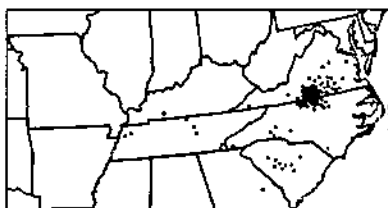


FIGURE 31.—Distribution of Flint wheat in 1920. Estimated area, 65,233 acres.

Early May was listed as a variety grown in Iowa as early as 1852 (86, p. 341) which later became an important variety in that State (73, p. 518). At least some of the wheat now grown under that name is Flint. The same is true for Rappahannock, which also is now used as synonymous with Red May and in 1875 was recorded as synonymous with Michigan Amber (7). Much of the Flint wheat now grown is known as "Red May."

*Distribution.*—Estimated area in 1920, 65,233 acres, grown in 6 States, as shown in figure 31.

*Synonyms.*—Early May, Little May, Little Red, Little Red May, May, Rappahannock, Red Davie, Red May.

## HUSTON

*Description.*—Plant spring habit, early to midseason, mid-tall; stem faintly purple, mid-strong; spike awnleted, oblong, dense, erect, easily shattered; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to narrow, oblique; beaks narrow, obtuse, 1 to 1.5 mm long; awnlets several, 3 to 10 mm long; kernels red, short, soft to semihard, broadly ovate; germ mid-sized; crease mid-wide, shallow to mid-deep, usually pitted; cheeks rounded; brush small, mid-long, sometimes collared.

This is one of the few soft red spring-wheat varieties grown in the United States.

*History.*—According to S. L. Williams, of the Eugene Mill & Elevator Co., Eugene, Oreg., Huston (reg. no. 54) was introduced in the vicinity of Eugene in 1876 by a Mr. Belshaw, who obtained a sample of the wheat at the Centennial Exposition, where it was on exhibition as Bulgarian Red Spring. He sowed the few kernels in his garden and in this way obtained sufficient seed to sow 5 acres. His land was low and heavy, however, and the wheat did not prove satisfactory, so he gave the seed to a Mr. Huston living 16 miles west

on the hill lands, who grew it with splendid success and the wheat came to be known as Huston.

*Distribution.*—Estimated area in 1929, 6,626 acres grown in Clackamas, Lane, Linn, and Polk Counties, Oreg.

*Synonyms.*—Bulgarian, Early Wonder, Grass, Little Red, Ninety-Day, Red Spring, Swamp.

#### ALTON (GHIRKA WINTER)

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, acute, 1 mm long; awnlets few, 3 to 10 mm long; kernels red, short to mid-long, hard, ovate; germ very small; crease narrow to mid-wide, shallow; cheeks rounded; brush mid-sized, mid-long.

This variety usually yields somewhat less than Turkey, and its breadmaking value is also slightly less.

*History.*—Alton (reg. no. 55) was introduced by the United States Department of Agriculture (215) as Ghirka Winter in December 1900 from Altonau, near Melitopol in northern Taurida, Russia (F.P.I. 5637). It was one of a large number of wheat varieties introduced by M. A. Carleton, Department cerealist, who went to Russia and Siberia in 1898 and again in 1900 for the purpose of obtaining cereal varieties.

This variety proved best adapted in Colorado. The name Alton was substituted for Ghirka Winter to avoid confusion with the variety of spring wheat known as Ghirka Spring. The name Alton is derived from Altonau, the original source of the seed.

*Distribution.*—Estimated area in 1929, 19,287 acres, grown in Colorado, Kansas, and Oklahoma.

*Synonym.*—Ghirka Winter.

#### NEWTURK

*Description.*—Newturk is similar to Alton except for being more glaucous and in having slightly longer awnlets and shorter kernels. It is high yielding, more resistant to shattering than Turkey, and equal in quality for breadmaking. Spikes, glumes, and kernels are shown in plate 15, A.

*History.*—Newturk (reg. no. 215) was developed in cooperative experiments of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Oregon and Montana Agricultural Experiment Stations. It is the result of a cross between Newton (a selection of Alton) and Turkey, made in 1916 at Moro, Oreg. Selections of this cross, made by J. A. Clark, were sent to the Judith Basin Branch Station, Moccasin, Mont., in 1920. One of these selections (106B-1-6) proved most promising and was named Newturk. Seed of the Newturk variety was distributed for commercial growing in 1920 when it was registered (58) as an improved variety. Its superior characters are good yield and quality and resistance to shattering.

*Distribution.*—Estimated area in 1929, 12,390 acres, grown in Montana.

*Synonym.*—Beardless Turkey.

#### RIDIT

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, narrow to mid-wide; shoulders mid-wide, oblique to square; beaks mid-wide, acute, 1 mm long; awnlets few, 3 to 12 mm long; kernels red, mid-long, hard, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of Ridit are shown in plate 15, B.

*History.*—Ridit (reg. no. 248) was developed from a cross between Turkey and Florence made by E. F. Gaines at the Washington Agricultural Experiment Station, Pullman, Wash. The cross was made in 1915, and a selection made in 1919 resulted in the Ridit variety. It was first distributed for commercial growing in Washington in 1923. It was registered (58) as an improved variety in 1926. The superior characters are resistance to many forms of bunt and to shattering.



**Distribution.**—Estimated area in 1929, 106,411 acres, grown in Washington, Idaho, and Oregon, as shown in figure 32. The Washington Agricultural Experiment Station has estimated that 200,000 acres were grown in 1933.

## MICHUKOF

**Description.**—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, oblong, dense, erect to inclined; glumes glabrous, white, short, mid-wide; shoulders mid-wide, square to elevated; beaks mid-wide, acute, 0.5 mm long; awnlets several, 3 to 12 mm long; kernels red, short, hard, ovate with truncate tip; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of Michukof are shown in plate 16, A.

**History.**—Michukof (reg. no. 233) was developed (228) at the Purdue University Agricultural Experiment Station from a cross made in 1912 between Michigan Amber and Malakof. The final selection was made in 1915, and the variety has been commercially grown since about 1920. It was registered (58) as an improved variety in 1926, its superior characters being high yield, winter hardiness and a hard, glutinous kernel of high test weight, producing flour of superior quality for bread-making purposes.

**Distribution.**—The estimated area of Michukof increased from 52,550 acres in 1924 to 130,107 acres in 1929. It is grown mostly in Indiana and Illinois, as shown in figure 33.

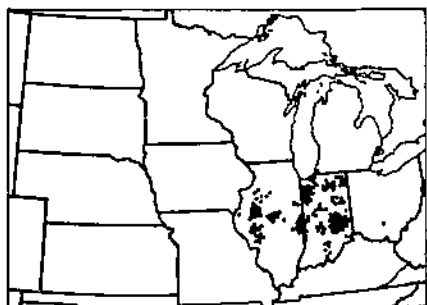


FIGURE 33.—Distribution of Michukof wheat in 1929. Estimated area, 130,107 acres.



FIGURE 32.—Distribution of Rild wheat in 1929. Estimated area, 106,411 acres.

## MOSIDA

**Description.**—Plant winter habit, midseason, short to mid-tall; stem white, strong; spike awnleted, oblong, dense, erect, easily shattered; glumes glabrous, white, mid-long to long, narrow to mid-wide; shoulders narrow, oblique to square; beaks broad, obtuse, 1 mm long; awnlets several, 5 to 25 mm long; kernels red, mid-long, semihard to hard; germ mid-sized; crease wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of Mosida are shown in plate 16, B.

**History.**—Mosida (reg. no. 247) was produced from a cross made at the Colorado Agricultural Experiment Station between Fultz-Mediterranean and Turkey in 1916. The crossed material was taken to the Idaho Agricultural Experiment Station, Moscow, Idaho, where the selection that is now called Mosida was made in 1918. It was distributed for commercial growing in northern Idaho in 1924 and registered (58) as an improved variety in 1926. Its superior characters are good strength of straw and high yield. This variety is well adapted to the cut-over lands of northern Idaho, but is not adapted in areas where shattering is apt to occur.

**Distribution.**—Estimated area in 1929, 12,392 acres, grown in Idaho and Oregon.

## RED BOBS

**Description.**—Plant spring habit, early, mid-tall; stem white, mid-strong to strong; spike awnless, fusiform, mid-dense, erect; glumes glabrous, white to yellowish, mid-long, mid-wide; shoulders wide, oblique to square; beaks wide, acute, 0.5 mm long, sometimes nearly wanting; apical awnlets usually wanting; kernels red, usually short, hard, oval to ovate, with truncate tip; germ mid-sized; crease mid-wide to wide, mid-deep to deep; cheeks angular; brush mid-sized, short.

This variety has several types of plants. In the northern spring-wheat sections of the United States Red Bobs has proved very susceptible to stem rust.

**History.**—Red Bobs (reg. no. 56) was originated from a head selection made in a field of Bobs wheat by Senger Wheeler in 1910 at Maple Grove Farm, Rosstern, Saskatchewan, Canada. It was distributed for the first time in 1918 and its history was recorded the following year by Mr. Burns in the *National Alfalfa Journal* (47). A fuller history of this variety has been recorded by Buller (44, pp. 253-275). It is evidently the result of a natural field hybrid between Bobs and a red-kerneled variety. Early Triumph, a selection made from Red Bobs by Senger Wheeler at Rosstern, Saskatchewan, is grown to a limited extent in the Pacific Northwest, but as it is very similar to Red Bobs it is here considered as a synonym.

**Distribution.**—Estimated area in 1920, 10,008 acres, grown in Montana, Idaho, Washington, Wyoming, Colorado, and North Dakota.

**Synonym.**—Early Triumph.

#### SUPREME

**Description.**—Supreme differs from Red Bobs in being taller and slightly later, in having lighter green leaves and stems when young, and in being more uniform. Spikes, glumes, and kernels of Supreme are shown in plate 17, A.

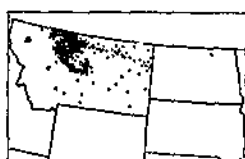


FIGURE 34.—Distribution of Supreme wheat in 1920. Estimated area, 200,840 acres.

**History.**—Supreme (reg. no. 257) is a selection from Red Bobs made by Senger Wheeler at Rosstern, Saskatchewan, Canada. The variety has been grown commercially in Canada since 1922 and in Montana since 1924, seed having been obtained by the Montana Agricultural Experiment Station, Bozeman, Mont., in March 1922. It was registered in 1927 (63) as an improved variety because it outyielded Marquis in Montana, is 4 to 7 days earlier, and has stronger stems. The bread-making properties of Supreme are equal to those of Marquis, although the protein content usually is less.

**Distribution.**—Estimated area in 1920, 200,840 acres, grown in Montana and North Dakota, as shown in figure 34.

#### GARNET

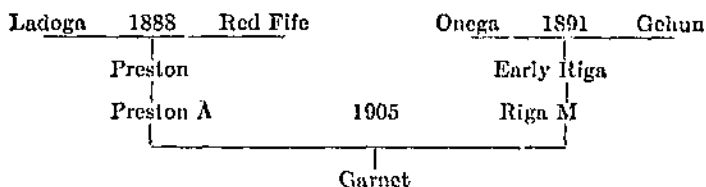
**Description.**—Plant spring habit, early, short to mid-tall; stem white, slender, weak to mid-strong; spike awnless, fusiform, mid-dense to lax, inclined, easily shattered; glumes glabrous, white, long, narrow; shoulders wanting to rounded; beaks narrow, acute, 1 mm long; awnlets several, 3 to 15 mm long; kernels red, short to mid-long, hard, elliptical; germ large; crease narrow, mid-wide; cheeks rounded; brush small, mid-long.

Garnet is resistant to bunt. Partly because of its early maturity, it is not a high yielding variety in the United States, and the quality of the grain is not equal to that of Marquis.

**History.**—Garnet (reg. no. 260) was originated from a cross made at Central Experimental Farm, Ottawa, Canada, in 1905, by C. E. Saunders and was distributed for commercial production in the Prairie Provinces of Canada in the spring of 1926.

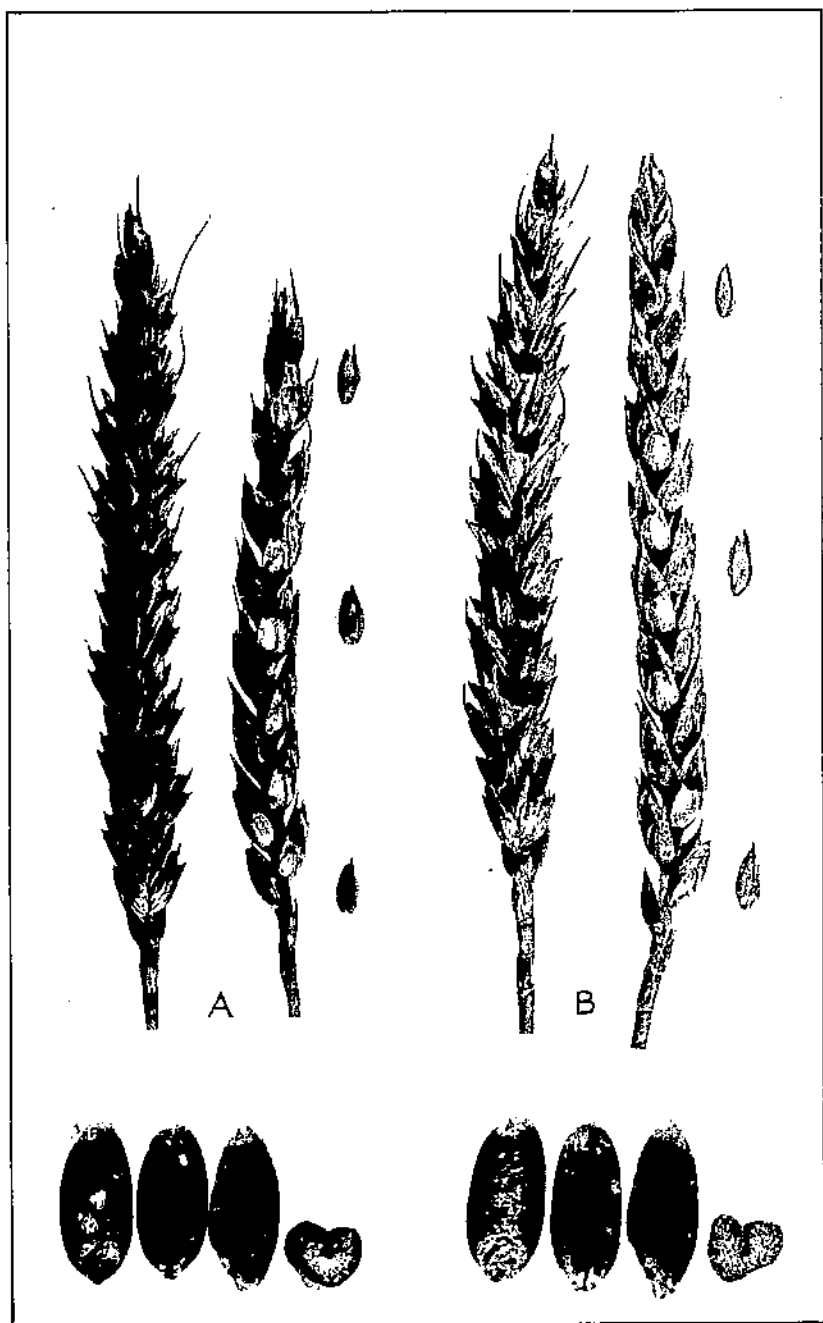
It was registered (63) in 1928 because of its early maturity, good yield, and strength of straw.

The parentage of Garnet has been recorded by Newman and Whiteside (154) as follows:

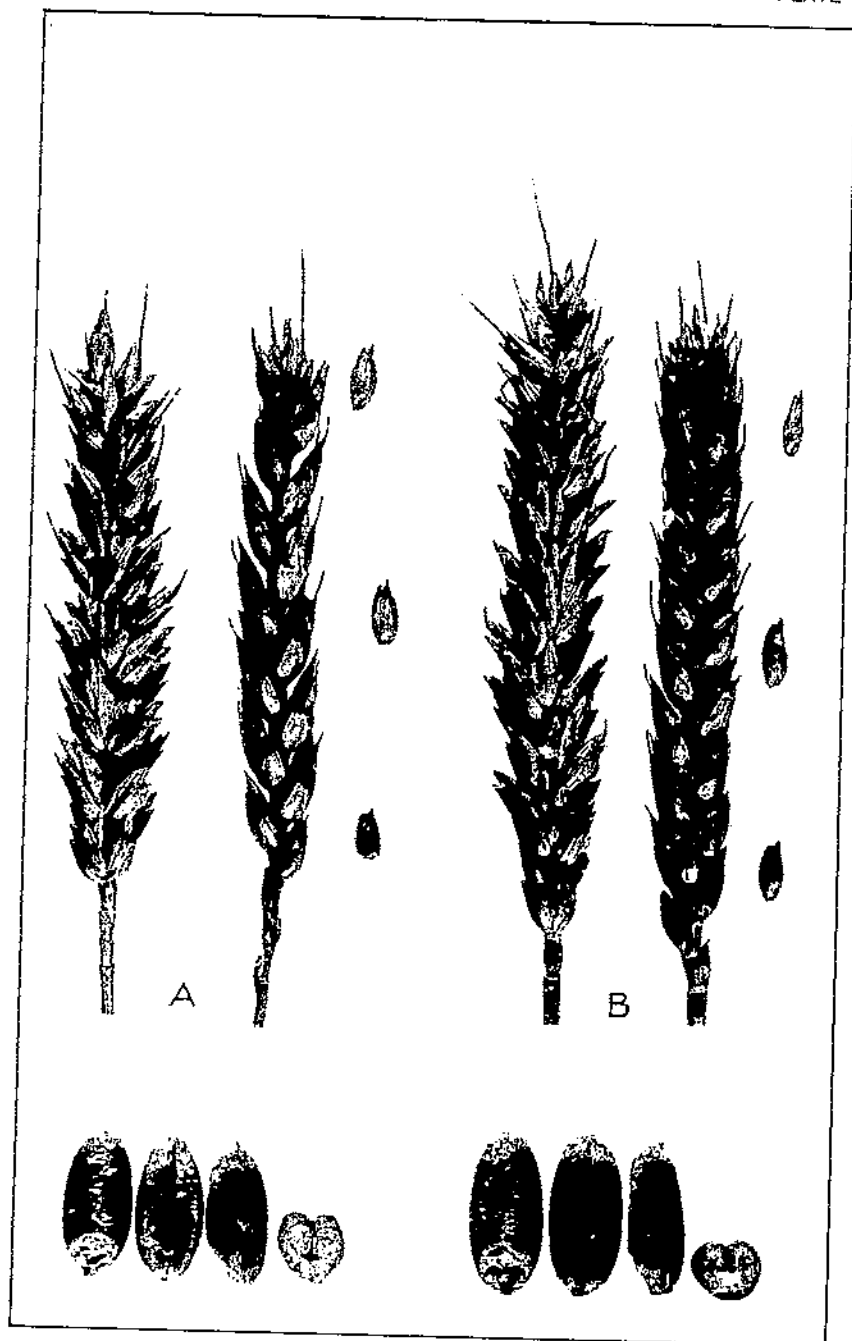


Garnet was first grown at experiment stations in the United States in 1925 and was first introduced from Canada by commercial growers in about 1928.

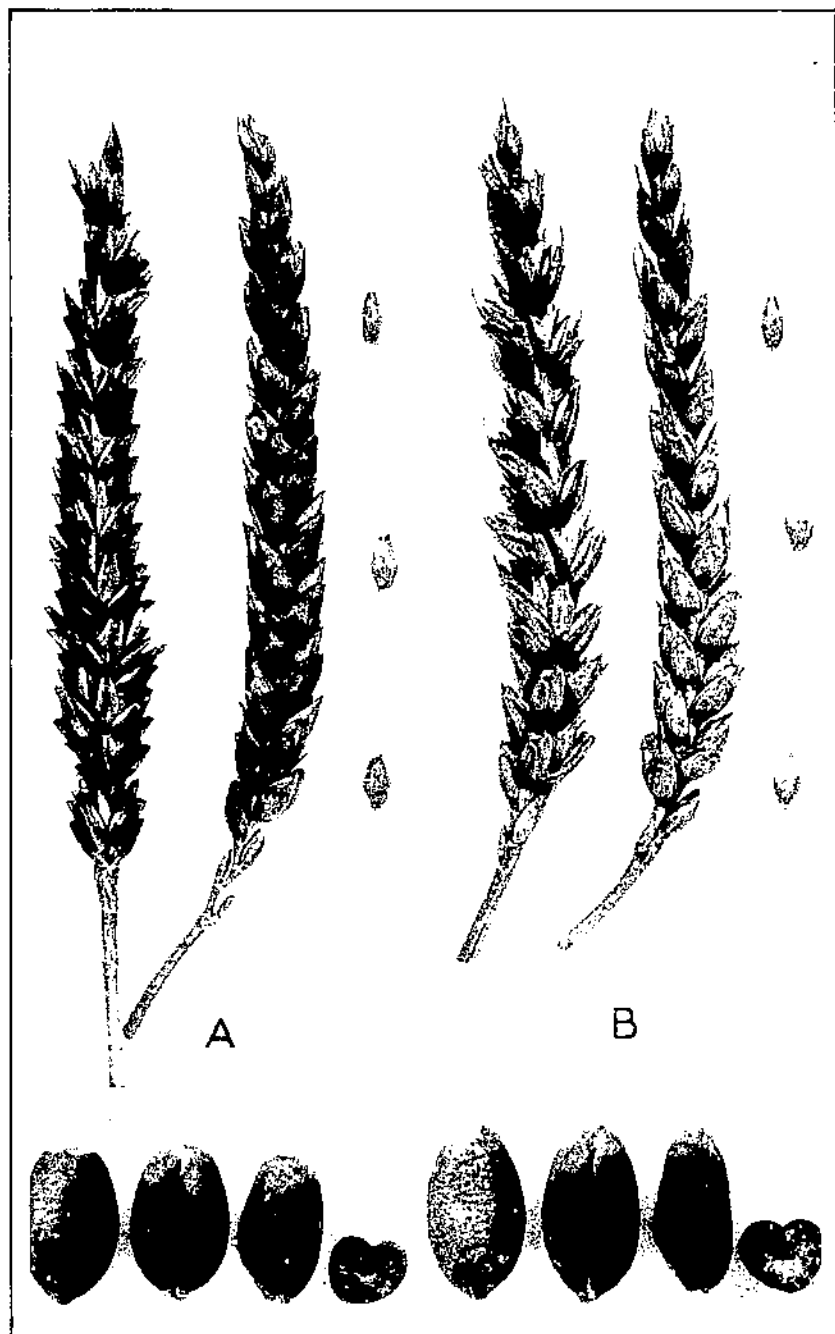
**Distribution.**—Estimated area in 1920, 8,958 acres, grown in North Dakota and South Dakota.



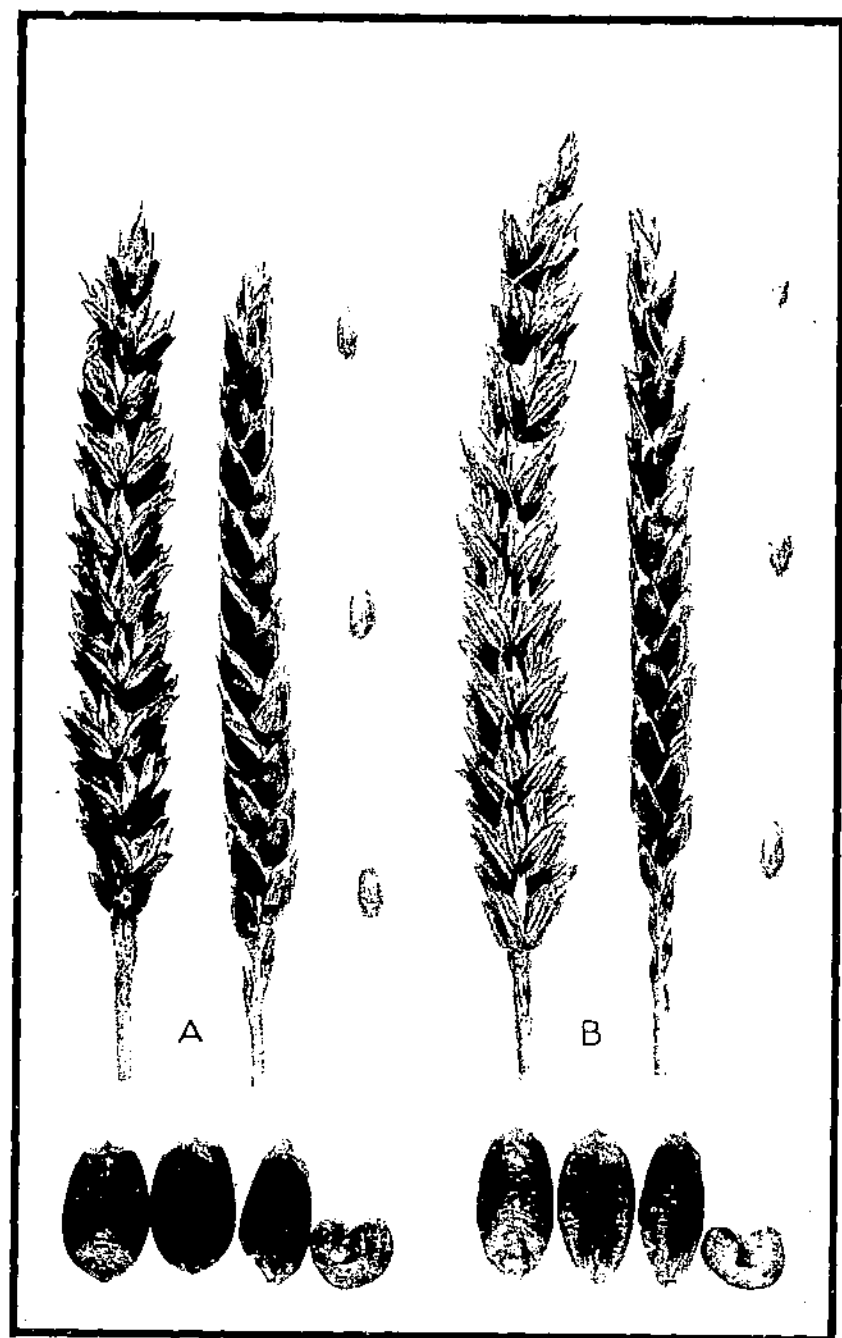
Newtark (A) and Rildt (B) wheats; Spikes and glumes natural size; kernels  $\times 3$ .



Michikof (A) and Mosida (B) wheats: Spikes and glumes natural size; kernels  $\times 3$



Supreme (A) and Marquillo (B) wheats; Spikes and glumes natural size; kernels  $\times 3$ .



Marquis (A) and Red Fife (B) wheats: Spikes and glumes natural size; kernels X3.

## MARQUILLO

*Description.*—Plant spring habit, early to midseason, short to mid-tall; stem white, mid-strong to strong; spike awnleted, fusiform, mid-dense, erect; glumes glabrous, white, sometimes showing streaks of brown or black, mid-long, mid-wide; shoulders mid-wide, rounded to elevated; beaks broad, acute, 1 to 1.5 mm long; awnlets many, 5 to 25 mm long; kernels red, mid-long to long, hard, ovate; germ large; crease mid-deep; cheeks angular; brush mid-large, mid-long, collared.

Marquillo is resistant to stem rust. The grain produces a yellowish flour and in that respect is undesirable. The variety, as shown by Powers (163), is not entirely stable. Spikes, glumes, and kernels of Marquillo are shown in plate 17, B.

*History.*—Marquillo (reg. no. 237) was produced in cooperative experiments between the Minnesota Agricultural Experiment Station and the Division of Cereal Crops and Diseases, United States Department of Agriculture, at University Farm, St. Paul, Minn. It is the result of a cross between Marquis and Tumbillo durum made in 1914. The selection 11-15-44, later named Marquillo, was made in 1918 and was first distributed in 1923. It was registered in 1926 (58) because it is slightly earlier than Marquis and moderately resistant to stem rust, has stronger stems, and under Minnesota conditions gives higher yields.

*Distribution.*—Estimated area in 1920, 10,150 acres, grown in Minnesota and South Dakota.

*Synonym.*—Minnesota No. 2202.

## MARQUIS

*Description.*—Plant spring habit, early to midseason, mid-tall; stem white, mid-strong; spike awnleted, fusiform, dense, erect to inclined; glumes glabrous, white to yellowish, short, wide; shoulders mid-wide to wide, usually square; beaks wide, acute, 0.5 mm long; awnlets few, 1 to 10 mm long; kernels red, short, hard, ovate, with truncate tip; germ mid-sized; crease wide, deep; cheeks angular; brush mid-sized, mid-long.

This is a high-yielding variety. It is one of the best varieties for milling and breadmaking. Spikes, glumes, and kernels are shown in plate 18, A.

*History.*—Marquis (reg. no. 57) is of hybrid origin, having been originated by the cerealists of the Dominion Department of Agriculture at the Central Experimental Farm, Ottawa, Canada. The crossing that resulted in Marquis was done under the direction of William Saunders, but the credit is due C. E. Saunders for selecting, naming, testing, and distributing the variety. He has given an account of its origin in the following words (179, pp. 118-120):

"All the details in regard to the origin of Marquis are not available, but it is one of the descendants of a cross between an early-ripening Indian wheat, Hard Red Calcutta (as female) and Red Fife (as male). The cross \* \* \* was made by Dr. A. P. Saunders, probably at the experimental farm at Agassiz, in the year 1892. The crossbred seeds, or their progeny, were transferred to Ottawa, and when the writer of this report was appointed in 1903 to take charge of the work of cereal breeding he made a series of selections from the progeny of all the crossbred wheats which had been produced at Ottawa up to that time. Some of these had been named and others were under numbers. Though they had all been subjected to a certain amount of selection, each of them consisted of a mixture of related types. In some cases all the types present were similar. In other instances striking differences were observed. The grain which had descended from the cross referred to above was found by careful study of individual plants (especially by applying the chewing test to ascertain the gluten strength and probable bread-making value) to be a mixture of similar looking varieties which differed radically in regard to gluten quality. One of the varieties isolated from this mixture was subsequently named Marquis. Its high bread-making strength and color of flour were demonstrated in the tests made at Ottawa in the early months of 1907, and all the surplus seed was at once sent to the Indian Head Experimental Farm for propagation.

"It will be clearly seen from the above account that the question, 'when was Marquis wheat originated?' can never be answered. It came into existence probably at Ottawa between the years 1895 and 1902. It remained, however, mixed with other related sorts until discovered by the writer in 1903. It was first grown in a pure state in 1904, when a few seeds were sown in a sheltered





in 1892. One of these, known as "North Dakota No. 313" (C.I. 3697), has been called Power and is the strain now most commonly grown. In experiments at the Williston Substation, Williston, N.Dak., it proved to be a high-yielding wheat for that section and seed was increased and distributed in the vicinity of that station about 1915.

*Distribution*.—Estimated area in 1920, 20,160 acres, grown in North Dakota.  
*Synonyms*.—Power's Fife, Station No. 66.

## RED FIFE

*Description*.—Plant spring habit, midseason to late, tall; stem white, mid-strong; spike awnleted, fusiform, mid-dense to lax, erect to inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks narrow, acute, 0.5 to 1 mm long; awnlets few, 2 to 15 mm long; kernels red, short to mid-long, hard, ovate; germ mid-sized; crease wide, deep; cheeks angular; brush mid-sized, mid-long.

This variety differs from Marquis in being taller and later, with kernels slightly longer and more pointed. It is only a fair-yielding wheat but has excellent milling and breadmaking properties. Spikes, glumes, and kernels of Red Fife wheat are shown in plate 18, B.

*History*.—Red Fife (reg. no. 58) wheat was introduced into the United States from Galicia, by way of Germany, Scotland, and Canada. Several conflicting stories of its introduction have been written. The most authentic story is that, about 1842, David Fife, of Otonabee, Ontario, Canada, received a small sample of wheat from a friend in Glasgow, Scotland. The friend had obtained the sample from a shipload of wheat from the port of Danzig in Germany, but supposedly of Russian origin. Mr. Fife sowed the wheat in the spring, but it proved to be a winter wheat. A plant of spring wheat developed, however, which was saved and increased. From it descended the wheat that became known as "Red Fife" throughout Canada. The details of this introduction and several interesting traditions concerning it have been fully recorded by Butler (44, pp. 206-218). That the original seed of Red Fife wheat probably came from Galicia has been established by two other identical introductions, one by the Canadian Department of Agriculture in 1904 (178, pp. 216-217) and another (C.I. 2463) by the United States Department of Agriculture in the same year (82, p. 11).

The cultivation of Red Fife wheat in the United States dates from 1860, when J. W. Clarke, a Wisconsin farmer, had an excellent crop (66). The name Red Fife was never commonly adopted, the word "Fife" being the name most often used. As the wheat increased in popularity and cultivation, other names became applied to it.

Many growers selected and distributed the Red Fife wheat and usually prefixed their own name to the name Fife. Among these are the following: Bernard Fife, Herman Fife, McKendry Fife, McKissick Fife, Pillsbury Fife, Verdon Fife, and Wilcox Fife. Wheats once known under these names have long since disappeared from culture. The names Fife and Scotch Fife were early used for Red Fife wheat in the United States and have continued in use until the present time.

*Distribution*.—The area of Red Fife decreased from 749,600 acres in 1910 to 175,008 acres in 1924 and to 28,101 acres in 1929. In the latter year it was reported in Colorado, Iowa, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming.

*Synonyms*.—Canadian Fife, Fife, Saskatchewan Fife, Scotch Fife.

## GLYNDON

*Description*.—Plant spring habit, midseason to late, tall; stem white, mid-strong; spike awnleted, fusiform, lax, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks narrow, acute, 0.5 to 1 mm long; awnlets several, 3 to 15 mm long; kernels red, mid-long, hard, ovate; germ mid-sized; crease wide, deep; cheeks angular; brush mid-sized, mid-long.

Glyndon differs from Red Fife and Power principally in having longer and laxer spikes.

*History*.—The Glyndon (reg. no. 60) strain of Fife wheat dates from about 1891, when it was first grown by the Minnesota Agricultural Experiment Sta-

tion at the Glyndon farm in Clay County in western Minnesota. In the burning of the station buildings at University Farm all records of its origin were lost. Without doubt, however, it is one of the many samples of Red Fife wheat obtained from Minnesota farmers in 1888 and 1889. In 1892 the improvement of eight of the best varieties of wheat that had been selected by the Minnesota station was begun by continuous selection by the late W. M. Hays, then at the North Dakota Agricultural Experiment Station. Four hundred selected kernels of the eight varieties that had been grown at Glyndon in the previous year were sown at Fargo, N.Dak., and a like number on the farm belonging to J. B. Power & Sons, of Power, Richland County, N.Dak. From the 400 selected kernels, 31 plants having the largest yield and of superior quality were chosen for seed the next season. In 1893, 100 to 400 kernels from each of these 31 plants were sown at Fargo in a manner similar to the method used in 1892. The best plant was chosen from the progeny of each of these 31 plants. One of them was accessioned as Minnesota No. 163. This selection, with many others, was sown at University Farm, St. Paul, Minn., in 1894, in a small plot. In 1895 and 1896, 31 strains were tested at University Farm, and 8 were selected and grown at other stations. Among them was Minnesota No. 163. After further testing, this strain was selected as the best of the Fife types and seed was increased and distributed to farmers in 1898 (109, p. 105). It was first distributed as Minnesota No. 163, but in 1915 the name Glyndon was assigned to it by the Minnesota station.

*Distribution.*—Estimated area in 1919, 2,000 acres and in 1924, 430 acres, grown in Minnesota, North Dakota, and South Dakota. It was formerly grown mostly in Minnesota, where it was once an important wheat. In recent years it has almost disappeared from cultivation.

*Synonym.*—Minnesota No. 163.

#### RENFREW

*Description.*—Plant spring habit, midseason to late, tall; stem white, mid-strong to strong; spike awnleted, oblong-fusiform; mid-dense, erect; glumes glabrous, white, mid-long, wide; shoulders wide, square; beaks broad, obtuse, 0.5 to 0.7 mm long; awnlets few, 3 to 12 mm long; kernels red, mid-long, hard, ovate; germ mid-sized; crease mid-wide to wide, mid-deep; cheeks angular; brush mid-sized, large, mid-long.

*History.*—According to Newman,<sup>12</sup> Renfrew was discovered in 1918 growing in an increase block of Marquis wheat at the University of Alberta. G. H. Cutler, who made the selection, regarded it as a natural cross, stating that "it appeared to be a cross between Marquis and Red Fife." It was tested in 1924, 1925, and 1926 by all the experiment stations in Alberta, and since 1924 has been grown by a large number of farmers in the southern part of Alberta. The variety was first grown experimentally in the United States in 1926 by the Montana Agricultural Experiment Station.

*Distribution.*—Estimated area in 1923, 5,713 acres in Montana. In Alberta it is grown on a limited area in the southeastern part of the Province.

#### GHIRKA

*Description.*—Plant spring habit, early to midseason, mid-tall; leaves pubescent; stem glaucous when immature, usually purple, sometimes only faintly so, mid-strong; spike awnleted, linear-fusiform, mid-dense, inclined to nodding; glumes glabrous, white, long, narrow; shoulders wanting to narrow, oblique; beaks narrow, acute, 1 mm long; awnlets few, 1 to 10 mm long; kernels pale red, mid-long, semihard, ovate to elliptical, slightly humped, acute; germ small to mid-sized; crease mid-wide to wide, mid-deep to deep; cheeks usually angular; brush small, mid-long.

This variety differs from the true Fife strains in having a longer and more tapering spike and larger and softer kernels. It is inferior to Fife strains for milling and bread making.

*History.*—Ghirka (reg. no. 64) was an important variety in Russia, grown principally in southern Russia and the Volga River district. It was introduced into the United States several times during the period from 1898 to 1904, inclu-

<sup>12</sup> Letter from L. H. Newman, Central Experimental Farm, Ottawa, Canada, dated Jan. 30, 1934.

five, eight lots having been imported by the United States Department of Agriculture. Other importations were made by Russian immigrants. Joseph Dukart, who settled at New England, N.Dak., brought a 2-pound lot from Russia in 1905. From the increase of this, several thousand acres were grown in western North Dakota from 1914 to 1916 (55, p. 2).

*Distribution.*—Estimated area in 1920, 930 acres, grown in Pierce County, N.Dak.

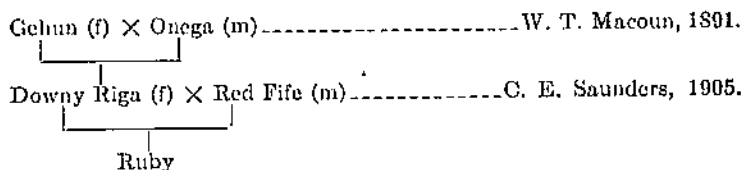
*Synonyms.*—Early Russian, Ghirka Spring, Russian, Russian Fife.

#### RUBY

*Description.*—Plant spring habit, early, short to mid-tall; stem purple, mid-strong; spike awnleted, oblong-fusiform, dense, erect; glumes glabrous, yellowish white, short, mid-wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets several, 3 to 10 mm long; kernels red, short, hard, ovate; germ mid-sized to large; crease mid-wide to wide, shallow to deep; cheeks angular; brush mid-sized, short.

Ruby differs from Marquis principally in being about 5 days earlier and in having purple straw. In the United States it has not compared favorably with Marquis in yield but has equal breadmaking value.

*History.*—Ruby (reg. no. 65) was originated by C. E. Saunders, former Dominion cerealist, at the Central Experimental Farm, Ottawa, Canada, and was distributed for the first time in 1917. The parentage of Ruby has been recorded by Buller (44, p. 186) as follows:



Ruby has been grown at experiment stations in the northern spring-wheat sections of the United States since 1918 and commercially since 1920.

*Distribution.*—Estimated area in 1920, 186,476 acres, grown in 10 States, as shown in figure 36.

*Synonyms.*—Disco, Golden.

#### KITCHENER

*Description.*—Plant spring habit, midseason, mid-tall to tall; stem purple, strong; spike awnleted, oblong to subclavate, mid-dense, erect; glumes glabrous, yellowish white, short, wide, shoulders mid-wide, oblique to square; beaks mid-wide, acute, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels red, short, hard, ovate, with truncate tips; germ mid-sized; crease wide, mid-deep; cheeks angular; brush mid-sized, mid-long.

Kitchener differs from Marquis in being taller and later and in having a broader spike, purple straw, and a slightly longer and more rectangular kernel.

*History.*—Kitchener (reg. no. 60) was originated from a head selected in a field of Marquis by Seager Wheeler in 1911 at Maple Grove Farm, Rosthern, Saskatchewan, Canada. It was increased and tested for yield by Mr. Wheeler for a period of 4 or 5 years and then distributed (226).

*Distribution.*—Estimated area in 1920, 4,148 acres, grown in Colorado and Montana.

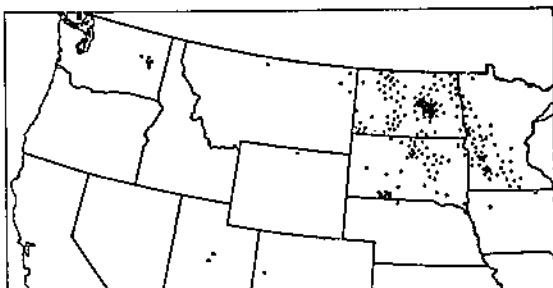


FIGURE 36.—Distribution of Ruby wheat in 1920. Estimated area, 186,476 acres.

## CLIMAX

**Description.**—Plant winter habit, midseason to late, tall; stem white, mid-strong; spike awnleted, linear-fusiform, lax, nodding; glumes glabrous, white, mid-long to long, mid-wide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 1 mm long; awnlets several, 3 to 15 mm long; kernels red, mid-long to long, soft, elliptical to ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks usually rounded; brush mid-sized, mid-long.

Climax is very distinct because of its long, lax, tapering, and nodding spike.

**History.**—The origin of Climax (reg. no. 67) is not definitely determined. It is very similar to the Celebrated K. B. No. 2 variety, differing only in having a more nodding spike. The latter wheat was distributed by the Knight & Bostwick Seed Co., Rochester, N.Y., who have given its history as follows:

"During the summer of 1898 we discovered growing in our field of Long Berry Clawson \* \* \* a single head of wheat that showed qualities distinctly superior to its celebrated parent. \* \* \* We sowed it in our trial grounds \* \* \* called it our Celebrated K. B. No. 2" (123, p. 90).

Its distribution dates from 1902, although it apparently did not become widely grown. This or a very similar wheat evidently was rather recently named Jones Climax and distributed by Everitt's O. K. Seed Store, Indianapolis, Ind., and the commercial distribution of the variety was thus established. There seems to be no evidence that A. N. Jones, of New York, who developed several varieties of wheat, had anything to do with this variety.

**Distribution.**—Estimated area in 1929, 9,018 acres, grown in Illinois, Indiana, Kansas, Ohio, and Pennsylvania.

**Synonyms.**—Celebrated K. B. No. 2, Grecian, Jones Climax, K. B. No. 2, Pennsylvania Standard, Wilson, Wilson Special.

## WHITE ODESSA

**Description.**—Plant winter habit, late, tall; stem white, weak to mid-strong; spike awnleted, linear-fusiform, lax, inclined to nodding; glumes glabrous, brown, long, narrow; shoulders narrow, wanting to oblique; beaks broad, triangular, 1 to 1.5 mm long; awnlets several, 5 to 25 mm long; kernels white, mid-long, soft, ovate; germ mid-sized; crease narrow, mid-deep; cheeks rounded; brush small, short.

White Odessa is very resistant to some forms of bunt. Some strains of White Odessa differ somewhat from the description given above, which is for C.I. 4655.

**History.**—Wheats similar to White Odessa commonly appear as mixtures in fields of Odessa in southern Idaho and Utah. The strain C.I. 4655 (reg. no. 251), distributed by the Idaho Agricultural Experiment Station in southern Idaho about 1928, was selected by the Franklin County (Idaho) agricultural agent, Mr. Morrison, from a field of Lofthouse wheat near Preston, Idaho, in 1915. It was registered in 1926 (58) after being tested at the Sherman County Branch Station, Moro, Oreg., where it was found to yield well and to be resistant to some forms of bunt.

**Distribution.**—Estimated area in 1929, 446 acres, grown in Idaho and Lewis Counties, Idaho.

## DAWSON

**Description.**—Plant winter habit, midseason, mid-tall; stem white, strong; spike awnleted, linear-oblong, mid-dense, inclined; glumes glabrous, light brown, mid-long, wide; shoulders wide, oblique to square; beaks mid-wide, obtuse, 0.5 mm long; awnlets several, 3 to 20 mm long; kernels white, short to mid-long, soft, ovate to oval; germ mid-sized to large; crease mid-wide to wide, mid-deep; cheeks usually angular; brush mid-sized, mid-long.

Dawson differs from Goldcoin chiefly in having white straw, an oblong spike, and no collar around the brush. This variety is very resistant to Hessian fly. Spikes, glumes, and kernels of Dawson wheat are shown in plate 19, A.

**History.**—Dawson (reg. no. 69) was originated in 1881 by Robert Dawson, of Paris, Ontario, Canada (193, p. 8). It was selected "in a field of Seneca or Clawson, in which he found one plant quite distinct and much superior to the rest of the crop. Mr. Dawson sowed the grain from this plant and has continued to grow this wheat since. It was practically unknown over Ontario until tested at the experimental station along with many old and new varieties and the comparative results published. It has ranked first in yield from the beginning" (194, p. 11).

**Distribution.**—Estimated area in 1929, 42,578 acres, grown in Connecticut, Michigan, New York, and New Jersey.

**Synonyms.**—American Banner, Dawson Golden Chaff, Golden Bronze, Golden Chaff, Improved Amber, White Winter.

## HONOR.

**Description.**—Honor apparently is identical with Dawson in all morphological characters, except for a slightly stronger stem. It is more winter hardy and a better yielder.

**History.**—Honor (reg. no. 70) was originated by the plant-breeding department of the Cornell University Agricultural Experiment Station, in cooperation with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. During the experimental stages it was known as Cornell Selection 522-68. Concerning the variety, H. H. Love, who was in charge of the cooperative experiments at Cornell, wrote<sup>1</sup> as follows: "Honor was selected from Dawson's Golden Chaff and seems to be a typical Golden Chaff [Dawson]. I think it is slightly more winter hardy than the commercial variety and has somewhat stiffer straw."

The selection was distributed from Cornell University to selected farmers for several years prior to the fall of 1920, when it was first offered for sale as Honor wheat by C. A. Rogers (172), of Bergen, N.Y.

**Distribution.**—Estimated area in 1929, 17,368 acres, all grown in New York.

## ARCO

**Description.**—Plant winter habit, early, short; stem white, very strong; spike awnless, clavate, dense, erect; glumes glabrous, brown, short, wide; shoulders wide, oblique to square; beaks broad, obtuse, 0.5 mm long; awnlets wanting; kernels white, short to mid-long, semihard to hard, oval; germ mid-sized; crease wide, deep; cheeks angular; brush large, long.

**History.**—Arco resulted from a cross between Arcadian and Hard Federation made by W. S. Carpenter at the Sherman County Branch Station, Moro, Oreg., in 1919. Selections from the cross were purified and tested at that station. Several were included in a nursery grown in cooperation with the county agricultural agent at Pendleton, Oreg., during the years 1923 to 1928. At a meeting of farmers held at the nursery in 1926 a few heads of the wheat were picked for examination. These heads, later identified as Arco, were saved by A. Pecavet, a farmer living near Pilot Rock, Oreg., who increased the seed. After finding the variety early and fairly well adapted to the dry-land conditions around Pilot Rock he distributed seed. Arco was also distributed in Morrow County by the Sherman County Branch Station in 1928.

**Distribution.**—Grown in Morrow County and in the southern part of Umatilla County, Oreg., since 1930.

**Synonym.**—Pecavet.

## WINDSOR

**Description.**—Plant winter habit, midseason, short to mid-tall; stem purple, mid-strong; spike awnleted, oblong-fusiform, mid-dense, nodding; glumes glabrous, brown, mid-long, mid-wide; shoulders wanting to narrow, rounded to oblique; beaks narrow, obtuse, 0.5 mm long; awnlets few, 5 to 15 mm long; kernels white, mid-long, soft, broadly ovate; germ mid-sized to large; crease mid-wide, shallow to mid-deep; cheeks usually angular; brush small, mid-long. Windsor differs from Goldcoin chiefly in having an oblong-fusiform, nodding spike and a more erect growth from spring seedling.

**History.**—The origin of Windsor (reg. no. 73) is undetermined. It was grown by the Ohio Agricultural Experiment Station as early as 1892 (229, p. 52).

**Distribution.**—Estimated area in 1929, 1,070 acres, in Hillsdale County, Mich.

**Synonym.**—Extra Early Windsor.

## GOLDEN

**Description.**—Golden differs from Goldcoin in being slightly later and in having shorter and stronger stems, more erect, dense, and clavate spikes. It is less easily shattered and is much more uniform.

<sup>1</sup> Correspondence of the Division of Cereal Crops and Diseases.

*History.*—Seventy-five heads were selected from a field of Goldcoin on the Sherman County Branch Station, Moro, Oreg., in 1923. After several years' tests selection no. 43, with kernels very similar to Goldcoin, was chosen as the best of the group. It was distributed to farmers in Union County and in the southern part of Morrow County in northeastern Oregon in 1930 and in Latah County, Idaho, in 1931.

*Distribution.*—Grown in Oregon and Idaho since 1930.

#### GOLDCOIN (FORTYFOLD)

*Description.*—Plant winter habit, midseason, short to mid-tall; stem purple, strong; spike awnleted, clavate, mid-dense, erect to inclined, easily shattered; glumes glabrous, brown, long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 1 mm long; awnlets several, 5 to 15 mm long; kernels white, short to mid-long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; checks usually rounded; brush small, mid-long, collared.

The distinctive characters of Goldcoin wheat are the purple straw, clavate spike, and collared brush. Spikes, glumes, and kernels of this variety are shown in plate 39, B.

*History.*—Goldcoin (reg. no. 74) is probably a descendant from the Redchaff or Redchaff Bald wheat mentioned in early agricultural literature as being grown in the Genesee Valley of New York, as early as 1798. The following history of Redchaff was recorded by Allen (28, p. 153) in 1885:

"The old Genesee Redchaff is a bald, white wheat, first cultivated in the same region in 1798, and for a long time it was the decided favorite. Since 1820, however, it has been very subject to rust and blast, but when circumstances are favorable it is still found to be highly productive. Its transfer to other localities may therefore be attended with great success."

Soules is an early name applied to a wheat apparently identical with Goldcoin. The following statement concerning the origin of Soules was recorded by Harmon (103, p. 225) in 1843:

"In the first volume of the New Genesee Farmer (2) this new wheat was noticed as being discovered, or a few heads being found, in a field of White Flint by Jonathan Soule, of Perrington, Monroe County."

This wheat became well established in New York in the late forties, and by 1857, according to Klippart (133, pp. 755-756), was an important variety in Ohio. About 1897 this wheat or a selection from it became known as "New Soules." Soules and White Soules were reported in 1919 from Michigan, Clawson, or White Clawson, has been found to be identical with Goldcoin, but the name, also, has a much earlier origin. According to Carleton (50, p. 65), the history of this wheat is as follows:

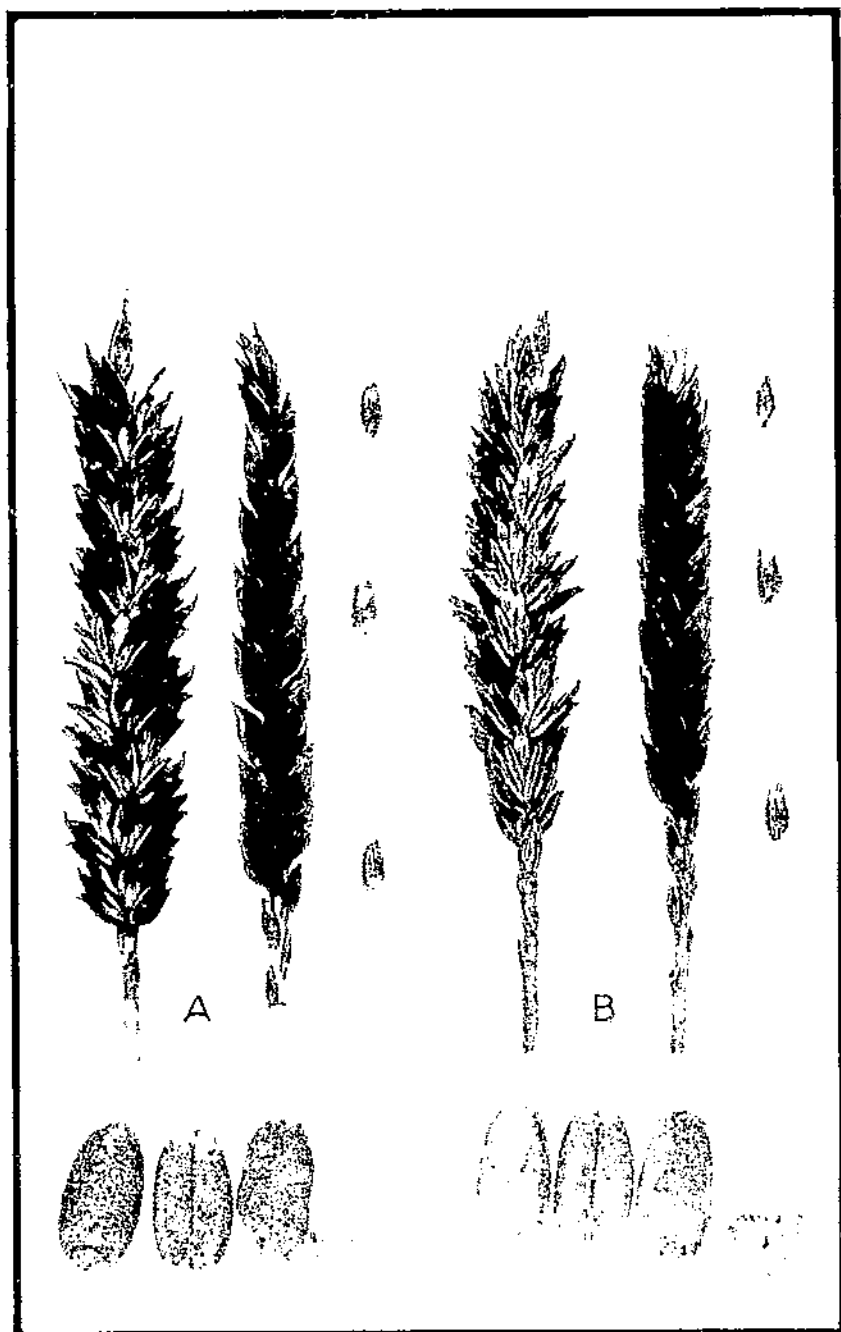
"This variety originated in Seneca County, N.Y., in 1805, through the selection of certain superior heads from a field of Fultz by Garrett Clawson. On planting the grain from these heads, both a white- and red-grained sort resulted the following season. The white wheat was considered the best, and the pint of seed obtained of this sort was sown, producing 39 pounds the following season. The third year after this 254 bushels were harvested and that season the variety was distributed to other farmers. In 1871 this variety took first premium at the Seneca County Fair, and in 1874 seed was distributed by this Department. Though judged inferior by millers at times, this variety has become a very popular one. It must not be confused with Early Red Clawson, a very distinct variety."

The Goldcoin variety, itself, is reported by Carleton (50, p. 66) to have been produced by Ira M. Green, at Avon, N.Y., about 1890, in the following manner:

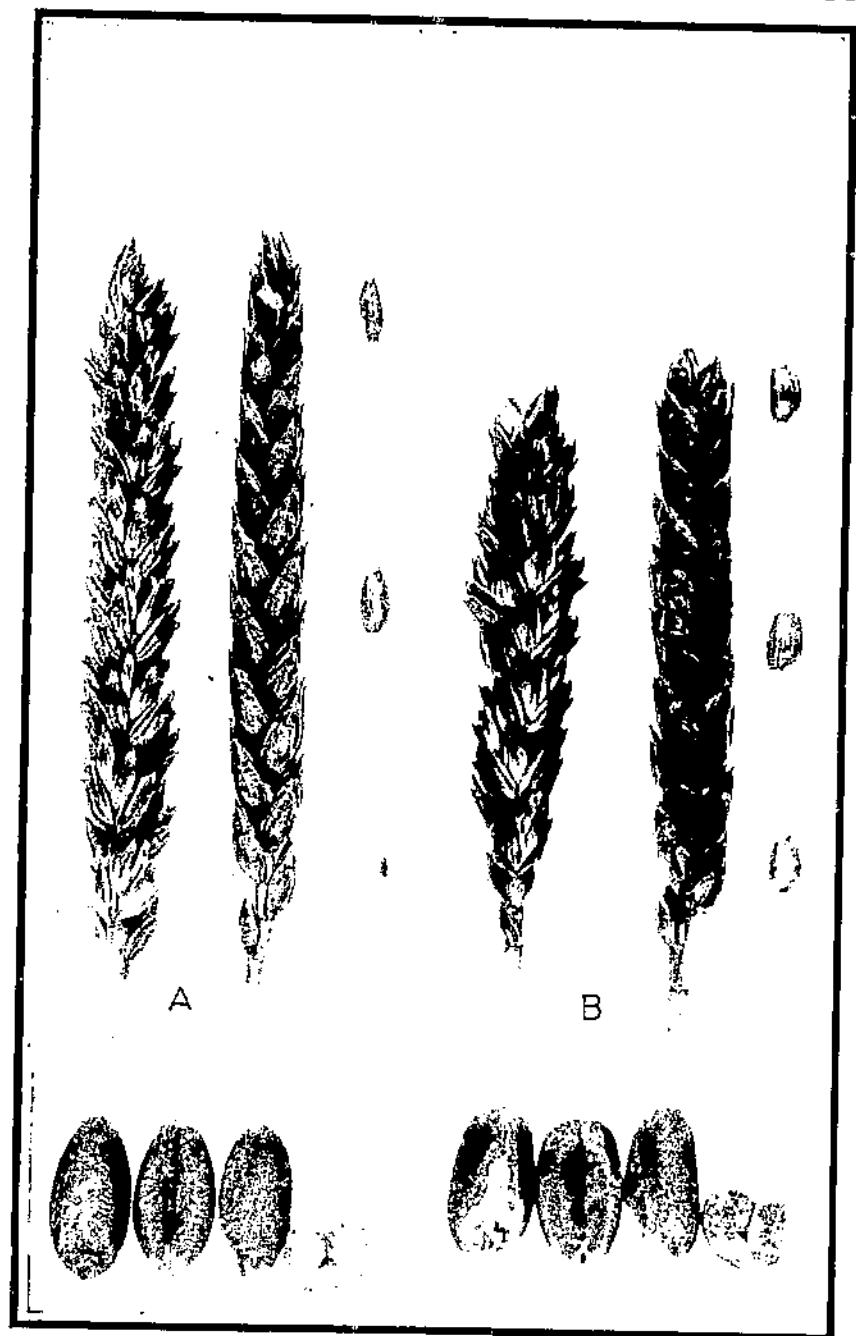
"Mr. Green grew a field of Dichi Mediterranean, a bearded, red-grained wheat, and while passing through the field one day found a bald head possessing white grains. Planting every grain of this head, he found as a result next season that he had heads with very long beards, some with short beards, and others with none at all. The grain also was mixed, some red and some white. He desired the bald wheat—hence only the grains from the bald heads were again planted. From this as a beginning, a practically new variety resulted. Various names have been given to it by different seedsmen, but it is best known by the name Gold Coin."

The commercial production of Goldcoin wheat dates from about 1900.

Fortyfold is the name under which Goldcoin was distributed by Peter Henderson & Co. (110), seedsmen, of New York City, as early as 1890. The variety



Dawson (A) and Goldecoin (B) wheats: Spikes and glumes natural size; kernels  $\times 3$ .



Federation (A) and Hard Federation (B) wheats: Spikes and glumes natural size; kernels X3.



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is grown under this name chiefly in California, Oregon, Washington, Idaho, and Utah.

Klondike is the name under which the same wheat was distributed by J. M. Thorburn & Co. (209), New York City, in 1908. No. 6 was applied to this wheat by Hickox-Rumsey Seed Co., Batavia, N.Y. It is claimed by Mr. Rumsey that the name No. 6 antedates Goldcoin. International No. 6, Rochester No. 6, and possibly Improved No. 6, are names under which the variety was distributed by the International Seed Co., of Rochester, N.Y. The distribution of the variety under these names seems to date from about 1908. The Junior No. 6 is said to be an improved strain of No. 6, but is identical with Goldcoin. It was named and distributed by the Hickox-Rumsey Seed Co., Batavia, N.Y. Goldcoin is mostly grown in New York under the names given in this paragraph.

*Distribution.*—Estimated area in 1929, 892,371 acres, grown in 14 States, as shown in figure 37.

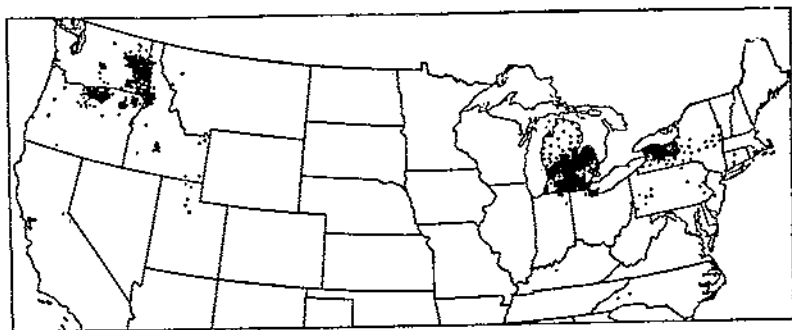


FIGURE 37.—Distribution of Goldcoin wheat in 1929. Estimated area, 892,371 acres.

*Synonyms.*—Abundance, Clawson, Eldorado, Fortyfold, Gold Bullion, Gold Medal, Goldmine, Golden Chaff, Improved No. 6, International No. 6, Junior No. 6, Klondike, New American Banner, New Soules, Niagara, Number 6, Oregon Goldmine, Plymouth Rock, Prizetaker, Prizewinner, Rochester No. 6, Soules, Superlative, Twentieth Century, White Century, White Clawson, White Eldorado, White Rock, White Russian, White Soules, White Surprise, Winter King.

#### KOFOD

*Description.*—Plant winter intermediate habit, midseason, mid-tall; stem white, slender, weak; spike awnleted, fusiform, mid-dense, nodding; glumes glabrous, yellowish, brown streaked, mid-long, mid-wide; shoulders mid-wide, usually oblique to square but sometimes more variable; beaks usually wide, obtuse, 1 mm long; awnlets many, 2 to 25 mm long; kernels white, mid-long, soft, ovate; germ small to mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long.

The spike characters of Kofod wheat are rather variable and unstable. The kernel is extremely soft.

*History.*—An interesting but undoubtedly mythical story regarding the origin of Kofod (reg. no. 68) wheat was published in the *Deseret Farmer* in 1906 (21). According to the story, Amasa Potter, of Payson, Utah, in 1870 was exploring ancient mounds in Utah County, near Payson, in one of which he found two skeletons and, among other things, a small quantity of wheat. Most of the grain had decayed, but a few apparently sound kernels remained. These he sowed, and increased and distributed the resulting yield. The published correspondence further shows that he let Orwell Simons, of Payson, have some of the seed, and he in turn let Peter Winward, of the same place, have some. A John C. Whitbeck obtained some of the seed from Peter Winward in 1875 and took it to Levan, Utah. Hans C. Kofod, of Levan, later obtained seed of this wheat from Mr. Whitbeck and thus got the start of what is now known as "Kofod" wheat. The fact that wheat usually loses its viability

after 10 or 15 years makes this story of its ancient origin extremely improbable.

*Distribution.*—Estimated area in 1929, 2,709 acres, grown in Cache, Juab, Millard, and Utah Counties, Utah.

*Synonym.*—Koffoid.

#### ALLEN

*Description.*—Plant spring habit, midseason to late, tall; stem white, mid-strong; spike awnleted, linear-lusiform, lax, inclined; glumes glabrous, brown, long, narrow; shoulders wanting to narrow, oblique; beaks narrow, acute, 1 mm long; awnlets several, 5 to 20 mm long; kernels white, mid-long, semihard, ovate; germ usually small; crease wide, shallow; cheeks usually angular; brush small, mid-long.

This variety is distinct because of its long, lax spike.

*History.*—The origin of Allen (reg. no. 76) is undetermined. It has been grown in Washington and Idaho since about 1900.

*Distribution.*—Estimated area in 1929, 1,280 acres, grown in Latah County, Idaho.

*Synonyms.*—Red Allen, Wolf Hybrid.

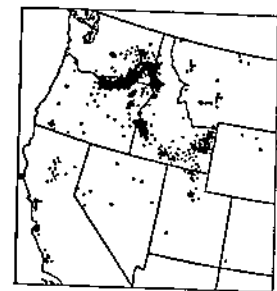
#### FEDERATION

*Description.*—Plant spring habit, early to midseason, short; stem white, strong; spike apically awnleted, oblong, dense, erect; glumes glabrous, brown, short, wide; shoulders wide, oblique to square; beaks narrow, acute, 0.5 mm long; awnlets few, 1 to 3 mm long; kernels white, usually short, soft, broadly ovate; germ mid-sized; crease usually narrow, shallow; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of this variety are shown in plate 20, d.

Federation is a high-yielding variety in the western United States. Although a spring variety, it is fairly hardy and is fall sown in mild climates.

*History.*—Federation (reg. no. 77), according to Richardson (170, reprint, pp. 124-126), "was produced by the late Mr. Farrer, wheat experimentalist, of New South Wales (Australia), from a cross between Purplestraw [Australian] and Yandilla. Yandilla is a cross between Improved Fife and Etewah, an Indian variety. The production of this wheat was probably the greatest of Mr. Farrer's many triumphs in wheat breeding, for none of his many successful cross-bred wheats have enjoyed such a wide measure of popularity as Federation."

FIGURE 38.—Distribution of Federation wheat in 1929. Estimated area, 752,867 acres.



Federation was first introduced into the United States by the United States Department of Agriculture (215, F.P.I. 38347) in 1914 from seed furnished by E. A. Cook, of Perth, West Australia. The variety first showed promise in nursery experiments at the Sherman County Branch Station, Moro, Oreg., in 1916, and was increased and thoroughly tested (100, p. 10). The first distribution to farmers for commercial growing was from that station in the spring of 1920.

*Distribution.*—Estimated area in 1929, 752,867 acres, grown in 9 States, as shown in figure 38.

#### POWERCLUB (POWER'S CLUB)

*Description.*—Plant spring habit, late, mid-tall to tall; stem white, mid-strong to strong; spike awnleted, oblong, very dense, erect; glumes glabrous, brown, mid-long, mid-wide; shoulders wanting to oblique; beaks broad, obtuse, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels white, mid-long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long, collared.

*History.*—Powerclub was developed by F. A. Powers, Route 2, Parma, Idaho, from a plant selected from a field of Jenkin. It was distributed about 1926. It apparently is the result of a field hybrid between Jenkin club and some common wheat.

*Distribution.*—Estimated area in 1929, 2,713 acres, grown in Idaho and Utah.  
*Synonym.*—Power's Club.

## FOISY

*Description.*—Plant spring habit, late, tall; stem white, mid-strong to strong; spike awnleted, linear-clavate, mid-dense to lax, erect; glumes glabrous, brown, mid-long, mid-wide; shoulders narrow, rounded to oblique; keel incurved above; beaks wide, truncate, 1 mm long; awnlets few, 3 to 15 mm long; kernels white, short, soft, ovate; germ mid-sized; crease mid-wide, shallow to mid-deep; cheeks usually rounded; brush mid-sized, mid-long.

Foisy wheat is easily distinguished by the tall plant and the long, rather lax, but clavate spike.

*History.*—Foisy (reg. no. 78) originated on the farm of M. G. Foisy, near the site of West Woodburn, in northern Marion County, Oreg. About 1895, Mr. Foisy "noticed a head of red chaff wheat in his field of white chaff wheat, of unusual size, gathered it, and planted it in his garden until he had sufficient to seed a small field. Mr. Foisy, who was a Frenchman, was too modest to call it after his name, but insisted that it was Oregon Red Chaff, yet there is no one about him that knows it by any other name than Foisy" (100, p. 10).

*Distribution.*—Estimated area in 1929, 1,431 acres, grown in Clackamas, Linu, Marion, and Washington Counties in western Oregon.

*Synonyms.*—Oregon Golden Chaff, Oregon Red Chaff, Red Chaff.

## HARD FEDERATION

*Description.*—Plant spring habit, early, short; stem white, strong; spike awnless, oblong, dense, erect; glumes glabrous, brown, short, wide; shoulders wide, square; beaks narrow, acute, 0.5 mm long; awnlets usually wanting; kernels white, short, hard, ovate, with truncate tip; germ large; crease mid-wide, mid-deep, frequently pitted; cheeks angular to rounded; brush large, mid-long.

Hard Federation differs from Federation in being earlier and slightly shorter and in having curled flag leaves and hard kernels. Spikes, glumes, and kernels of Hard Federation are shown in plate 20, B.

*History.*—Hard Federation (reg. no. 79) was originated by selection from Federation in Australia. The following history was recorded (22, p. 664) in 1914:

"In consequence of the variations of the ordinary type exhibited by the strain of Federation wheat now being grown at Cowra Experiment Farm, it has been deemed advisable to apply a distinct name to it, and 'Hard Federation' has been selected as the most appropriate. The departure from type was first noticed by J. T. Pridham, plant breeder, in 1907 or 1908, one of the plants selected from the stud plots being observed to thrash grain of remarkably hard and flinty appearance. The plant has the distinctive brown head and general appearance of Federation in the field, but the grain was of a class that has never been seen in the variety before. The seed was propagated, and in 1910 the occurrence of white heads was noticed, and from then until 1912 distinctly white heads were common among the brown, but in 1913 there were no white-headed plants, and it is hoped that the seed will now be true to type."

Hard Federation was first introduced into the United States in August 1915 by the United States Department of Agriculture (215, F.P.I. 41079). The seed was presented to the United States Department of Agriculture by George Valder, undersecretary and director of the Department of Agriculture, Sydney, New South Wales. It was first grown at the Sherman County Branch Station, Moro, Oreg., in 1916. Experiments conducted by the Department in Oregon and California from 1917 to 1919, reported by Clark, Stephens, and Florell (65, pp. 12-17), have shown it to be a high-yielding, dry-land wheat, and it was distributed for commercial growing in 1920.

*Distribution.*—Estimated area in 1929, 61,781 acres, grown in 5 States, as shown in figure 39.

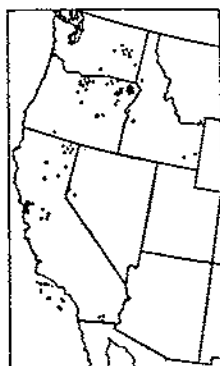


FIGURE 39.—Distribution of Hard Federation wheat in 1929. Estimated area, 61,781 acres.

## HARD FEDERATION 31

*Description.*—This selection differs from Hard Federation in having slightly taller, stronger, and more glaucous stems, in being more uniform in time of heading and height, and in being later.

*History.*—Hard Federation 31 proved to be the best of 85 head selections made by D. E. Stephens from a field of Hard Federation on the Sherman County Branch Station, Moro, Oreg., in 1921. It was distributed for growing in the Grande Ronde Valley of eastern Oregon in 1923, where it is replacing the Hard Federation variety.

*Distribution.*—Grown in the Grande Ronde Valley in eastern Oregon since 1928.

## AXMINSTER

*Description.*—Plant spring habit, midseason, mid-tall to tall; stem white, mid-strong; spike awnleted, oblong, dense, erect; glumes glabrous, light brown, mid-long, mid-wide; shoulders mid-wide, rounding to square; beaks broad, obtuse, 0.5 mm long; awnlets few, 3 to 12 mm long; kernels white, short, hard, oval to ovate; germ mid-sized; crease wide, deep; cheeks angular; brush mid-sized, mid-long, collared.

*History.*—Axminster was developed by Samuel Larcombe of Birtle, Manitoba, Canada. "It is believed to be a natural cross between Marquis and an unknown variety and resistant to certain forms of stem rust."<sup>14</sup> Mr. Larcombe commenced its development in 1916 and distributed seed in 1925.

*Distribution.*—Estimated area in 1929, 183 acres, all in North Dakota.

## GOLD DROP

*Description.*—Plant winter habit, early, mid-tall; stem white, weak to mid-strong; spike awnleted, fusiform, erect to inclined; glumes glabrous, light brown, short to mid-long, mid-wide to wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 10 mm long; kernels red, short to mid-long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

Gold Drop is distinguished from other wheats of this group by its earliness and by the short, fusiform spike and lighter brown glumes.

*History.*—Gold Drop (reg. no. 80) doubtless is the old English variety usually referred to as Golden Drop. Koernicke and Werner (193, p. 295) state that this variety was bred in 1834 by a Mr. Gorrie, at Aunat Garden in Great Britain. It has been grown in the United States for many years, being mentioned by Rawson Harmon, of Wheatland, Monroe County, N.Y., in 1843 (103, p. 223). The samples furnishing the plants here described were obtained from Izard County, Ark., where farmers state that it has been grown since about 1895.

An improved strain of Golden Drop, called Hallet's Pedigree Golden Drop, was used by Cyrus G. Pringle as one of the parents of Defiance.

*Distribution.*—Estimated area in 1929, 134 acres, all in Arkansas.

*Synonyms.*—Golden Drop, Littleton.

## RED WAVE

*Description.*—Plant winter habit, midseason to late; mid-tall to tall; stem white, mid-strong; spike awnleted, broadly fusiform, mid-dense, nodding; glumes glabrous, brown, mid-long, wide; shoulders wide, rounded to oblique, sometimes nearly square; beaks wide, obtuse, 1 mm long; awnlets several, 5 to 15 mm long; kernels red, mid-long, soft, ovate; germ mid-sized; crease mid-wide to wide, mid-deep, sometimes pitted; cheeks usually angular; brush mid-sized, mid-long.

Red Wave is distinguished by the broadly fusiform, nodding spike. It is inferior to many other soft red winter wheats for breadmaking. Spikes, glumes, and kernels of this variety are shown in plate 21, A.

*History.*—Red Wave (reg. no. 82) originated by A. N. Jones, Le Roy, Genesee County, N.Y., in 1906, as the result of a cross between Early Red Clawson and an unnamed crossbred wheat of Russian parentage (110, 1908).

<sup>14</sup> Letter from L. H. Newman dated Jan. 30, 1934.

*Distribution.*—Estimated area in 1929, 255,737 acres, grown in 17 States, as shown in figure 40.

*Synonyms.*—Advance, Indiana Red Wave, Jones Red Wave, Old Dutch, Red Chaff, Red Ivory, Red Wafer, Ruble, Rust Proof, Waif, Waverly, World's Fair.

#### ODESSA

*Description.*—Plant winter habit, late, mid-tall to tall; stem usually white, mid-strong; spike awnleted, fusiform, mid-dense to lax, inclined; glumes glabrous, brown, long, mid-wide; shoulders mid-wide, usually oblique to square, sometimes elevated; beaks usually wide, obtuse, 1 mm long; awnlets several, those below apex strongly incurved or recurved, 5 to 20 mm long; kernels red, mid-long, soft, ovate to elliptical; germ small; crease mid-wide, mid-deep; cheeks usually rounded; brush small, mid-long to long.

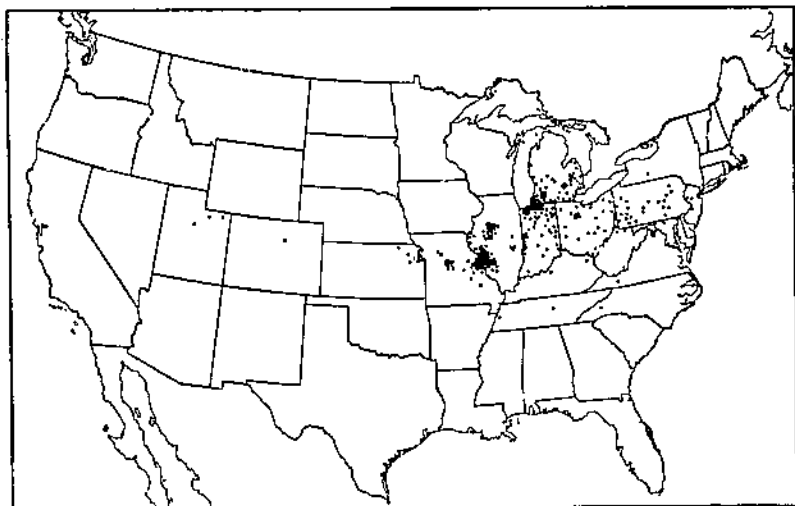


FIGURE 40.—Distribution of Red Wave wheat in 1929. Estimated area, 255,737 acres.

Odessa is very winter hardy and some strains are resistant to bunt. It is distinguished from other varieties in this group by its late maturity and its slender fusiform spike. Different strains of Odessa vary widely, owing in part to natural field hybridization. Several white-kernelled strains have been selected from these natural hybrids, some of which, like White Odessa, are resistant to some forms of bunt. Because of its winter resistance, Odessa often is used as one parent for crosses in breeding for greater winter resistance. Minn-hard and Minturki, winter-hardy varieties developed at the Minnesota Agricultural Experiment Station, are the result of a cross between Odessa and Turkey. Spikes, glumes, and kernels of Odessa wheat are shown in plate 21, B.

*History.*—Odessa (reg. no. 85), according to Carleton, (50, p. 59), is of Russian origin. Several introductions have been made. The variety was grown in Minnesota as early as 1865.

"The Odessa wheat is one of the importations of the United States Department of Agriculture that is coming into notice and favor. It was started, says the Lake City (Minn.) Leader, by Porter Martin, of Dakota County, four years ago, from a small package of seed sent him by Hon. Ignatius Donnelly and has been grown exclusively on his farm till this year, for the purpose of giving it a reliable test" (4, p. 238).

The variety was included among a number of wheats obtained by the Minnesota Agricultural Experiment Station in 1893 and 1894 from American consuls and from seed dealers in Russia (109, p. 40). It is evident, however, that the variety was quite widely grown in the United States before that time. A

variety known as "Odessa" was grown by the Wisconsin College of Agriculture in 1875 (224). A sample of Odessa wheat obtained from the Black Sea region was grown by the Colorado Agricultural Experiment Station in 1879 (39, p. 40). It also was reported to have been grown in Utah for 40 years, having been taken there from the Eastern States by Mormon settlers, and in California in the seventies and eighties, because of its resistance to rust in the coastal areas.

*Distribution*.—Estimated area in 1929, 5,160 acres, grown in Idaho, Kentucky, Missouri, Nebraska, Tennessee, Utah, and Wyoming.

*Synonym*.—Grass.

#### RUDDY

*Description*.—Plant winter habit, late, tall; stem glaucous, white, strong; spike awnleted, oblong, mid-dense, erect to inclined; glumes glabrous, light brown, short, wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets few, 2 to 8 mm long, incurving; kernels red, mid-long, soft, oval; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, long.

*History*.—Ruddy (reg. no. 80) was originated by hybridization at the Washington Agricultural Experiment Station, Pullman, Wash. It has Jones Fife, Little Club, and Turkey in its parentage and is a selection from the same cross from which Triplet was obtained. Ruddy was increased from a plant selected in 1909 and was named and distributed to a few farmers in the fall of 1919.

*Distribution*.—Estimated area in 1929, 597 acres, grown in Spokane County, Wash.

#### RUPERT

*Description*.—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, linear-oblong to subclavate, mid-dense, nodding; glumes glabrous, brown, mid-long, wide; shoulders widening to narrow to mid-wide, oblique; beaks wide, obtuse, 1 mm long; awnlets several, 2 to 20 mm long; kernels red, mid-long, soft, ovate to elliptical; germ small to mid-sized; crease wide, mid-deep to deep; cheeks usually rounded; brush mid-sized, mid-long.

Rupert differs from Red Wave in having an oblong spike, which sometimes is subclavate.

*History*.—The origin of Rupert (reg. no. 87) is not definitely known. Apparently it was first grown under the name Woods, concerning which R. Crouch, of Morristown, Tenn., wrote as follows:

"Mr. William Woods, of Talbot, Tenn., many years ago noticed an extra head of wheat in his field, and from this head of wheat Woods wheat is largely raised in this (Humboldt) and adjoining counties."

Another early name for the variety is Hartzel. John D. Daley, of Clinton, Ohio, stated in 1919 that this wheat "was selected out of some wheat grown by Joe Hartzel, of Barborton, Ohio, about 18 years ago".

A wheat under the name Rupert's Giant probably was first advertised by J. M. Thorburn & Co., seedsmen, of New York City (209), but this was described as "a red bearded wheat, long stem, strong growing, resists the Hessian fly best". Rupert's Giant, grown by the writers from samples obtained from the Cornell University (N.Y.) Agricultural Experiment Station in 1913 and 1917, is awntess and is as described above.

*Distribution*.—Estimated area in 1929, 6,102 acres, grown in South Carolina, Tennessee, and Virginia.

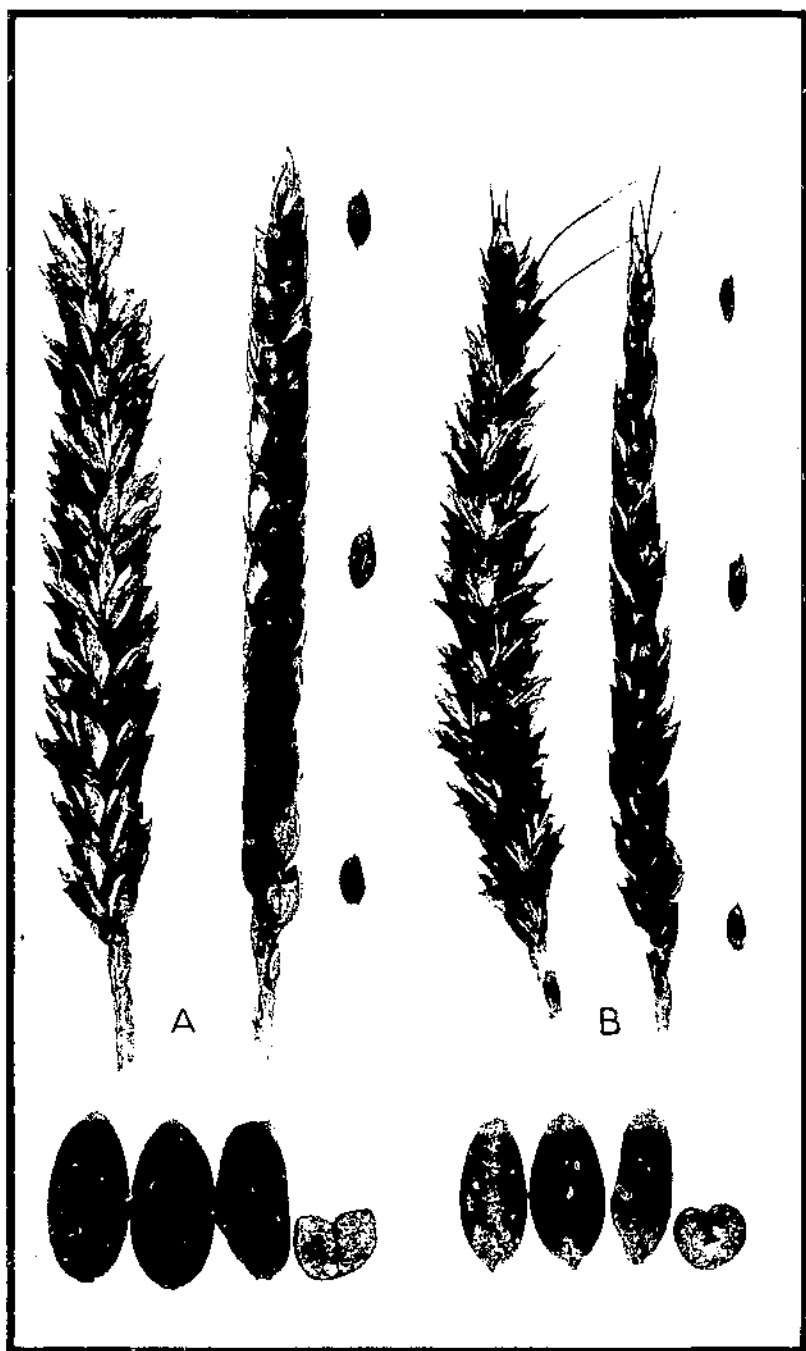
*Synonyms*.—Gold Medal, Hartzel, Haskell, Red Haskell, Red Hassel, Ruck, Rupert's Giant, Woods.

#### RURAL NEW YORKER NO. 6

*Description*.—Plant winter habit, early to midseason, short to mid-tall; stem white, mid-strong; spike awnleted, clavate, dense, erect to inclined; glumes glabrous, brown, mid-long, wide; shoulders mid-wide to wide, oblique to square; beaks wide, obtuse, 1 mm long; awnlets several, 5 to 20 mm long; kernels red, small to mid-long, soft, ovate, and broad across basal end; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

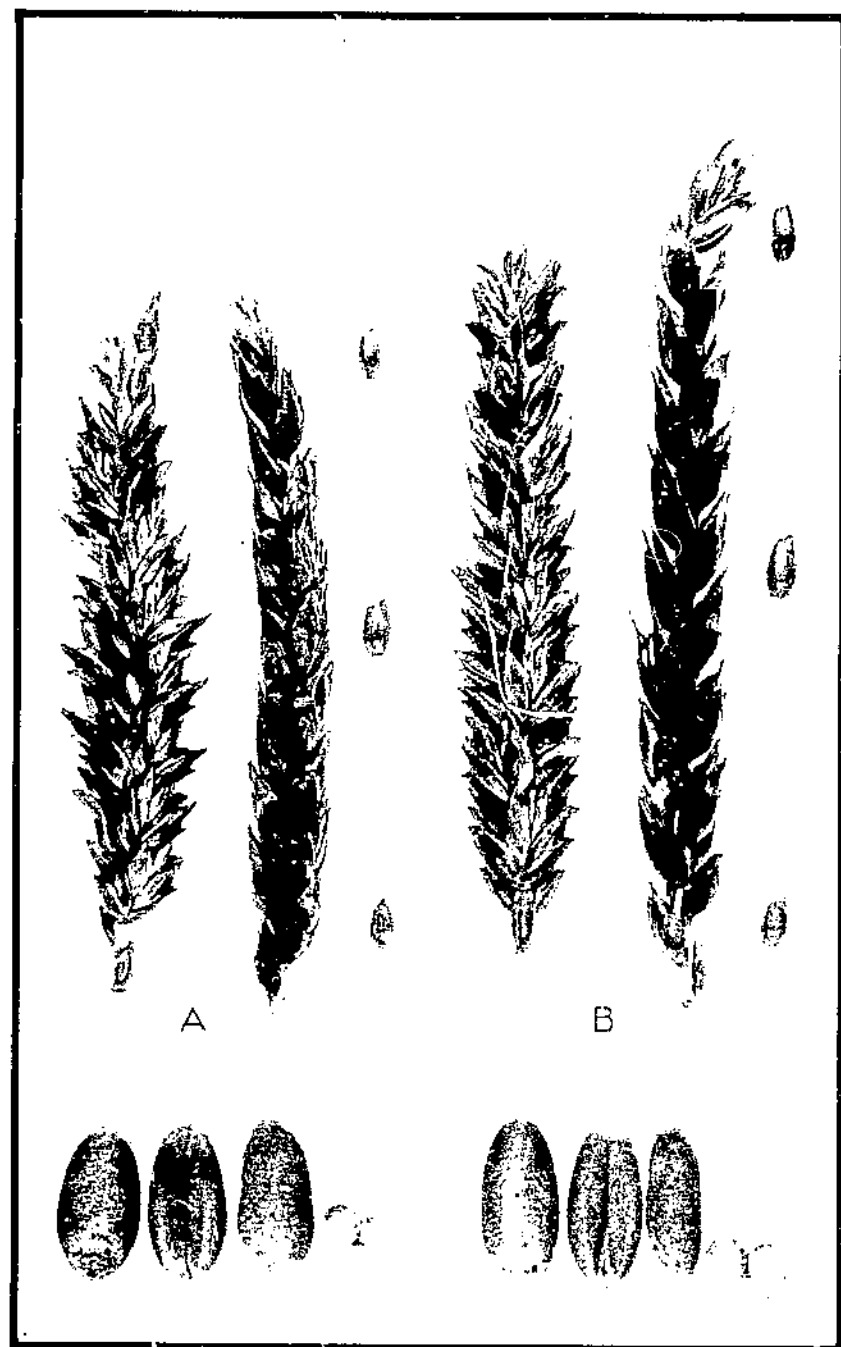
This variety is distinguished by its dense, clavate spike.

*History*.—Rural New Yorker No. 6 (reg. no. 88) is reported to have been originated by crossing wheat and rye. The cross was made by Elbert S. Car-



Red Wave (A) and Odessa (B) wheats: Spikes and glumes natural size; kernels  $\times 3$ .





Currell (A) and Poole (B) wheat. Spikes in 1, times natural size, kernels  $\times 1$ .

man, editor of the Rural New Yorker, in 1883 (16). Martin was the mother parent of the cross. Seed of the variety was first offered for sale by Peter Henderson & Co. (110), seedsmen, of New York City, in 1894. Leighty (141, p. 426), in reviewing Mr. Carman's wheat-rye hybrids, gives the following conclusions regarding Rural New Yorker No. 6:

"From this description, and from a statement made elsewhere concerning its origin, it seems that No. 6 is actually descended from the true wheat-rye hybrid obtained in 1883. It is noteworthy for the fact, since it is the only variety introduced by Mr. Carman, whose record, so far as determined by the writer, clearly indicated such origin."

*Distribution*.—Estimated area in 1924, 5,777 acres, grown in Illinois and Ohio. It was not reported in 1919 or 1929.

*Synonyms*.—Burtaker, Number 6, Red Hussar, Twentieth Century.

#### CURRELL

*Description*.—Plant winter habit, early to midseason, mid-tall; stem usually purple, mid-strong; spike awnleted, fusiform, mid-dense, inclined; glumes glabrous, brown, mid-long, narrow to mid-wide; shoulders mid-wide, oblique to square; beaks usually wide, sometimes nearly wanting, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels dull red, short to mid-long, soft, ovate; germ mid-sized; crease narrow to mid-wide, shallow to mid-deep, distinctly triangular; cheeks usually rounded; brush small, mid-long.

Spikes, glumes, and kernels of this variety are shown in plate 22, A.

*History*.—The history of Currell (reg. no. 99) has been recorded by Carleton (52, p. 202) as follows:

"Currell Prolific wheat was selected by Mr. W. B. Currell, of Virginia, from a field of Fultz in 1881. The original seed was from three spikes. It was first sold for seed in 1884."

*Distribution*.—Estimated area in 1929, 430,596 acres, grown in 13 States, as shown in figure 41.

*Synonyms*.—Currell's Prolific, Gill, Golden Chaff, Pearl Prolific, Perfection, Prettybone, Prolific, Red Odessa, Red Prolific, Tennessee Prolific.

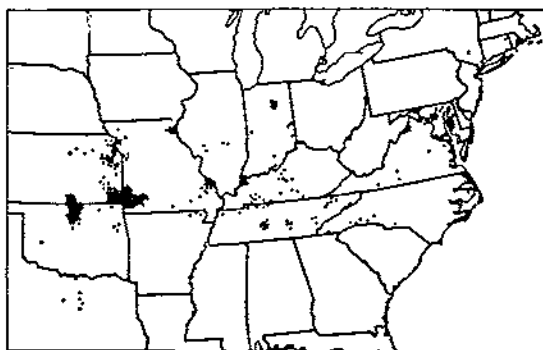


FIGURE 41.—Distribution of Currell wheat in 1929. Estimated area, 430,596 acres.

#### BALDROCK

*Description*.—Plant winter habit, midseason, mid-tall; stem purple, mid-strong to strong; spike awnleted, fusiform, mid-dense, nodding; glumes glabrous, brown, mid-long, mid-wide; shoulders wide, oblique to rounding; beaks mid-wide, obtuse, 0.5 mm long; awnlets few, 3 to 12 mm long; kernels red, mid-long, soft, elliptical; germ mid-sized; crease wide, deep; cheeks angular; brush mid-sized, mid-long.

*History*.—Baldrock (reg. no. 271) was produced (80) by the farm crops department of the Michigan Agricultural Experiment Station, East Lansing, Mich., from a field hybrid between Red Rock and an unknown variety. Many awnless selections were made from these hybrids in Red Rock and tested from 1917 to 1922. Baldrock is one of these strains. It was increased in 1930 and 145 bushels were distributed to farmers in 1931. It was registered (56) as an improved variety in 1932 because of its resistance to lodging, awnleted spikes, good yields under Michigan conditions, and satisfactory flour quality.

*Distribution*.—Grown in Michigan since 1931.

## POOLE

*Description.*—Plant winter habit, midseason, mid-tall; stem purple, mid-strong; spike awnleted, usually fusiform, sometimes nearly oblong or linear-oblong, wide, mid-dense to lax, usually nodding; glumes glabrous, brown, mid-long, wide; shoulders wide, oblique to square; beaks wide, obtuse, 0.5 mm long; awnlets several, 5 to 20 mm long; kernels red, mid-long, soft, ovate to oval, frequently elliptical, flattened; germ small to mid-sized; crease, mid-wide, mid-deep to deep; cheeks usually rounded; brush small to mid-sized, mid-long.

Poole is distinguished by the wide, nodding spikes. The kernels are rather narrow, flattened, and rounded in outline. Spikes, glumes, and kernels of Poole wheat are shown in plate 22, B.

*History.*—The origin of Poole (reg. no. 92) is undetermined, but it has been an important variety in Ohio and Indiana since about 1880. It was grown by the Ohio Agricultural Experiment Station as early as 1884 (187, p. 15).

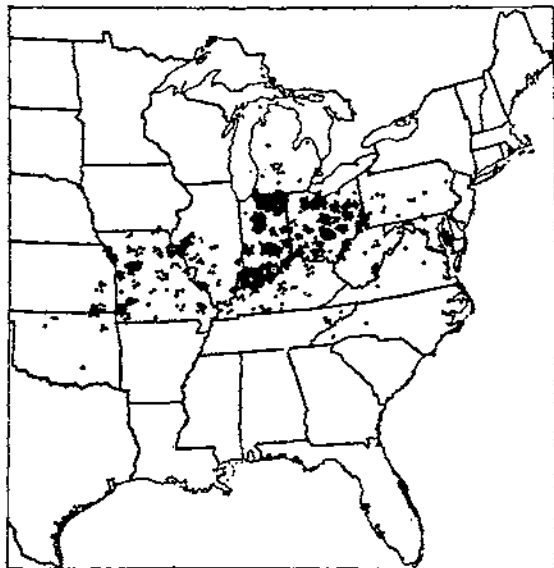


FIGURE 42.—Distribution of Poole wheat in 1929. Estimated area, 600,817 acres.

grown on 2,453,400 acres. In 1924 the estimated area was 1,050,023 acres, and in 1929, 600,817 acres, grown in 16 States, as shown in figure 42.

*Synonyms.*—Beechwood, Beechwood Hybrid, Bluestem, California Red, GDI, Harvest King, Hedge Prolific, Hundred Mark, Hydro Prolific, Kentucky Bluestem, Mortgage Lifter, Nissley, Nissley's Hybrid, Ocean Wave, Oregon Red Chaff, Red Amber, Red California, Red Chaff, Red Fultz, Red King, Red Russell, Royal Red Cluwsen, Sweet Water Valley, Wagner, Winter King.

## V.P.I. 112

*Description.*—V.P.I. 112 is very similar to Poole but is slightly taller; it has weaker stems, and the beaks and awnlets may be slightly longer.

*History.*—V.P.I. 112 resulted from a plant selection from Poole made in 1905 at the Virginia Polytechnic Institute, Blacksburg, Va. It was first distributed for commercial growing in 1915.

*Distribution.*—Estimated area in 1929, 32,400 acres, grown in Virginia, North Carolina, and Tennessee. The Virginia station estimates that 25,000 acres were grown in 1933.

## PORTAGE

*Description.*—Portage is similar to Poole except for a stiffer straw and a higher yield and quality.

**History.**—Portage (reg. no. 93) is the result of a plant selected from Poole and was developed at the Ohio Agricultural Experiment Station. It was recommended by the Ohio Station as a high-yielding wheat superior to Poole for breadmaking and was distributed about 1916 (230, pp. 478-481).

**Distribution.**—The estimated area of Portage in 1919 was 4,500 acres, which was increased to 57,320 acres in 1924. By 1929, however, the area had decreased to 13,067 acres, all in Ohio, having been replaced by Trumbull.

#### RUSSIAN RED

**Description.**—Russian Red differs slightly from Poole in having more persistent glumes that have more triangular shoulders and longer beaks (1 to 1.5 mm long).

**History.**—Russian Red (reg. no. 94) usually is grown under the name "Red Russian", but as other varieties are known by this name it is here designated as Russian Red. The following history of this wheat was reported by B. H. Collins, who was offering the seed for sale in 1898:

"In answers to questions, allow me to say that the Red Russian wheat I advertise in the Farmer was selected by an agent sent by the American Seed Co., of Rochester, N.Y., to Russia to secure their best wheat. It was introduced in this section by a prominent mill in Indianapolis at \$1.50 a bushel. They paid 1 cent extra for a few years to encourage its more general introduction. It has of late years sold at the seed stores at a 2-cent premium and does this year. It is hardy, smooth, medium hard, and very productive. The only fault I found in growing it 12 years is that it shatters when cut dead ripe, so that I often grow half of my crop Fultz, which can wait. Lately, however, I grow all Russian" (71, p. 7).

This variety was grown by the Ohio Agricultural Experiment Station as early as 1888 (114, p. 29). It was distributed widely by Peter Henderson & Co. (110), seedsmen, of New York City, and J. A. Everitt & Co. (88), seedsmen, of Indianapolis, Ind., in the early nineties.

**Distribution.**—The estimated area of Russian Red increased from 50,474 acres in 1924 to 60,806 acres in 1929, the latter acreage, however, being far below that of 1919, when 172,100 acres were grown. The 1929 acreage was in 11 States, as shown in figure 43.



FIGURE 43.—Distribution of Russian Red wheat in 1929. Estimated area, 60,806 acres.

#### CHINA

**Description.**—Plant winter habit, late, tall; stem purple, weak to mid-strong; spike awnleted, fusiform, mid-dense to lax, inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders narrow to mid-wide, usually rounded; beaks wide, obtuse, 0.5 mm long; awnlets few, 3 to 12 mm long; kernels red, short to mid-long, soft, ovate to elliptical, tip end usually flattened, ventral side slightly dished; germ small; crease narrow to mid-wide, shallow to mid-deep; cheeks rounded; brush small, mid-long, collared.

China differs principally from Currell in being taller and later and in having longer spikes and a different-shaped kernel, as shown in the descriptions. Spikes, glumes, and kernels of China wheat are shown in plate 23, 4.

*History.*—In 1851 the Rural New Yorker gave the following account of the origin of China (reg. no. 95), which appeared for the first time in the Niagara Democrat:

"The kernels from which they (specimens) grew were originally brought from China some six years ago (1845). The seed was handed to Mr. Caverns by O. Turner, the popular local historian, who obtained them from the then lately returned Minister to China, Hon. Caleb Cushing. From a small quantity received by Mr. Caverns for experiment, an amount sufficient to give it extensive and permanent culture has been received."

Several other histories of the origin of China wheat are recorded in literature, but the above is thought to be the correct history of the variety here described.

*Bluestem and Pennsylvania Bluestem* are names widely used for China in the States where it is grown. A. H. Hoffman, seedsman, of Landisville, Pa., distributed the variety in that State under the name Pennsylvania Bluestem.

*Distribution.*—The estimated area of China decreased from 63,900 acres in 1919 to 57,671 acres in 1924 and to 13,663 acres in 1929, grown in Delaware, Kentucky, Maryland, Pennsylvania, and Virginia.

*Synonyms.*—Bluestem, Lebanon Valley, Mortgage Lifter, Pennsylvania Bluestem.

#### WHEELING

*Description.*—Plant winter habit, midseason to late, mid-tall to tall; stem purple, strong; spike awnleted, oblong-fusiform, mid-dense, erect; glumes glabrous, light brown, mid-long to long, mid-wide; shoulders wanting to narrow, oblique; beaks wide, obtuse, 0.5 mm long; awnlets few, 3 to 15 mm long; kernels red, mid-long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush small, mid-long.

Wheeling differs from China in being shorter and in having a shorter and more erect spike and narrower shoulders.

*History.*—Wheeling (reg. no. 93) has the following history: "This variety was originated about 18 years ago (1890) by Louis Wheeling, of Indiana. Mr. Wheeling, while walking in his wheat field, noticed some heads slightly different from the surrounding ones. These he selected, and from them came the variety that bears his name" (123, p. 90).

*Distribution.*—The estimated area of Wheeling decreased from 10,900 acres in 1919 to 851 acres in 1929, all in Indiana.

*Synonym.*—Dutro Clipper.

#### SHEPHERD

*Description.*—Plant winter habit, midseason, mid-tall; stem purple, mid-strong; spike awnleted, oblong-fusiform, mid-dense, erect to inclined; glumes glabrous, brown, short to mid-long, wide; shoulders wide, rounding to square; beaks broad, obtuse, 0.5 mm long; awnlets few, 3 to 12 mm long; kernels red, short to mid-long, soft, ovate; germ mid-sized; crease wide, mid-deep; cheeks angular; brush mid-sized, mid-long.

Shepherd is resistant to flag smut and the rosette phase of wheat mosaic.

*History.*—Shepherd (reg. no. 253) was originated in cooperative experiments of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the department of plant breeding of Cornell University. The original selection was from the variety known as "Tennessee Fultz" and was made at Ithaca, N.Y., in 1912 by C. E. Leighty. It was registered in 1926 (58). Its superior characters are resistance to flag smut and the rosette phase of wheat mosaic. Shepherd has been grown commercially since 1923 in areas of Illinois where these diseases occur.

*Distribution.*—Estimated area in 1929, 3,309 acres, all in Illinois.

#### RED MAY (MICHIGAN AMBER)

*Description.*—Plant winter habit, early to midseason, mid-tall to tall; stem purple, mid-strong; spike awnleted, usually oblong, mid-dense, erect to inclined; glumes glabrous, brown, short to mid-long, wide; shoulders wide, usually square; beaks narrow, triangular, 0.5 mm long; awnlets few, 3 to 12 mm long; kernels red, usually short, soft, ovate; germ mid-sized; crease mid-wide to wide, mid-deep to deep; cheeks usually angular; brush usually small, mid-long.

Red May differs from Poole and China in being earlier and in having a broader and more oblong spike and wider glumes with squarer shoulders. The glumes and shoulders of Red May also are wider than those of Wheedling. Spikes, glumes, and kernels of Red May wheat are shown in plate 23, B.

*History.*—Red May (reg. no. 97) is believed to be identical with or descended from the Red or Yellow Lammas. Several writers have suggested the identity. Tracy (218, p. 396) mentions Yellow Lammas as being a synonym of Red May. Lammas was mentioned by Koernicke and Werner (135, pp. 253, 290) as being a very old English wheat grown prior to 1699. Both the Red and Yellow Lammas were grown in Virginia many years before the Revolutionary War. A White May wheat of a later period, according to Cabell (48, p. 14), was grown in Virginia as early as 1764. A more recent history of Red May indicates that it was originated by General Harman from the Virginia May (a white-kerneled wheat) about 1830 (103, p. 226). This wheat has been grown quite widely under the name Red May since 1845.

Early May was commonly used as a synonym for both Red May and White May from 1843 to 1857. In 1854 a White May variety in addition to the one already discussed is claimed to have been originated by Charles H. Boughton, Center Crossroads, Essex County, Va. This was also known as "Boughton" and "Tappahannock." The name "Early May" is now used for both Red May and Flint.

The name "May" is now used most commonly as a synonym for Red May, although the variety probably was originally a white-kerneled wheat of earlier origin than Red May. The name is also known to be used for other varieties.

Michigan Amber was grown on the eastern farm of the Pennsylvania Agricultural College, in Chester County, Pa., as early as 1871 (69, p. 134). Concerning the variety, the Farmers' Advocate, London, Ontario, published the following statement, which was republished in the Rural New Yorker in 1875 (7, pp. 186-187):

"Michigan Amber, or Rappahannock, is of an amber color; growth and appearance otherwise resembling the Midge-proof variety."

Although commonly used, the name Michigan Amber seems to be of a later date than Red May, and for that reason the latter is preferred.

The writers' samples of the variety are similar to Red May, with the possible exception of being a few days later in maturity. This might easily be due to the fact that Michigan Amber wheat has been grown farther north than the Red May since about 1870.

Michigan Wonder was reported as one of the highest yielding wheats at the Missouri Agricultural Experiment Station in 1911 (149, p. 211). The writers' samples are the same as Red May, except that they are slightly more erect.

Orange wheat was reported as having been introduced into Monroe County, N.Y., from Virginia in 1845 (104, p. 286). In 1857 Klippart (133) reported Orange wheat as a beardless, white-grained winter wheat grown in Ohio. The wheat now grown as Orange, however, has red kernels and apparently is identical with Red May. It is reported as one of the excellent-yielding awnless varieties of wheat for Missouri in 1910 (74, p. 67).

Pride of Indiana wheat obtained from the Indiana and Missouri Agricultural Experiment Stations is the same as Red May. The origin of the wheat is undetermined. Possibly the name became used for wheat through error, as it is a name of an important variety of corn in Indiana.

The name "Red Cross" is sometimes wrongly applied to Red May wheat. Since 1893 the John A. Salzer Seed Co., seedsmen, of La Crosse, Wis., have been selling a wheat under the name Red Cross that apparently is identical with Red May. They bought the seed from a J. J. Barron, who claimed to have originated it (176, p. 17). This he states was done by crossing three varieties. No evidence is given, however, to prove that the crosses were made.

*Distribution.*—The estimated area of Red May decreased from 1,165,900 acres in 1919 to 399,915 acres in 1924 but increased to 709,161 acres in 1929, while acreage was reported from 20 States, as shown in figure 44.

*Synonyms.*—Beechwood, Canadian Hybrid, Early Harvest, Early May, Early Ripe, Enterprise, Jones Longberry, May, Michigan Amber, Michigan Wonder, Orange, Pride of Indiana, Red Amber, Red Cross, Red Republic, Republican Red.

## ILLINI CHIEF

*Description.*—Plant winter habit, midseason to late, tall; stem purple, strong; spike awnleted, oblong, mid-dense, erect to inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders wide, usually square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets few, 3 to 15 mm long; kernels red, short to mid-long, soft, ovate; germ mid-sized; crease wide, mid-deep to deep; cheeks usually angular; brush mid-sized, mid-long.

Illini Chief is very similar to Red May, but differs slightly in being taller and later. It was originally mixed with Jones Five and with pubescent brown-glumed strains, most of which were heterozygous. Illini Chief is very resistant to Hessian-fly injury.

*History.*—Illini Chief (reg. no. 98) was first distributed in the fall of 1915 by E. L. Gillham, Edwardsville, Ill. He advertised the variety as resistant to Hessian fly, stating "that it does practically resist Hessian-fly attack" (96).

McColloch and Salmon (144) and Painter, Salmon, and Parker (158) have published recent data supporting the earlier reports of the resistance of Illini Chief to Hessian fly.

Further history of Illini Chief wheat is recorded as follows:

"Ed. Gillham, who was the first man to grow the wheat, bought the seed nine years ago from a neighbor by the name of Finley, and it is still known as Finley wheat in Madison County" (23, p. 5).

Finley was reported in 1919 from Kansas, Missouri, and Ohio. The name Finley also was in use in the early eighties for an awnless variety with white, glabrous glumes and red kernels (77, p. 29). This wheat apparently has now gone out of cultivation.

A second article in the *Prairie*

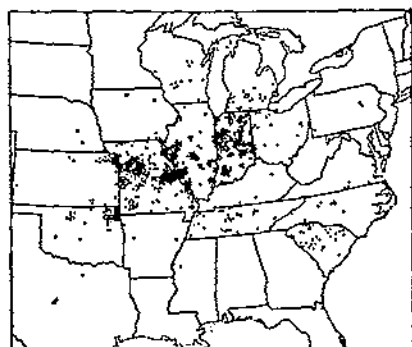


FIGURE 44.—Distribution of Red May wheat in 1929. Estimated area, 793,161 acres.

Farmer by S. A. Forbes (90), State entomologist of Illinois, contains the following sentence: "Mr. Gillham has traced his original stock to an Ohio farmer, who called it Early Carlyle."

*Distribution.*—Estimated area in 1929, 2,551 acres, grown in Illinois and Missouri.

*Synonyms.*—Early Carlyle, Finley.

## RED CLAWSON

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem purple, strong; spike awnleted, oblong to linear-clavate, mid-dense, erect to inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders mid-wide to wide, usually square, sometimes rounded or oblique; beaks mid-wide, obtuse, 0.5 to 1 mm long; awnlets several, 5 to 15 mm long; kernels pale red, mid-long, soft, ovate to elliptical; germ small to mid-sized; crease mid-wide, shallow to mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

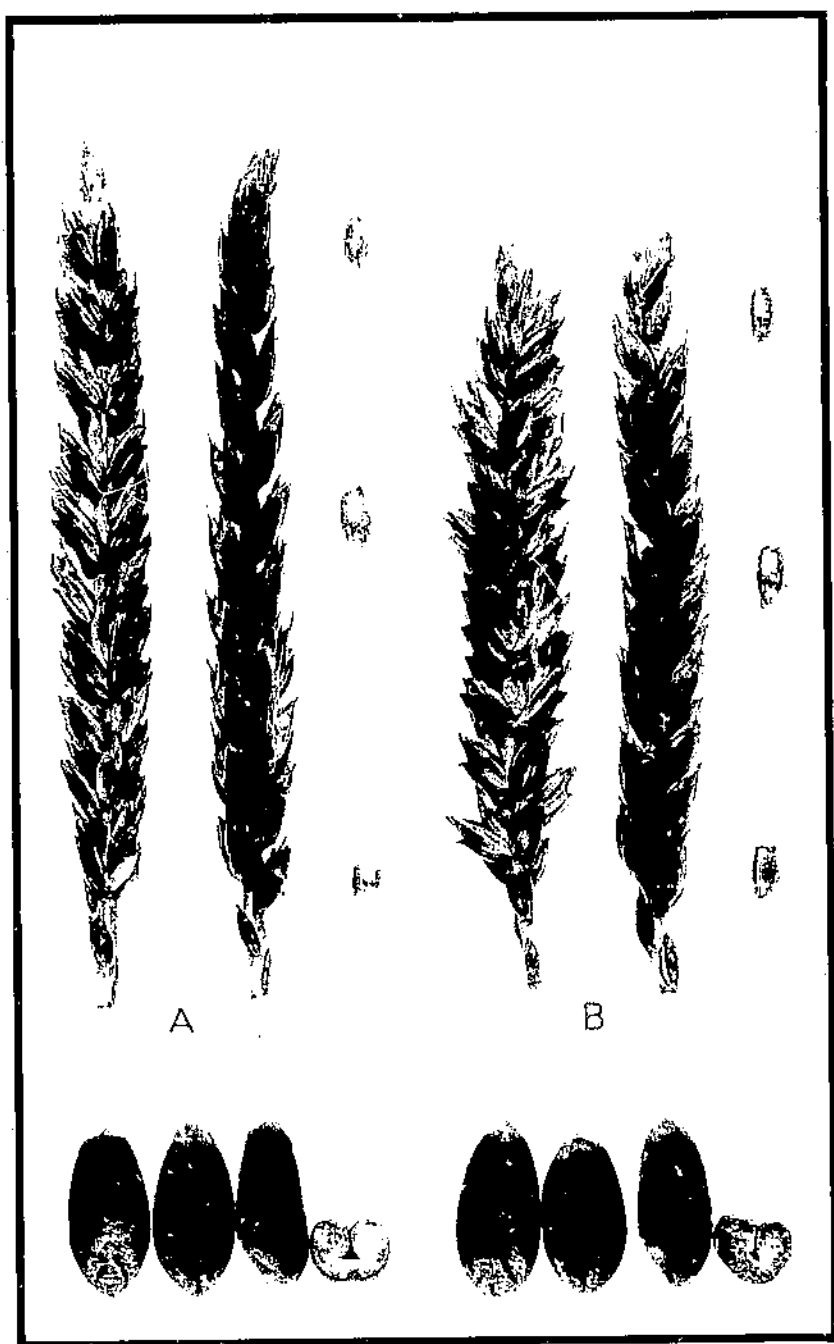
Red Clawson differs from Red May in being later and in having a slightly longer and more clavate spike, narrower glumes, and a longer kernel.

*History.*—Red Clawson (reg. no. 99) was originated in 1888 as the result of a cross between Clawson, a white wheat, and Golden Cross, made by A. N. Jones, of Newark, Wayne County, N.Y. (50). It was advertised and distributed by Peter Henderson & Co. (110), seedsmen, New York City, as early as 1889.

The name "Clawson" properly is applied only to the white-kerneled wheat, which was one parent of the Red Clawson, but sometimes is used for Red Clawson.

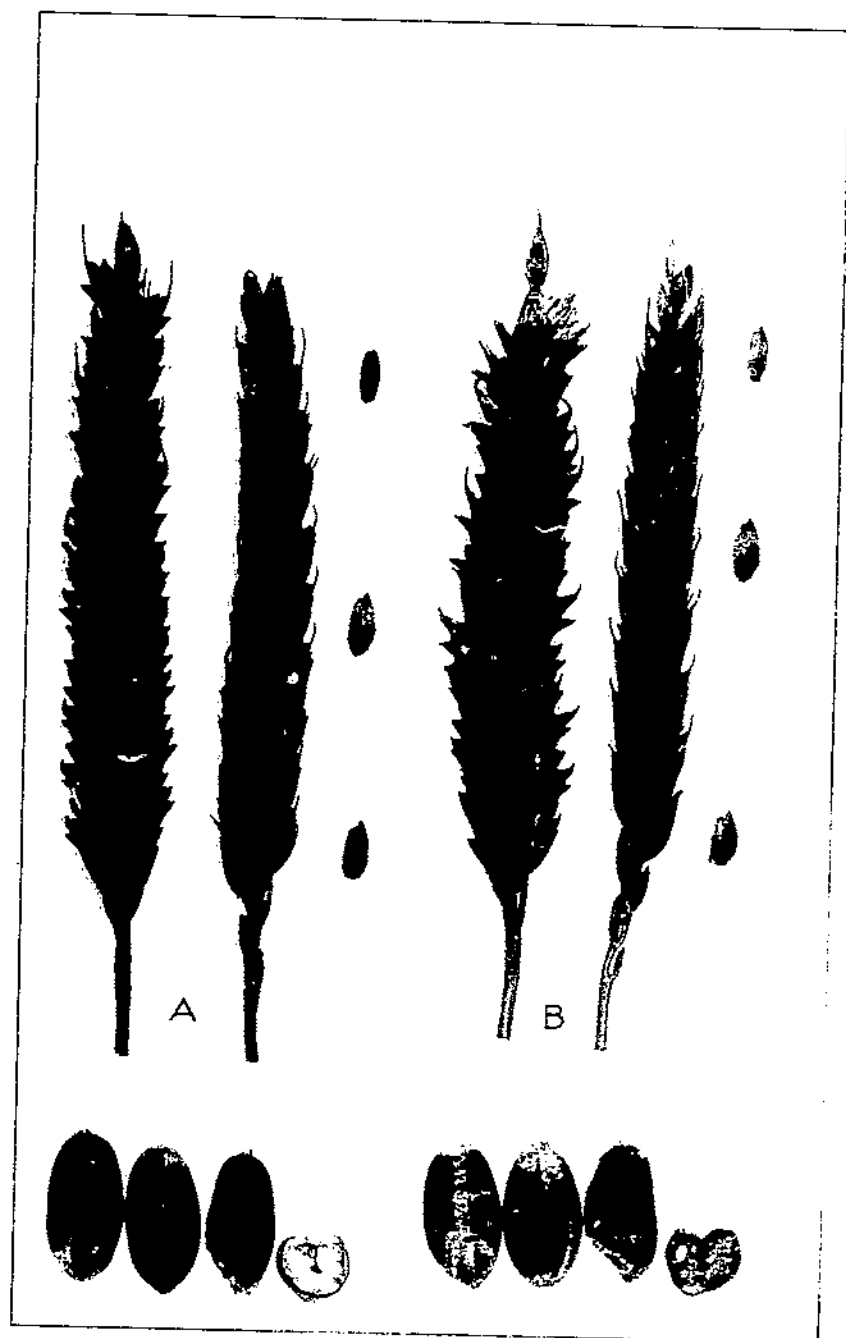
*Distribution.*—Estimated area in 1929, 10,823 acres, grown in Indiana, Michigan, and Pennsylvania.

*Synonyms.*—Clawson, Early Red Clawson, Zeller's Valley.



China (A) and Red May (B) wheats: Spikes and glumes natural size; kernels  $\times 3$ .





Triplet C.F. and Jones Pile B wheats. Spikes and kernels natural size, kernels  $\times \frac{1}{2}$ .

## ROCHESTER

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem purple, strong; spike awnleted, very clavate, dense, erect; glumes glabrous, brown, mid-long, mid-wide; shoulders wide, oblique to square; beaks mid-wide, obtuse, 0.5 to 1 mm long; awnlets several, 3 to 15 mm long; kernels red, short to mid-long, soft, ovate, lumped; germ small; crease mid-wide, mid-deep, pitted; cheeks rounded; brush mid-sized, mid-long to long.

Rochester wheat has an extremely dense, clavate spike which distinguishes it from most other varieties.

*History.*—The origin of Rochester (reg. no. 100) is undetermined. It was advertised by Henderson (110) as early as 1891.

*Distribution.*—The estimated area of Rochester decreased from 900 acres in 1919 to 123 acres in 1924, and in 1929 it was not reported. It was formerly grown in Monroe County, N.Y., and in Morris County, N.J.

*Synonyms.*—Pride of the Valley, Rochester Red, Shepherd's Tennessee Fultz.

## RED CHIEF

*Description.*—Red Chief is nearly identical with Rochester, but the spike is not quite so dense.

*History.*—Red Chief (reg. no. 101) is reported by Henderson (110, 1903) to have originated from Early Red Clawson and Red Arcadian. By whom this cross was made is not stated.

*Distribution.*—Estimated area in 1924, 60 acres, all in Kentucky. It was not reported in 1929.

*Synonym.*—Early Red Chief.

## STANLEY

*Description.*—Plant spring habit, midseason to late, tall; stem white, mid-strong; spike awnleted, fusiform, lax, erect, easily shattered; glumes glabrous, brown, mid-long, narrow; shoulders wanting to narrow, oblique; beaks narrow, sometimes wanting, usually acute, 0.5 mm long; awnlets few, 3 to 10 mm long; kernels red, short to mid-long, semihard to hard, ovate; germ mid-sized; crease mid-wide, shallow to deep, triangular; cheeks angular; brush mid-sized, mid-long.

*History.*—Stanley (reg. no. 104) originated about 1895 from the progeny of a cross made by William Saunders, Dominion cerealist, Ottawa, Canada. "The Stanley is a twin wheat with the Preston, both having had origin in the one kernel" (181, p. 14). "Parentage Ladoga (female) crossed with Red Pife (male)" (177, p. 219). An awned, white-glumed, white-kernelled winter wheat also has been grown under the name Stanley (229, p. 38).

*Distribution.*—Estimated area in 1929, 424 acres, in Broadwater County, Mont.

## MONTANA KING

*Description.*—Plant spring habit, midseason to late, mid-tall; stem sometimes faintly purple, mid-strong; spike awnleted, fusiform, mid-dense, erect to inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders wide, oblique to square; beaks broad, obtuse, 1 mm long; awnlets several, 5 to 20 mm long; kernels red, mid-long, hard, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long.

*History.*—Montana King is thought to be the result of a field cross between Marquis and Ladoga. It is the product of a plant selection in a field of Marquis in Canada, where it was first known as Brownhead, or Brontch's Brownhead. In the United States it was distributed widely in 1928 and 1929 by a seed firm of Scobey, Mont., under the name Montana King.

*Distribution.*—Estimated acreage in 1929, 38,712 acres, in North Dakota and Montana.

*Synonyms.*—Brontch's Brownhead, Brownhead.

## SILVERCOIN

*Description.*—Plant winter habit, midseason, short to mid-tall; stem white, strong; spike awnleted, clavate, dense, erect to inclined; glumes pubescent, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 1 mm long; awnlets few, 3 to 10 mm long; kernels white, short to mid-

long, soft, ovate to oval; germ mid-sized; crease mid-wide, mid-deep; cheeks angular to rounded; brush mid-sized, mid-long.

*History.*—According to M. L. Peterson, Mendon, Cache County, Utah, Silvercoin (reg. no. 105) wheat originated in a dry-land field of mixed Goldcoin and Sonora, belonging to Eph. Hansen, a few miles from Mendon, about 1900. The wheat was selected, increased, and distributed and became known as "Eph. Hansen" wheat, but the name later was changed to Silvercoin, though when and by whom is not known.

*Distribution.*—Estimated area in 1929, 5,648 acres, grown in Utah.

#### INDIAN

*Description.*—Plant spring habit, early, short; stem white, weak to mid-strong; spike awnleted, oblong, dense, erect, easily shattered; glumes pubescent, white, mid-long, mid-wide; shoulders mid-wide, oblique to elevated; beaks narrow, acuminate, 1 to 3 mm long; awnlets several, 3 to 5 mm long; kernels white, short, soft, ovate to oval; germ mid-sized; crease mid-wide, shallow; cheeks unusually rounded; brush small, short.

Indian differs from Sonora principally in having white instead of brown glumes.

*History.*—The origin of Indian (reg. no. 107) wheat is not definitely known. It probably is the result of a natural field hybrid between Sonora and some other variety. It is a common mixture in the Sonora variety, although it has been separated and grown by itself for many years. George L. Little, Jr., of Morgan, Morgan County, Utah, reported in 1917 that the origin of the variety was not known, but that it had been grown in his county for 40 or 50 years.

*Distribution.*—The estimated area of Indian in 1919 was 200 acres, which increased to 957 acres in 1924, but it was not reported in 1929. It was formerly grown in Arizona and Utah.

#### PUSA NO. 4

*Description.*—Plant spring habit, early, short; stem white, mid-strong; spike awnless, oblong, very lax, inclined; glumes pubescent, white, mid-long, mid-wide; shoulders wide, rounding to elevated; beaks mid-wide, obtuse, 0.5 to 1 mm long; awnlets usually wanting; kernels white, mid-long, hard, ovate; germ mid-sized; crease mid-wide, shallow; cheeks rounding; brush small, short.

*History.*—According to Pridham and Callaghan (166), Pusa No. 4 was originated as a natural cross in the breeding plots of the Indian Government at Pusa and is thought to contain Federation blood. These authors also report it as being the leading variety in Queensland, Australia. Pusa No. 4 was introduced from India (F.P.I. 41682) by the United States Department of Agriculture in 1915. Experiments have shown that it is adapted to sections of southern California, where it was distributed by the California Agricultural Experiment Station about 1926. A shipment of seed from California to Jim Clark, of Moscow, Idaho, resulted in 200 acres being sown there in 1930.

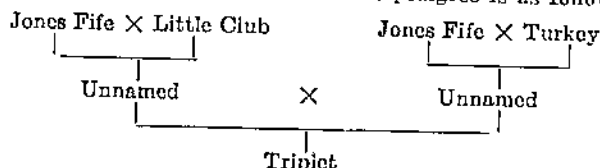
*Distribution.*—Estimated area in 1929, 589 acres, in California.

#### TRIPIET

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, oblong-fusiform, mid-dense, inclined; glumes pubescent, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets several, 3 to 12 mm long, sometimes incurved throughout spike; kernels red, short to mid-long, semihard, ovate; germ small; crease narrow to mid-wide, shallow; cheeks rounded; brush small, mid-long.

Tripiet differs from Jones Fife in being slightly shorter and earlier and in having a harder kernel with a smaller germ and rounded rather than angular cheeks. Plate 24, A, shows spikes, glumes, and kernels of Tripiet.

*History.*—Tripiet (reg. no. 108) was originated at the Washington Agricultural Experiment Station, Pullman, Wash. Its pedigree is as follows:



It was first grown as a pure strain in 1910 and was distributed for commercial growing in 1918, after it had proved to be a high-yielding variety in nursery and plot experiments at Pullman.

*Distribution.*—Estimated area in 1929, 168,018 acres, grown in Washington, Idaho, and Oregon, as shown in figure 45.

#### MEALY

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem white, mid-strong to strong; spike awnleted, oblong-fusiform, mid-dense, inclined; glumes pubescent, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets few, 3 to 10 mm long; kernels red, mid-long, semihard, ovate; germ mid-sized; crease wide, deep; cheeks angular; brush large, long.

Mealy differs from Triplet in being slightly taller and later, with stronger stems and in having kernels with more angular cheeks and larger and longer brush.

*History.*—Mealy (reg. no. 109) was distributed by the United States Department of Agriculture in 1895 and for several years thereafter, and the following record of its origin accompanied the seed:

"Originated by M. A. Mealy, in 1880, by planting the kernels of three heads of wheat selected from a growing crop of Fultz. It is similar to other varieties known as White Velvet Chaff; is of fair promise and is said to excel the Fultz in yield and flouring qualities" (49, p. 19).

White Velvet Chaff was the name of a wheat grown prior to the origin of Mealy, but the varieties probably were identical. The wheat under this name evidently has disappeared from cultivation.

*Distribution.*—Estimated area in 1929, 7,964 acres, grown in Ohio and Pennsylvania.

*Synonyms.*—Velvet Chaff, Velvet Head, White Velvet Chaff.

#### JONES FIFE

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, oblong-fusiform, mid-dense, nodding; glumes pubescent, white,

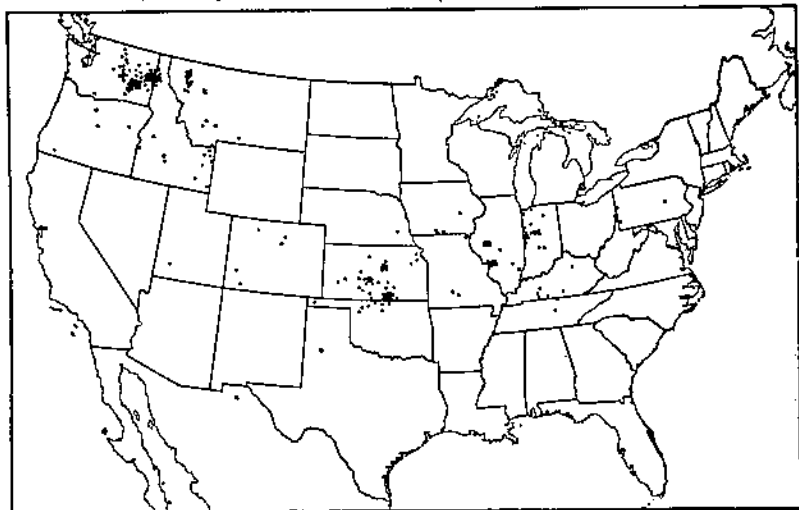


FIGURE 46.—Distribution of Jones Fife wheat in 1929. Estimated area, 167,416 acres.

mid-long, mid-wide to wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets few to several, lower ones often incurved, 3 to 8 mm long; kernels red, short to mid-long, soft to semihard, ovate, humped;



FIGURE 45.—Distribution of Mealy wheat in 1929. Estimated area, 168,018 acres.

germ mid-sized; crease mid-wide to wide, mid-deep to deep; cheeks angular; brush mid-sized, mid-long.

This variety differs from Mealy principally in having a nodding spike and a softer kernel. It makes a comparatively weak flour for breadmaking. Spikes, glumes, and kernels of Jones Fife wheat are shown in plate 24, B.

*History.*—Jones Fife (reg. no. 110) was originated by A. N. Jones, of Newark, Wayne County, N.Y., in 1889.<sup>16</sup> According to Carleton (52, p. 221), "it descended from Fultz, Mediterranean, and Russian Velvet."

Crail Fife is a local name applied to Jones Fife wheat in Montana, Frank Crail, of Bozeman, Mont., being the farmer who grew and distributed the variety under that name. A similar wheat called Burbank's Super, or Super wheat, was distributed by Luther Burbank, of Santa Rosa, Calif., in the fall of 1917. Apparently most of his stock was purchased and resold by the State Seed & Nursery Co., of Helena, Mont. The writers have found Super wheat to be identical with Jones Fife in all taxonomic characters, as well as in yield and in milling and baking quality.

*Distribution.*—The estimated area of Jones Fife decreased from 476,100 acres in 1919 to 200,222 acres in 1924 and to 167,416 acres in 1929, in 17 States, as shown in figure 46.

*Synonyms.*—Burbank's Super, Canadian Hybrid, Crail Fife, Fife, Fishhead, Jones Winter Fife, Silver King, Super, Velvet Chaff, Winter Fife.

#### MISSOURI VALLEY

*Description.*—Plant spring habit, early, mid-tall to tall; stem purple, weak to mid-strong, very slender; spike awnless, fusiform, mid-dense, inclined to nodding; glumes pubescent, white to yellowish, short, narrow to mid-wide; shoulders narrow, oblique to square; beaks narrow, triangular, acute, 0.5 mm long; awnlets wanting; kernels red, short, hard, ovate to oval; germ mid-sized; crease mid-wide, mid-deep; cheeks rounding; brush large, mid-long.

*History.*—Missouri Valley was produced by W. E. Hansen, Sanish, N.Dak., who in 1930 advertised it extensively and distributed the seed.

*Distribution.*—Grown in North Dakota since 1930.

*Synonym.*—Missouri Valley Special.

#### REWARD

*Description.*—Plant spring habit, early, short to mid-tall; stem white, mid-strong but easily crinkled at the nodes; spike awnleted, fusiform, mid-dense, erect to inclined; glumes pubescent, white, sometimes black striped, short, mid-wide; shoulders mid-wide, oblique to elevated; beaks broad, acute, triangular, 0.5 to 1 mm long; awnlets several, sometimes black, 5 to 15 mm long; kernels red, short to mid-long, hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounding to angular; brush mid-sized, short. Spikes, glumes, and kernels of Reward are shown in plate 25, A.

*History.*—Reward (reg. no. 261) was developed from a cross between Marquis and Prelude made in 1911 by C. E. Saunders at the Central Experimental Farm, Ottawa, Canada. It was tested at several experiment stations in Canada, beginning in 1921, and was distributed for commercial growing in Canada in 1928. Reward was first grown at experiment stations in the United States in 1925 and was first introduced into the United States from Canada by commercial growers in 1928.

Reward was registered (63) in 1928, its advantages being early maturity, some degree of rust resistance, high-test weight, and good quality for bread-making. It has the highest protein content of any of the commercial varieties of hard red spring wheat grown in the United States and is recognized as one of the best show wheats, having won many prizes at fairs.

*Distribution.*—Estimated area in 1929, 6,520 acres, in South Dakota, North Dakota, Minnesota, and Montana. Since 1929 its acreage has increased rapidly, both in the United States and Canada. In the United States fully 100,000 acres were grown in 1933, and in Canada the area was estimated at 1,000,000 acres.

<sup>16</sup> Printed stationery of A. N. Jones.

## HAYNES BLUESTEM

*Description.*—Plant spring habit, late, mid-tall to tall; stem white, glaucous before maturity, mid-strong to strong; spike awnleted, narrowly fusiform, mid-dense to lax, inclined, easily shattered; glumes pubescent, white, short, mid-long, narrow; shoulders mid-wide, oblique to square; beaks mid-wide, obtuse, 0.5 mm long; awnlets few, 3 to 15 mm long; kernels real, short to mid-long, hard, ovate; germ mid-sized; crease narrow, mid-deep to deep; cheeks rounded; brush mid-sized, mid-long to long.

This variety is very susceptible to stem rust. When rust is not present it yields well under humid conditions. It has long been considered an excellent milling and breadmaking wheat. Spikes, glumes, and kernels of Haynes Bluestem are shown in plate 25, B.

*History.*—Haynes Bluestem (reg. no. 111) was first developed through selection by L. H. Haynes (108), of Fargo, N.Dak., about 1895. He recorded the following information concerning its previous origin and his work toward its improvement:

"The wheat now grown in the Northwest, ordinarily known as a Bluestem, was grown 40 years ago (1855) in some Eastern States as a Red Winter wheat. Being semilarid when grown in the East, since being changed into a spring wheat and grown in the hard-wheat district of the Northwest, it is now hard and the berry as beautiful an amber as can be found. \* \* \*

Mr. Haynes distributed this wheat widely throughout the Dakotas and Minnesota for several years, starting about 1892. As shown in the more complete history in Department Bulletin 1074 (59), Bluestem wheat was grown in the Dakotas before Mr. Haynes originated his strain. As he has recorded, it probably was grown in the eastern United States as a winter wheat before being grown as a spring wheat in the Northwest. Haynes Bluestem wheat was further improved by the Minnesota Agricultural Experiment Station. A selection, first known as Minnesota No. 169, was developed and distributed by that institution in the late nineties (109, pp. 69-72). This strain also has been known as Haynes Bluestem and is now the principal strain grown under that name. The name Bluestem now is most commonly used for this whole group of Bluestem wheats and also as a farm name for the variety. As the original Bluestem and the strains cannot be distinguished from each other, the name Haynes Bluestem is used here to distinguish this wheat from five other important varieties of wheat commonly known as "Bluestem" in the United States and to retain its identity with the old and well-known name Bluestem.

*Distribution.*—The estimated area of Haynes Bluestem decreased from 1,557,800 acres in 1919 to 133,031 acres in 1924 and 72,943 acres in 1929, grown in 11 States, as shown in figure 47. The acreage of Haynes Bluestem has continued to decrease since 1929 because of the late maturity and susceptibility to stem rust of this variety. Since 1931 it has not been grown to any extent.

*Synonyms.*—Bluestem, Bolton Bluestem, Marvel Bluestem, Minnesota No. 169, Velvet Bluestem.

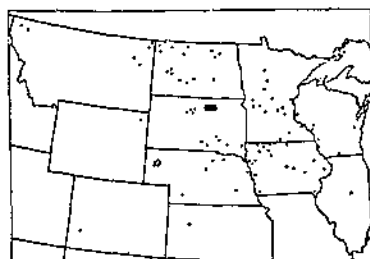


FIGURE 47.—Distribution of Haynes Bluestem wheat in 1929. Estimated area, 72,943 acres.

## GALGALOS

*Description.*—Plant spring habit, although remaining prostrate during its early growth, midseason, mid-tall; leaves pubescent, glaucous; stem white, slender, weak; spike awnleted, fusiform, lax, inclined; glumes pubescent, light brown, long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, acute, 1 to 2 mm long; awnlets many, 3 to 30 mm long; kernels white, mid-long, soft, ovate to elliptical, slightly humped, ventral side rounded; germ small; crease narrow, shallow; cheeks usually rounded; brush mid-sized, mid-long.

This variety is distinguished by its pubescent, brown glumes and pubescent leaves. It is a hardy, high-yielding wheat in dry climates and is often fall sown. It is one of the best white wheats for breadmaking. Its weak straw, however, is a serious objection. Spikes, glumes, and kernels of Galgalos wheat are shown in plate 26, A.

*History.*—Galgalos (reg. no. 113, F.P.I. 9872) was introduced in 1903 by the United States Department of Agriculture (215) from the Erivan Government in Transcaucasian Russia. The seed of Galgalos was increased in Oregon by E. M. Smith, The Dalles, Oreg. (then of Hay Creek, Oreg.), from a sample sent him from the United States Department of Agriculture in 1904.

*Distribution.*—Estimated area in 1929, 11,516 acres, in Oregon, California, Washington, and Nevada.

*Synonyms.*—Russian Red, Velvet Chaff.

#### SONORA

*Description.*—Plant spring habit, early, short to mid-tall; stem white, weak; spike awnleted, oblong, short, dense, erect, easily shattered; glumes pubescent, brown, mid-long, mid-wide; shoulders narrow, usually oblique; beaks narrow, acuminate, 1 to 3 mm long; awnlets several, 3 to 8 mm long; kernels white, short, soft, ovate to oval; germ small; crease mid-wide, shallow; cheeks rounded; brush small, short.

This variety is distinct because of its long, acuminate beaks. It is usually a poor-yielding variety except in southern California and Arizona, where it appears well adapted. It produces a weak flour that is used mostly for pastry and breakfast foods. Spikes, glumes, and kernels of Sonora wheat are shown in plate 26, B.

*History.*—Sonora (reg. no. 114) was brought to the United States from Magdalena Mission, northern Sonora, Mexico, where it has been grown since about 1770.<sup>10</sup> It is known to have been grown in the United States since about 1820. It is the wheat grown by the Pima and Yuma Indians in Arizona. Several samples of wheat, similar to Sonora, have been introduced by the United States Department of Agriculture from South Africa.

FIGURE 48.—Distribution of Sonora wheat in 1929. Estimated area, 91,852 acres.

*Distribution.*—Estimated area in 1929, 91,852 acres, in 9 States, as shown in figure 48.

*Synonyms.*—Ninety-Day, Red Chaff, White Sonora.

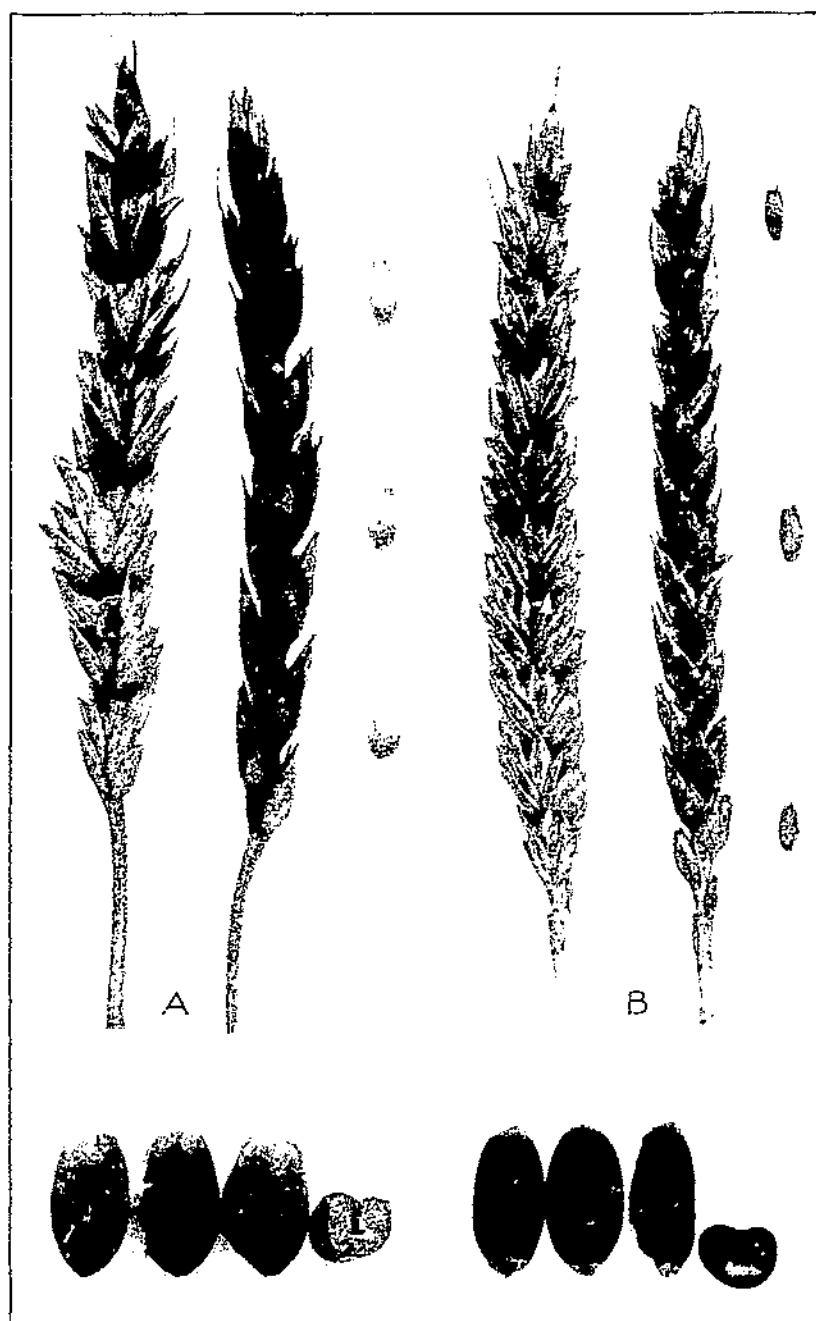
#### GRANDPRIZE

*Description.*—Plant winter habit, midseason to late, short; stem white, strong; spike awnleted, clavate, dense, inclined; glumes pubescent, brown, mid-long, wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm long; awnlets several, 3 to 15 mm long; kernels red, mid-long, soft to semihard, broadly ovate to oval; germ mid-sized; crease usually wide, deep, pitted; cheeks rounded to angular; brush large, mid-long to long.

Grandprize is usually not uniform in shape of spike, a small percentage of oblong spikes usually being present.

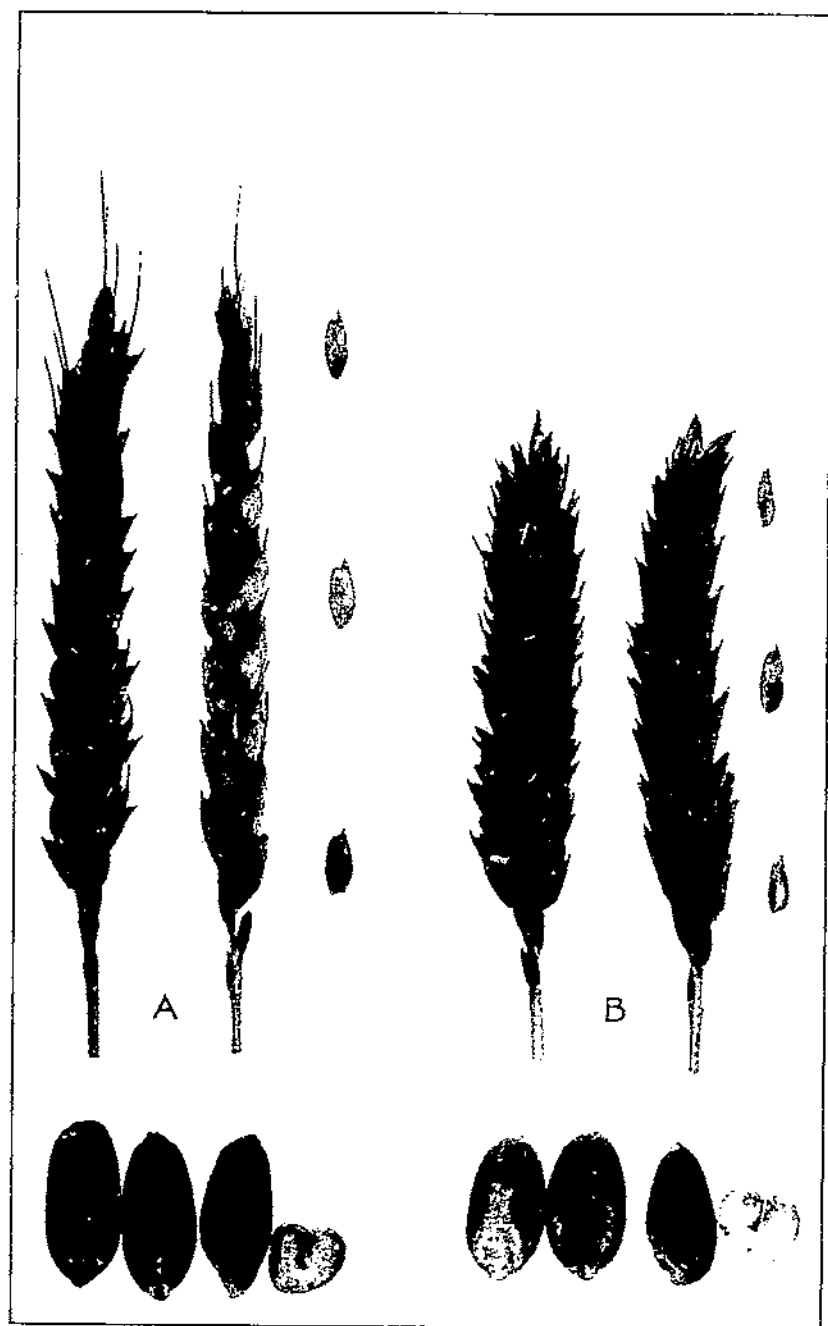
*History.*—Grandprize (reg. no. 115) was originated by A. N. Jones, of Le Roy, N.Y., between 1900 and 1908. It was distributed by Peter Henderson & Co. (110), seedsmen, of New York City, in 1910. The wheat derived its name from the fact that Mr. Jones received a grand prize for his cereal exhibit at the St. Louis Exposition in 1904.

<sup>10</sup> Verbal statement of W. W. Mackie, Jan. 22, 1919.

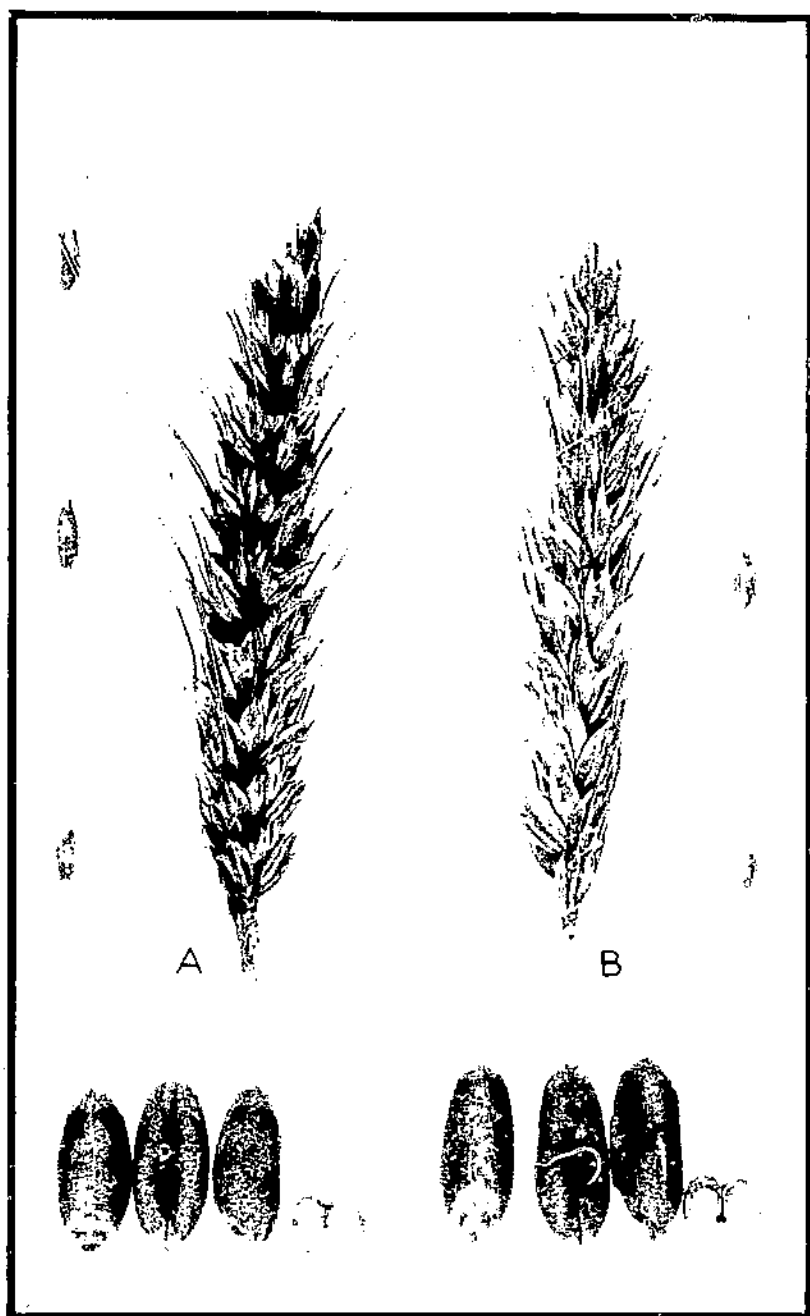


Reward (A) and Haymes Bluestem (B) wheats. Spikes and chaffs natural size; kernels  $\times 4$ .

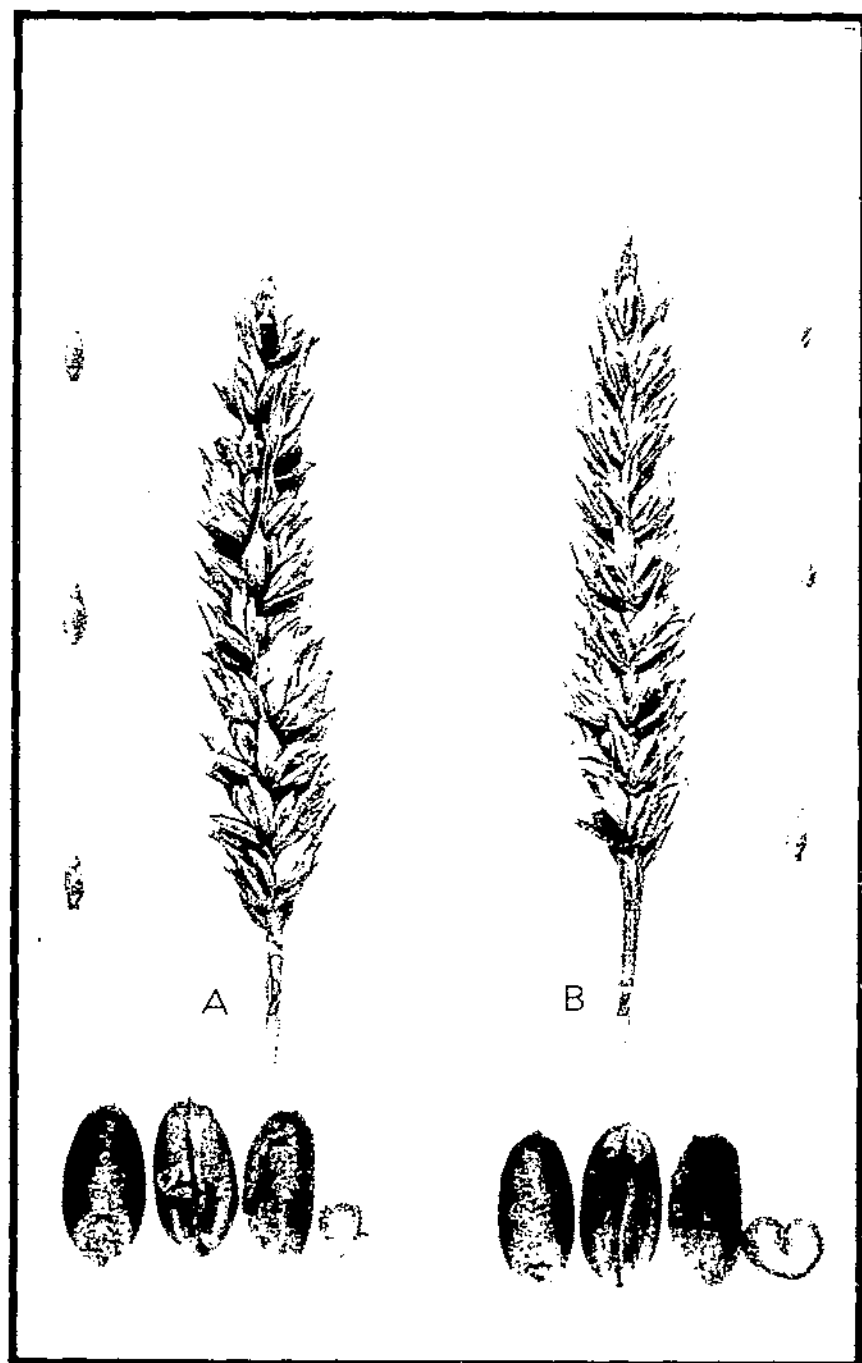




Gulgabo (A) and Sonora (B) wheats. Spikes and glumes natural size; kernels  $\times 3$ .



Propo (A) and Baart (B) wheats: Spikes and glumes natural size; kernels X3.



Gipsy (A) and Valley (B); wheat spikes and awns natural size, kernels  $\times 3$ .

*Distribution.*—Estimated area in 1929, 1,036 acres, in Pennsylvania.

*Synonyms.*—Bull Moose, Golden Chaff, New Genesee, St. Louis Grandprize, Velvet Head.

#### DEMOCRAT

*Description.*—Plant winter habit, midseason, tall; stem white, strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to narrow; beaks 1 to 5 mm long; awns 3 to 6 cm long; kernels white, mid-long, soft, ovate; germ small to mid-sized; crease usually narrow, shallow to mid-deep; cheeks angular; brush small, mid-long.

Democrat is the only awned variety of winter wheat having white glumes and kernels.

*History.*—The origin of Democrat (reg. no. 116) wheat is undetermined. It was grown by the Ohio Agricultural Experiment Station as early as 1883. It was obtained by that station from George Burr, of Lodi, Ohio, and at that time was recorded as being a variety quite generally grown in Ohio (76, p. 17).

*Distribution.*—Estimated area in 1929, 1,918 acres, in Illinois, Ohio, and Pennsylvania.

#### PALISADE

*Description.*—Plant spring habit, midseason, mid-tall; stem white, weak, slender; spike awned, fusiform, mid-dense, inclined to nodding; glumes glabrous, white, mid-long, narrow; shoulders wanting to narrow, oblique; beaks 2 to 4 mm long; awns 3 to 7 cm long; kernels white, mid-long, soft, ovate to elliptical; germ small; crease narrow to mid-wide, shallow; cheeks rounded to angular; brush mid-sized, short.

*History.*—Palisade wheat (reg. no. 120) was obtained by the North Platte sub-station, North Platte, Nebr., from a farmer in the vicinity of Palisade, Nebr., about 1907. The previous history of the variety is undetermined. The White Oregon variety, which appears to be synonymous, was grown in the central part of the United States many years ago.

*Distribution.*—Estimated area in 1929, 1,568 acres, grown under the names of synonyms in Colorado.

*Synonyms.*—White Oregon, White Palisade, White Spring.

#### PROPO

*Description.*—Plant spring habit, early to midseason, mid-tall; stem faintly purple, weak to mid-strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks 2 to 5 mm long; awns 3 to 7 cm long; kernels white, mid-long, soft, ovate to elliptical, slightly humped; germ small to mid-sized; crease mid-wide, mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

Propo (reg. no. 121) is distinct from the other wheats in the group in having faintly purple stems. A spike, glumes, and kernels of this variety are shown in plate 27, A.

*History.*—This variety was first known as Proper, for which the following history was recorded in 1879 (168):

"The Proper originated from the selection of a number of heads of bearded wheat in a field of Mr. Proper, at Sutter station, on the line of the Marysville & Vallejo Railroad, in Sutter County."

The following later and somewhat different history of Propo has been recorded by Shaw and Gaumnitz (192, p. 313) of the California Agricultural Experiment Station:

"Of Propo, R. M. Shackelford, of Paso Robles, for many years connected with the milling trade of this State, is authority for the statement that this variety was a field selection from a sowing made from a shipment of wheat from Chile."

Hendry, in 1931 (111), after examining plant materials found in the adobe walls of buildings erected during the period 1701 to 1837 by Spanish missionaries in Mexico, California, and Arizona, reports the following:

"Propo wheat has been found in twelve of the fourteen buildings examined and appears to have been the most extensively grown wheat variety throughout the region during the Spanish and Mexican periods. The specimens are uniform in type and appear to be identical with those of the variety as it is known in California today."

It seems apparent that Propo is a very old variety that became badly mixed and was later reselected from commercial fields in California.

*Distribution.*—Estimated area in 1929, 18,483 acres, grown in Riverside, San Luis Obispo, and Santa Barbara Counties, Calif.

*Synonym.*—Proper.

#### BAART

*Description.*—Plant spring habit, early to midseason, mid-tall to tall; stem white, weak; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, long, narrow; shoulders narrow, oblique to square; beaks 3 to 5 mm long; awns 3 to 6 cm long; kernels white, long, semihard to hard, ovate to obpyriform; germ small; crease narrow, shallow; cheeks usually rounded; brush mid-sized, short to mid-long.

This variety can be distinguished from all others by the large yellowish pear-shaped kernels. A spike, glumes, and kernels of Baart wheat are shown in plate 27, B.

*History.*—Baart (reg. no. 123) was received as Early Baart with four other varieties (215, F.I.L. 5078) from Australia by the United States Department of Agriculture in 1900. The commercial distribution of the variety in this

country is the result of this introduction. In Australia it has never been a leading commercial variety, although it has been grown by some farmers for many years. In recent introductions of wheat from South Africa, varieties have been obtained that are identical with Baart. The name "Baart" is Dutch for bearded. It seems probable that the variety was introduced to Australia from the Orange River Colony or the Transvaal in South Africa (65, p. 3).

Neethling, 1932 (151), states that "Baard" wheat was mentioned in South African literature as early as 1739 and suggests that the original stock may have been introduced from western Europe.

In the United States the variety was first distributed for commercial growing by the Arizona Agricultural Experiment Station, which obtained its original seed from the then Office of Cereal Investigations, United States Department of Agriculture. The variety was well estab-

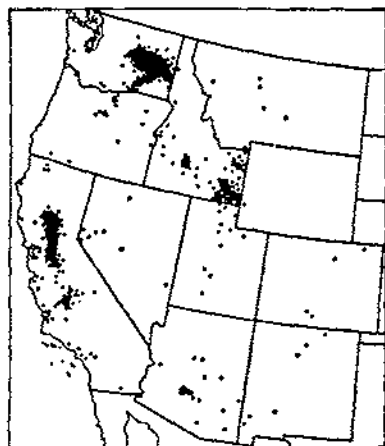


FIGURE 49.—Distribution of Baart wheat in 1929. Estimated area, 766,547 acres.

lished in Arizona in 1914, when it was first grown in Washington from seed from Arizona; it later spread to Oregon and Idaho and to California about 1917.

*Distribution.*—The estimated area of Baart increased from 500,500 acres in 1919 to 766,547 acres in 1929, grown in 11 States, as shown in figure 49.

*Synonyms.*—Arizona Baart, Columbia, Diener Hybrids, Diener No. 18, Early Baart, White Columbia.

#### GLADDEN

*Description.*—Gladden is similar to Gipsy, but can be distinguished from it by its shorter beaks, which usually do not exceed 3 mm. It also has stronger stems and is superior to Gipsy in yield and quality.

*History.*—The following history of Gladden (reg. no. 126) has been reported by C. G. Williams (291), of the Ohio Agricultural Experiment Station, where the variety was originated.

"The Gladden wheat originated from a single head of wheat selected from a field of Gipsy wheat in 1905, and was first grown in 1906 under the number 6100, along with other head rows of Gipsy, Fultz, Poole, and other varieties. It has many of the characteristics of the Gipsy wheat, being bearded, having a white chaff and red kernel.

"In consulting the old notebooks of 14 years ago I find it described as 'very erect' in growth, the words being underscored, and given the highest rank for

stiffness of straw of any of the Gipsy rows, and as high a rank as any row in the test. The photographs taken in 1907, 1910, and 1915 show more than ordinary stiffness of straw.

"Insofar as yield is concerned, it had to stand high from the start or be cast aside. A vast majority of the heads tested were weeded out each year on account of ordinary yield. In milling and baking tests in 1915 the Gladden showed superior qualities.

"This variety passed along under the number name, 6100, until 1915, when it seemed best to give it a real name in order to prevent confusion, as it was being distributed quite a little over the State. It was named for Washington Gladden, a man not associated with agriculture particularly, but the most useful citizen Ohio had for many years."

*Distribution.*—Estimated area in 1929, 41,735 acres, grown in Ohio, Indiana, and Wisconsin.

#### GIPSY

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spikes awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks 2 to 8 mm long; awns 3 to 7 cm long; kernels red, mid-long, soft to semihard, ovate, humped; germ mid-sized; crease mid-wide, shallow to mid-deep, pitted; cheeks usually rounded; brush small, mid-long.

A spike, glumes, and kernels of Gipsy wheat are shown in plate 28, A.

*History.*—The origin of Gipsy (reg. no. 127) is undetermined. It was grown in Missouri as early as 1877 (9) and at the Ohio Agricultural Experiment Station by 1888 (77, p. 28). There is a tradition that the name was given the variety because it was first obtained from a gypsy.

*Distribution.*—The estimated area of Gipsy decreased from 122,500 acres in 1919 to 25,931 acres in 1929, in Indiana, Kansas, Ohio, and West Virginia.

*Synonyms.*—Defiance, Egyptian, Farmers Friend, Gipsy Queen, Golden Straw, Grains o' Gold, Lebanon, Niagara, Reliable.

#### VALLEY

*Description.*—Valley differs from Gipsy only in being taller and slightly earlier and in having slightly longer spikes, beaks, and glumes. Photographs of a spike, glumes, and kernels of Valley are shown in plate 28, B.

*History.*—Valley (reg. no. 128) was obtained by the Ohio station from Elias Tetter, Pleasant Plain, Ohio, in 1883 and grown by them for the first time in 1884 (77, p. 35). It is "said to have originated in the Scioto Valley, Ohio" (115, p. 3).

Indiana Swamp is a name under which a sample of wheat very similar to Valley was obtained from the Illinois station in 1913. A wheat under that name was grown by them as early as 1902. The Everitt O.K. Seed Store advertised Indiana Swamp wheat in 1899, stating that it was of the Mediterranean type. The name "Swamp" is also used for several other varieties.

*Distribution.*—Estimated area in 1929, 754 acres, grown in Illinois, Kansas, and Pennsylvania.

*Synonyms.*—German Amber, Indiana Swamp, Niagara, Russian Amber, Rust Proof.

#### KAWVALE

*Description.*—Plant winter habit, midseason, mid-tall; stem purple, strong; spike awned, fusiform, mid-dense, erect to inclined, easily shattered; glumes glabrous, white, short, mid-wide; shoulders narrow, wanting to oblique; beaks narrow, acute, incurving, 1 to 3 mm long; awns 3 to 6 cm long; kernels red, mid-sized, semihard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

This variety is more winter hardy than most of the other soft red winter wheats and is resistant to leaf rust and to Hessian fly.

*History.*—Kawvale (reg. no. 265) was developed at the Kansas Agricultural Experiment Station, Manhattan, Kans., in experiments cooperative with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. The original selection was made in 1918 from Indiana Swamp, a synonym of Valley, by J. H. Parker. Kawvale was

included in rod-row tests in 1922 and in plot experiments in 1926. It was first included in cooperative tests with farmers in Kansas in 1928. The variety was registered in 1929 (63) and released for commercial growing in the fall of 1932. Its superior characters are high yield and resistance to leaf rust and Hessian fly attack.

*Distribution.*—Grown in Kansas since 1933.

#### RED INDIAN

*Description.*—Red Indian is similar to Fulcaster except for having shorter and stronger stems.

*History.*—The history of this wheat is undetermined. It is a distinct strain of Fulcaster grown in Ohio. Seed was obtained in September 1927 from C. O. Piernan, Ottawa, Ohio.

*Distribution.*—Estimated area in 1924, 26,483 acres, grown in Ohio. It was not reported in 1929.

#### MAMMOTH RED

*Description.*—Mammoth Red is similar to Fulcaster except for being slightly later and shorter and in having a slightly larger and harder kernel.

*History.*—Mammoth Red (reg. no. 132) was first obtained by the United States Department of Agriculture in 1904 from the 101 Ranch, Bliss, Okla. The wheat was distributed by the David Hardie Seed Co., Dallas, Tex., in the early nineties. In experiments at the Maryland Agricultural College, College Park, Md., it was the highest yielding of the many varieties tested over a period of years and has been distributed from that station and from the Arlington Experiment Farm, Rosslyn, Va.

*Distribution.*—Estimated area in 1929, 54,385 acres, grown in Delaware, Maryland, Michigan, and Missouri, as shown in figure 50.

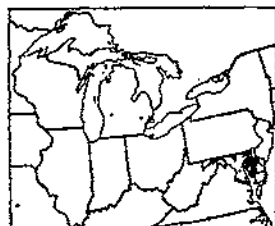


FIGURE 50.—Distribution of Mammoth Red wheat in 1929. Estimated area, 54,385 acres.

#### FULCASTER

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem purple, strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide to wide; shoulders mid-wide, oblique to square; beaks 2 to 8 mm long; awns 3 to 6 cm long; kernels red, mid-long, soft, ovate, humped; germ mid-sized; crease mid-wide, mid-deep, sometimes pitted; cheeks usually angular; brush mid-sized, mid-long.

Fulcaster differs from Gipsy and Valley in having purple straw and slightly shorter beaks. A prominent characteristic is the orange-colored stripes on the glumes. It has long been one of the most popular and widely grown varieties of soft red winter wheat in the United States. A spike, glumes, and kernels of this variety are shown in plate 23, A.

*History.*—According to Carleton (50, p. 70), "Fulcaster (reg. no. 131) was produced in 1886 by S. M. Schindel, of Hagerstown, Md., and is a hybrid between Fultz and Lancaster", the latter being the Mediterranean variety.

Many names have been used for wheat similar to Fulcaster. The earliest record is under the name "Dietz." It was first included in the varietal experiments of the Ohio station in 1884. The same wheat, however, apparently soon came to be called Dietz Longberry (15, p. 591) and was later known as Dietz Longberry Red (49, p. 18). The true origin of Dietz Longberry and Fulcaster is somewhat obscure. The former has the earlier published history. However, according to N. Schmitz, formerly of the Maryland Agricultural Experiment Station, Mr. Schindel claimed that Mr. Dietz merely gave the name Dietz Longberry to his Fulcaster wheat.

Among the other names Stoner and Miracle are most commonly used.

Stoner cannot be distinguished from Fulcaster by any character and is here considered merely a strain of that variety. The history of Stoner has been recorded by Ball and Leighty (37, p. 15).

Mr. Stoner increased his seed during the 2 years 1905 and 1906 and distributed it in 1907, usually under the name "Miracle." As reported in De-

partment Bulletin 1074 (59), many extravagant claims were made for it by Mr. Stoner and agents who handled the seed.

**Distribution.**—The estimated area of Fulcaster was 2,576,000 acres in 1919, but it decreased to 1,816,534 acres in 1924 and to 1,400,057 acres in 1929. This acreage is shown in 24 States in figure 51. Virginia, Missouri, Ill. and Maryland lead in the production of Fulcaster. Important decreases in acreage from 1924 to 1929 occurred in Pennsylvania, Oklahoma, Maryland, Indiana, and Delaware, owing in part to the increase of Nittany, a selection of Fulcaster.

**Synonyms.**—Acme, Acme Bred, Bearded Blue-stem, Bearded Purple-straw, Blankenship, Blue Ridge, Bluestem, Canadian, Champion, Corn, Cumberland Valley, Dietz, Dietz Longberry, Dietz Longberry Red, Ebersole, Egyptian Amber, Eversole, Farmers Friend, Georgia Red, Golden Chaff, Golden King, Greening, Improved Acme, Ironclad, Kansas Mortgage Lifter, Kentucky Giant, Lancaster, Lancaster-Fulcaster, Lincoln, Martha Washington, Michigan Red Line, Moore's Prolific, Number 10, Price's Wonder, Red Wonder, Stoner (Eden, Famine, Forty-to-One, Goose, Half Bushel, Kentucky Wonder, Marvelous, Millennium, Millennium Dawn, Miracle, Multiplier, Multiplying, New Light, New Marvel, Peck, Russellite, Russell's Wonder, Stooling, Three Peck, Two Peck, Wonderful), Turkish Amber, Tuscan Island, Winter King.

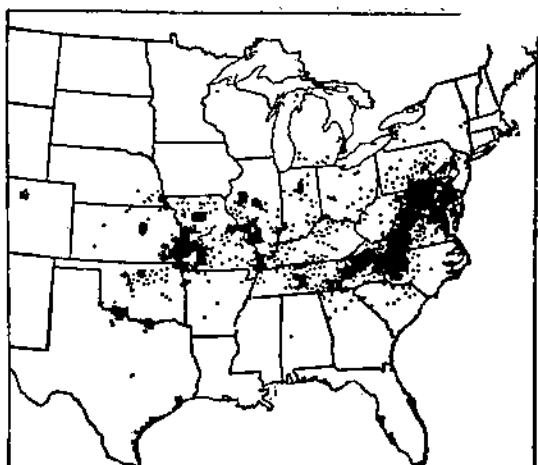


FIGURE 51.—Distribution of Fulcaster wheat in 1929. Estimated area, 1,400,057 acres.

#### V.P.I. 131

**Description.**—This selection of Fulcaster differs from Fulcaster only in having somewhat shorter beaks and in being more uniform.

**History.**—V.P.I. 131 is the result of a plant selected in 1905 from Fulcaster by the Virginia Polytechnic Institute, Blacksburg, Va. It was first distributed for commercial growing in 1915.

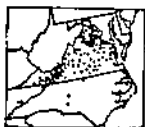


FIGURE 52.—Distribution of V.P.I. 131 in 1929. Estimated area, 80,135 acres.

**Distribution.**—Estimated area in 1929, 80,135 acres, grown in Virginia, Tennessee, North Carolina, and West Virginia (fig. 52). It is estimated by the Virginia station that 250,000 acres were grown in 1933.

#### NITTANY (PENN. NO. 44)

**Description.**—Plant winter habit, midseason to late, tall; stem purple, mid-strong to strong; spike awned, oblong-fusiform, mid-dense, erect to inclined; glumes glabrous, white, mid-long, wide; shoulders mid-wide, oblique to square; beaks 2 to 10 mm long; awns 3 to 8 cm long; kernels red, mid-long, soft, ovate, humped; germ mid-sized; crease wide, mid-deep, sometimes pitted; cheeks angular; brush large, mid-long. Spikes, glumes, and kernels of Nittany are shown in plate 29, B.

This variety differs from Fulcaster in being later and taller, in having more oblong spikes and slightly longer beaks, and in producing higher yields under Pennsylvania conditions.

**History.**—Nittany (reg. no. 254) was developed (225) by the Pennsylvania Agricultural Experiment Station, State College, Pa. It is the result of a plant selection from Fulcaster made in 1900 by C. F. Noll. This variety has



been grown commercially in Pennsylvania since 1918 as Penn. No. 44, or Nittany. It was registered (68) in 1927. Its advantages are high yield and good breadmaking qualities. Nittany is best adapted to soils of medium fertility.

*Distribution.*—Estimated area in 1920, 398,312 acres, grown in 9 States, as shown in figure 53.

*Synonym.*—Penn. No. 44.

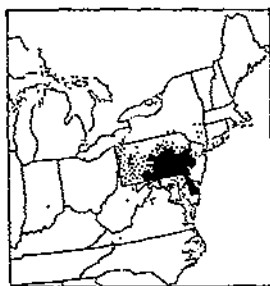


FIGURE 53.—Distribution of Nittany in 1920. Estimated area, 398,312 acres.

in 1888, claiming it to be a cross between Mediterranean and Clawson.

*Distribution.*—Estimated area in 1920, 111 acres, grown in Wisconsin.

#### GOLDEN CROSS

*Description.*—Plant winter habit, midseason to late, short to mid-tall; stem purple, mid-strong, coarse; spike awned, oblong to clavate, dense, erect to inclined; glumes glabrous, white, mid-long, mid-wide to wide; shoulders mid-wide, oblique to elevated; beaks 2 to 15 mm long; awns 3 to 6 cm long; kernels pale red, short to mid-long, soft, usually oval; germ mid-sized; crease mid-wide to wide, mid-deep; cheeks angular; brush mid-sized, mid-long.

This variety is distinguished by its clavate spike.

*History.*—Golden Cross (reg. no. 134) was originated by A. N. Jones, of Newark, N.Y., in 1886. According to Mr. Jones' stationery, it was the first wheat which he produced. Peter Henderson & Co. (110) advertised and distributed the variety

#### MARVEL

*Description.*—Plant spring habit, midseason to late, tall; stem white, mid-strong; spike awned, linear-fusiform, lax, erect to inclined, easily shattered; glumes glabrous, white, mid-long, mid-wide; shoulders narrow, rounded to elevated; beaks 1 to 2 mm long; awns 3 to 8 cm long; kernels red, mid-long, soft to semihard, ovate; germ mid-sized; crease mid-wide, mid-deep to deep; cheeks angular; brush mid-sized, mid-long.

Marvel is very susceptible to rust, shatters easily, and is of inferior quality.

*History.*—Originated by T. G. Overby, near Mellette, S. Dak., who claims that it is the result of a cross between Velvet Chaff (Preston) and Marquis. It was distributed by Mr. Overby for commercial growing in 1928.

*Distribution.*—Estimated area in 1920, 3,083 acres, in South Dakota and North Dakota.

*Synonym.*—Overby.

#### JAVA

*Description.*—Plant spring habit, early, mid-tall; stem white, slender, mid-strong; spike awned, fusiform, mid-dense, inclined, easily shattered; glumes glabrous, white, mid-long to long, narrow to mid-wide; shoulders wanting to narrow, oblique; beaks 2 to 15 mm long; awns 2 to 8 cm long; kernels red, mid-long, soft, ovate to elliptical, pointed; germ small to mid-sized; crease mid-wide, mid-deep; cheeks usually angular; brush mid-sized, mid-long, slightly collared.

The above is the description of the most common type of Java, which usually is distinguished by its long beaks. There are many types in the Java variety as grown in the field, including both hard and soft kernels, white and brown glumes, and various lengths of beaks.

*History.*—Java (reg. no. 136) is probably one of the oldest spring varieties grown in the United States. It apparently was first known as "Siberian", concerning which the following was recorded in 1837 (1):

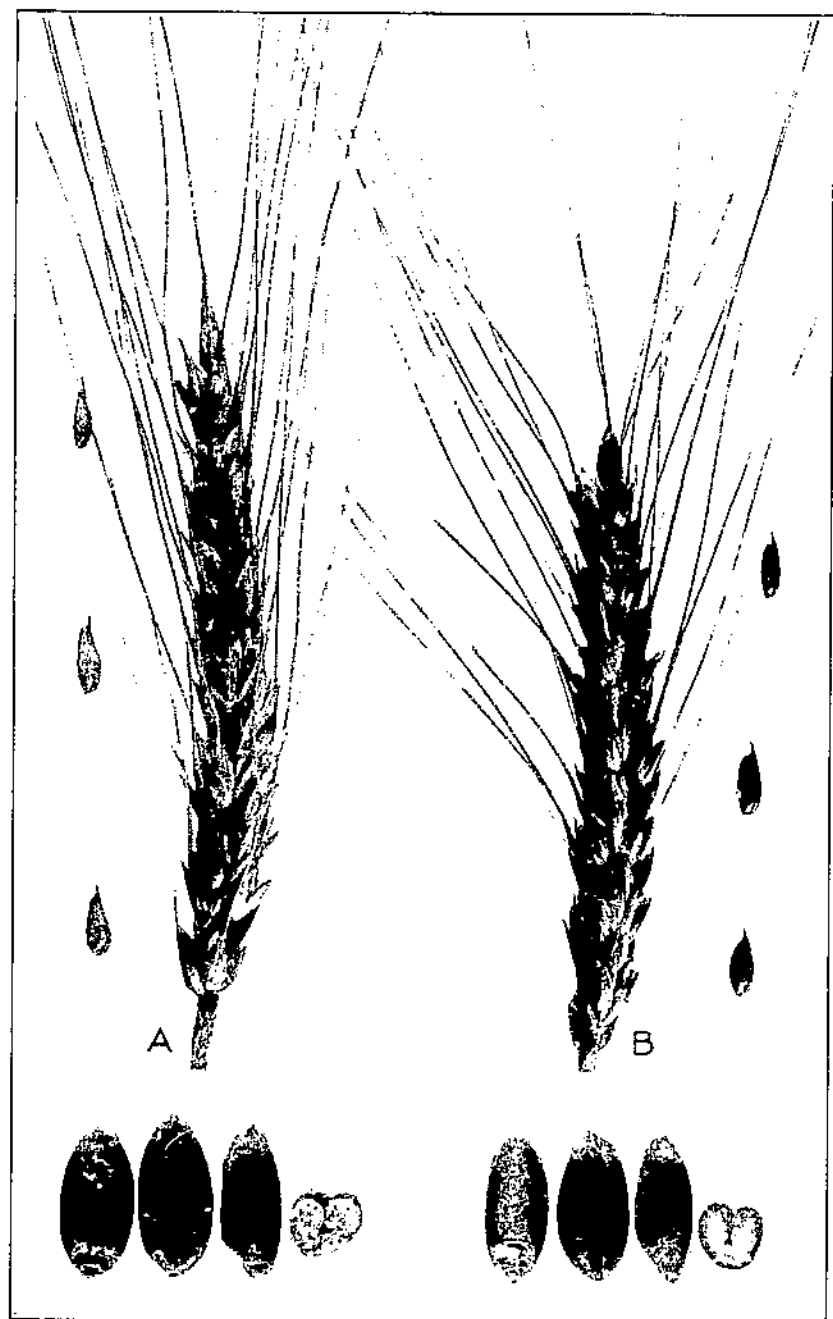
"'Cultivator' says: 'Received sample from Dr. Goodsell, of Ulica, said to have come from Switzerland.'"

A Siberian variety was also reported from Farmville, Va., in 1849 (148, p. 132):

"WHEAT.—The favorite varieties of this grain are, first, The Turkey, called also Siberian wheat. A small parcel of this was brought from South Carolina



Fuleaster (A) and Nuttany (B) wheats: Spikes and glumes natural size; kernels  $\times 3$ .



Minutaki (A) and Blackball (B) wheats. Spikes and glumes natural size, kernels  $\times 3$ .

by the late Rev. James Wharey and divided between the late Captain Pemberton and myself."

China Tea, sometimes referred to as Black Tea, is also identical with Java and has the following history, as reported by Klippart (133, p. 758):

"Some 12 years since (1845) there was found by a merchant in Petersburg, Rensselaer County, N.Y., 6 or 7 kernels of this kind of wheat, in a chest of black tea, which was sown."

China Tea was listed in 1863, in a report of the standing committee of the Iowa Agricultural Society, as the first spring-wheat variety preferred by growers (73, p. 518). This fact, together with the identity of the samples grown by the writers and the importance of Java in Iowa, indicates that Java is simply a new name for the China Tea variety.

The name "Java" has been used since at least 1861, as the following was published under that date in the *Genesee Farmer* (31):

"**JAVA WHEAT.**—According to a correspondent of the *Country Gentleman*, this variety of spring wheat was introduced into this country in the following singular manner. A woman who was roasting some Java coffee found among it a grain of wheat, which she planted; saved the product and planted again, and so on for 3 years, when she distributed the seed among her friends, who all reported that it was an excellent variety."

In 1890 Wallace's Farmer, of Des Moines, Iowa, published several short articles on the desirability of growing early varieties of wheat and oats. A request was made to their readers to report any variety of spring wheat that was grown that would ripen in Iowa by the Fourth of July. Among several of the varieties that were reported was the Early Java, from C. F. Morton, southeastern Nebraska (18). As a result of this request, Java wheat was grown in 1900 at the Iowa Agricultural Experiment Station, Ames, Iowa, and on the farm of M. E. Ashby, living 5 miles north of Des Moines. For several years Wallace's Farmer entered into an active campaign for the distribution of Java wheat. The variety thus became quite widely grown in that State. In 1920 Wallace's Farmer published a brief history of the cultivation of Java wheat in Iowa (25).

An early strain of Java, known as Kearney County, is grown at experiment stations in Nebraska.

**Distribution.**—Estimated area in 1929, 17,479 acres, in Illinois, Iowa, North Dakota, and Nebraska.

**Synonyms.**—Black Tea, China Tea, Dixie, Early Iowa, Early Java, Siberian, Swedish, Tea Leaf.

#### PROGRESS

**Description.**—Plant spring habit, early, mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense, erect to inclined; glumes glabrous, white, long, narrow; shoulders narrow, rounding to elevated; beaks 2 to 10 mm long; awns 2 to 8 cm long; kernels red, mid-long, soft to semihard, ovate; germ mid-sized; crease narrow to mid-wide, shallow; cheeks rounded; brush mid-sized, short.

Progress is resistant to stem rust, but its kernels are softer than those of the hard red spring varieties and, although high in protein content, it usually produces bread of low loaf volume.

**History.**—Progress (reg. no. 234) was developed at the Marshfield branch station of the Wisconsin Agricultural Experiment Station. It is the result of a plant selection from a field of Java wheat made by E. J. Delwiche in 1916. It was distributed for commercial growing in 1921. It was registered as an improved variety in 1926 (58) because of its high yield at the Ashland and Marshfield stations and its resistance to stem rust.

**Distribution.**—Estimated area in 1929, 33,103 acres, grown in Wisconsin, North Dakota, and Illinois.

**Synonyms.**—Canadian Progress, Nordhaugen, Prosper.

#### CONVERSE

**Description.**—Plant spring habit, midseason, mid-tall to tall; stem white, mid-strong; spike awned, fusiform, mid-dense, inclined to nodding; glumes glabrous, white, mid-long, narrow; shoulders wanting to narrow, oblique to elevated; beaks 3 to 20 mm long; awns 3 to 8 cm long; kernels pale red, mid-long, soft to semihard, ovate, humped, acute at base; germ mid-sized; crease mid-wide, mid-deep; cheeks usually angular; brush mid-sized, short to mid-long.

**History.**—The origin of Converse (reg. no. 138) is undetermined. The sample here described was obtained in 1908, and the wheat had doubtless been grown for several years before that year under the name Red Russian. The variety was renamed in 1920 (62, p. 6) and the following information recorded:

"The name Converse is here given to a commercial variety of spring wheat grown in Wyoming under the name Red Russian. The name Red Russian is used for three other varieties in the United States, so a new name has been selected for this variety. The original sample (C.I. 4141) was obtained by a representative of the Department of Agriculture from Converse County, Wyo., hence the name."

**Distribution.**—Estimated area in 1929, 2,224 acres, in Colorado.

**Synonym.**—Red Russian.

#### MINTURKI

**Description.**—Plant winter habit, midseason, mid-tall; stem white, weak; spike awned, fusiform, mid-dense, inclined; glumes glabrous, yellowish white, mid-long, narrow; shoulders wanting to narrow, oblique; beaks 1 to 5 mm long; awns 4 to 8 cm long; kernels red, mid-long, semihard, ovate to elliptical; germ small; crease narrow, shallow to mid-deep; cheeks rounded; brush small, mid-long. A spike, glumes, and kernels of Minturki wheat are shown in plate 30, A.

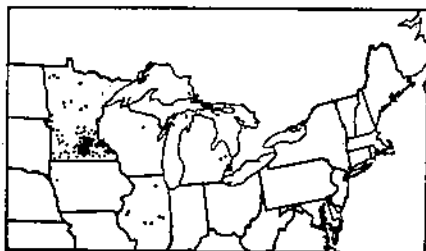


FIGURE 54.—Distribution of Minturki wheat in 1929. Estimated area, 89,028 acres.

This variety is very winter hardy and is moderately resistant to stem rust and bunt. It resembles Turkey except for having softer kernels and being more winter hardy.

**History.**—Minturki (reg. no. 139) is the result of a cross between Odessa and Turkey, made at the Minnesota Agricultural Experiment Station, University Farm, St. Paul, in 1902, during the time W. M. Hays was in charge of plant breeding there. Of the many selections made from the progeny of this cross two have shown sufficient value to be named and distributed by the Minnesota station. This selection was first known as "Minnesota No. 1507" but was named Minturki in 1919 (107, pp. 17-28) when it was first distributed.

**Distribution.**—Estimated area in 1929, 89,028 acres, in six States, as shown in figure 54. Since 1931, the acreage in Minnesota alone has been estimated by the Minnesota station at 150,000 acres.

**Synonym.**—Minnesota No. 1507.

#### SHERMAN

**Description.**—Plant winter habit, midseason, mid-tall; stem white, mid-strong to strong; spikes awned, fusiform, mid-dense to lax, inclined; easily shattered; glumes glabrous, yellowish white, mid-long, narrow; shoulders wanting to narrow, oblique to square; beaks 3 to 30 mm long; awn 3 to 8 cm long; kernels red, mid-long, semihard, ovate to elliptical; germ small; crease narrow, shallow; cheeks rounded; brush mid-sized, mid-long.

This variety differs from Turkey chiefly in having stronger stems, more easily shattered glumes, longer beaks, and softer kernels, and in being resistant to some forms of bunt.

**History.**—Sherman (reg. no. 249) was developed in experiments cooperative between the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Oregon Agricultural Experiment Station at the Sherman County Branch Station at Moro. It is the result of a double cross between Budapest×Turkey and Zimmerman×Turkey, made about 1908 by M. A. Carleton. The selection resulting in Sherman was made in 1915 by J. A. Clark at Moccasin, Mont.

Experiments at Moro have shown that it is resistant to some forms of bunt and yields well. It was distributed in southern Idaho by the Idaho Agricultural Experiment Station in 1928.

**Distribution.**—Estimated area in 1929, 1,266 acres, in Oneida and Ada Counties in southern Idaho.

## EARLY BLACKHULL

**Description.**—Early Blackhull differs from Blackhull principally in being about 8 days earlier and somewhat shorter. In comparative experiments Early Blackhull has been less hardy and also has yielded less than Blackhull.

**History.**—Early Blackhull was selected from a field of Blackhull in 1921 by A. P. Haeberle, of Clearwater, Kans. Owing to various vicissitudes seed increase was slow. In 1928 Mr. Haeberle had a 40-acre field. In December 1933 he reported that 960 bushels of seed had been sold during the past 3 years.

**Distribution.**—Estimated area in 1929, 248 acres, grown in Kansas. Since 1929 its acreage has increased.

**Synonym.**—Early Hardy (Blackhull).

## BLACKHULL

**Description.**—Plant winter habit, early to midseason, mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, usually with black stripes, mid-long, mid-wide; shoulders wanting to narrow, oblique; beaks 1 to 3 mm long; awns 2 to 7 cm long, sometimes black; kernels red, mid-long, semihard to hard, usually elliptical; germ small; crease narrow, shallow; cheeks rounded; brush mid-sized, mid-long. A spike, glumes, and kernels are shown in plate 30, B.

This variety is a few days earlier than Turkey and has a softer kernel. It is distinctly less hardy than Turkey. Except under certain unfavorable weather conditions, the glumes of Blackhull have black stripes on the surface or sometimes are almost entirely black.

**History.**—Blackhull (reg. no. 142) was originated by Earl G. Clark (54), of Sedgwick, Kans., as a selection from a field of Turkey. He states:

"The Clark's Black Hull wheat is a wonderful hardy variety of wheat that I have developed from three black heads found in 1912. It has proven superior to all other varieties of winter wheat."

The variety was first distributed by Mr. Clark in the fall of 1917.

**Distribution.**—The estimated area of Blackhull increased from a few acres in Harvey County, Kans., in 1919 to 1,519,992 acres in 1924 and to 5,959,067 acres in 1929. This acreage was reported from 11 States and is shown in figure 55. There has been some decrease in acreage since 1929. The States of Kansas, Oklahoma, and Texas have the largest acreages.

**Synonyms.**—Black Chaff, Clark's Black Hull, Clark's Black Hulled.

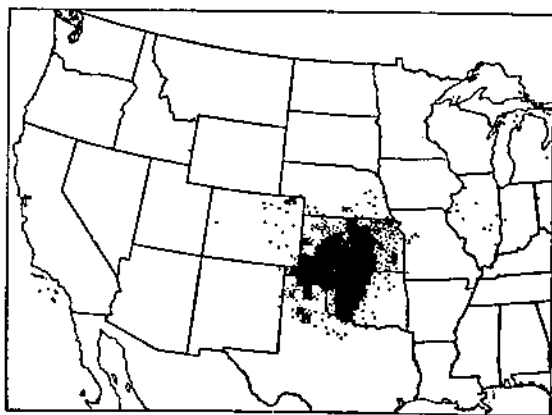


FIGURE 55.—Distribution of Blackhull wheat in 1929. Estimated area, 5,959,067 acres.

## SUPERHARD (SUPER-HARD BLACKHULL)

**Description.**—This variety is identical with Blackhull except for slightly harder kernels and poorer milling and baking quality.

**History.**—Superhard is the result of a selection made from Blackhull by Earl G. Clark, Sedgwick, Kans., the originator of Blackhull. In 1920, while picking a sample of Blackhull for exhibit entry, Mr. Clark saved 250 kernels that seemed to be very hard and dark in color. These kernels were spaced individually and at harvest in 1921 only the 70 better plants were saved. These 70 selections were seeded in individual rows in the fall of 1921. In the fall of 1922 the best appearing, hardest-kernelled strain was seeded along

with 21 other selections. According to Mr. Clark, this selection was again outstanding in 1923. It was named "Super-Hard Blackhull" and put on the market in 1923. The variety spread rapidly and became widely grown in south-central Kansas and adjacent areas. It became mixed with Blackhull and, owing to the similarity of the varieties, it is hard to tell which one is being grown.

*Distribution.*—Estimated acreage in 1929, 99,635 acres, grown in Kansas, Nebraska, and Oklahoma, as shown in figure 56.

*Synonym.*—Super-Hard Blackhull.



FIGURE 56.—Distribution of Superhard wheat in 1929. Estimated area, 99,635 acres.

#### REGAL

*Description.*—Plant winter habit, midseason, mid-tall; stem purple, weak; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to narrow, oblique; beaks 1 to 2 mm long; awns 3 to 8 cm long; kernels red, mid-long, semihard to hard, ovate to elliptical; germ small; crease narrow to mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

Regal differs from Turkey in having purple stems, shorter beaks, and softer kernels and in being resistant to some forms of bunt and less winter hardy.

*History.*—Regal (reg. no. 250) was developed in cooperative experiments of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Oregon Agricultural Experiment Station at Moro, Oreg. It resulted from a purple-stem plant selected by H. M. Woolman and D. E. Stephens in 1921 from Turkey selection (C.I. 7363). Turkey (C.I. 7363), originally carried as C.I. 1571c, was in turn a selection from C.I. 1571.

Regal was registered in 1926 (58) as an improved variety because of its resistance to some forms of bunt, yielding ability at Moro, Oreg., and purple stems, which latter are an advantage in maintaining purity for seed certification. It was distributed from the Sherman County Branch Station in 1926 and was grown to a limited extent in Sherman County, Oreg., and on the dry lands in southern Idaho. However, it proved not to be resistant to the bunt forms prevalent in southern Idaho and is now seldom grown in this area.

*Distribution.*—Estimated area in 1929, 513 acres, in Oneida County, Idaho.

#### WISCONSIN PEDIGREE NO. 2

*Description.*—This variety differs from Turkey in sometimes having faintly purple stems and slightly softer kernels. The purple stems are not usually apparent under Wisconsin conditions.

*History.*—Wisconsin Pedigree No. 2 (reg. no. 148) is a selection of Turkey wheat developed by the Wisconsin Agricultural Experiment Station and distributed by it as a high-yielding strain since the fall of 1918.

*Distribution.*—Estimated area in 1929, 3,948 acres, in Wisconsin and Indiana.

#### COOPERATOROKA

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem faintly purple, mid-strong; spike awned, fusiform, mid-dense, nodding; glumes glabrous, white, mid-long, narrow; shoulders wanting to narrow, oblique to elevated; beaks 3 to 10 mm long; awns 5 to 9 cm long; kernels red, mid-long, semihard to hard, ovate to elliptical; germ small; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

This variety differs from Turkey principally in being taller and later, in having purple stems and softer kernels, and in being slightly less winter hardy. It is also resistant to some forms of bunt.

*History.*—Cooperatoroka (0194) was introduced from the Odessa Experiment Station, Russia, in 1928 by J. W. Pincus, seed division of the Amtorg Trading Corporation, New York City. The seed was distributed with other varieties in quantities of from 20 pounds to a bushel to experiment stations and seed growers in the United States. R. M. Woodruff, seed grower, of Pratt, Kans., intro-

\* WOODRUFF, R. M. 23-page pamphlet on wheat varieties. No date. Pratt, Kans.

duced the variety from Russia in 1927. He increased seed and sold it as Kooperatka in Kansas. The acreage now grown is the result of this latter distribution.

*Distribution.*—Grown in Kansas and Oklahoma since 1930.

*Synonyms.*—Kooperatka, Kooperatorka.

#### IOWIN

*Description.*—Plant winter habit, midseason to late; mid-tall to tall; stem purple and white, mostly purple, mid-strong; spike awned, fusiform, mid-dense, nodding; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to elevated; beaks 5 to 25 mm long; awns 5 to 9 cm long; kernels red, mid-long, semihard to hard, elliptical; germ small; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

Iowin differs from Turkey in being taller and later, in having longer beaks, purple stems, and slightly softer kernels, and in being resistant to stem rust.

*History.*—Iowin (reg. no. 267) was developed by the Iowa Agricultural Experiment Station. It is the result of a plant selection from Theiss wheat made by L. C. Burnett. It was first commercially grown and registered (56) in 1930. The advantages of Iowin are rust resistance and high yield under low conditions.

*Distribution.*—Grown in Iowa since 1930.

#### YOGO

*Description.*—Plant winter habit, midseason, mid-tall; stem white, weak; spike awned, fusiform, mid-dense to lax, nodding; glumes glabrous, white, mid-long, narrow; shoulders wanting to narrow, rounding to oblique; beaks 1 to 2 mm long; awns 3 to 10 cm long; kernels red, mid-long, hard, ovate to elliptical; germ small; crease narrow, mid-deep; cheeks rounded; brush small, mid-long.

Yogo is very winter hardy, resistant to some forms of bunt, and high yielding in some sections of the northern Great Plains. It is easily distinguished from Turkey wheat by its lax, nodding spikes.

*History.*—Yogo (reg. no. 272) was produced from a cross (Minturki X Beloglina) X Buffalo made in 1919 at the Kansas Agricultural Experiment Station, Manhattan, Kans., in a winter-hardiness breeding program, cooperative with the Division of Cereal Crops and Diseases, United States Department of Agriculture. Head selections made from bulk progenies of the cross grown at the Judith Basin Branch Station, Moccasin, Mont., in 1923 resulted in Yogo. The variety was first tested on farms in Montana in the fall of 1932, in which year it was registered (56) as an improved variety. The superior characters were high yield, winter hardiness, and bunt resistance.

*Distribution.*—Grown in Montana since 1933.

#### CHEYENNE

*Description.*—Plant winter habit, midseason, short to mid-tall; stem white, slender, strong; spike awned, oblong-fusiform, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide to wide, oblique to elevated; beaks 1 to 3 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate to elliptical; germ small; crease mid-wide, mid-deep; cheeks rounding to angular; brush mid-sized, mid-long.

This variety differs from Turkey principally in having shorter and stronger stems, denser and more erect spikes, wider shoulders, and shorter beaks, in being more tolerant of Hessian-fly attack, and in having weaker breadmaking properties.

*History.*—Cheyenne (reg. no. 269) is the result of a plant selected from Grimean (C.I. 1435) in 1922 at the Nebraska Agricultural Experiment Station, Lincoln, Nebr. The new variety was included in plot tests at Lincoln in the fall of 1927 and distributed to farmers in 1930 as Nebraska No. 50. It was registered (56) as an improved variety in 1931 because of its stiff straw, resistance to shattering, and high yields. The seed originally distributed became mixed, and a purified seed supply was named Cheyenne and made available in 1933.

*Distribution.*—Grown in Nebraska since 1930.

*Synonyms.*—Fly Proof, Nebraska No. 50.



## TURKEY

*Description.*—Plant winter habit, midseason, mid-tall; stem white, slender, weak; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to narrow, oblique; beaks 2 to 8 mm long; awns 3 to 8 cm long; kernels dark red, mid-long, hard, ovate to elliptical; germ small; crease narrow to mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

This variety is winter-hardy and drought resistant. The first leaves are narrow and of a dark-green color. The kernels are usually distinguishable because of their dark-red color and small germ. A spike, glumes, and kernels of Turkey wheat are shown in plate 31, A.

*History.*—Turkey (reg. no. 143) is the name most commonly used for the Crimean group of hard winter wheats grown in the United States. Many histories of this wheat have been written. That recorded by Carleton (51, pp. 398-399) is given here, however, as he introduced many strains and spent much time in an attempt to determine accurately the history of the wheat.

"The original home of hard winter wheat is in the area of Russia just north and east of the Black Sea and north of the Caucasus Mountains. The area includes chiefly the governments of Taurida (including the Crimea), Ekaterinoslav, Kharkof, and Stavropol, and the Don and Kuban territories. In that region the wheat is generally called simply winter wheat, but is known locally by various names as Krimka (Crimean), Kharkof, Beloglina, Uita, Torgova, etc. \* \* \*

"The history of hard winter wheat in the United States is closely associated with the movement of Russian Mennonite immigrants to the middle Great Plains. These people originally went from west Prussia to southern Russia about 1770 because of certain land grants and civil privileges offered by the Government under Empress Catherine. One hundred years later their descendants desiring further advantages to be obtained in America emigrated to the middle Great Plains and settled principally in Kansas. The greater number were from the Molochna colonies in northern Taurida, but some were from the Crimea proper and others from Ekaterinoslav. The first settlements in Kansas were made in 1873, near Newton, Halstead, and Moundridge. Each family brought over a bushel or more of Crimean wheat for seed, and from this seed was grown the first crop of Kansas hard winter wheat. Bernard Warkentin, a miller, who erected mills at Newton and Halstead, was chiefly instrumental in introducing the Turkey wheat, but in this pioneer movement of the Mennonites two other men were associated—Christian Krehbiel, first a farmer, but who later in 1886 erected a mill at Moundridge, and C. B. Schmidt, acting as immigration agent for the Santa Fe Railroad."

Crimean is the name properly used for this whole group of hard red winter wheats. It also has been used as a varietal name for separate introductions. The first introduction of the wheat under this name is thought to have been made by Carleton in 1900 (215, F.P.I. 5635) from Kurman-Kemelchli, Central Crimea, Russia. Many other names have been used for wheat similar to Turkey.

Kharkof, for the most part, is a wheat morphologically identical with Turkey. Several introductions were made which came from a region much farther north, and it was, therefore, thought to be a much more winter-hardy wheat than Turkey. The Kharkof wheat was first introduced into the United States by M. A. Carleton in 1900, from Starobelsk, Kharkof, Russia (215, F.P.I. 5641; C.I. 1442). Two other strains (F.P.I. 7467, C.I. 1583; and F.P.I. 7786, C.I. 2193, or C.I. 6206) were obtained in 1901 through A. Boenke, president of the Kharkof Agricultural Society. The latter of these two introductions contained a considerable portion of long-beaked strains more similar to Beloglina than the true Kharkof. A fourth lot of Kharkof (F.P.I. 9125, C.I. 2208), consisting of 450 bushels, was received in 1902 from the Starobelsk district through E. A. Bessey. For several years these strains of Kharkof wheat gave slightly better results than the ordinary Turkey wheat of Kansas and became quite widely distributed in that State, as well as in Wyoming and Montana. In recent years, however, little difference in hardness or yield has been observed, except in northern Wyoming and in Montana, where it still consistently yields better than Turkey.

**Malakof** is a name under which many strains of Crimean wheat have been introduced and grown. Wheat of this name is thought to have been first distributed by the Ratakin Seed Co., Shenandoah, Iowa, in the early nineties from seed that was said to have come from Russia.

**Distribution.**—The acreage of Turkey wheat in 1929, including that grown under the name Kharkof and many other synonyms, is shown in figure 57. Turkey is the most widely grown variety and was reported from 28 States. In 1929 it occupied 15,925,677 acres, or 25.69 percent of the total wheat acreage. In 1910 it occupied 21,598,200 acres, comprising 29.63 percent of all wheat, and in 1924, 14,332,147 acres, comprising 28.18 percent of all wheats.

In 1929 Kharkof was reported in 18 of the 28 States reporting Turkey, the total estimated area being 383,243 acres. This is only 2.4 percent of the reported total acreage of Turkey.

**Synonyms.**—Alberta Red, Argentine, Bulgarian, Crimean, Defiance, Egyptian, Hard Winter, Hundred-and-One, Hungarian, Improved Turkey, Kharkof, Lost Freight, Malakof, Malcome, Minnesota Red Cross, Minnesota Reliable, Pioneer Turkey, Red Russian, Red Winter, Romanella, Russian, Tauranian, Theiss, Turkey Red, Turkish Red, Ullu, Wisconsin No. 18, World's Champion, Zuni.

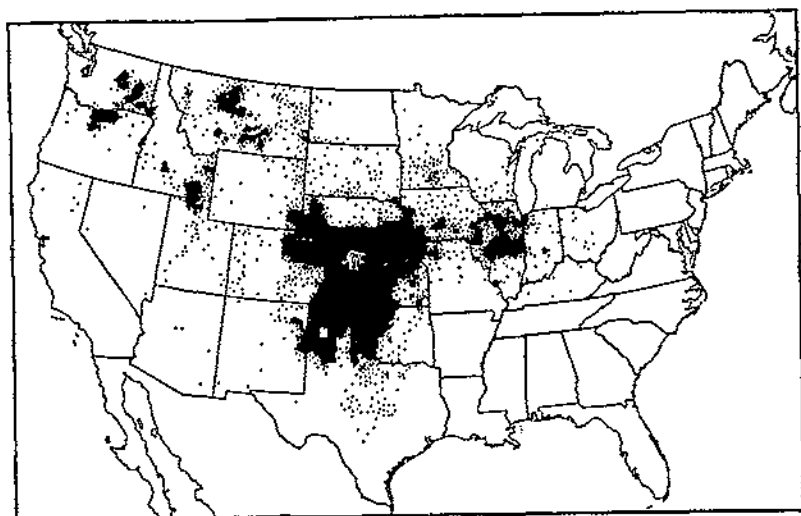


FIGURE 57.—Distribution of Turkey wheat in 1929. Estimated area, 15,925,677 acres.

#### EAGLE CHIEF

**Description.**—Eagle Chief is a mixture or a segregating population from a field cross of Turkey and Fulcaster or some other soft wheat.

**History.**—About 1902 the Santa Fe Railroad Co. distributed small lots of Kharkof wheat at Alva, Okla. C. H. Hyde, of Alva, grew this wheat and in 1920 selected some stiff-strawed plants from a field while harvesting. Concerning the origin of Eagle Chief, Mr. Hyde says:<sup>15</sup>

"I noticed occasionally over the field, 10 or 15 rods apart, a bunch of wheat standing up and upon examination found that most of it had four grains to the mesh and that it had very stiff, coarse straw and the head showed different than the Kharkof wheat. I gathered all I could find from this unharvested wheat, not quite a gallon of threshed wheat \* \* \*."

This seed was increased until 1927, when Mr. Hyde named and distributed it, selling 2,000 bushels. In 1928 he had 5,000 bushels for sale.

**Distribution.**—Estimated acreage in 1929, 6,881 acres, in Oklahoma.

<sup>15</sup> Leaflet on Eagle Chief Wheat by C. H. Hyde, Alva, Okla. Aug. 25, 1930.

## ILRED

*Description.*—This selection from Turkey differs only in being higher yielding and more uniform under Illinois conditions.

*History.*—Ilred (reg. no. 232) is the result of a plant selected from Turkey by L. H. Smith in 1910 at the Illinois Agricultural Experiment Station (202), Urbana, Ill. It was first grown commercially in 1923 as Turkey 10-110. It was registered (58) in 1926 because of its high yields in experiments at Urbana.

*Distribution.*—Estimated acreage in 1929, 24,190 acres, in Illinois.

*Synonym.*—Turkey 10-110.

## IOTURK

*Description.*—Ioturk is similar to Turkey, differing only in consistently higher yields in Iowa. It is resistant to some forms of bunt.

*History.*—Ioturk (reg. no. 266) is a selection from Turkey made by the farm-crops section of the Iowa Agricultural Experiment Station, Ames, Iowa. It was distributed for commercial growing about 1926. It was registered (56) as an improved variety in 1930 because of its high yields in experiments at Ames.

*Distribution.*—Estimated area in 1929, 4,149 acres, all in Iowa.

## IOWA NO. 404

*Description.*—Iowa No. 404 apparently is identical with Turkey, but in experiments in Iowa it has shown greater winter hardiness and proved more productive.

*History.*—Iowa No. 404 (reg. no. 144) is the result of a plant selected from Turkey (Minn. No. 529) developed at the Iowa Agricultural Experiment Station and first distributed in the fall of 1913 as a winter-hardy and high-yielding pure strain of Turkey wheat.

*Distribution.*—Estimated area in 1929, 1,906 acres, all in Iowa.

## KARMONT

*Description.*—Karmont is similar to Turkey, Kharkof, and Montana No. 36. It is a hardy, high-yielding strain in Montana.

*History.*—Karmont (reg. no. 244) was developed in cooperative experiments of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Montana Agricultural Experiment Station at the Judith Basin Branch Station, Moccasin, Mont. It is the result of a head selection made by E. L. Adams from Kharkof (C.I. 1583) in 1911. Karmont was grown commercially in Montana for the first time in 1921. It was registered (58) in 1926 because of its high-yielding ability under Montana conditions.

*Distribution.*—Estimated area in 1929, 85,935 acres, in Montana, Idaho, and Utah, as shown in figure 58.

## MONTANA NO. 36

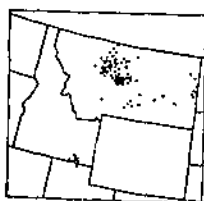


FIGURE 58.—DISTRIBUTION of Karmont wheat in 1929. Estimated area, 85,935 acres.

*Description.*—This variety cannot be distinguished from Turkey and Kharkof but has proved superior in winter hardiness and yield in experiments and commercial trials in Montana.

*History.*—Montana No. 36 (reg. no. 146) is the result of a plant selected from Kharkof at the Montana Agricultural Experiment Station, Bozeman, Mont., and distributed in the fall of 1915 as a winter-hardy, high-yielding strain.

*Distribution.*—Estimated area in 1929, 31,028 acres, in Montana.

## NEBRASKA NO. 6

*Description.*—Nebraska No. 6 also is identical with Turkey in all taxonomic characters.

*History.*—This is a high-yielding selection of Turkey developed at the Nebraska Agricultural Experiment Station and distributed in the fall of 1918.

*Distribution.*—Estimated area in 1929, 9,444 acres, all in Nebraska.

## NEBRASKA NO. 60

*Description.*—Nebraska No. 60 is nearly identical with Turkey in all taxonomic characters.

*History.*—Nebraska No. 60 (reg. no. 147) is a high-yielding selection of Turkey wheat developed at the Nebraska Agricultural Experiment Station. It was distributed for commercial growing and for testing at experiment stations in other States in the fall of 1918.

*Distribution.*—Estimated area in 1929, 345,163 acres, in Nebraska, Kansas, and Colorado, as shown in figure 59.

## RIO

*Description.*—Rio differs from Turkey only in having slightly shorter stems and in being resistant to many forms of bunt.

*History.*—Rio is the result of a head selected from Argentine (C.I. 1569), a Crimean wheat obtained from the Marseille (France) grain exchange by the United States Department of Agriculture in 1900. The selection was made in 1920 by D. E. Stephens at Moro, Oreg., in cooperative investigations between the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Oregon Agricultural Experiment Station. It is resistant to many forms of bunt and gives high yields of a good quality of grain. Rio was first distributed to farmers in Sherman County, Oreg., in 1931.

*Distribution.*—Grown in eastern Oregon since 1931.

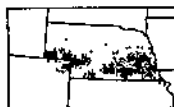


FIGURE 59.—Distribution of Nebraska No. 60 wheat in 1929. Estimated area, 345,163 acres.

## ORO

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong to strong; spike awned, oblong-fusiform, dense, erect to inclined; glumes glabrous, white, mid-long, narrow to mid-wide; shoulders narrow, rounded to elevated; beaks 2 to 8 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate to elliptical; germ small; crease mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

Oro differs from Turkey principally in being slightly taller and in having stronger stems and denser and more oblong spikes and in being much more resistant to most forms of bunt.

*History.*—Oro (reg. no. 259) is the result of a head selected from a Turkey wheat known as no. 889. The history of this Turkey is unknown. The selection later known as "Oro" was made in 1921 by H. M. Woolman in cooperative investigations between the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Oregon Agricultural Experiment Station at the Sherman County Branch Station at Moro. It showed a high degree of resistance to bunt and yielded well in the drier winter-wheat areas of the Pacific Northwest. It was distributed to farmers in Sherman County, Oreg., in 1927 and in southern Idaho in 1929. It was registered (63) as an improved variety in 1928 because of its high yields, stiff straw, and resistance to bunt.

*Distribution.*—Estimated area in 1929, 774 acres in Jefferson County, Oreg. Grown since 1929 in southern Idaho.

## TENMARQ

*Description.*—Plant winter habit, early to midseason, mid-tall; stem white, slender, mid-strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to mid-wide, oblique to elevated; beaks 3 to 30 mm long; awns 3 to 8 cm long; kernels red, short to mid-long, hard, ovate; germ small; crease mid-wide, mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

Tenmarq differs from Kaured in being earlier and less winter hardy and in having stronger stems and shorter kernels, as well as greater resistance to stem rust in the mature-plant stage.

*History.*—Tenmarq (reg. no. 264) was produced from a hybrid between Marquis and P-1066, the latter a sister selection of Kaured made from Crimean (C.I. 1435). The original cross was made in 1917 at Manhattan, Kans., in

experiments cooperative between the Kansas Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. Tenmarq is the result of a plant selection made by J. H. Parker in 1921. The selection was included in nursery tests in 1922 and in field plots in 1924 at Manhattan. The new variety was entered in cooperative tests with Kansas farmers in 1928. Tenmarq was registered (63) in 1929 and released for commercial growing in 1932.

*Distribution.*—Grown in Kansas since 1932.

#### KANRED

*Description.*—Plant winter habit, midseason, mid-tall; stem white, weak; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders narrow, oblique to elevated; beaks 3 to 25 mm long; awns 3 to 10 cm long; kernels dark red, mid-long, hard, ovate to elliptical; germ small; crease narrow to mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

Kanred is very similar to Turkey, but it is slightly more winter hardy and slightly earlier and can be distinguished from that variety by its longer beaks on the outer glumes and its resistance to some forms of both leaf and stem rust. This resistance to rust is an important factor in the ability of the variety

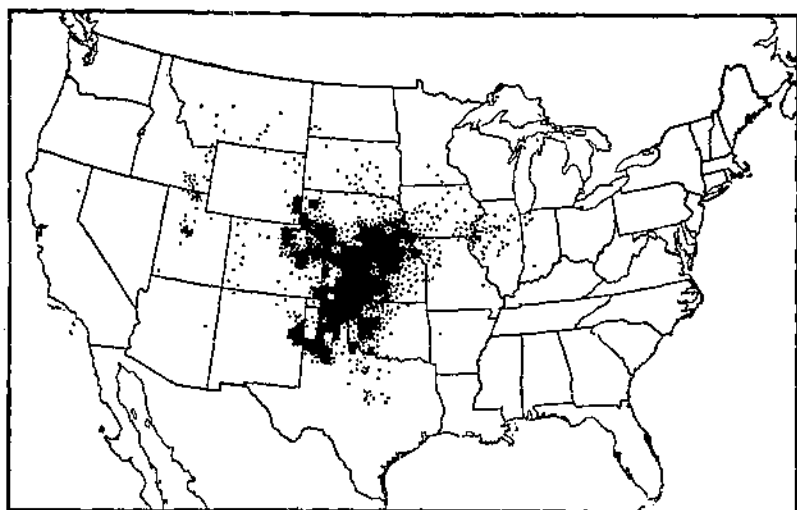
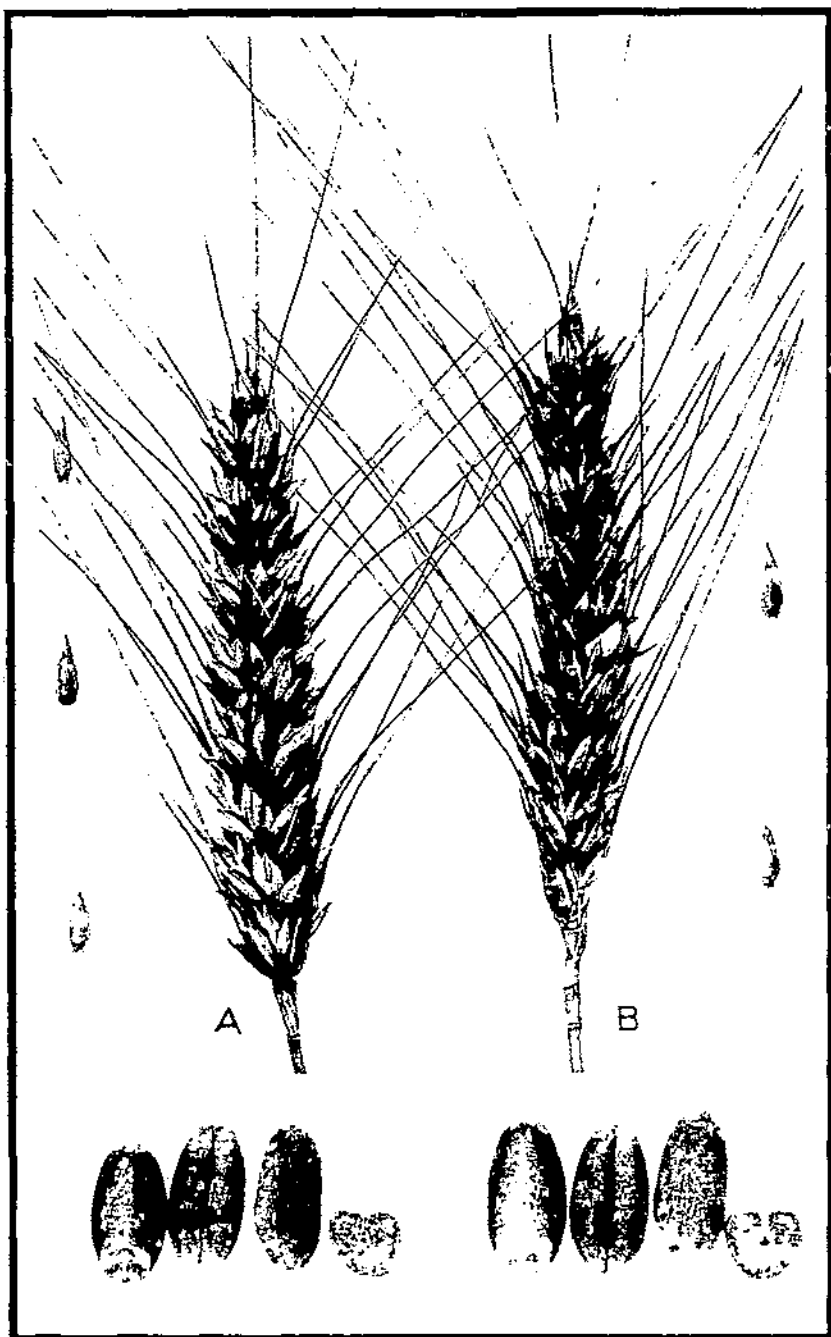


FIGURE 60.—Distribution of Kanred wheat in 1929. Estimated area, 3,490,184 acres.

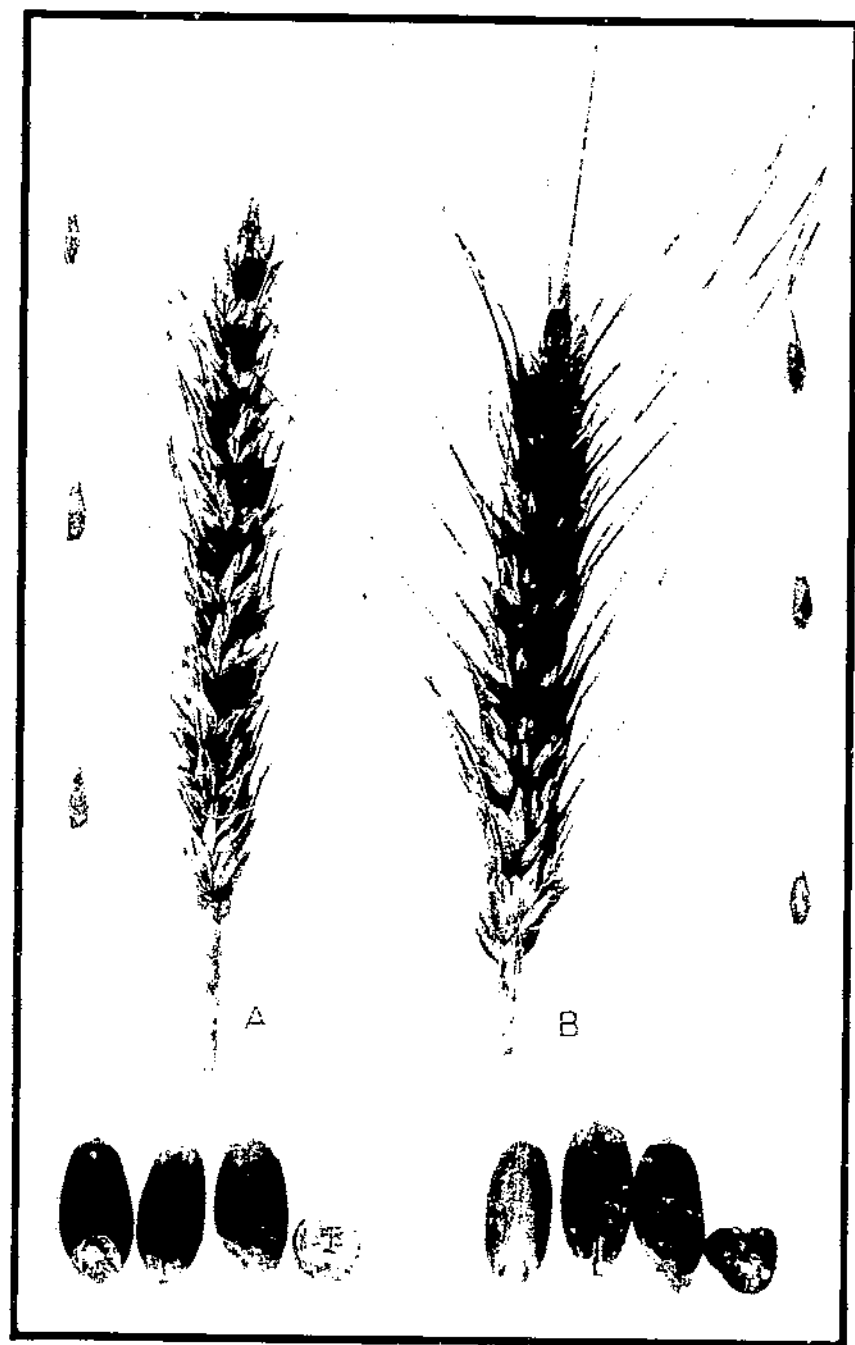
to outyield Turkey wheat in some sections. It is substantially equal to Turkey in milling and breadmaking value. A spike, glumes, and kernels of Kanred are shown in plate 31, B.

*History.*—Kanred (reg. no. 149) is the product of a single head selected from Crimean (C.I. 1435), which had been introduced into the United States from Russia by the United States Department of Agriculture. The head from which it descended was one of 554 selected in 1906 by H. F. Roberts, of the botany department of the Kansas Agricultural Experiment Station (175). In 1911 the more promising strains were included in experiments by the agronomy department of the Kansas station, and several of them, including Kanred, were grown in field plots. In 1916 it was discovered to be rust resistant. During these years of preliminary testing it was known by the number P-762. In 1917 it was named Kanred (a contraction of Kansas Red). About 4,000 acres were seeded to this variety in the fall of 1917 and more than 50,000 acres in the fall of 1918.

*Distribution.*—The estimated area of Kanred in 1919 was 100,800 acres and in 1924, 4,314,962 acres. In 1929 the estimated area was reduced to 3,490,184



Turkey (A) and Kinred (B) wheats. Spikes and plumes natural size, kernels x3.



Preston (A), and Kota (B) wheats. Spikes and glumes natural size, kernels  $\times 3$ .

acres, as shown in figure 60. It was grown in 18 States, Kansas, Texas, Nebraska, Oklahoma, and Colorado leading in acreage in the order named.

*Synonym.*—P-762.

#### BELOGLINA

*Description.*—This variety is nearly identical with Kanred, except that it is slightly later and does not have the resistance of that variety to stem and leaf rust.

*History.*—Beloglina (reg. no. 150) was introduced from Russia by the United States Department of Agriculture. Four introductions have been made. The first lot was obtained by M. A. Carleton in 1900 from Rostov on Don, Russia (215, F.P.I. 6012), where it was claimed to have been one of the most hardy red winter wheats known. It was grown near Beloglinskaya, in the northern portion of the Stavropol Government, a region of great extremes of temperature and moisture. This wheat has proved somewhat more winter hardy than commercial strains of Turkey and Kharkof, but not enough so to make it become an important variety.

*Distribution.*—Estimated area in 1924, 34 acres, grown in Wisconsin. It was not reported in 1929.

#### BACSKA

*Description.*—The Bacska wheat grown in Wisconsin is very similar to Kanred, except that it is slightly taller and later, has more nodding spikes, and does not have the resistance of Kanred to stem and leaf rust.

*History.*—Bacska (reg. no. 151) (215, F.P.I. 5498) was originally introduced from Budapest, Hungary, in 1900 by the United States Department of Agriculture. A selection made from the original introduction at Ashland, Wis., by E. J. Delwiche, of the Wisconsin Agricultural Experiment Station, is the only Bacska wheat now known to be commercially grown. It is sometimes called Wisconsin Pedigree No. 408.

*Distribution.*—Estimated area in 1929, 2,281 acres, in Wisconsin.

*Synonym.*—Wisconsin Pedigree No. 408.

#### RELIEF

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem white, weak; spike awned, fusiform, mid-dense to lax, inclined to nodding; glumes glabrous, yellowish with light-brown stripes, mid-long, mid-wide; shoulders wanting to narrow, oblique to elevated; beaks 1 to 3 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate to elliptical; germ small; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

Relief differs from Turkey in being taller, in having a longer and laxer spike, darker glumes, shorter beaks, a slightly longer kernel, and in being resistant to some forms of hant.

*History.*—This variety was developed from a cross between Hussar and a selection from Turkey (Utah No. 26) made in 1925 by D. C. Tingey, of the Utah Agricultural Experiment Station, Logan, Utah. The selection that resulted in Relief was made in 1928. It was tested at several stations in the western United States in 1932 and 1933 under the designation 43e21. It showed a high degree of resistance to the forms of *Tilletia tritici* that were causing heavy losses in the Cache Valley of Utah. It also yielded well in limited trials and was distributed to a few farmers for further trial in the fall of 1932. In 1934 the variety was named and released for general distribution.

*Distribution.*—Grown on a limited acreage in the Cache Valley of Utah in 1933.

#### UTAH KANRED

*Description.*—Plant winter habit, midseason, mid-tall; stem white, weak; spike awned, fusiform, mid-dense to lax, nodding; glumes glabrous, yellowish with brown stripes, mid-long, narrow to mid-wide; shoulders narrow to mid-wide, oblique to slightly elevated; beaks variable, 1 to 3 mm and 3 to 20 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate to elliptical; germ small; crease narrow to mid-wide, mid-deep; cheeks rounded; brush small, mid-long.



This variety differs from Kanred in having longer, laxer, and more nodding spikes, darker glumes, and more variable and shorter beaks, and in being less winter hardy.

*History.*—In experiments at the Nephi Dry-Farm Substation, Nephi, Utah, this wheat proved to be a high-yielding variety and was distributed in 1922. The original source of this variety is not known. When distributed, it was thought to be Kanred and, having been commercially grown as Kanred for many years, is now designated as above.

*Distribution.*—Most of the 36,490 acres reported as Kanred in Utah in 1929 is this variety.

*Synonym.*—Kanred.

#### KOMAR

*Description.*—Komar differs from Ceres in having shorter beaks (1 to 3 mm long), weaker stems, greater resistance to stem rust, and a slightly better yield along the southern border of the spring-wheat belt.

*History.*—Komar (reg. no. 270) was produced (220) from the same cross between Marquis and Kota from which Ceres was selected. The cross was made in 1918 by L. R. Waldron, plant breeder of the North Dakota Agricultural Experiment Station, Fargo. The selection designated as 1656.84, which resulted in Komar, was made in 1923.

Komar has been extensively tested at experiment stations in the spring-wheat region and has given excellent results, especially in the southern part. It was distributed by the Iowa Agricultural Experiment Station in 1930 and by the Colorado Agricultural Experiment Station in 1931. It was registered (56) as an improved variety in 1931 because of its high yields under Iowa conditions and its resistance to stem rust.

*Distribution.*—Grown in Iowa and Colorado since 1930.

*Synonym.*—Number 1656, N. D. No. 1656.84.

#### KOTA

*Description.*—Plant spring habit, midseason, mid-tall; stem white, weak to mid-strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, square to elevated; beaks 3 to 20 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate to elliptical, slightly humped; germ small; crease wide, usually shallow; cheeks usually angular; brush small, short to mid-long.

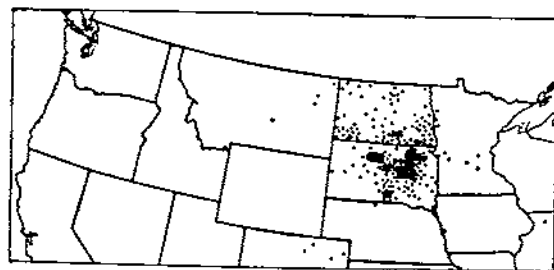


FIGURE 61.—Distribution of Kota wheat in 1920. Estimated area, 250,985 acres.

Kota can be distinguished by its long beaks and elevated shoulders. The kernels are very hard and slightly humped and have a small germ.

Kota is resistant to stem rust and to drought. A spike, glumes, and kernels of Kota are shown in plate 32, B.

*History.*—Kota (reg. no. 153) was obtained in Russia by H. L. Bolley, of the North Dakota Agricultural College, in 1903, while making a study of the flax industry of Europe for the United States Department of Agriculture. It was separated from Monard durum wheat, found to be resistant to stem rust and to have high agronomic value, and was named Kota in 1919 by Waldron and Clark (221, pp. 187-195).

"R.B.R. 3" is the designation used by Professor Bolley for a wheat identical with Kota. According to Professor Bolley, R.B.R. 3 was one of his original introductions from Russia in 1903, introduced as P.P.I. 10214.<sup>29</sup> The unpub-

<sup>29</sup> Correspondence with J. A. Clark, Division of Cereal Crops and Diseases, dated Apr. 13, 1919.

ished record for this number in the Division of Plant Exploration and Introduction is "winter wheat from Balachof, Tambof Government", as one of 25 lots of wheat introduced from Russia by Professor Bolley in 1903. In 1911 Professor Bolley distributed his R.B.R. 3 to several farmers and to the Langdon substation, but the variety never became commercially established by that distribution. In the spring of 1919, after the discovery of resistance to stem rust in Kota and its similarity to R.B.R. 3, Professor Bolley distributed a second lot, consisting of about a bushel of seed, to Jahner Herre, Kelso, N.Dak., who was the first farmer to increase it.

*Distribution.*—The estimated area of Kota in 1924 was 471,313 acres, which was reduced to 250,985 acres in 1929 (fig. 61), it having been superseded by Ceres in many sections. Since 1929 the acreage of Kota has rapidly decreased.

*Synonym.*—R.B.R. 3.

#### CERES

*Description.*—Plant spring habit, midseason, mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense, erect to inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, rounded to elevated; beaks 2 to 10 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate; germ small; crease mid-wide, shallow to mid-deep; cheeks usually angular; brush mid-sized, short. A spike, glumes, and kernels are shown in plate 33, A.

Ceres is resistant to stem rust and drought and is a high-yielding wheat of good quality for breadmaking. It also was damaged less by grasshoppers in 1933 than were other hard red spring and durum varieties.

*History.*—Ceres (reg. no. 241) was developed (220) at the North Dakota Agricultural Experiment Station from a cross between Marquis and Kota made by L. R. Waldron in 1918. It was registered (58) and distributed in North Dakota in 1926 and has since become widely grown because of its rust and drought resistance, early maturity, high yield, and good quality. It is, however, susceptible to hunt and loose smut.

*Distribution.*—Estimated area in 1929, 347,632 acres, grown in North Dakota, Minnesota, South Dakota, Iowa, and Montana. This distribution is shown in figure 62. Since 1929 the acreage of Ceres has increased rapidly. In 1932 it was estimated<sup>20</sup> that fully 3,000,000 acres were grown and in 1933 probably 5,000,000 acres were produced in the United States and Canada. Of this acreage about 3,000,000 acres were in North Dakota, 1,000,000 acres in Minnesota, South Dakota, and Montana, and 1,000,000 acres in Manitoba and Saskatchewan, Canada.

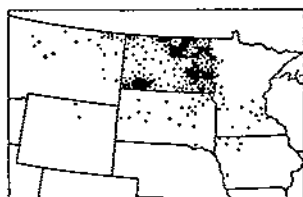


FIGURE 62.—Distribution of Ceres wheat in 1929. Estimated area, 347,632 acres.

#### CHAMPLAIN

*Description.*—Plant spring habit, midseason to late, tall; stem white, strong; spike awned, fusiform, mid-dense, erect; glumes glabrous, yellowish white, mid-long, mid-wide; shoulders narrow to mid-wide, oblique to square; beaks 1 to 3 mm long; awns 2 to 7 cm long; kernels red, short, semihard to hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long to long, collared.

This variety is distinct in having short, wide, semihard to hard red kernels with a long, collared brush. The lower leaves of Champlain are distinctly pubescent.

*History.*—The following history of Champlain (reg. no. 135) was published in the Rural New Yorker in 1877 (8):

"Champlain was produced in 1870 by Mr. Pringle in his endeavors to unite the hardiness of the Black Sea with the fine qualities of the Golden Drop. Several varieties were the result of this cross, from which the above was chosen as showing increased vigor and productiveness over its parents. A selection from this for the past seven years has now, Mr. Pringle thinks, established its character, and the result is a wheat bearded like the Black Sea with the white chaff of the Golden Drop."

<sup>20</sup> Report of the Third Hard Spring Wheat Conference, Fargo, N.Dak. 1932. 6 pp. Washington, D.C. [Micrographed.]

C. G. Pringle did his wheat breeding at Charlotte, Vt., near Lake Champlain. This wheat evidently was named for the lake.

Pringle's Champlain is the name under which the variety first became known. Mr. Pringle apparently, however, did not intend that his name should be a part of the name of any of the varieties of wheat that he distributed.

*Distribution.*—Estimated area in 1929, 527 acres, chiefly under irrigation in Yellowstone County, Mont.

*Synonyms.*—Pringle's Champion, Pringle's Champlain.

#### PRESTON (VELVET CHAFF)

*Description.*—Plant spring habit, midseason to late, mid-tall; stem white, sometimes faintly purple, especially on lower internodes, mid-strong; spike awned, fusiform, mid-dense, inclined, easily shattered; glumes glabrous, white, mid-long, mid-wide; shoulders wanting to narrow, oblique to elevated; beaks 1 to 3 mm long; awns 2 to 7 cm long; kernels red, mid-long, hard, ovate; germ mid-sized; crease narrow to mid-wide, shallow to mid-deep; cheeks angular; brush mid-sized, mid-long.

The kernels of Preston have a dull seed coat and a rather narrow triangular crease. The grain has a high test weight per bushel. A spike, glumes, and kernels of Preston wheat are shown in plate 32, A.

*History.*—Preston (reg. no. 152) was bred from a cross between Ladoga, a Siberian wheat, and Red Fife. The hybrid was made by William Saunders, at the Central Experimental Farm, Ottawa, Canada, in 1888. It was grown at the experiment station at Indian Head, Saskatchewan, as early as 1893, and was sent to the Minnesota Agricultural Experiment Station for growing in the spring of 1896.

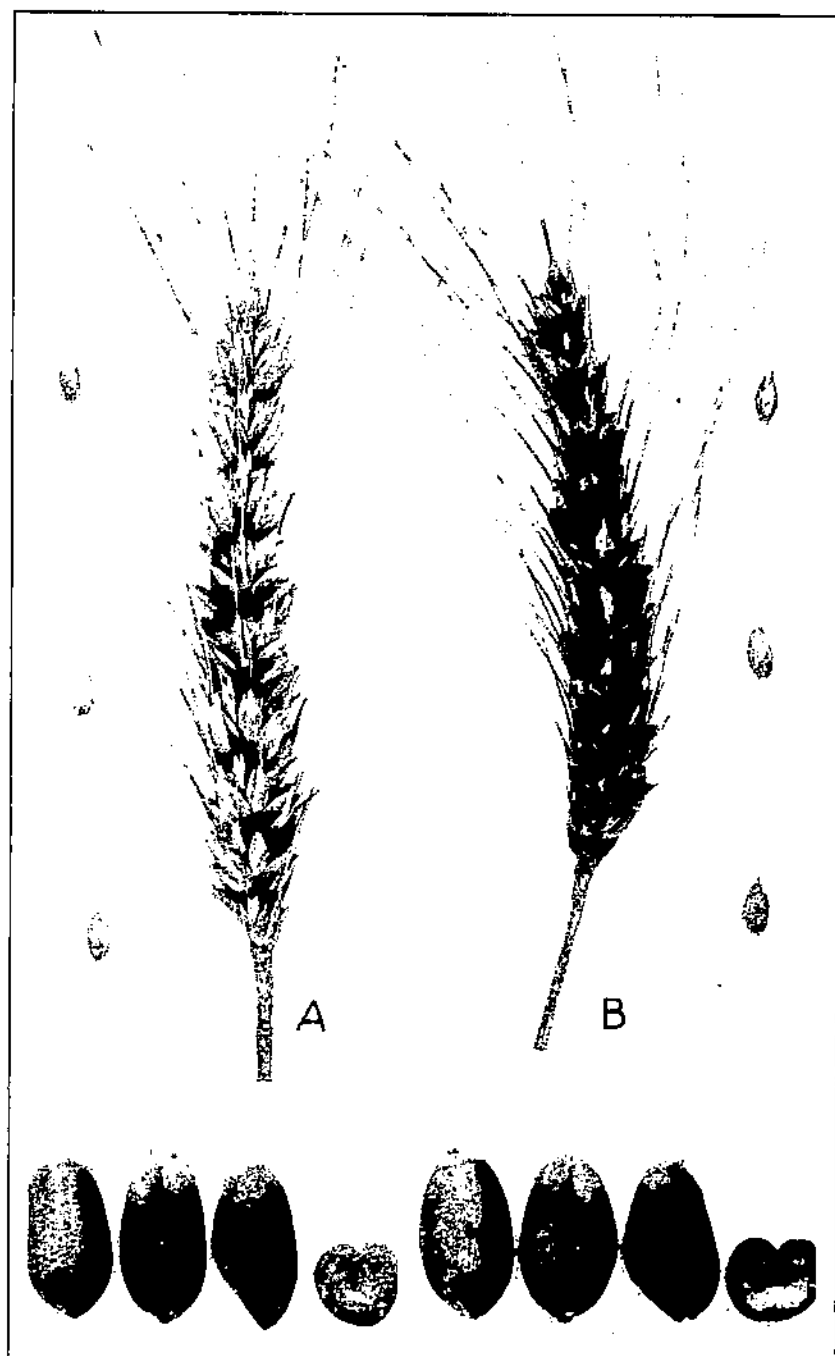
It is not known definitely that the Velvet Chaff wheat now widely grown is Preston and is the result of the above cross. It is probable that some of this wheat is an older variety from which the original name had been lost. In addition to the synonyms, listed below, which represent sorts apparently identical with the commercial Preston spring wheat, there are types of wheat found within the Java variety that cannot be distinguished from the Velvet Chaff.

Many names have been used for wheat similar to Preston. Bearded Fife is a name chiefly used for Preston in South Dakota since 1904, or earlier, although in more recent years it is commonly called Velvet Chaff. The name Bearded Fife was used to distinguish this wheat, which was also often called Red Fife, from the well-known Red Fife wheat of Canada. Blue Ribbon is the name of a selected lot of a wheat, apparently identical with Preston, distributed by H. E. Krueger, of Beaver Dam, Wis., since about 1909. He stated "that the wheat 'was selected 10 years ago, from an old Fife variety, and ripens about with Marquis.' A wheat called Climax or South Dakota Climax was first obtained by the South Dakota Agricultural Experiment Station in 1903 from John Carpenter, Metland, S. Dak. It apparently is the Preston variety and was formerly grown to a considerable extent under the name Climax in South Dakota. Golden Drop is the name under which a sample of wheat identical with Preston was obtained in Iowa in 1919. A definite history of the bearded spring Golden Drop variety is not available, but this is probably an old English wheat. A spring wheat similar to the above was grown under this name in New Hampshire in 1872 (223, p. 492).

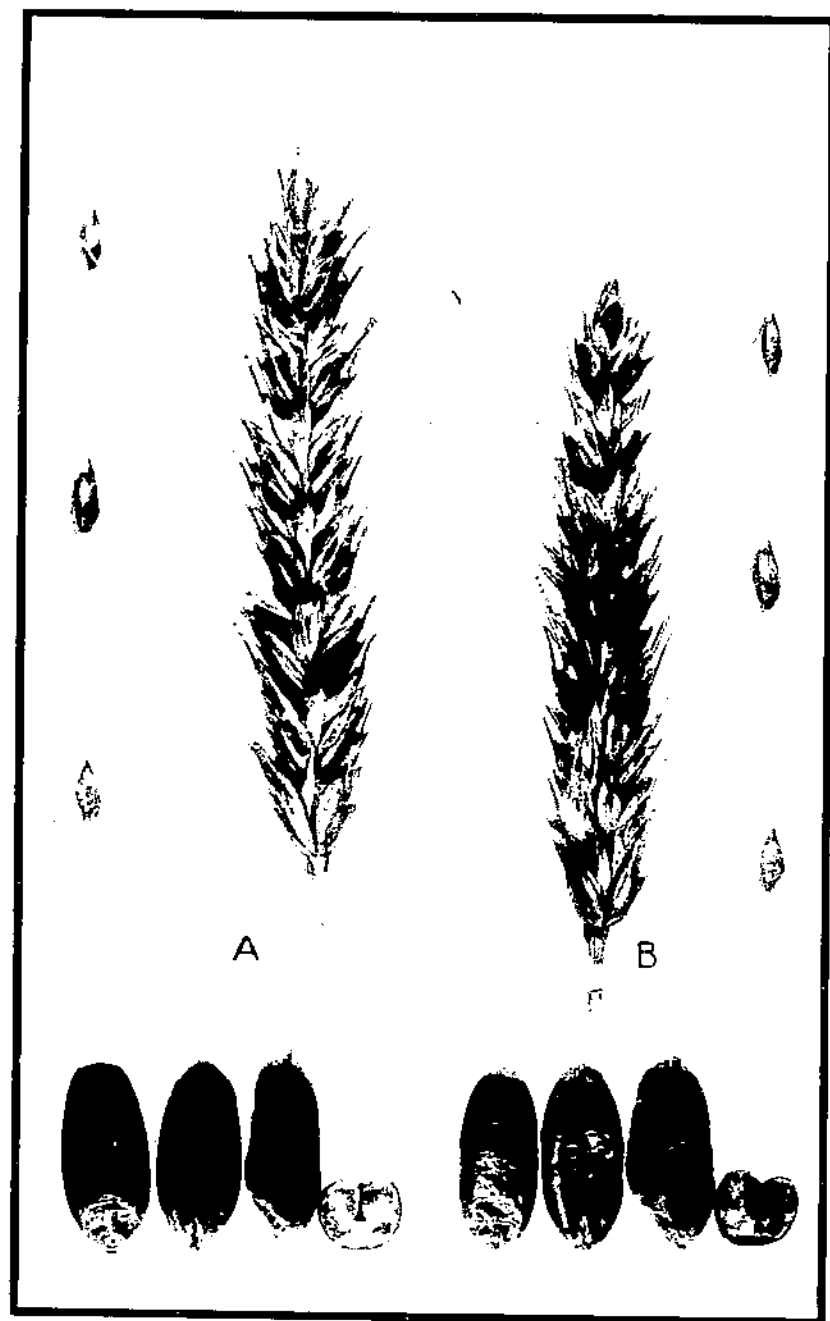
Johnson is a name of a wheat similar to or identical with Preston. A Johnson or No. 55 has been reported by J. M. Thorburn & Co. as "an amber, bearded, white-chaff variety", originated in 1883 by E. S. Carman, then editor of the Rural New Yorker (209, p. 48). Rural New Yorker No. 55 also was described in 1888 (16, p. 523) as a "pure wheat cross. Medium to ripen. Stems yellow. Heads average nearly 4 inches. Eight ears to a side. Chaff white, heavily bearded, three to four grains to a breast, fair size, bright amber color, hard regular heads, i. e., not inclined to club." In 1890 the Rural New Yorker (17, p. 516) reported "No. 55 has been named 'Johnson' after Prof. S. W. Johnson, of Yale." A Johnson wheat was grown in California as early as 1871 (5).

"The Marysville Appeal has seen some samples from a field of wheat growing near Yuba City which are reported to be an average of the crop of about 40

\* Correspondence with the Division of Cereal Crops and Diseases, dated Apr. 20, 1917.



Ceres (A) and Reliance (B) wheats. Spikes and glumes natural size, kernels  $\times 3$ .



Italy (A) and Nipper (B) wheats. Spikes and glumes natural size; kernels  $\times 3$ .

acres of the bearded Chile variety and give promise of a good crop without further rain. The proprietor estimates a yield of from 30 to 40 bushels per acre. This variety of wheat is highly prized by the grain growers of Sutter, and is known as the Johnson wheat."

Johnson's Early Fife is a name used for the wheat that later became known as Bearded Red Fife or Red Fife bearded, which is identical with the commercial Velvet Chaff or Preston. Wheeler and Balz (227) state:

"The so-called Red Fife, a hard, red, bearded wheat, \* \* \*. The origin of this variety, which is also called Golden Fife and Johnson's Early Fife, is somewhat obscure."

The original Golden Fife was introduced into South Dakota by Otto Johnson of Redfield, S.Dak., in 1902. Mr. Johnson obtained his seed from John Krumann of Sioux City, Iowa. Mr. Krumann obtained his seed from a seed company in Clarinda, Iowa, in the spring of 1901. It seems probable that this wheat, which later became grown extensively in the Dakotas and Minnesota under the name of Velvet Chaff, was in reality a strain of Java wheat. The fact that it was brought into South Dakota from Iowa at a time when Java wheat was being exploited in Iowa, and before Preston was introduced, naturally leads to this belief. It was most extensively grown about 1913 and is still grown to some extent in the James River Valley of South Dakota and has recently been found to be identical with certain strains of Java.

Minnesota No. 188 is a number given by the Minnesota Agricultural Experiment Station to Preston wheat that was received from William Saunders, of Ottawa, Ontario, Canada.

Velvet Chaff is a name that came into use about 1905 for a wheat similar to Preston or identical with it. Just how and when this particular name arose is not known. By 1912 the wheat grown under this name was widely grown in the Dakotas and Minnesota, and the name Velvet Chaff was used by the Minneapolis Chamber of Commerce and the Chicago Board of Trade as a grade name. By 1914, however, this wheat was included in the northern grades of wheat and the name Velvet Chaff was abandoned as a grade name. The name has continued in use, however, as a varietal name for the wheat on farms. The only observable difference between this wheat and the true Preston from Canada is that the latter more often shows a purple tinge in the stems and has a slightly rougher seed coat.

**Distribution.**—The estimated area of Preston wheat in 1919 was 2,233,200 acres, which decreased rapidly to 1929, when it was only 287,801 acres. This distribution is shown in figure 63. The variety was reported from 12 States, the leading ones being Minnesota, South Dakota, and North Dakota.

**Synonyms.**—Bearded Fife, Blue Ribbon, Climax, Golden Drop, Golden Fife, Johnson, Johnson's Early Fife, Minnesota No. 188, Red Fife, Velvet Chaff.

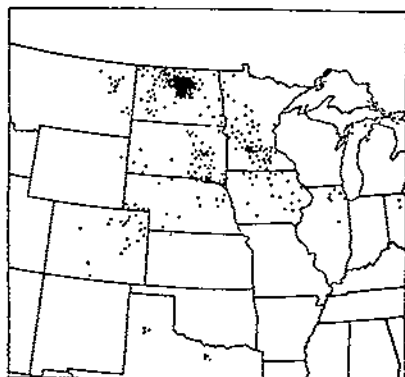


FIGURE 63.—Distribution of Preston wheat in 1929. Estimated area, 287,801 acres.

#### RELIANCE

**Description.**—Plant spring habit, midseason to late, mid-tall; stem white, mid-strong to strong; spike awned, fusiform, mid-dense, erect to inclined; glumes glabrous, white, short to mid-long, mid-wide; shoulders wanting to narrow, oblique to elevated; beaks 3 to 15 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate; germ small; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, short. A spike, glumes, and kernels of Reliance wheat are shown in plate 33, B.

Reliance is a hardy, high-yielding, smut-resistant variety.

**History.**—Reliance (reg. no. 243) was produced by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, in cooperation with the Oregon, California, Minnesota, Montana, and

**North Dakota Agricultural Experiment Stations.** It was originated from a hybrid between Kanred and Marquis made in 1917 at the Sherman County Branch Station, Moro, Oreg. The selection that resulted in Reliance was made in 1920 by J. A. Clark at Chico, Calif. The spring habit and seedling reaction to stem rust of Reliance and other selections were determined at University Farm, St. Paul, Minn. The high yields of this variety, in comparison with those of other selections and varieties, were determined at the Northern Great Plains Field Station, Mandan, N.Dak., and the Judith Basin Branch Station, Moccasin, Mont., from which stations limited quantities of seed were distributed for commercial growing. The variety was registered (58) in 1926 because of its seedling resistance to stem rust, plant vigor, strong stems, and high yields.

**Distribution.**—Estimated area in 1929, 311 acres, all in North Dakota.

#### HOPE

**Description.**—Plant spring habit, midseason, mid-tall; leaves pubescent; stem purple, mid-strong; spike awned, fusiform, mid-dense, erect to inclined, very resistant to shattering; glumes glabrous, white, mid-long, mid-wide to wide; shoulders mid-wide, rounded to elevated; beaks 2 to 10 mm long; awns 2 to 6 cm long; kernels red, mid-long, hard, ovate; germ small; crease wide, mid-deep; cheeks angular; brush large, long.

Under field conditions in the United States Hope is nearly immune from stem rust and loose smut and resistant to leaf rust and mildew. From spring seeding it also is very resistant to bunt. It is susceptible to frost and heat injury and to the black-chaff disease.

**History.**—Hope (reg. no. 240) was developed by E. S. McFadden as the result of a cross made in 1915 between Vernal emmer and Marquis wheat. The cross was made at Brookings, S.Dak., while Mr. McFadden was employed by the South Dakota Agricultural Experiment Station. For several years the hybrid material was carried in bulk at the Highmore Substation, Highmore, S.Dak., where Mr. McFadden was conducting experiments cooperative with the Division of Cereal Crops and Diseases. However, the selection that resulted in Hope was made in 1923 by Mr. McFadden on his farm near Webster, S.Dak., where it was increased and distributed in 1927. Hope was registered (58) in 1926 because of its nearly immune reaction to stem rust. It was the first variety of hard red spring wheat to have the stem-rust reaction of emmer and has been used extensively as a parent in breeding to transfer this reaction to other varieties of hard red spring wheat.

**Distribution.**—Estimated area in 1929, 3,405 acres, all in South Dakota. Since 1929 its commercial acreage probably has not increased.

#### RUDY

**Description.**—Plant winter habit, midseason to late, mid-tall to tall; stem white, mid-strong; spike awned, linear-fusiform, lax, inclined to nodding; glumes glabrous, yellowish white with black-striped margins, mid-long, wide; shoulders mid-wide, usually oblique; beaks 1 to 5 mm long; awns 3 to 8 cm long; kernels red, long, soft, usually elliptical; germ small; crease wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

This variety is distinct in having long, soft kernels and black stripes on the glumes. A spike, glumes, and kernels of Rudy are shown in plate 34, 1.

**History.**—The origin of Rudy (reg. no. 155) has been recorded by Carleton (59, p. 65) as follows:

"One of the best of the most recently produced varieties is the Rudy, which was originated at Troy, Ohio, in 1871, by M.

Rudy, through a careful propagation of the seed from a superior and a distinct stool of wheat found in a large field."

Rudy wheat was not included in the varietal experiments of the Ohio Agricultural Experiment Station until 1892. It is reported as having been introduced into Michigan, however, from western Ohio, in 1891.

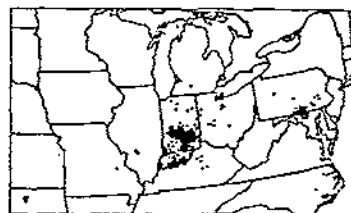


FIGURE 64.—Distribution of Rudy wheat in 1929. Estimated area, 191,078 acres.

*Distribution.*—Estimated area in 1929, 191,078 acres, in nine States, as shown in figure 64.

*Synonyms.*—Anti-Rust, Black Mediterranean, Early Rudy, Kentucky Giant, Queen of New York.

#### NIGGER

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem purple, mid-strong to strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, long, wide; shoulders mid-wide, oblique to square; beaks 1 to 2 mm long; awns 3 to 9 cm long; kernels red, long, soft, ovate to elliptical, slightly humped; germ mid-sized; crease mid-wide, deep, pitted; cheeks rounded to angular; brush mid-sized, mid-long.

Nigger differs from Rudy chiefly in having purple straw and shorter beaks. A spike, glumes, and kernels of Nigger are shown in plate 34, B.

*History.*—"Nigger [reg. no. 157] wheat is said to have been first distributed from the farm of a colored man in Darke County, Ohio" (115, p. 4). It was grown in experiments by the Ohio Agricultural Experiment Station as early as 1884.

*Distribution.*—The estimated area of Nigger in 1929 was 126,484 acres, grown in eight States, as shown in figure 65. The acreage of Nigger has steadily decreased since 1919.

*Synonyms.*—Winter Green, Winter John, Winter King.

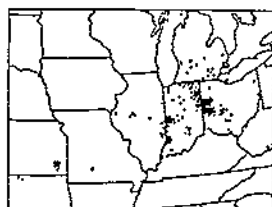


FIGURE 65.—Distribution of Nigger wheat in 1929. Estimated area, 126,484 acres.

#### NABOB

*Description.*—Plant winter habit, midseason, mid-tall; stem purple, mid-strong to strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, long, mid-wide; shoulders wanting to narrow, rounded to square; beaks 1 to 3 mm long; awns 3 to 8 cm long; kernels red, mid-long to long, soft, elliptical; germ mid-sized; crease mid-wide, deep; cheeks angular; brush mid-sized, long.

*History.*—Nabob (reg. no. 262) was developed at the Ohio Agricultural Experiment Station. It is the result of a selection from Nigger made by L. B. Thatcher in 1918. It was registered (63) and distributed for commercial growing in 1928. Its superior characters are early maturity, winter hardiness, semiresistance to bunt, and good yield and quality.

*Distribution.*—Estimated area in 1929, 257 acres, all in Ohio.

#### SILVERSHEAF

*Description.*—Plant winter habit, midseason, tall; stem usually white, mid-strong, coarse; spike awned, fusiform, lax, inclined, easily shattered; glumes glabrous, white, long, mid-wide; shoulders mid-wide, usually elevated; beaks 2 to 30 mm long; awns 3 to 10 cm long; kernels pale red, long, soft, elliptical; germ small; crease mid-wide, shallow to mid-deep; cheeks rounded; brush mid-sized, mid-long.

The variety as grown contains mixtures of purple straw. Silversheaf is distinct in having dark coffee-colored stripes on the glumes.

*History.*—Silversheaf (reg. no. 158) was originated by A. N. Jones (127), Le Roy (formerly of Newark, N.Y.), Genesee County, N.Y., in 1903. Concerning it he has written the following:

"I offer this season for the first time the finest Longberry Red wheat ever known in this country. \* \* \* This wonder in the wheat line originated from a cross between my No. 8, or better known as American Brouze, and the cross-breed from a cross between Lancaster and Seedling No. 91, Longberry."

He described the wheat as follows:

"Straw of a light yellow color, medium tall, thick walled and strong; head long, wide, and full, which as they ripen has a drooping habit. Chaff white, thin, with a silvery glisten in the sun; grain large, dark, and flinty, nearly as long as rye."

This wheat was advertised and distributed by Peter Henderson & Co. (110), seedsmen, of New York, as early as 1903.



*Distribution.*—Estimated area in 1929, 6,050 acres, in New York, Pennsylvania, and Maryland.

*Synonyms.*—Australian, Clipperd's Bearded, Coffee, Davis, Jones Silver Sheaf Longberry Red.

#### DIXON (HUMPBACK II)

*Description.*—Plant spring habit, late, tall; stem white, mid-strong; spike awned, fusiform, lax, inclined; glumes glabrous, yellowish white, long, narrow; shoulders usually wanting; beaks wide, 3 to 30 mm long; awns 4 to 7 cm long; kernels pale red, mid-long to long, semihard, ovate, humped; germ mid-sized; crease mid-wide, deep, sometimes pitted; cheeks rounded to angular; brush mid-sized, long.

This variety is distinguished by the humped kernels, the absence of shoulders on the glumes, and the wide, lax spikes. The kernels have a smaller brush and germ than found in Humpback.

*History.*—The origin of Dixon (reg. no. 160) is undetermined. It has been grown in Wisconsin for many years. The name Dixon was chosen as a name for Humpback II or Smooth Humpback, as the two varieties are very similar. The Humpback variety originated from field selections made by J. P. Berglund, a farmer living near Kensington, Minn. (208, p. 1). The original head probably was the result of a natural field hybrid. Two strains were developed, one with pubescent glumes and one with glabrous glumes. The glabrous-glumed strain (Dixon) was distributed a few years later than the pubescent strain, which was distributed about 1905.

*Distribution.*—Estimated area in 1929, 214 acres, in Wisconsin. Some, if not most, of the acreage of wheat in western Nebraska known as "Humpback" is Dixon. This wheat also is called Ghirka by the grain trade.

*Synonyms.*—Ghirka, Humpback II, Johnson, Smooth Humpback.

#### FRETES

*Description.*—Plant spring habit, although very prostrate in early growth, midseason, mid-tall; stem white, weak to mid-strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to elevated; beaks 2 to 15 mm long; awns 2 to 7 cm long; kernels pale red, long, soft, ovate, humped, pointed; germ small; crease mid-wide to wide, shallow to mid-deep; cheeks angular; brush mid-sized, mid-long.

*History.*—Fretes (reg. no. 159) was introduced into the United States from El Outaya, Constantine, Algeria, in 1901 (215, F.P.I. 7582) by David Fairchild and C. S. Scofield, of the United States Department of Agriculture. It is extensively grown in the oases of the Sahara Desert, where it is sown in November. The variety is said to have originated from a shipment of Russian wheat into Algeria at the time of a famine many years ago.

*Distribution.*—Fretes was formerly grown in Los Angeles County, Calif. It was not reported grown in 1929.

#### CHUL

*Description.*—Plant spring habit, early, short to mid-tall; stem white, very weak; spike awned, fusiform, lax, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to apiculate; beaks 5 to 45 mm long; awns 3 to 10 cm long; kernels red, long, hard, ovate, tapering, humped; germ small; crease wide, shallow; cheeks angular; brush small, mid-long.

The kernels of Chul are large, very hard, and somewhat similar to those of durum wheat.

*History.*—Chul (reg. no. 161) was introduced into the United States in 1902 (215, F.P.I. 9131) from Russian Turkistan by the United States Department of Agriculture through E. A. Bessey. The seed was obtained from Dzhibzak, a town about 100 miles northwest of Samarkand. There it is grown on the steppes without irrigation and is both fall and spring sown. The original seed was a mixture of red and white kernels, the greater part being red. The name Chul, therefore, has been continued for the red-kernelled portion. The white-kernelled types are identical with Talimka. Both types have been grown separately at experiment stations, but a part of the original introduction, which consisted of 100 pounds, was distributed to farmers. The wheat grown

commercially under this name, therefore, is mostly a mixture of Ohul and Talimka.

*Distribution.*—In 1919 Ohul was grown in Lake, Siskiyou, and Yolo Counties, Calif., and Clark County, Nev. Since then it has gone out of cultivation.

*Synonym.*—Idaho Hard.

#### EMERALD (EARLY SPRING)

*Description.*—Plant spring habit, midseason, mid-tall; stem white, slender, very weak; spike awned, fusiform, mid-dense to lax, inclined; glumes glabrous, yellowish brown, mid-long, narrow; shoulders wanting to narrow, oblique; beaks 1 to 5 mm long; awns 3 to 7 cm long; kernels white, mid-long, soft to semihard, ovate; germ mid-sized; crease narrow to mid-wide, shallow; cheeks usually angular; brush mid-sized, short.

*History.*—Emerald (reg. no. 163) was obtained by the Nebraska Agricultural Experiment Station in 1913 from C. N. Schmale, a farmer living near Emerald, Nebr., as Early Spring wheat. Its previous history is undetermined, but it was named Emerald in 1922.

*Distribution.*—Estimated area in 1924, 1,610 acres, grown as Early Spring, in Nebraska. It was not reported in 1929.

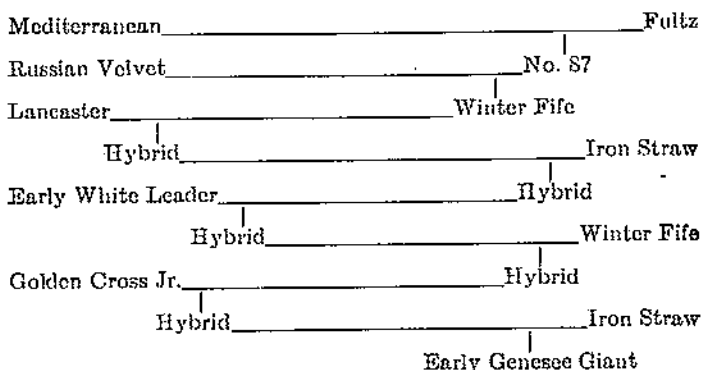
*Synonym.*—Early Spring.

#### GENESEE GIANT

*Description.*—Plant winter habit, midseason, short to mid-tall; stem purple, very strong; spike awned, clavate, dense, erect; glumes glabrous, brown, mid-long, wide; shoulders narrow, usually rounded; beaks 2 to 12 mm long; awns 3 to 7 cm long; kernels white, short, semihard to hard, oval; germ mid-sized; crease mid-wide, mid-deep; cheeks usually rounded; brush mid-sized, mid-long; kernels produced in upper end of spikes resemble club wheat.

This variety is distinct in having a clavate spike and hard white kernels.

*History.*—Genesee Giant (reg. no. 164) was first distributed by A. N. Jones, of Newark, Wayne County, N.Y., the originator, in 1893. It was advertised by Peter Henderson & Co., seedsmen, of New York, in 1894, and described elaborately and recommended highly by them. It is the result of a composite cross that has been recorded by Carleton (50, p. 71), as follows:



Pedigree Giant is a wheat similar to Genesee Giant obtained from the Idaho Agricultural Experiment Station in 1912. A wheat was distributed by A. N. Jones as Pedigree Genesee Giant in 1894, the year following the distribution of Genesee Giant. This doubtless accounts for this name. It is possible that the original Genesee Giant was somewhat mixed and a pure strain was distributed later.

*Distribution.*—Estimated area in 1929, 449 acres in Ohio. In 1919 it was grown on 1,600 acres in Davis and Weber Counties, Utah.

*Synonyms.*—Early Genesee Giant, Farmers Trust, Genesee, Giant Square-head, Golden Cross, Pedigree Giant.

## CANADIAN RED

*Description.*—Plant spring habit, early, short; stem white, slender, weak; spike awned, oblong-fusiform, mid-dense, inclined; glumes glabrous, brown, long, mid-wide; shoulders mid-wide, oblique to elevated; beaks 2 to 20 mm long; awns 2 to 6 cm long; kernels white, midlong, semihard to hard, ovate, humped, curved; germ mid-sized; crease mid-wide, shallow to mid-deep; cheeks rounded; brush small, short.

*History.*—The origin of Canadian Red (reg. no. 165) is undetermined. It was obtained in July 1919 from F. G. Stokes, of Kelseyville, Calif., who reported that it constituted 15 percent of the wheat grown in the vicinity of Kelseyville, Lake County, Calif.

*Distribution.*—Grown in Lake County, Calif., in 1919. It was not reported in 1924 or 1929, but was reported from Douglas County, Wash., in 1932.

*Synonym.*—Canadian Spring.

## LONGBERRY NO. 1

*Description.*—Plant winter habit, midseason, tall; stem white, mid-strong; spike awned, oblong-fusiform, mid-dense, inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders wanting to narrow, usually rounded; beaks 3 to 10 mm long; awns 3 to 7 cm long; kernels white, mid-long to long, soft, ovate, curved; germ small to mid-sized; crease mid-wide, mid-deep, pitted; cheeks rounded; brush mid-sized, mid-long to long.

*History.*—Longberry No. 1 (reg. no. 166) was originated by A. N. Jones (127) at Newark, Wayne County, N.Y. Concerning its origin he has written as follows:

"This Amber Longberry wheat, sent out in bulk in 1898 has proved to be one of great value in all sections. Originating from a cross seedling, parentage of which came from a cross between Mediterranean and Russian Velvet."

*Distribution.*—Estimated area in 1929, 1,193 acres in Kentucky and Pennsylvania.

*Synonyms.*—Jones Longberry, Jones Longberry No. 1.

## SEVIER

*Description.*—Plant spring habit, midseason, mid-tall; stem white, slender, weak to mid-strong; spike awned, somewhat laterally compressed, oblong, dense, erect to inclined; glumes glabrous, light brown, mid-long, mid-wide; shoulders mid-wide, oblique; beaks 1 to 3 mm long; awns 2 to 6 cm long; kernels white, mid-long, hard, ovate, humped; germ mid-sized; crease mid-wide, shallow; cheeks angular; brush mid-sized, mid-long.

This variety is not pure as commercially grown. It is very distinct and peculiar, as it represents nearly an intermediate form between common and durum wheat, and for that reason also somewhat resembles pouliard wheat. It has the laterally compressed spike, sharply keeled glumes, and large, hard kernels of durum and the short, hollow stem, short awns, and mid-long brush of common wheat.

*History.*—The origin of Sevier (reg. no. 168) is undetermined. It may be the result of a natural field hybrid between common and durum wheat. It was first noted to be commercially grown in Utah by Stewart (203, p. 165) in the summer of 1918 and first listed as Kubanka durum wheat. Samples were obtained by the writers from Mr. Stewart and from the Federal Board of Review, Chicago, Ill., and the wheat was found not to be Kubanka and was also determined to be more nearly a common than a durum wheat. As the variety had been grown in Sevier County, Utah, for 25 years or more, it was named Sevier by Stewart (204, p. 25).

*Distribution.*—Estimated area in 1929, 2,872 acres, all in Utah.

## DURUM-MEDITERRANEAN

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem white, mid-strong; spike awned, fusiform, mid-dense, inclined to nodding; glumes glabrous, brown, mid-long, mid-wide; shoulders narrow to mid-wide, rounded to elevated; beaks 1 to 8 mm long; awns 3 to 8 cm long; kernels pale red, mid-long, soft, ovate to elliptical; germ mid-sized; crease narrow to mid-wide, mid-deep; cheeks usually rounded; brush mid-sized, mid-long to long.

**Diehl-Mediterranean** differs from Mediterranean principally in having white straw and a smaller kernel. A spike, glumes, and kernels of Diehl-Mediterranean wheat are shown in plate 35, A.

**History.**—Diehl-Mediterranean (reg. no. 169) was advertised and distributed by Peter Henderson & Co., seedsmen, of New York City, for the first time in 1884, and is said by them to have originated by fertilizing the Red Mediterranean with the pollen of the Diehl (110, 1884). The same history is given in an article in the Rural New Yorker of the same year, in which it is also said that the variety was originated in Monroe County, N.Y., but by whom was not noted (13). The Diehl wheat was a white-kernelled variety with a clavate spike, probably similar to Seneca Chief. During the late eighties Diehl-Mediterranean was distributed widely by the United States Department of Agriculture in the congressional seed distribution.

**Distribution.**—Estimated area in 1929, 36,053 acres, in Illinois, Indiana, Kansas, Michigan, North Carolina, Ohio, Oklahoma, Tennessee, Virginia.

**Synonyms.**—Auburn, Big Four, Big Ten, Blue Ridge, Eclipse, Hybrid Mediterranean, Michigan Bronze, Michigan Brown, Miller's Choice, Rattle Jack, Russian Amber, Shepherd's Perfection, Shepherd's Prolific, Spade.

#### RUSSIAN

**Description.**—Plant winter habit, midseason to late, mid-tall; stem white, strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, brown, mid-long, narrow; shoulders wanting to narrow, rounded to elevated; beaks 2 to 10 mm long; awns 3 to 8 cm long, sometimes black; kernels red, mid-long, semihard, ovate to elliptical; germ small; crease mid-wide, shallow to mid-deep; cheeks rounded to angular; brush mid-sized, mid-long to long.

Russian differs from Diehl-Mediterranean principally in being later and shorter and in having narrower and darker colored glumes and, under some conditions, black awns.

**History.**—Russian (reg. no. 170) was obtained from the Virginia Agricultural Experiment Station, Blacksburg, Va., in 1917. Its origin is undetermined. It is slightly different from Russian Amber listed as a synonym of Diehl-Mediterranean and also different from any other wheat grown in the United States under the name of Russian.

**Distribution.**—Estimated area in 1929, 17,051 acres, in Indiana, Kentucky, Michigan, Ohio, and Pennsylvania.

#### IMPERIAL AMBER

**Description.**—Plant winter habit, midseason, mid-tall; stem usually white, sometimes faintly purple on lower internodes, mid-strong; spike awned, broadly fusiform, mid-dense, inclined; glumes glabrous, brown, long, mid-wide; shoulders wanting to narrow, rounded to oblique; beaks 3 to 25 mm long; awns 2 to 8 cm long; kernels red, mid-long, soft, ovate to elliptical; germ small to mid-sized; crease mid-wide, mid-deep to deep, pitted; cheeks usually rounded; brush mid-sized, mid-long.

Imperial Amber differs from Diehl-Mediterranean principally in having longer glumes and beaks.

**History.**—The origin of Imperial Amber (reg. no. 171) is undetermined. Several samples have been obtained from the Missouri and Indiana Agricultural Experiment Stations. The samples have varied slightly in length of beak and other minor characters. The strain above described is a selection (C.I. 5338) made by C. E. Leighty at the Arlington Experiment Farm, Rosslyn, Va., from a bulk sample obtained from the Missouri Agricultural Experiment Station in 1913.

**Distribution.**—Estimated area in 1929, 217 acres, all in Arkansas.

**Synonyms.**—Davidson, Farmers Trust.

#### GOENS

**Description.**—Plant winter habit, early to midseason, mid-tall to tall; stem faintly purple, strong; spike awned, fusiform, mid-dense, inclined, easily shattered; glumes glabrous, brown, mid-long to long, mid-wide; shoulders narrow, usually oblique; beaks 1 to 3 mm long; awns 2 to 7 cm long; kernels red, mid-long, soft, ovate; germ mid-sized to large; crease mid-wide, mid-deep to deep, sometimes pitted; cheeks usually rounded; brush mid-sized, mid-long.

Goens differs from Diehl-Mediterranean principally in being earlier and in having purple straw, more easily shattered spikes, and shorter beaks. A spike, glumes, and kernels of Goens are shown in plate 35, B.

**History.**—Goens (reg. no. 172), under the names Red Chaff and Red Chaff Bearded, has long been known in the United States. According to Klippart, in 1857 (133, p. 739) this wheat was "cultivated in Clermont County, Ohio, for upward of 50 years." He further states that the origin of the name Goens is undetermined. It "was introduced into Muskingum County (Ohio) by John Dent in 1808." The Red Chaff wheat mentioned above, however, may be only the Mediterranean variety, as Goens has been said to be a cross between Mediterranean and Gipsy made by a man named Goens in Ohio and afterwards developed by his son. Concerning the introduction of the variety into Shelby County, Ind., Russell G. East, county agent, Shelbyville, Ind., has written as follows:

"Answering your inquiry regarding Shelby Red Chaff wheat. The year 1887 a man named Hall living at Fountaintown, in this county, purchased a carload of seed wheat in Paulding County, Ohio. From this start this variety has become the common variety grown throughout the county and has been known locally as Hall, Red Hall, Red Chaff, and Red Chaff Bearded."

The names Going and Owen are commonly used on Ohio farms for Goens. Hall and Red Hall are names used for a wheat identical with Goens in Indiana, particularly in Hancock and Shelby Counties, where it has been grown for 20 to 25 years. According to J. E. Barrett, of Fortville, Ind., the variety was named Hall for J. M. Hall, the man who first took the wheat into Hancock County. Red Chaff and Red Chaff Bearded, as indicated above, are old names now most commonly used for Goens wheat in Indiana, Ohio, and Illinois. Red Chaff was reported from several other States, but, as this name is used also for other varieties, the distribution of Goens wheat as Red Chaff cannot be definitely determined. Shelby Red Chaff is the name adopted by the farm bureau executive board of Shelby County, Ind.

**Distribution.**—Estimated area in 1929, 24,930 acres, in Ohio, Indiana, and Michigan.

**Synonyms.**—Baldwin, Cummings, Dunlap, Dunlop, Going, Hall, Miller's Pride, Owen, Red Chaff, Red Chaff Bearded, Red Hall, Shelby Red Chaff.

#### IOBREED

**Description.**—Plant winter habit, midseason to late, mid-tall to tall; stem white, mid-strong to strong; spike awned, fusiform, mid-dense, erect to inclined, easily shattered; glumes glabrous, brown, mid-long, narrow to mid-wide; shoulders narrow to mid-wide, rounded to elevated; beaks 2 to 10 mm long; awns 3 to 8 cm long; kernels red, short, hard, ovate; germ mid-sized; crease mid-wide, mid-deep; brush mid-sized, mid-long.

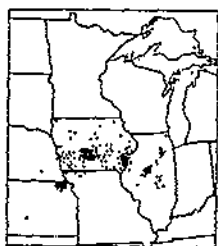


FIGURE 66.—Distribution of Iobred wheat in 1929. Estimated area, 107,892 acres.

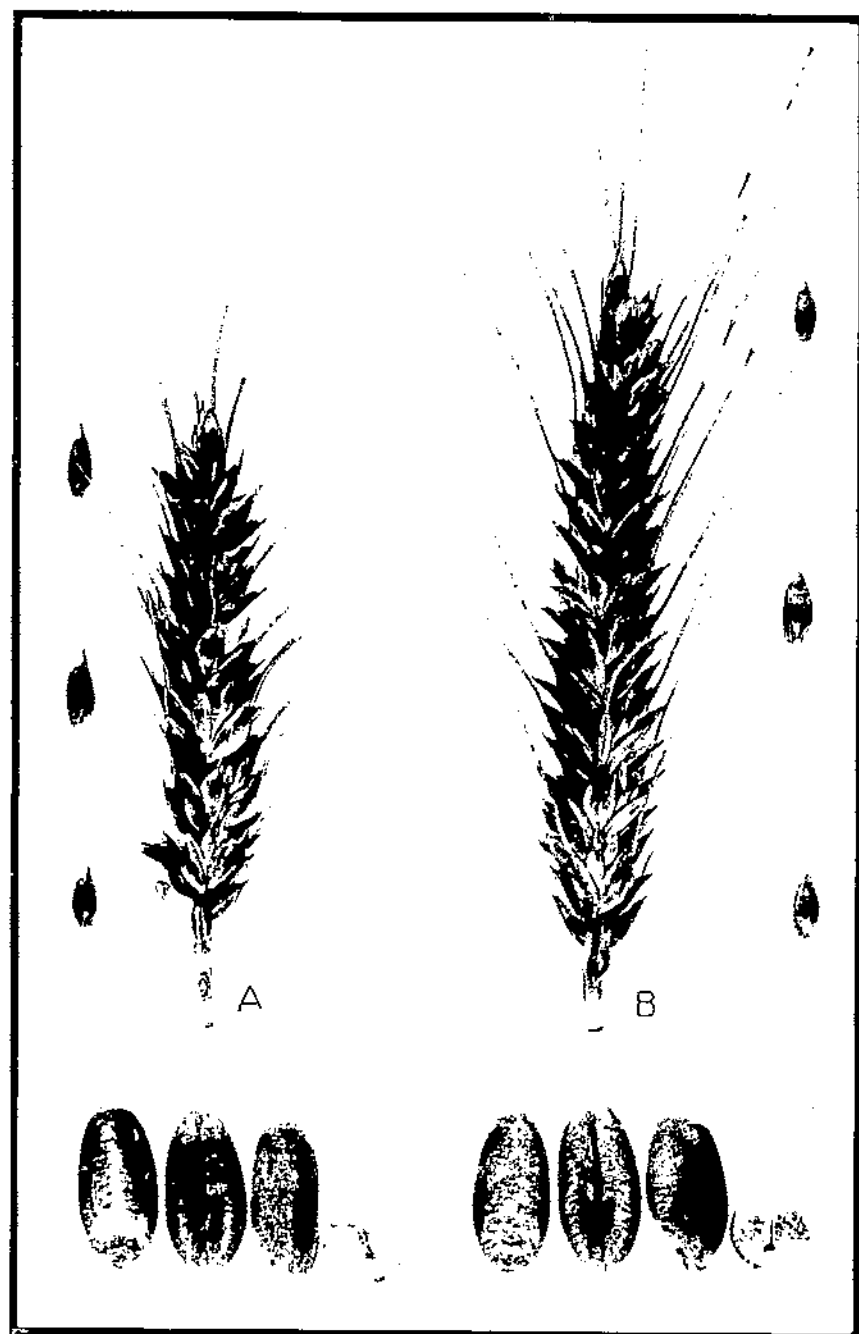
**History.**—Iobred (reg. no. 236) was produced at the Iowa Agricultural Experiment Station, Ames, Iowa, in cooperation with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. It is a selection of Bunat (Iowa No. 1661) made in 1915 by L. C. Burnett. It was first distributed for commercial growing in 1923. It was registered (58) as an improved variety in 1926. The superior characters of Iobred for Iowa conditions are winter hardiness, strong straw, and high quality. Under dry conditions, or if allowed to stand too long, the grain shatters badly.

**Distribution.**—Estimated area in 1929, 107,892 acres, grown in five States, as shown in figure 66.

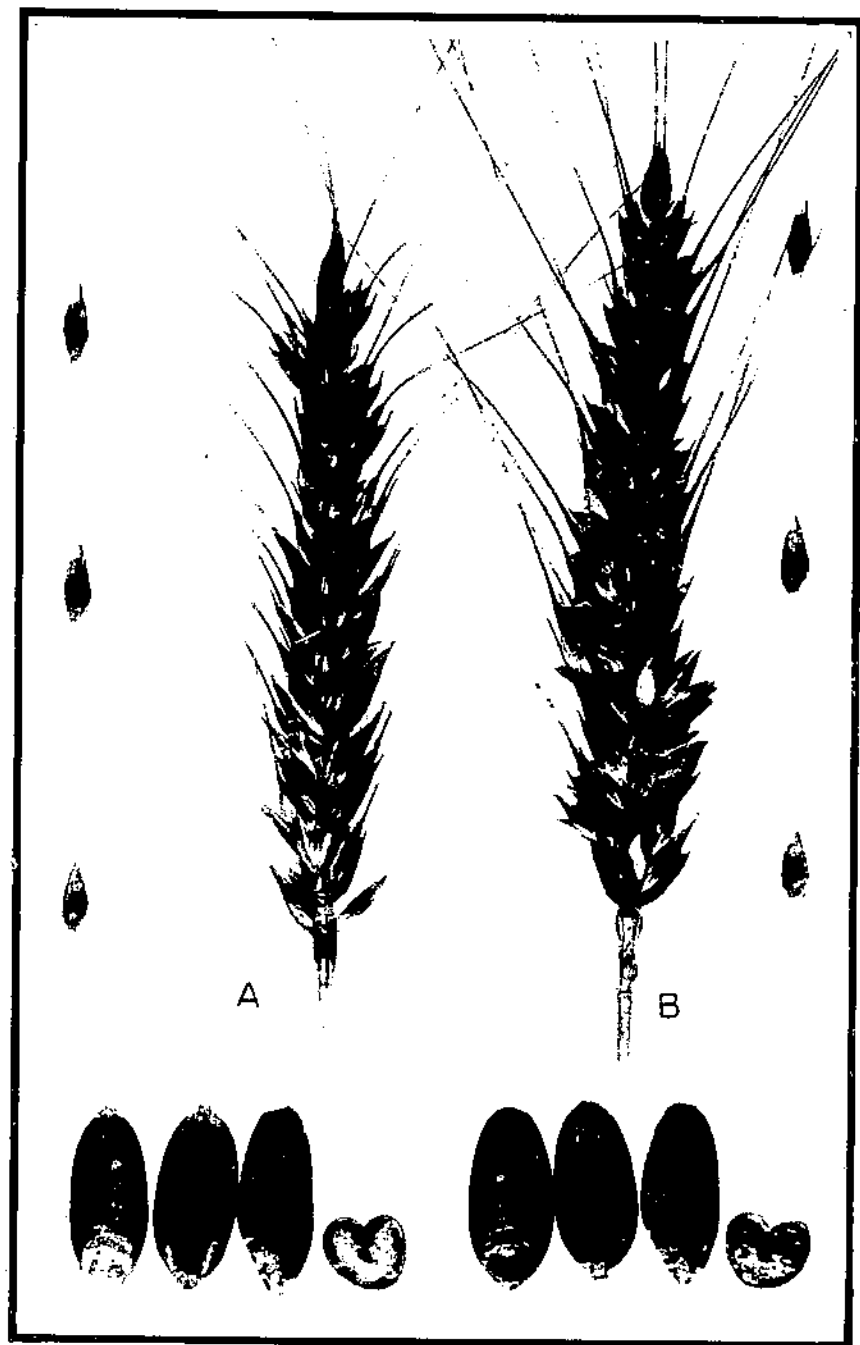
#### ASHKOF

**Description.**—Plant winter habit, mid-tall to tall; stem white, mid-strong to strong; spike awned, fusiform, mid-dense to lax, inclined to nodding, easily shattered; glumes light brown, sometimes black striped, mid-long, narrow to mid-wide; shoulders wanting to narrow, rounded to elevated; beaks 1 to 5 mm

= Correspondence of the Division of Cereal Crops and Diseases. Mar. 1, 1922.



Dahl-Mediterranean (A) and Goens (B) wheats. Spikes and glumes natural size, kernels  $\times 3$



Mediterranean (*A*) and Red Rock (*B*) wheats. spikes and glumes natural size; kernels  $\times 4$ .

long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate; germ small; crease mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

Ashkof is resistant to several forms of hant.

*History.*—Ashkof (reg. no. 235) was developed at the Ashland Branch Station of the Wisconsin Agricultural Experiment Station. It is a selection from Malakof made by E. J. Delwiche in 1911. Ashkof is similar to the Hungarian type of hard red winter wheat except that the glumes are brown. It more closely resembles Pesterboden than Turkey. It was registered in 1926 (58). Its superior characters being winter hardiness and high yield. It was first distributed for commercial growing in the fall of 1923.

*Distribution.*—Estimated area in 1929, 1,382 acres, all in Wisconsin.

#### ENID

*Description.*—Plant winter habit, midseason, mid-tall; stem white and purple mixed, weak to mid-strong; spike awned, fusiform, mid-dense, inclined to nodding; glumes glabrous, brown, mid-long, narrow to mid-wide, rounded to oblique; beaks 2 to 10 mm long; awns 3 to 8 cm long; kernels red, mid-long, hard, ovate; germ mid-sized; crease mid-wide to wide, mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

*History.*—Enid wheat was developed from a brown-glumed plant selected in a field of Turkey wheat by Walter Krienke, near Enid, Okla.

"Walter found several heads in the field with the hull red and the straw was stronger and the heads were much larger; so he took these few heads and threshed them with his hands and then took the seed and planted them on a little spot of ground where there was no other wheat. He kept that up until he had enough seed to sow the whole field with the red-hulled wheat, and now most of the farmers here are planting it as it does better than most any other kind."<sup>22</sup>

It was grown widely in Garfield County, Okla., in 1932.

*Distribution.*—Grown in Oklahoma since 1930.

*Synonym.*—Enid Strain.

#### REDHULL

*Description.*—Redhull is a mixed type of hard red winter wheat as commercially grown. The predominating type is awned and has brown glumes with black stripes.

*History.*—Redhull is reported to have been developed from a brown-glumed selection from a field of Blackhull at Haven, Kans., by F. E. Tonn in 1921.<sup>23</sup> Seed was increased and sold by R. M. Woodruff of Pratt, Kans.

*Distribution.*—Estimated area in 1929, 7,255 acres, in Kansas and Oklahoma.

#### LADOGA

*Description.*—Plant spring habit, midseason, mid-tall to tall; stem faintly purple on lower internodes, mid-strong; spike awned, fusiform, mid-dense, inclined to nodding; glumes glabrous, brown, short to mid-long, narrow; shoulders narrow, usually rounded; beaks variable; awns 2 to 9 cm long; kernels red, mid-long, hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks usually angular; brush small, mid-long.

All commercial samples of Ladoga wheat are variable in beak length, as stated, ranging from 1 to 5 mm to as long as 3 to 25 mm. A selection obtained from C. E. Saunders, of Ottawa, Canada, has beaks only 1 to 2 mm long.

*History.*—Ladoga (reg. no. 177) wheat was introduced into Canada from Russia, where it was grown in latitude 60° N., near Lake Ladoga, north of Leningrad, about 1888. It was sent by the Canadian Department of Agriculture to several hundred farmers in northwestern Canada from 1888 to 1903, in the hope that it would provide a wheat ripening earlier than Red Fife (180). By 1903, milling and baking tests had shown that the variety was of poor quality, and its further distribution was not encouraged. Spring Turkey is the name used for wheat apparently identical with Ladoga, which is grown both as mixtures and pure in Montana and Wyoming. The writers are of the opinion that this is the Ladoga variety.

<sup>22</sup> Letter from Fred Moehle, route 1, Enid, Okla., dated Mar. 17, 1934.

<sup>23</sup> Woodruff, R. M. 23-page pamphlet on wheat varieties. No date, Pratt, Kans.



*Distribution.*—Estimated area in 1929, 9,533 acres, grown mostly under the name Spring Turkey in Montana and Wyoming.

*Synonym.*—Spring Turkey.

#### SEA ISLAND

*Description.*—Sea Island is a mixed lot of wheat as commercially grown, the predominating type being similar to Ladoga, except in having more purple stems.

*History.*—Sea Island is a spring wheat that was quite commonly grown during the nineties but has largely gone out of cultivation. The origin of the variety is undetermined.

*Distribution.*—Estimated area in 1929, 8,383 acres, in Colorado, Kansas, Missouri, Iowa, Oregon, and Wyoming.

#### WHITEMAN (HURDSFIELD)

*Description.*—Plant spring habit, midseason to late, tall; stem purple, strong; spike awned, oblong to subcylindrical (common-club intermediate), very dense, erect; glumes glabrous, brown, short, mid-wide; shoulders mid-wide, rounded to elevated; beaks 3 to 25 mm long; awns 2 to 6 cm long; kernels red, short, semihard to hard, ovate to elliptical; germ small to mid-sized; crease wide, deep; brush mid-sized, short.

*History.*—Whiteman is said to have been developed by Clyde Whiteman, near Hardsfield, N.Dak., by "planting alternate rows of Marquis and Preston with the idea of getting some hybrids." Mr. Whiteman distributed seed of the variety in 1927. It appears to be the result of a cross between a common and a club wheat and resembles the intermediate or  $P_1$  type of plant.

*Distribution.*—Estimated area in 1929, 3,532 acres, in Mountrail and Wells Counties, N.Dak.

*Synonym.*—Hardsfield.

#### DENTON

*Description.*—Denton differs from Mediterranean principally in having white stems. It is taller, has stiffer stems and a denser spike, and is resistant to leaf rust.

*History.*—Denton (reg. no. 255) was developed (1939) by the Texas Agricultural Experiment Station at substation no. 6, Denton, as a plant selection from Mediterranean. The selection was made in 1918, at which time A. H. Leidigh was agronomist and C. H. McDowell superintendent of the substation. The variety was distributed for commercial growing in 1926 and was registered (63) in 1927, because of its high yields in experiments at Denton and its resistance to leaf rust and because its stems were stronger than those of Mediterranean.

*Distribution.*—Estimated area in 1929, 10,270 acres, in Texas and Oklahoma.

#### MEDITERRANEAN

*Description.*—Plant winter habit, midseason, tall; stem purple, mid-strong to strong, coarse; spike awned, fusiform, mid-dense to lax, erect to inclined, easily shattered; glumes glabrous, brown, long, mid-wide; shoulders wanting to narrow, rounded to oblique; beaks 1 to 8 mm long; awns 3 to 8 cm long; kernels red, long, soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

A spike, glumes, and kernels of Mediterranean are shown in plate 26, A.

*History.*—Reference to the Mediterranean (reg. no. 180) variety in American literature begins in 1842, when the variety was widely grown, with the statement that it had been introduced some years before. One writer says (103, p. 228) it was introduced into Maryland from the Mediterranean Sea region in 1837. In 1863 it was recorded (143, p. 507) that it was introduced in 1819 from Genoa, Italy, by John Gordon, of Wilmington, Del. It came into prominence in New York between 1845 and 1855, from which time its culture spread rapidly westward. Its early popularity apparently was gained because it was more resistant to Hessian-fly damage than other varieties. It was found also to be several days earlier than the winter wheats commonly grown at that time, such as Bluestem, Red Bluestem, Golden Straw, and others. It was called rust resistant probably because of its earliness, and was commended as a high yielder of especially heavy grain and adapted to poorer soils than

most varieties. White wheats being the standard, it was vigorously criticized, especially by millers, because its red kernels yielded a dark flour and because of the thickness of the bran. This disapproval persisted for at least 25 years, but after the introduction of roller mills it became recognized as a good milling wheat. In the earlier years it became known under many different names, as Bearded Mediterranean, Red Mediterranean, and Red Chaff Mediterranean, to distinguish it from other and different varieties to which the name Mediterranean became attached. Other synonyms were Columbian and Quaker in Pennsylvania and German in Maryland. These names apparently now have gone out of use. Other names are frequently used for the variety. The early confusion in names probably was the result of repeated introductions.

**Distribution.**—Estimated area in 1929, 542,793 acres. This acreage was reported from 20 States, Texas, Oklahoma, Illinois, and Missouri leading in acreage (fig. 67). The acreage decreased from 2,770,100 acres in 1919 to 509,967 acres in 1924.

**Synonyms.**—Acme, Bluestem, Farmers Trust, Great Western, Key's Prolific, Lancaster Red, Lehigh, Miller, Miller's Pride, Missouri Bluestem, Mortgage Lifter, Red Chaff, Red Sen, Red Top, Rocky Mountain, Standby, Swamp.

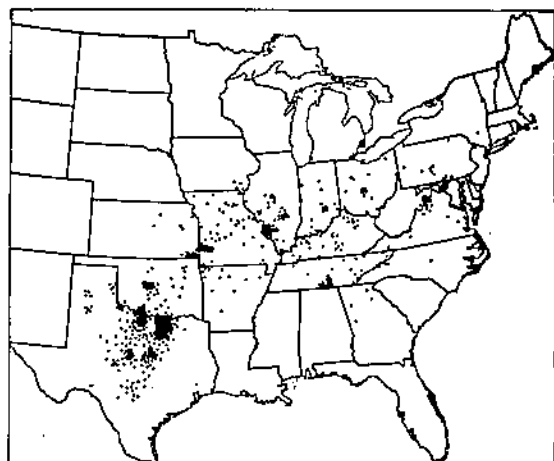


FIGURE 67. —Distribution of Mediterranean wheat in 1929. Estimated area, 542,793 acres.

#### RED ROCK

**Description.**—Red Rock is similar to Mediterranean except for a slightly longer, wider, and laxer spike and a harder kernel having a wider and deeper crease. It yields better than Mediterranean in Michigan and is superior to it for milling and breadmaking.

A spike, glumes, and kernels of Red Rock are shown in plate 36, B.

**History.**—Red Rock (reg. no. 181) was originated at the Michigan Agricultural Experiment Station from an individual kernel picked out of a white wheat called Plymouth Rock. The selection was first sown in the fall of 1908. By 1914, 60 bushels were sent out by the experiment station to as many farmers, 1 bushel being furnished each farmer. In 1915, 69 bushels were distributed in the same way. It is estimated that in the fall of 1915, 1,000 bushels of Red Rock wheat were sown in various parts of Michigan (200, p. 2).

**Distribution.**—Estimated area in 1929, 261,246 acres, grown in 12 States, as shown in figure 68, 87 percent of the acreage being reported from Michigan.

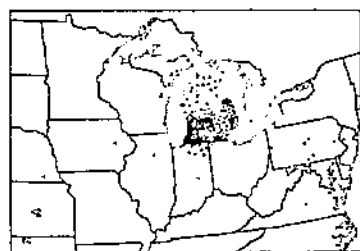


FIGURE 68. —Distribution of Red Rock wheat in 1929. Estimated area, 261,246 acres.

#### BERKELEY ROCK

**Description.**—Plant winter habit, late, tall; stem purple, mid-strong; spike awned, linear-fusiform; mid-dense, inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders wanting to mid-wide, rounded to elevated; beaks 1 to 2

mm long; awns 3 to 8 cm long; kernels red, mid-long, semihard, ovate to elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush large, mid-long.

Berkeley Rock differs from Red Rock in being taller and in having shorter beaks and harder kernels. It is resistant to bunt.

*History.*—Berkeley Rock was developed (81) at the Michigan Agricultural Experiment Station by F. A. Spragg from a cross between Red Rock and Berkeley (Turkey) made in 1912. The selection later named Berkeley Rock was made in 1915 and seed was distributed for commercial growing in 1922.

*Distribution.*—Estimated area in 1929, 17,433 acres, in Michigan and Pennsylvania.

#### HYPER

*Description.*—Plant spring habit, early to midseason, short to mid-tall; stem white, mid-strong to strong; spike awned, oblong, dense, erect to inclined; glumes pubescent, white, short, mid-wide; shoulders wanting to mid-wide, rounded to elevated; beaks 3 to 25 mm long; awns black, 2 to 6 cm long; kernels white, mid-long, soft to semihard, ovate; germ small to mid-sized; crease mid-wide to wide, mid-deep; cheeks rounded; brush mid-large, mid-long.

*History.*—Hyper was developed by S. C. Andrews, a farmer living near Ephrata, Wash. In a letter, Mr. Andrews gave the following account of its origin:

"I found one stool of three heads of this wheat the season of 1924 in a field of (Pacific) Bluestem. The Bluestem was badly dried up with hot winds. These three heads were undamaged, and that is the outstanding characteristic of this wheat. \* \* \* In point of yield Hyper has proven superior to Baart only when wheat ripens up with a hot wind."

The earliness, pubescent glumes, and black awns suggest that Prelude may have been one parent.

*Distribution.*—Grown in Grant County, Wash., since 1929.

#### KRUSE

*Description.*—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awned, oblong, mid-dense to dense, erect to inclined; glumes pubescent, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks 1 to 3 mm long; awns 3 to 6 cm long; kernels red, mid-long, soft to semihard, oval; germ mid-sized; crease wide, deep; cheeks angular; brush small, mid-long.

Kruse is resistant to some forms of bunt.

*History.*—Kruse wheat was selected by Herman Kruse, of Berea, Mont., from a field of Kanred in 1922. The selection was increased but never did well in Montana chiefly because of lack of winter hardiness. In 1925 a ¼-pound sample was sent to a brother, F. C. Kruse, Benson Station, Omaha, Nebr. The variety was increased until the fall of 1929, when it was offered for sale. At this time some 648 bushels were available. The variety was popular with some growers because of its large heads and stiff straw. It is possible that Kruse wheat is the result of a field hybrid between Jones Pife and Kanred.

*Distribution.*—Grown in Nebraska since 1930.

#### QUIVIRA

*Description.*—Plant winter habit, early, mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense to dense, inclined to nodding, easily shattered; glumes pubescent, white, mid-long, mid-wide; shoulders narrow, wanting to square; beaks 2 to 8 mm long; awns 3 to 6 cm long, sometimes black; kernels red, mid-long, hard, ovate; germ small; crease mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

*History.*—Quivira (reg. no. 273) was produced from a hybrid between Prelude (female) × Kanred (male). The cross was made by V. H. Florell in 1920 at the United States Plant Introduction Garden, Chico, Calif. Seed from the F<sub>1</sub> plants was sent to the Kansas Agricultural Experiment Station, Manhattan, Kans., for fall seeding in 1921. Selections were made at Manhattan by J. H. Parker. The selection from which Quivira resulted was grown in an

\* Letter from S. C. Andrews, Ephrata, Wash., dated Dec. 21, 1933.

8-foot row in 1925 and in a replicated row-row nursery in 1926-27. It has been grown in plot experiments since the fall of 1928. It was registered (56) in 1932, its principal advantages being that it is from 6 to 7 days earlier than Kanred and higher yielding.

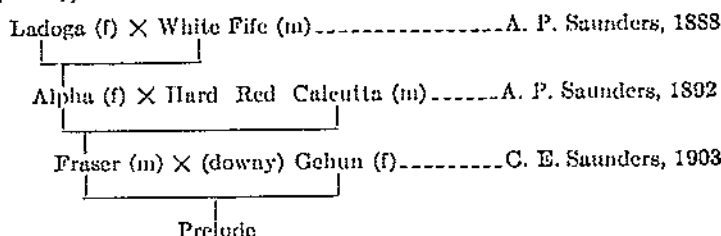
*Distribution.*—Grown in Kansas since 1933.

#### PRELUDE

*Description.*—Plant spring habit, early, short; stem usually white, sometimes faintly purple on lower internodes, mid-strong; spike awned, fusiform, mid-dense, erect, easily shattered; glumes pubescent, yellowish, mid-long, mid-wide; shoulders narrow, oblique to square; beaks 2 to 5 mm long; awns black, 2 to 5 cm long; kernels dark red, short, hard, ovate, truncate; germ mid-sized; crease mid-wide, shallow to mid-deep, triangular; cheeks angular; brush small, short.

Prelude is distinguished from other varieties by its early maturity and its black awns. It shatters easily and therefore should be harvested before it is entirely ripe. It usually is a low-yielding variety but is adapted to northern latitudes, where its earliness enables it to escape fall frosts. It also has shown to advantage in some years in experiments on the southern border of the spring-wheat sections of the Great Plains area, where early maturity is an important factor. In this area, however, winter wheat outyields spring wheat. Prelude is an excellent milling and breadmaking variety.

*History.*—Prelude (reg. no. 187) was originated by C. E. Saunders, cerealist of the Dominion Department of Agriculture, at the Central Experimental Farm, Ottawa, Canada (179, p. 118). The parentage of Prelude is shown by Buller (44, p. 186), as follows:



Prelude was first distributed in Canada in 1913. It was introduced into the United States by the United States Department of Agriculture in 1915 for experimental purposes. Prelude wheat has been distributed as Wisconsin Wonder by H. E. Krueger, of Beaver Dam, Wis. In advertising the variety Mr. Krueger claims to have originated it from a plant selected in a field of Marquis about 1910. The distribution of Wisconsin Wonder wheat dates from 1916.

*Distribution.*—Estimated area, 2,167 acres in 1929, in North Dakota and South Dakota.

*Synonym.*—Wisconsin Wonder.

#### HUMPBACK

*Description.*—Plant spring habit, late, tall; stem white, mid-strong; spike awned, fusiform, mid-dense to lax, inclined; glumes pubescent, white, long, mid-wide; shoulders usually wanting, sometimes narrow, oblique; beaks 2 to 8 mm long; awns 3 to 8 cm long; kernels pale red, mid-long to long, semihard, ovate, humped; germ large; crease mid-wide, deep, pitted; cheeks rounded to angular; brush small, long.

This variety is distinct because of its pubescent glumes and its rather large, soft kernels, which are distinctly humped. It is a very poor milling and bread-making variety.

*History.*—Humpback (reg. no. 188) was originated from field selections made by J. P. Berglund, a farmer living near Kensington, Minn. (208, p. 1). The original head probably was the result of a natural field hybrid. Two strains were developed, the first being the strain above described, which was distributed about 1905. The second has glabrous glumes, but is otherwise similar. It is described elsewhere as Dixon. Bearded Bluestem is the name by which the

variety was first distributed by Mr. Berglund, but the name Humpback soon became attached to the variety and the use of the name Bearded Bluestem largely has been discontinued.

*Distribution.*—Estimated area, 13,377 acres in 1929, of which 12,712 were reported from northwestern Nebraska and 665 from west-central Minnesota. The acreage reported as Humpback from Nebraska is thought to be largely Dixon, the glabrous-glumed Humpback, sometimes also called Ghirka.

*Synonyms.*—Bearded Bluestem, Ghirka, World Beater.

#### PENQUITE

*Description.*—Plant winter habit, midseason, mid-tall; stem purple, mid-strong; spike awned, fusiform, mid-dense, nodding, easily shattered; glumes pubescent, brown, long, mid-wide; shoulders wanting to narrow, usually oblique; beaks 1 to 2 mm long; awns 3 to 7 cm long; kernels red, mid-long, soft, ovate, humped; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush small, mid-long.

*History.*—According to Thorne (210, p. 618):

"Penquite [reg. no. 189] originated in Clinton County, Ohio, where in 1857 or 1858 Abram Penquite, while cradling in a field of wheat, noticed three heads of a different variety from the rest of the field. These he saved and propagated, and from them has come the wheat now widely known in southwestern Ohio as the Velvet Chaff."

Japanese Velvet Chaff is the name under which a wheat identical with Penquite was obtained by the United States Department of Agriculture at the Paris Exposition in 1900. It has been grown in experiments in Virginia and Maryland, but is not known to be of commercial importance.

Velvet Chaff is the name under which Penquite has been best known in Ohio since about 1880. Although the name Velvet Chaff has become generally used for the variety, it is also confused with, and used for, other varieties, and for these reasons the name Penquite is here adopted.

*Distribution.*—Estimated area, 4,049 acres in 1929, in Oklahoma and Ohio.

*Synonyms.*—Japanese Velvet Chaff, Penquite's Velvet Chaff, Velvet Chaff.

#### CLUB WHEAT

The plants of club wheat may be of either winter or spring habit and either tall or short. The stems usually are stiff and strong. The spikes usually are awnless but may be awned, and are elliptical, ob-

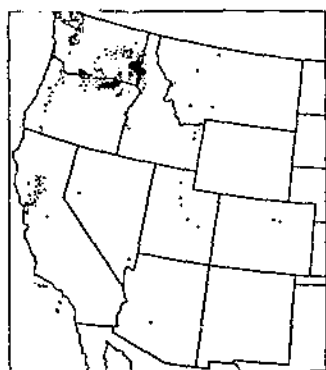


FIGURE 69.—Distribution of club wheats in 1929. Estimated area, 725,214 acres.

long, or sometimes clavate or club-shaped, short, usually less than 2½ inches in length, very compact, and laterally compressed. The spikelets usually contain five fertile florets and spread at nearly a right angle to the rachis. The glumes and lemmas are persistent, so the grain does not shatter easily when ripe. The kernels of club wheat are small and laterally compressed or "pinched" because of crowding in the compact spikes. Most club-wheat kernels have a small, short brush and a narrow, very shallow crease. The grain of most varieties is of rather poor quality for breadmaking and is used largely for biscuit and pastry flours.

The club wheats are distinguished from common wheats by the shorter and denser, laterally compressed spikes. The varieties of wheat grown in the eastern part of the United States often referred to as club because of having clavate spikes do not belong to this group, but are common wheats.

The nonshattering and stiff-strawed characters of club wheats are of much economic importance in the Pacific coast area, where they are principally grown, because in that area wheat commonly is harvested with a combined harvester long after the grain is fully ripe. Figure 69 shows the distribution of club wheats in the United States in 1929.

## KEY TO THE VARIETIES OF CLUB WHEAT

1a. SPIKE AWNLESS.		
2a. GLUMES GLABROUS.		
3a. GLUMES WHITE.		
4a. KERNELS WHITE ( <i>Triticum compactum humboldtii</i> Koern.).		
KERNELS SHORT TO MID-LONG.		
KERNELS SOFT TO SEMIHARD.		
WINTER HABIT.....	HYBRID 128...	129
INTERMEDIATE HABIT.....	ALBIT.....	130
Plant short; glumes and kernels very short.		
Spike elliptical.....	HYBRID 143...	130
SPRING HABIT.....		
Plant short, early.		
Spike oblong-ovate.....	POSO.....	131
Plant tall.		
Spike oblong-fusiform.....	LITTLE CLUB...	131
Spike elliptical-ovate.....	HIG CLUB.....	131
KERNELS SEMIHARD TO HARD.		
SPRING HABIT.....		
Spike elliptical.....	HYBRID 63...	132
4b. KERNELS RED ( <i>T. compactum wernerianum</i> Koern.).		
KERNELS SHORT TO MID-LONG.		
KERNELS SOFT TO SEMIHARD.		
SPRING HABIT.....		
Kernels semihard.....	HYBRID 123...	132
2b. GLUMES BROWN.		
4a. KERNELS WHITE ( <i>T. compactum rafutum</i> Koern.).		
KERNELS SHORT TO MID-LONG.		
KERNELS SOFT TO SEMIHARD.		
WINTER HABIT.....	GENRO.....	132
SPRING HABIT.....		
Spike oblong-fusiform; glumes dark brown.		
Spike mid-dense.....	HOOD.....	133
Spike dense.....	JENKIN.....	133
Spike clavate.		
Glumes light brown.....	REDCHAFF.....	133
Glumes bluish brown.....	BLUECHAFF.....	134
2b. GLUMES PUBESCENT.		
3a. GLUMES WHITE.		
4a. KERNELS RED ( <i>T. compactum wilmottianum</i> Koern.).		
KERNELS SHORT TO MID-LONG.		
KERNELS SOFT TO SEMIHARD.		
INTERMEDIATE HABIT.....		
Spike elliptical.....	COPPEL.....	134
1b. SPIKE AWNED.		
2a. GLUMES GLABROUS.		
3a. GLUMES BROWN.		
4a. KERNELS RED ( <i>T. compactum erinaceum</i> Koern.).		
KERNELS SHORT TO MID-LONG.		
KERNELS SOFT TO SEMIHARD.		
SPRING HABIT.....	MAYVIEW.....	134

## DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF CLUB WHEAT VARIETIES

## HYBRID 128

*Description.*—Plant winter habit, midseason, mid-tall to tall; stem white, strong; spike awnleted, elliptical, dense, erect; glumes glabrous, white, short, wide; shoulders narrow, usually rounding; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 10 mm long; kernels white, short, soft, ovate to oval, irregular, humped; germ mid-sized; crease mid-wide, shallow; checks angular; brush small, mid-long.

Hybrid 128 is a true winter wheat, high yielding, but very susceptible to bunt or stinking smut.

Spikes, glumes, and kernels of Hybrid 128 wheat are shown in plate 37, A.

*History.*—Hybrid 128 (reg. no. 190) was originated at the Washington Agricultural Experiment Station, Pullman, Wash. Its history has been recorded by Schafer and Gaines (193, p. 8) as follows:

"Hybrid 128 is a cross between Jones Winter Fife and Little Club. It was originated in 1899 by Prof. W. J. Spillman. After being selected and tested for eight years it was distributed to ranchers for further testing."

Professor Spillman started his work in wheat breeding at the Washington Agricultural Experiment Station in 1899. Valuable results were obtained, Hybrid 128 being only one of the varieties which resulted from the first crosses. The work was hardly commenced, however, before he left the institution, and the important task of making the selections, testing the many strains, and distributing the new varieties was left to other workers. His work with wheat, however, resulted in some of the very earliest discoveries of the fundamental principles of heredity in plant breeding. He left Pullman in June 1902, and it was not until 1909 that he published the results of his studies in hybridization (198). In the same year he published a more popular bulletin from the Washington Agricultural Experiment Station, which gave some of the results of his early experiments (199).

The wheat breeding at Pullman was continued by E. E. Elliott and C. W. Lawrence (85), who were largely responsible for the distribution of some of the earlier hybrid varieties, including Hybrid 128.

Since 1929 a considerable acreage of Hybrid 128 has been replaced by Albit in Whitman and Columbia Counties, Wash., and by Federation in Umatilla County, Oreg., and Walla Walla County, Wash.

*Distribution.*—Estimated area in 1929, 356,910 acres, grown in Washington, Oregon, and Idaho, as shown in figure 70.

*Synonyms.*—Washington Hybrid 128, White Hybrid.

#### ALBIT

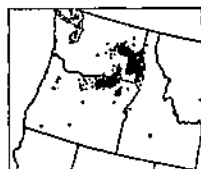


FIGURE 70.—Distribution of Hybrid 128 wheat in 1929. Estimated area, 356,910 acres.

*Description.*—Albit differs from Hybrid 128 in having slightly longer spikes, less harsh glumes, slightly longer awnlets (3 to 15 mm long), and sometimes lighter green leaves. It is resistant to some forms of bunt, is less widely adapted, and has a slightly lower test weight than Hybrid 128. Spikes, glumes, and kernels of Albit wheat are shown in plate 37, B.

*History.*—Albit (reg. no. 258) was developed by the Washington Agricultural Experiment Station from a cross made by E. F. Gaines, in 1920, between Hybrid 128 and White Odessa (C. I. 4655). The selection, later named Albit, was made in 1923 and released for commercial production in the fall of 1926. It was registered (63) as an improved variety in 1927. Because of its bunt resistance, the acreage of Albit increased rapidly in the heavier rainfall sections of the Palouse.

*Distribution.*—Estimated area in 1929, 78,190 acres, in Washington and Idaho. This distribution is shown in figure 71. Since 1929 the acreage has increased rapidly.

#### HYBRID 143

*Description.*—Plant winter intermediate habit, midseason to late, short to mid-tall; stem white, strong; spike awnleted, elliptical, dense, erect; glumes glabrous, white, short, wide; shoulders mid-wide, usually rounded; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 10 mm long; kernels white, very short, soft, ovate to oblong, humped; germ small to mid-sized; crease narrow, shallow; cheeks angular; brush very small, short to mid-long.

Hybrid 143 is distinct in having very short kernels.

*History.*—Hybrid 143 (reg. no. 193) was originated at the Washington Agricultural Experiment Station from a cross between White Track and Little Club, made by W. J. Spillman in 1899. It was first distributed in 1907 by the Washington station and has been grown both from fall and spring sowing.

The name Shot Club is sometimes used for Hybrid 143 because of its peculiar short, roundish, shotlike kernels.

*Distribution.*—The estimated area of Hybrid 143 decreased from 49,500 acres in 1919 to 10,198 in 1929, when it was reported in Nez Perce and Kootenai Counties, Idaho, and Whitman County, Wash.

*Synonyms.*—Shot Club, White Hybrid.

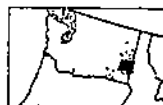


FIGURE 71.—Distribution of Albit wheat in 1929. Estimated area, 78,190 acres.

## POSO

*Description.*—Plant spring habit, early, short; stem white, strong; spike awnleted, dense, oblong to clavate; glumes glabrous, white (sometimes light brown striped), mid-long, mid-wide; shoulders mid-wide, rounded; beaks wide, obtuse, 0.5 mm long; awnlets few, 3 to 15 mm long; kernels white, short, soft, ovate, humped, truncate; germ mid-large to large; crease narrow, shallow; cheeks rounded; brush large, short.

*History.*—Poso was developed by W. W. Mackie, of the California Agricultural Experiment Station, from a cross between Little Club and Clarendon, an Australian variety of common wheat. It was distributed for growing in Solano County, Calif., in 1930.

*Distribution.*—Grown in California since 1930.

## LITTLE CLUB

*Description.*—Plant spring habit, late, mid-tall to tall; stem white, strong; spike awnleted, oblong-fusiform, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, usually rounded; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 10 mm long; kernels white, short, soft, ovate, humped, acute; germ small; crease narrow, shallow; cheeks angular to rounded; brush small, mid-long.

Little Club is distinguished from other white-glumed club varieties in having longer and more slender spikes and slender, pointed kernels.

Spikes, glumes, and kernels of Little Club wheat are shown in plate 38, A.

*History.*—The origin of Little Club (reg. no. 191) is undetermined. It was formerly believed to have been introduced from Chile, as considerable quantities of club wheat were shipped to the Pacific coast from Chile during the sixties and seventies.

It was reported grown in Yolo County, Calif., in 1878 (46, p. 339). According to Hunter (125, p. 24), Little Club probably was one of the first varieties of wheat grown in the Columbia Basin of Oregon. For years it was the leading wheat in the Palouse district and along the foothills of the Blue Mountains in Oregon.

Little Club wheat was found by Hendry (111) in the adobe walls of buildings erected during the period from 1701 to 1845 by Spanish missionaries and Mexican ranchers in Mexico, California, and Arizona, and his findings establish the introduction of this variety from Mexico through the agency of the Spanish missionaries.

*Distribution.*—The estimated area of Little Club decreased from 106,100 acres in 1919 to 17,517 acres in 1929, grown in Oregon, Washington, California, and Idaho.

*Synonym.*—Small Club.

## BIG CLUB

*Description.*—Plant spring habit, midseason, mid-tall to tall; stem white, strong; peduncle curved; spike awnleted, elliptical to clavate, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, usually rounded; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 5 mm long; kernels white, short, soft, nearly oval, humped; germ small; crease narrow, shallow; cheeks usually angular; brush small, mid-long.

Big Club differs from Little Club in having wider, shorter, and thicker spikes, curved peduncles, and wider and rounder kernels. The shape of the spike is very similar to that of Hybrid 128. Spikes, glumes, and kernels of Big Club wheat are shown in plate 38, B.

*History.*—Big Club (reg. no. 192) is reported to have been introduced into Oregon about 1870 from Chile (6). The variety was widely grown in Oregon in the seventies as Chile Club and Oregon Club. It evidently was first grown in California, for in 1866 Chile Club was reported to be "remarkably well adapted to the soil and climate" of that State (83, p. 586).

Regarding the history of Big Club, Hendry<sup>2</sup> has written as follows:

"I have found Big Club in mixture with Little Club in the adobe walls of the Spanish Mission, San Francisco de Solano, erected during the period 1824-

<sup>2</sup> Letter from G. W. Hendry, Berkeley, Calif., dated Mar. 7, 1934.



1830. Apparently Big Club existed as an Impurity in Little Club in California during the Spanish period."

Big Four is a name under which Big Club wheat is known in Idaho. Crookneck Club is a name applied to Big Club wheat because of the distinct crooks or curves that usually occur in the upper portion of the peduncle. Salt Lake Club is a name used for Big Club wheat in Utah. The name Big Club was first used for this variety about 1905 and it probably came into use to distinguish it from Little Club.

*Distribution.*—The estimated area of Big Club decreased from 21,700 acres in 1919 to 4,236 in 1929, in California, Idaho, Montana, Washington, Oregon, and Utah. The actual area may be considerably larger, as much of the 50,630 acres reported only as Club from California in 1929 is Big Club.

*Synonyms.*—Big Four, Chile Club, Crookneck Club, Montezuma Club, Oregon Club, Salt Lake Club.

#### HYBRID 63

*Description.*—Plant spring habit, midseason to late, mid-tall; stem white, strong; spike awnleted, elliptical to oblong, dense, erect; glumes glabrous, white, mid-long, narrow to mid-wide; shoulders mid-wide, usually rounded; beaks wide, obtuse, 0.5 mm long; awnlets few, 3 to 20 mm long; kernels white, short, semihard to hard, ovate to elliptical, humped; germ small; crease narrow, shallow; cheeks rounded to angular; brush small, mid-long.

This variety is winter hardy and is distinguished by its rather long narrow glumes and semihard to hard kernels.

*History.*—Hybrid 63 (reg. no. 195) was originated at the Washington Agricultural Experiment Station. It is of hybrid origin, being selected from a cross made by W. J. Spillman in 1899 between Turkey and Little Club. The variety was distributed to farmers in 1907 by the Washington station. Although it is a spring wheat, it usually has been grown from fall sowing.

*Distribution.*—Estimated area, 33,200 acres in 1919 and 11,266 acres in 1924. It was not reported in 1929. It is known, however, to be grown on a small area in Wasco County, Oreg., and Walla Walla County, Wash.

*Synonyms.*—Turkey Hybrid, White Hybrid.

#### HYBRID 123

*Description.*—Plant spring habit, midseason to late, mid-tall; stem white, strong; spike awnleted, oblong to elliptical, dense, erect; glumes glabrous, white, short, mid-wide; shoulders narrow, usually rounded; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 5 mm long; kernels red, short, soft to semihard, ovate, humped; germ small; crease mid-wide, shallow; cheeks angular; brush small, mid-long.

*History.*—Hybrid 123 (reg. no. 197) was originated at the Washington Agricultural Experiment Station from a cross between Jones Five and Little Club, made by W. J. Spillman in 1899. The variety was distributed by the Washington station in 1907, after the early trials had indicated that it was a good yielding variety.

*Distribution.*—The estimated area of Hybrid 123 increased from 28,100 acres in 1919 to 51,808 acres in 1924, but decreased to 20,053 acres in 1929, when it was reported in Whitman and Klickitat Counties, Wash., Sherman County, Oreg., and Latah County, Idaho.

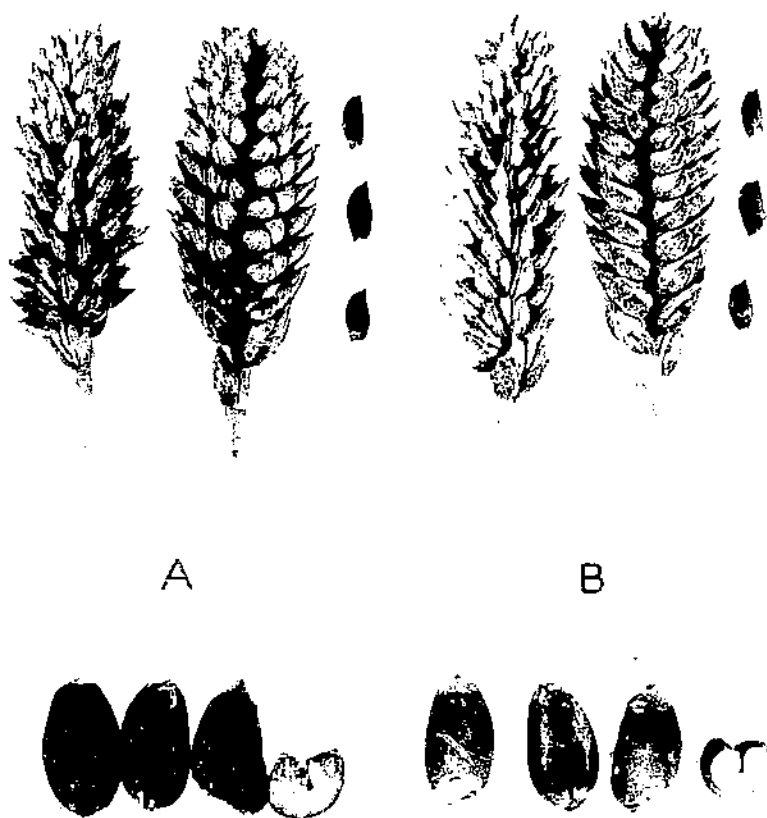
*Synonyms.*—Red Hybrid, Red Walla.

#### GENRO

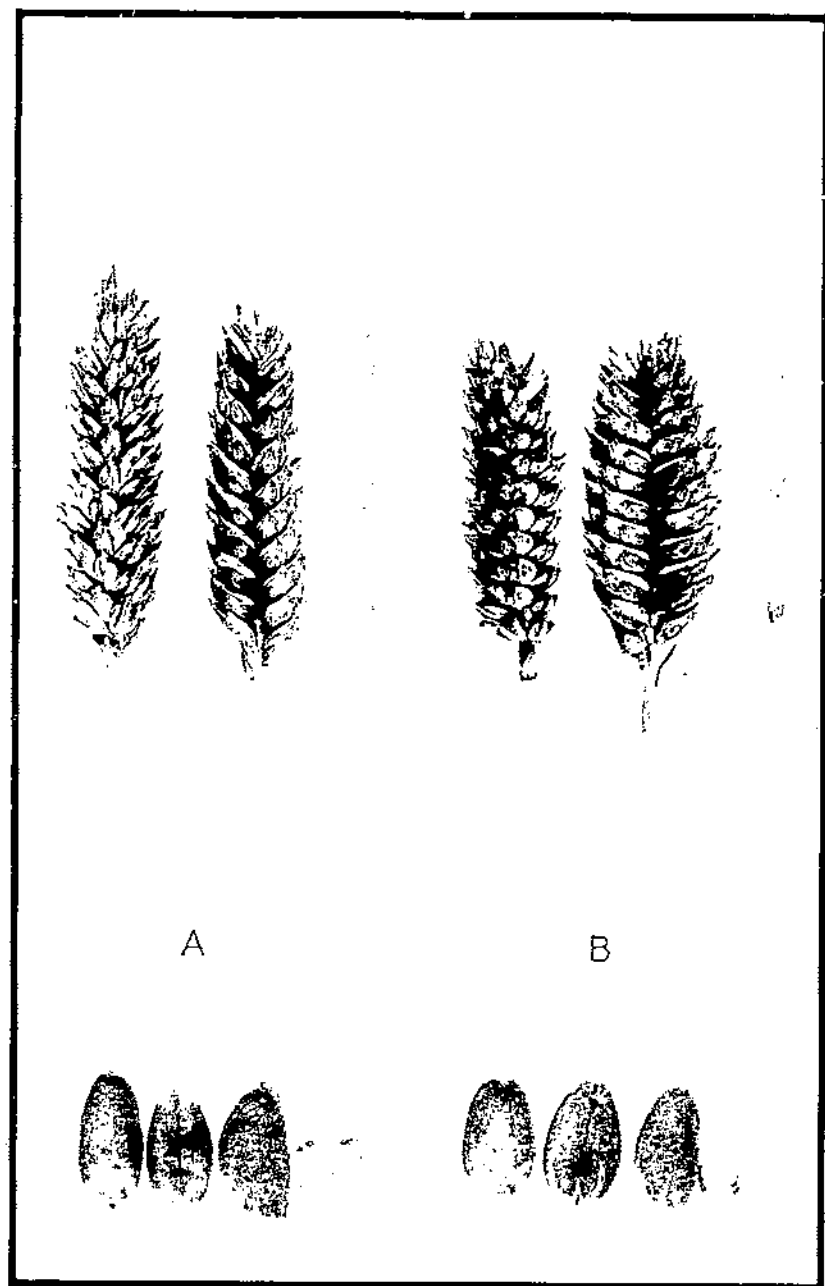
*Description.*—Plant winter habit, midseason, short; stem purple, very strong; spike awnleted, oval, very dense, erect; glumes glabrous, brown, short, mid-wide; shoulders narrow, rounded; beaks broad, obtuse, 0.5 mm long; awnlets few, 2 to 10 mm long; kernels white, short, soft, ovate, flattened; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

Genro is very susceptible to bunt and is not winter hardy.

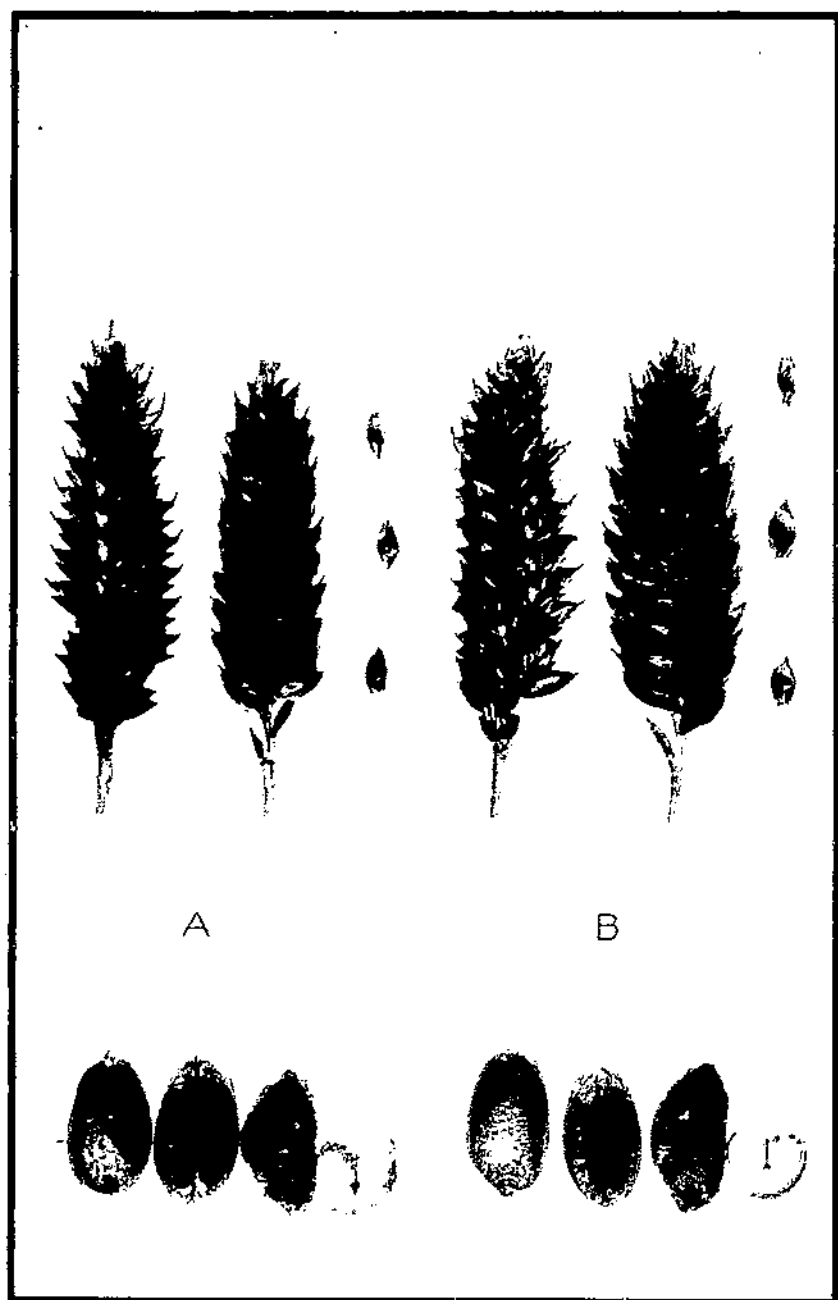
*History.*—Genro was developed by F. C. Strevey, a farmer living near Panawawa, Wash., from a single plant found in a field of Marquis in 1922. This plant was a club wheat with purple stems, brown pubescent chaff, and red



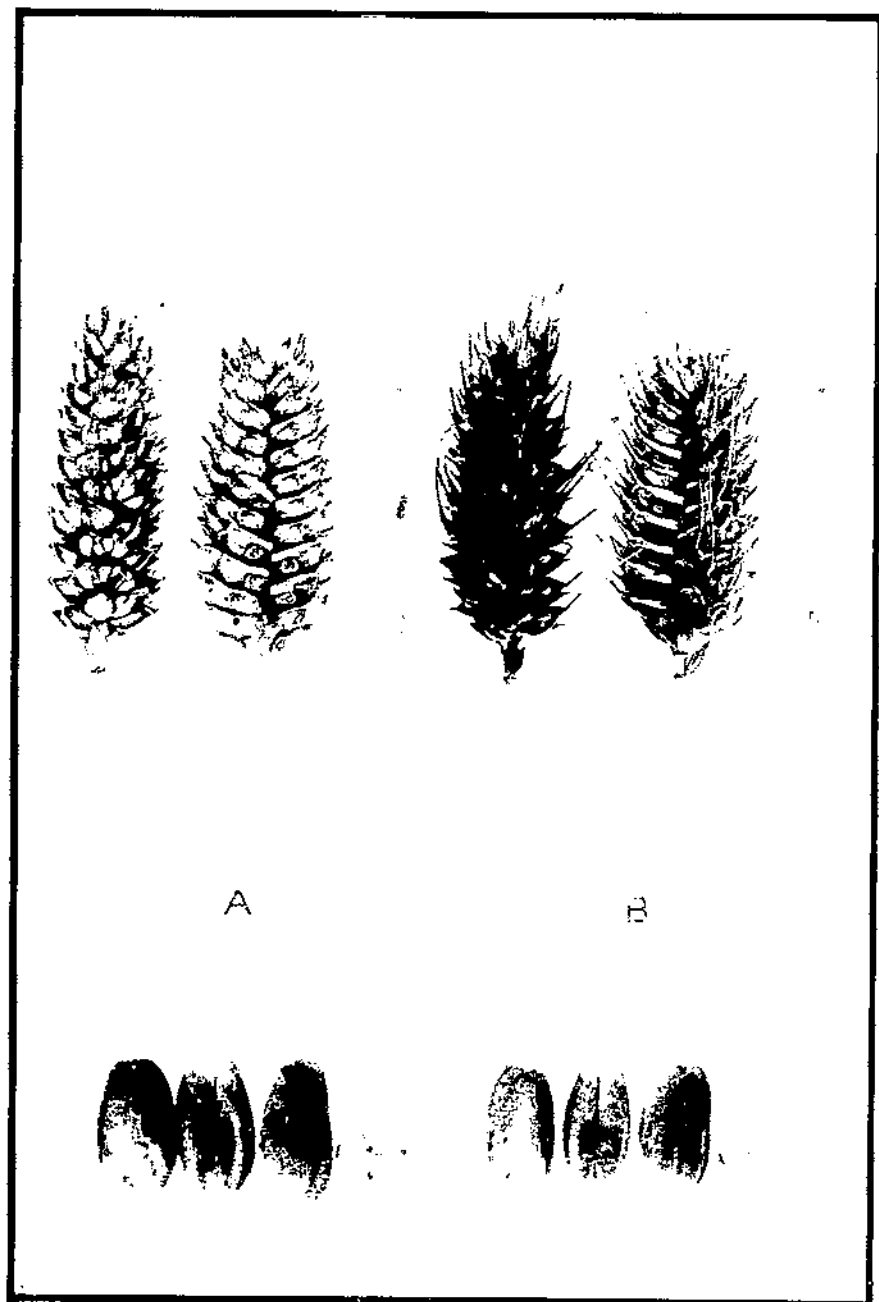
Hybrid LS-1 and Albat (*P. wheate*) spikes and glumes natural size, kernels  $\times 3$ .



Little Club (A) and Big Club (B), wheats; spikes and glumes natural size, kernels  $\times 3$ .



Jenkin (A) and Redchaff (B) wheats. Spikes and glumes natural size; kernels  $\times 3$ .



Copper (A) and Mayview (B) wheats. Spikes and glumes natural size, kernels  $\times 3$ .

grain. As suggested by Mr. Streyer, it probably was an F<sub>1</sub> between Goldcoin and Coppei, as both these types were recovered from the segregating material in 1923. After selecting the desired types one strain was increased and distributed to neighbors in 1928. It was found, however, to be segregating for chaff and stem color. A strain that had been purified was increased until about 40 acres were grown in 1932. Seed from this strain, which is the type described, was distributed.

*Distribution.*—The bulk strain has been grown since 1928 and the pure strain since 1931 in southwestern Whitman County, Wash.

## HOOD

*Description.*—Hood differs from Jenkin in being taller; it has longer and laxer spikes and more tenacious glumes and is more hardy for fall sowing. This is the tallest commercial variety of club wheat and is taller than most common wheats.

*History.*—Hood was developed by the Oregon Agricultural Experiment Station at Corvallis, Oreg., where it was found to be the best of about 175 head selections from Jenkin made in Umatilla County by G. R. Lyslop. It was distributed in western Oregon in the fall of 1920.

*Distribution.*—Grown in western Oregon since 1929.

## JENKIN

*Description.*—Plant spring habit, late, tall; stem white, strong; spike awnleted, oblong-fusiform, dense, erect; glumes glabrous, brown, mid-long, mid-wide; shoulders mid-wide, usually rounded; beaks broad, obtuse, 0.5 mm long; awnlets few, 2 to 10 mm long; kernels white, short, soft, broadly ovate, humped; germ small; crease mid-wide, mid-deep to deep, sometimes pitted; cheeks angular to rounded; brush small, mid-long.

Spikes, glumes, and kernels of Jenkin are shown in plate 39, A.

*History.*—The origin of Jenkin (reg. no. 198) is undetermined. It is known to have been grown in the vicinity of Wilbur, Lincoln County, Wash., about 1895 (126). By 1900 it was grown around Walla Walla, Wash., and Pendleton, Oreg., and during the next decade largely replaced other varieties in those sections, being grown from both fall and spring sowing. In this area Jenkin has now largely been replaced by Federation, a high-yielding common white wheat with short, stiff straw.

*Distribution.*—The estimated area of Jenkin increased from 66,500 acres in 1919 to 112,115 acres in 1924 but decreased to 92,199 acres in 1929, when it was grown in Idaho, Washington, Oregon, and Montana, as shown in figure 72.

*Synonym.*—Jenkin's Club.

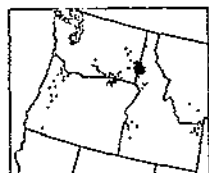


FIGURE 72.—Distribution of Jenkin wheat in 1929. Estimated area, 92,199 acres.

## REDCHAFF

*Description.*—Plant spring habit, midseason to late, mid-tall; stem white, strong; spike awnleted, clavate, dense, erect; glumes glabrous, light brown, mid-long, mid-wide; shoulders mid-wide, usually oblique; beaks wide, obtuse, 0.5 mm long; awnlets few, 2 to 10 mm long; kernels white, short, soft, ovate, humped; germ small, abrupt; crease mid-wide, shallow; cheeks usually angular; brush small, mid-long.

Redchaff differs from Jenkin in being shorter and earlier and in having a more clavate spike and lighter brown glumes. Spikes, glumes, and kernels of Redchaff are shown in plate 39, B.

*History.*—The origin of Redchaff (reg. no. 199) is undetermined. According to Hunter (125, p. 24), it was an important variety of club wheat in the Columbia Basin of Oregon and Washington in 1907.

*Distribution.*—The estimated area of Redchaff decreased from 40,000 acres in 1919 to 8,618 in 1929, when it was grown in Oregon, Nevada, Utah, and Washington.

*Synonyms.*—Oregon Red Chaff, Red Chaff Club.

## BLUECHAFF

*Description*.—Plant spring intermediate habit, late, mid-tall; stem white, strong; spike awnleted, elliptical to clavate, dense, erect; glumes glabrous, bluish brown, mid-long, mid-wide, shoulders wanting to narrow, usually rounded; beaks narrow, incurved, obtuse, 0.5 to 1 mm long; awnlets few, 3 to 15 mm long; kernels white, short to mid-long, soft, ovate, humped; germ small; crease mid-wide, shallow; cheeks angular; brush small, mid-long.

The glumes of Bluechaff have a distinct bluish tinge not observed in any other club wheats.

*History*.—The origin of Bluechaff (reg. no. 200) was recorded<sup>27</sup> by James Calvert, of Junction City, Oreg., as follows:

"My boy, A. C. Calvert, while shocking after me while I was binding, 24 years ago this harvest, found seven heads of the wheat from one stalk. It looked so much better, harder, and plumper wheat than any of the other wheat, that I took it home and planted in in the garden and hoed it the same as we did the corn, and it developed such plump heads and kernels of wheat that I kept on until the seventh year, when we raised 750 bushels of wheat."

*Distribution*.—Estimated area in 1929, 936 acres, grown in Jackson County, Oreg.

*Synonyms*.—Blue Chaff Calvert Club.

## COPPEI

*Description*.—Plant winter intermediate habit, midseason, mid-tall; stem white, strong; spike awnleted, oblong to elliptical, dense, erect; glumes pubescent, white, mid-long, mid-wide; shoulders narrow, usually oblique; beaks wide, obtuse, 0.5 to 1 mm long; awnlets several, 2 to 15 mm long; kernels red, short to mid-long, soft to semihard, ovate, humped; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded to angular; brush small, mid-long. Spikes, glumes, and kernels of Coppei wheat are shown in plate 40, A.

*History*.—Coppei (reg. no. 402) was developed by J. L. Harper, who, in the fall of 1907, selected a plant of an unknown variety found in a field of Little Club belonging to W. G. Preston, located near Coppei Creek, 3 miles south of Waitsburg, Wash. Mr. Harper saved five heads from this plant and sowed the seed from them in his garden in Waitsburg. In 1908 he threshed from this plot about a pound of wheat. This he gave to J. R. Kinder, a farmer, who increased the seed until 1911, when he distributed it to others. Mr. Harper named the variety Coppei because it came from a farm near Coppei Creek.<sup>28</sup> The variety probably is the result of a natural field cross between Little Club and Jones Fife.

*Distribution*.—The estimated area increased from 4,800 acres in 1919 to 23,754 acres in 1924 and decreased to 3,135 acres in 1929, grown in Whitman and Spokane Counties, Wash.

*Synonym*.—Coppei Club.

## MAYVIEW

*Description*.—Plant spring habit, late, mid-tall; stem usually white, sometimes faintly purple on lower internodes, strong; spike awned, elliptical to clavate, dense, erect; glumes glabrous, brown, mid-long, wide; shoulders mid-wide, usually rounded; beaks wide, incurved, 1 to 4 mm long; awns 2 to 5 cm long; kernels red, short, soft, ovate, humped, curved; germ small; crease mid-wide, shallow; cheeks usually angular; brush small, short.

This variety is distinguished by the awned spikes (pl. 40, B).

*History*.—Mayview (reg. no. 204) was found growing in the summer of 1917 in the vicinity of May View, Wash., by E. F. Gaines, of the Washington Agricultural Experiment Station, who named the variety Mayview. It originated from a plant selected in a field of Fortyfold in 1911 or 1912. Several thousand bushels were said to have been grown around May View, Wash., by 1915. Its culture has since been largely discontinued on account of its awns.

*Distribution*.—Mayview was not reported in 1919 or 1924. In 1929 it was reported grown on 322 acres in Douglas County, Oreg.

<sup>27</sup> Correspondence with Ira P. Whitney, county agricultural agent, Eugene, Oreg., dated Oct. 17, 1921.

<sup>28</sup> Correspondence from R. K. Bonnett, Idaho Agricultural Experiment Station, dated July 24, 1920.

## SPELT

Spelt may be of either winter or spring habit and awnless or awned. It has a long, narrow, lax spike and a brittle rachis. The pedicel (internode of the rachis) is long and wide, and after threshing remains attached to the face of the spikelet below the one which it bears. The spikelets are two-kerneled, arched on the inner side, and closely appressed to the rachis. The kernels, which remain enclosed in the glumes after threshing, are pale red, long, and laterally compressed, and have an acute tip and a narrow, shallow crease.

Spelt is grown commercially only to a slight extent in the United States. Most of the acreage grown is in Virginia, West Virginia, and Oregon and is of the Alstroum variety. The varieties often called "speltz" in this country are not spelt but emmer. A few varieties chiefly grown experimentally are separated in the following key:

## KEY TO THE VARIETIES OF SPELT

SPIKE AWNLESS.		
GLUMES GLABROUS.		
GLUMES WHITE ( <i>Triticum spelta album</i> AL.).		
SPRING HABIT.....	WHITE SPRING.....	135
INTERMEDIATE HABIT.....	ALSTROUM.....	135
GLUMES BROWN ( <i>T. spelta rufum</i> AL.).		
INTERMEDIATE HABIT.....	RED WINTER.....	135

## DESCRIPTION, HISTORY, AND DISTRIBUTION OF SPELT VARIETIES

## WHITE SPRING

**Description.**—Plant spring habit, late, mid-tall; stem white, strong; spike awnleted, linear-fusiform, lax, erect; glumes glabrous, white, mid-long, wide; shoulders wide, square; beaks wide, obtuse, 0.5 mm long; awnlets few, 1 to 8 mm long; kernels red, long, semihard, elliptical, humped, curved, enclosed in glumes; germ small; crease wide, shallow, pitted; cheeks angular; brush mid-sized, long.

A spike, glumes, a spikelet, and kernels of White Spring spelt are shown in plate 41, A.

**History.**—Obtained by the Department of Agriculture from J. M. Thorburn & Co., seedsmen, of New York City, in 1904. (Reg. no. 225.)

**Distribution.**—Not known to be grown commercially.

## ALSTROUM

**Description.**—Plant intermediate winter habit, late, mid-tall; stem faintly purple, strong; spike apically awnleted, linear-fusiform, lax, inclined to nodding; glumes glabrous, white, mid-long, narrow; shoulders mid-wide, square; beaks obtuse, 0.5 mm long; awnlets usually wanting; kernels red, long, semihard, elliptical, humped, curved, enclosed in glumes; germ small; crease wide, shallow; cheeks angular; brush mid-sized, long.

**History.**—Alstroum (reg. no. 226) was obtained by the United States Department of Agriculture in 1901 from the Washington Agricultural Experiment Station, Pullman, Wash. Its further history is undetermined.

**Distribution.**—Grown commercially to a slight extent in Virginia, West Virginia, and Oregon.

## RED WINTER

**Description.**—Plant intermediate winter habit, late, mid-tall; stem faintly purple, strong; spike awnleted, linear-fusiform, lax, erect; glumes glabrous, brown, mid-long to long, wide; shoulders wide, square; beaks obtuse, 0.5 mm long; awnlets few, 3 to 20 mm long; kernels red, long, soft, humped, curved, usually enclosed in glumes; germ small; crease wide, shallow; cheeks angular; brush mid-sized, long.

This variety differs from Alstroum spelt in having brown glumes. Spikes, glumes, a spikelet, and kernels of Red Winter spelt are shown in plate 41, B.



**History.**—Red Winter (reg. no. 227) was first obtained by the United States Department of Agriculture in 1901 from the Washington Agricultural Experiment Station. Its further history is undetermined. Many samples of this and other spelt varieties doubtless have been introduced into the United States from time to time. A sample of spelt practically identical with the above was introduced from Switzerland about 1913 by Paul Scheddiger, of Spearfish, S.Dak., and was distributed by him in 1915. Most of this winter-killed during the next two winters, which were unusually severe.

**Distribution.**—Formerly grown to a small extent in South Dakota and Wyoming; not known to be grown commercially at the present time.

### POULARD WHEAT

The poulard wheats may be of either winter or spring habit and usually are tall with broad leaves. The culms are thick, usually solid, but sometimes pithy. The spikes are long and occasionally compound or branched. The spikelets are compactly arranged on the spike, and the glumes are short and sharply keeled. The kernels are thick, humped, and mostly hard, but usually become very starchy (yellow berry).

The poulards are most closely related to the durums. The glumes and kernels usually are shorter and the kernels thicker in the dorso-ventral diameter and are somewhat softer. In many instances the varieties of poulard and durum are so nearly alike that it is difficult to distinguish them.

Only a few varieties of poulard wheat are cultivated in the United States, and the grain of these is of no commercial value except as feed for stock. The varieties grown can be distinguished by the accompanying key.

#### KEY TO THE VARIETIES OF POULARD WHEAT

1a. SPIKE BRANCHED.		
2a. SPIKE AWNEED.		
3a. GLUMES GLABROUS.		
4a. GLUMES YELLOW.		
5a. KERNELS WHITE ( <i>Triticum turgidum pseudocereale</i> Koern.).		
KERNELS SHORT TO MID-LONG.		
SPRING HABIT.	ALASKA	Page 136
8b. GLUMES PUBESCENT.		
4a. GLUMES BROWN.		
5a. KERNELS WHITE ( <i>T. turgidum mirabile</i> Koern.).		
KERNELS MID-LONG TO LONG.		
WINTER HABIT.	TITANIC	137

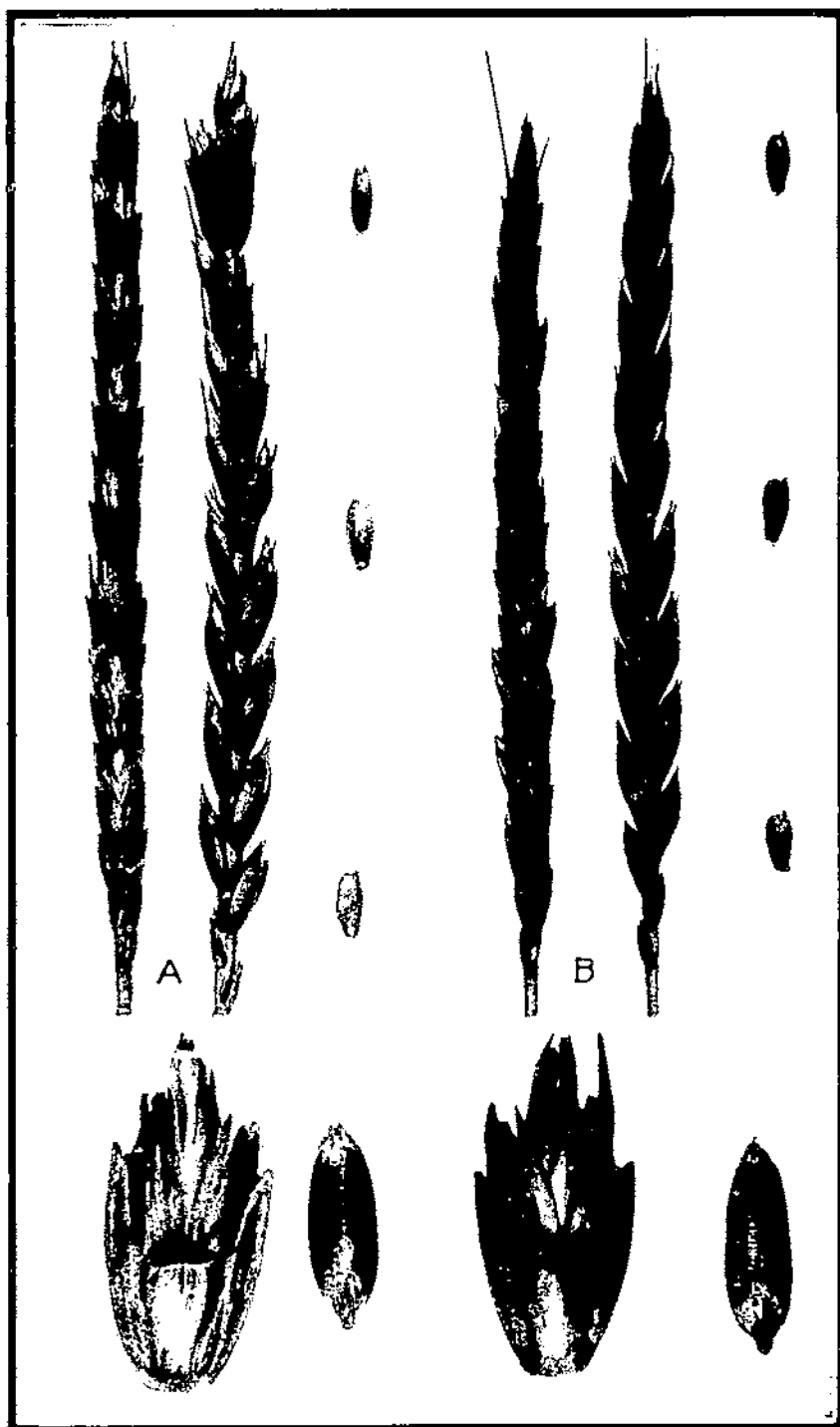
#### DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF POULARD WHEAT VARIETIES

##### ALASKA

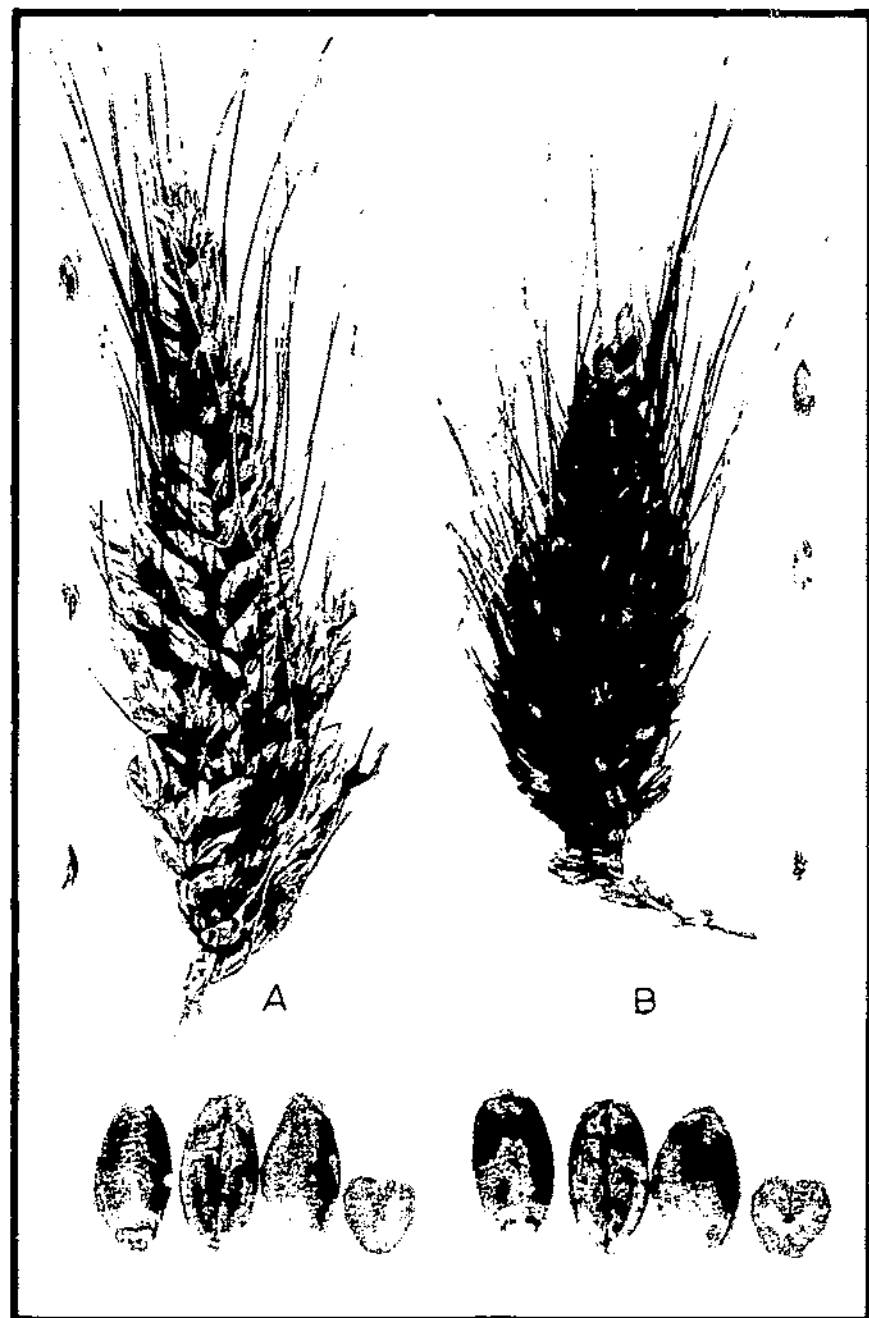
**Description.**—Plant spring habit, late, tall; stem white, mid-strong, spike branched, awned, nodding; glumes glabrous, yellow, short, mid-wide; shoulders narrow, usually rounded; beaks nearly wanting; awns black, 3 to 12 cm long; kernels white, short to mid-long, hard, often becoming starchy, ovate, humped; germ mid-sized; crease mid-wide, shallow, sometimes pitted; cheeks usually angular; brush mid-sized, short.

Alaska is recognized by the composite spikes, glabrous glumes, and white kernels. A spike, glumes, and kernels of this variety are shown in plate 42, A.

**History.**—The Alaska (reg. no. 206) variety of poulard wheat probably has been introduced into this country several times from the Mediterranean region of Europe, where poulard wheats are grown commercially to a small extent. The first introduction of this wheat into the United States was thought by Ball and Leighty (37, p. 4) to have been in 1806, when it was brought from Ireland under the name of Jerusalem. Several other introductions have been recorded in American literature. The wheat often has been used by unscrupulous seedsmen for extravagant exploitation. The names listed as synonyms have all been used at one time or another for the variety



White Spring (A), and Red Winter (B) spels. Spikes and glumes natural size, kernels X3.



Alaska (A) and Tilam (B) wheat: spikes and glumes natural size, kernels  $\times 3$ .

in the United States. In recent years the name Alaska has been generally adopted for the wheat. It was the name used for the variety by Abraham Adams, of Juliaetta, Idaho, who distributed seed of the variety in the Pacific Northwest from about 1904 to 1908.

*Distribution.*—Estimated area in 1929, 1,715 acres, in California, Arizona, South Dakota, and Idaho.

*Synonyms.*—Egyptian, Eldorado, Jerusalem, King Tut, Many Headed, Many Spiked, Miracle, Mortgage Lifter, Multiple Headed, Mummy, Reed, Seven Headed, Seven Headed Sinner, Smyrna, Syrian, Taos, Wheat of Miracle, Wheat 3,000 Years Old, Wild Goose.

#### TITANIC

*Description.*—Plant winter habit, late, mid-tall to tall; stem white, mid-strong, stout; spike branched, awned, nodding; glume, pubescent, brown, short, narrow; shoulders wanting to narrow, oblique; beaks 1/2 in. long; awns black, usually deciduous, 3 to 10 cm long; kernels white, part-long, semihard, usually becoming very starchy, oval to ovate, humped; germ mid-sized; crease mid-wide, shallow, sometimes pitted; cheeks angular; brush mid-sized, short.

This variety differs from Alaska in having a winter habit and pubescent brown glumes. A spike, glumes, and kernels are shown in plate 42, B.

*History.*—Titanic (reg. no. 207) was introduced into the United States by Harry Towell, of Fort Stanley, Wash., in 1912. Mr. Towell had obtained 12 kernels from a friend in England, who had obtained a very small quantity from an importation made into that country from Argentina. The wheat was first grown on the San Juan Islands, in Washington, by Mr. Towell, and by 1916 he had about 100 acres. J. C. Hawkins contracted to sell the wheat in 1916 for seed at \$1 a pound. He gave it the name Titanic, because of the marine disaster that occurred during the year the variety was introduced, Mr. Towell, the introducer, being one of the surviving passengers on the vessel.

*Distribution.*—Formerly grown to a very small extent in the Puget Sound section of Washington.

#### DURUM WHEAT

The plants of durum wheat are of spring habit and tall. The peduncle is pithy, at least in the upper portion. The spikes are compact and laterally compressed, and hence are narrower when seen in a face view. The glumes are persistent and sharply keeled, and the lemmas are always awned except in a few awnless forms recently originated by hybridization. The awns are long and coarse and are white, yellow, brown, or black. The kernels are white or red and usually rather long and pointed; they are very hard and translucent, making the white-kerneled forms appear amber-colored. The kernels always have a short brush and angular cheeks and are the hardest of all known wheats.

The durum wheats, as before stated, are sometimes very similar to certain poulard varieties. The spikes, however, usually are much thinner, the glumes are longer, and the kernels are longer, more slender, and usually much harder.

Durum wheat has been widely grown in the United States only during the past 35 years. The durum wheat area has moved northward until the center of production is in northeastern North Dakota at the present time. The area grown outside of North Dakota, South Dakota, and Minnesota has been greatly reduced since 1920. Most of the varieties of durum wheat were introduced from southern Russia and the Mediterranean region, where, exclusive of North America, the largest acreage of this class of wheat is grown. Certain introductions, including Kubanka, made by the United States Department of Agriculture about 1900, became popular with farmers in the northern Great Plains and prairie sections, and the production

glabrous, yellowish, mid-long, mid-wide; shoulders mid-wide, usually oblique; beaks broad, incurved, 1 mm long; awns yellowish, 5 to 15 cm long; kernels white, mid-long to long, hard, elliptical to ovate; germ mid-sized; crease mid-wide, shallow; cheeks angular; brush mid-sized, short.

Acme differs principally from Kubanka in being shorter, in having weaker straw and a longer, laxer, and narrower spike. It is very resistant to stem rust and is a high-yielding variety.

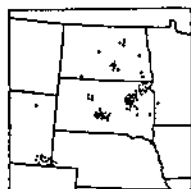


FIGURE 75.—Distribution of Acme wheat in 1920. Estimated area, 72,938 acres.

*History.*—Acme (reg. no. 211) originated as a plant selection from Kubanka (C.I. 1516) made by Manley Champlin, formerly a representative of the United States Department of Agriculture, in cooperative experiments with the South Dakota Agricultural Experiment Station at the Highmore Substation, Highmore, in 1909. It was grown commercially in 1916. In the rust epidemic of that year it was discovered to be resistant to stem rust. As it differs from the true Kubanka, it was given a distinctive name. The strain of Kubanka from which Acme was selected was obtained by the United States Department of Agriculture at the Paris Exposition in 1900. The seed came from the Samara Government, Russia.

Although introduced and grown under the name of Kubanka, this lot is not identical with the true Kubanka and is much like Acme, but was not pure nor so resistant to rust.

*Distribution.*—Estimated area in 1920, 72,938 acres, grown in North Dakota, South Dakota, Minnesota, Nebraska, and Wyoming, as shown in figure 75.

#### MONAD

*Description.*—Monad is very similar to Acme, differing principally in having somewhat stronger stems and shorter awns. It is as resistant to stem rust as Acme and usually yields better than Acme in North Dakota, and the grain is of slightly better quality.

*History.*—Monad (reg. no. 212) was introduced in 1903 from the Saratov Government, Russia, 100 versts east of Volga (F.P.I. 10207), by H. L. Bolley, of the North Dakota Agricultural Experiment Station. Seed of the variety was distributed by Professor Bolley to several farmers and to the Dickinson and Langdon substations as D-1 (Durum No. 1) in 1911. Its identity on the farms nearly became lost. In 1917 it was named Monad by Ball and Clark (35, p. 44) after it was found in experiments at the Dickinson Substation, Dickinson, N.Dak., to be high-yielding and resistant to stem rust. It was increased at the Dickinson Substation from 1918 to 1920 for commercial distribution. In 1920 R. S. Goodhue (97), county agent, of Stutsman County, N.Dak., reported finding the variety commercially grown in that county from one-half bushel of seed originally furnished O. J. Seiler, of Stutsman County, by Professor Bolley in 1911. August Clemens, of Leonton Township, obtained seed from Mr. Seiler and increased and grew it until 1919, when he brought it to the attention of County Agent Goodhue, who distributed 3,700 bushels among farmers in Stutsman County in the spring of 1920.

*Distribution.*—Estimated area in 1920, 94,682 acres, grown in North Dakota and South Dakota, as shown in figure 76.

*Synonym.*—D-1.

#### ARNAUTKA

*Description.*—Plant spring habit, midseason, tall; stem white, mid-strong; spike awned, fusiform, mid-dense, nodding; glumes glabrous, yellowish, mid-long, mid-wide; shoulders narrow, usually oblique; beaks wide, 1 to 5 mm long; awns yellowish, 6 to 18 cm long; kernels white, long, hard, elliptical; germ mid-sized; crease mid-wide, shallow; cheeks angular; brush mid-sized, short.

Arnautka differs from Kubanka in having a longer, narrower, and laxer spike, which usually is more nodding when ripe.

*History.*—Arnautka (reg. no. 213) was first introduced by the United States Department of Agriculture in 1864 (169). It was grown in 1865 with other varieties of wheat on what are now the grounds of the Department of

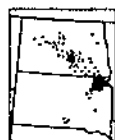
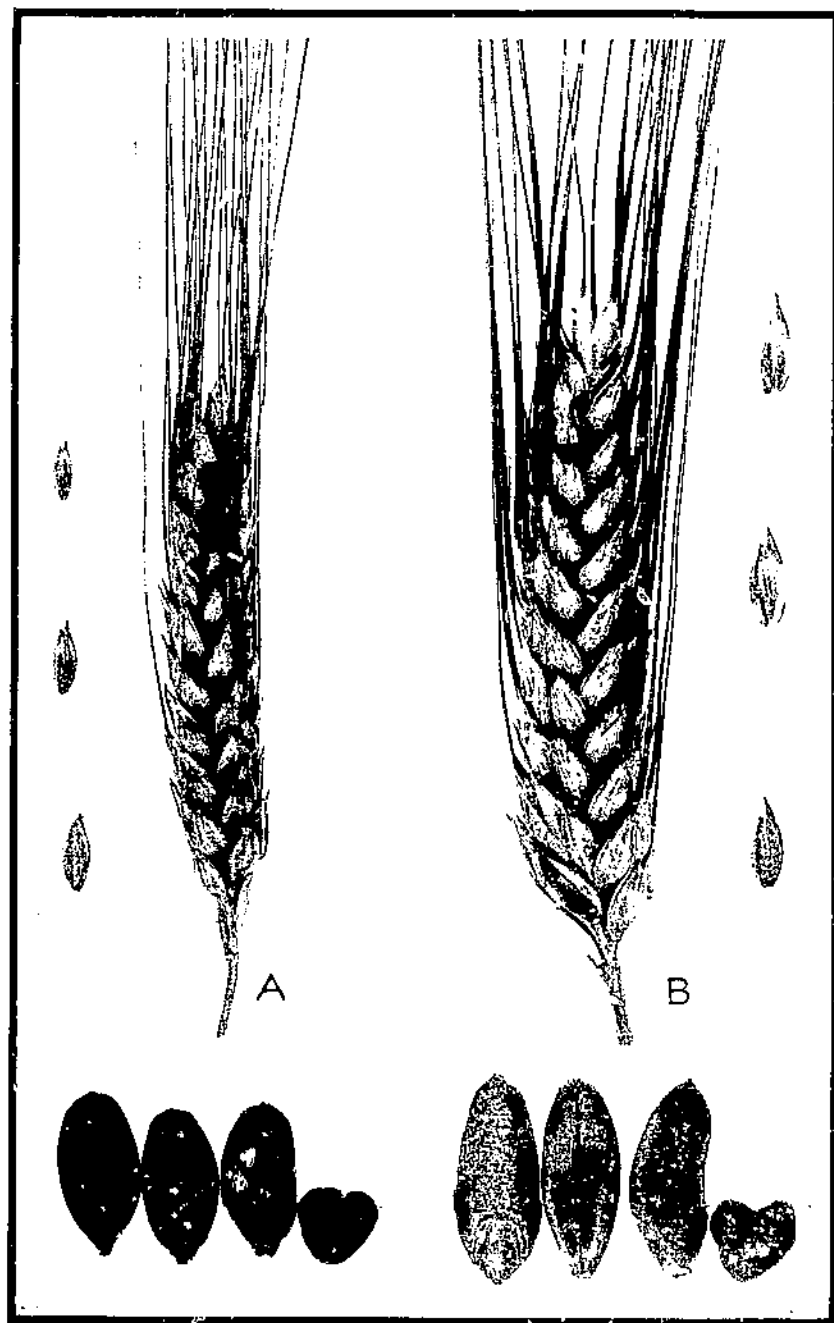


FIGURE 76.—Distribution of Monad wheat in 1920. Estimated area, 94,682 acres.



Pentad (*A*) and Peliss (*B*) wheats; Spikes and glumes natural size; kernels  $\times 3$ .



Kubanka (A) and Mindum (B) wheats; Spikes and plumes natural size; kernels X3.

Agriculture, near Fourteenth Street, Washington, D.C. (35, p. 8). It was distributed to several sections of the United States, but as far as known never became commercially established. The basis for the present commercial stock is thought to have been brought by early immigrants from Russia to North Dakota (50, p. 40), where it was called Wild Goose. Distribution from this source by the Department of Agriculture dates from 1900, when seed (C.I. 1494) was obtained from T. N. Olum, of Lisbon, N.Dak. This seed was distributed with Kubanka and other varieties. The variety had previously become established, however, in southeastern North Dakota, where it early proved to be well adapted.

Goose and Wild Goose were names commonly used for Arnautka or durum wheat in general, particularly by the grain trade, during the early years of durum-wheat cultivation in the United States. There is a tradition that the seed was originally obtained from the crop of a wild goose.

Nicaragua is a name used for Arnautka durum wheat in the southern Great Plains, particularly Texas. The source of this wheat is not known. In discussing its origin Carleton (50, p. 40) mentioned "one would infer from the name that it came from Nicaragua." It became grown throughout northern Texas in the early nineties and is still grown there to a considerable extent. It is identical with the Arnautka variety.

Pierson is the name under which a selected lot of durum wheat identical with Arnautka was distributed by G. H. Pierson, of Claremont, S.Dak., with the claim that it was a rustproof durum wheat. Concerning this wheat, Mr. Pierson has written as follows:<sup>20</sup>

"I obtained the seed 17 years ago (1897) from an immigrant who was driving through the State of South Dakota and using it for horse feed. The man was from Kansas and said that they used this wheat for horse and hog feed there. I raised it for some years as a horse and hog feed and then commenced to breed it. It is rustproof with a large head and hardy stiff straw. It outyields all other varieties."

*Distribution.*—Estimated area in 1929, 17,514 acres, in Texas, North Dakota, and South Dakota. Much of the 3,495,814 acres reported in 1929 as durum is of the Arnautka variety.

*Synonyms.*—Goose, Johnson, Nicaragua, Pierson, Wild Goose.

#### MINDUM

*Description.*—Mindum is similar to Arnautka, except for being slightly earlier, in having slightly weaker straw, narrower glumes, longer awns, and a shorter or nearly absent brush, and in being slightly more resistant to stem rust. A spike, glumes, and kernels of Mindum wheat are shown in plate 44, B.

*History.*—Mindum (reg. no. 214) was first grown in 1896 in a nursery at University Farm, St. Paul, Minn., as a selection from wheat called "Hedgerow" by the Minnesota station.

The statement was made in the Minnesota accession book that Mindum was a head selection from a field of common wheat. It proved to be a rust-resistant strain at University Farm and was tested at the substations. It produced high yields in experiments conducted at the Northwest substation, Crookston, Minn., during the years 1913 to 1916. The variety was named Mindum (a contraction of Minnesota durum) in 1918 (107 p. 33).

*Distribution.*—Estimated area in 1929, 322,151 acres, grown in Minnesota, North Dakota, and South Dakota (fig. 77).



FIGURE 77.—Distribution of Mindum wheat in 1929. Estimated area, 322,151 acres.

#### AKRONA

*Description.*—Akrona differs from Arnautka in being slightly earlier and shorter. It is more uniform, particularly in kernel type, and the kernels are high in yellow carotinoid pigment, as revealed by the gasoline color test.

*History.*—Akrona (reg. no. 246) was developed by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of

<sup>20</sup> Correspondence of the Division of Cereal Crops and Diseases, dated May 30, 1914.



Agriculture, and the Colorado Agricultural Experiment Station in cooperative experiments at Akron, Colo. It is the result of a selection from Arnautka (C.I. 1493) made by Clyde McKee in 1912. The value of the selection was determined by F. A. Coffman. Arnautka was first distributed for commercial growing in Colorado in 1922 and registered (58) in 1926. Its superior characters are early maturity, high yield under Colorado conditions, and high quality for the manufacture of macaroni.

*Distribution.*—Grown in Colorado.

#### KUBANKA

*Description.*—Plant spring habit, midseason, tall; stem white, mid-strong; spike awned, broadly oblong, dense, inclined to nodding; glumes glabrous, yellowish, mid-long, wide; shoulders mid-wide, usually rounded; beaks wide, 1 mm long; awns yellowish, 6 to 15 cm long; kernels white, large, hard, elliptical; germ mid-sized; crease mid-wide, shallow; cheeks angular; brush mid-sized, short.

Kubanka is a high-yielding variety and is more resistant to stem rust than Arnautka. It differs from Arnautka in having shorter, denser, and more erect spikes and shorter beaks and kernels. It also is a better milling variety than Arnautka. A spike, glumes, and kernels of Kubanka wheat are shown in plate 44, A.

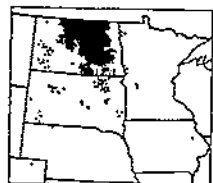


FIGURE 78.—Distribution of Kubanka wheat in 1929. Estimated area, 724,864 acres.

*History.*—Kubanka (reg. no. 215) is of Russian origin. More than a dozen importations into the United States have been made. The principal introduction of the variety was made in 1900 by M. A. Carleton, of the United States Department of Agriculture, from Uralsk Territory, Russia (215, F.P.I. 5039). The original seed of this introduction was grown under contract in New Mexico and South Dakota in 1901, and the following year 200 bushels of seed were distributed to many growers. The distribution was continued by the Department up to 1909. Aside from the distribution made by the United States Department of Agriculture, both the North Dakota and South Dakota Experiment Stations

distributed large quantities to growers. Kubanka first proved especially well adapted to the drier western portions of the Great Plains area. In recent years it has proved well adapted to the more humid sections also and is now considered the most widely adapted of the durum varieties to the varying conditions in the northern spring-wheat section of the United States.

*Distribution.*—Estimated area in 1929, 724,864 acres, grown in six States, but mostly in North Dakota (fig. 78). The known acreage of Kubanka had increased from 52,300 acres in 1919 to 479,046 acres in 1924. Much of the acreage reported only as durum also is Kubanka.

*Synonyms.*—Beloturka, Gharnovka, Pererodka, Taganrog, Yellow Gharnovka.

#### NODAK

*Description.*—Nodak differs from Kubanka in being shorter, more resistant to stem rust, and more uniform in kernel type. The kernels, however, are duller and more subject to yellow berry. The quality of the grain for the manufacture of semolina and macaroni also is less desirable than that of Kubanka.

*History.*—Nodak (reg. no. 242) was developed in cooperative experiments of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the North Dakota Agricultural Experiment Station at the Dickinson substation, Dickinson. It is the result of a selection from Kubanka (C.I. 1440) made in 1915 by R. W. Smith. It was distributed for commercial production in 1923 and registered (58) in 1926. Its superior characters are high yield and resistance to stem rust.

*Distribution.*—Estimated area in 1929, 36,910 acres, in North Dakota and South Dakota.

#### MAROUANI

*Description.*—Plant spring habit, midseason, very tall; stem white, weak; spike awned, broadly oblong, dense, nodding; glumes glabrous, yellowish, mid-

long, wide; shoulders narrow, usually elevated; beaks wide, 1 to 15 mm long; awns yellowish, 8 to 20 cm long; kernels white, very long, hard, elliptical, humped; germ large; crease mid-wide, shallow to mid-deep; cheeks angular; brush small, short.

*History.*—Marouani (reg. no. 218) (215, F.P.I. 7578) was introduced from the Province of Oran, Algeria, in 1901, through D. G. Fairchild and C. S. Scofield, for the United States Department of Agriculture. Concerning the introduction they have written as follows:

"This wheat is cultivated extensively on the elevated rolling lands in the western part of the Province and is one of the best of the types of durum wheats cultivated by the Arabs. The quantity obtained is from the estates of M. J. Labouresse, at Tessala, near Sidi bel Abbes. It has been carefully selected by Mr. Labouresse from year to year until a fairly pure and very vigorous stock has been obtained. The variety is very hardy, resistant to rust, and succeeds fairly well under rather droughty conditions. The grain is especially adapted for the manufacture of semolina. In the Province of Oran the wheat is sown in November and ripens in June, but it might succeed as a spring wheat in the spring-wheat region of the northern United States."

In experiments in the United States Marouani wheat proved best adapted to the central and southern Great Plains.

*Distribution.*—Estimated area in 1924, 4,691 acres, in Texas. It was not reported in 1919 or 1920.

#### GOLDEN BALL

*Description.*—Plant spring habit, mid-season, short to mid-tall; stem white, mid-strong; spike awned, oblong-fusiform, dense, inclined; glumes pubescent, white, mid-long, mid-wide; shoulders narrow, oblique to elevated; beaks 1 to 5 mm long; awns black, 5 to 18 cm long; kernels white, long, hard, ovate, humped; germ large; crease mid-wide, shallow to mid-deep; cheeks angular; brush small, short.

In recent experiments Golden Ball has been found to be nearly immune from most forms of bunt.

*History.*—Golden Ball (reg. no. 220) (215, F.P.I. 46706) was introduced by the United States Department of Agriculture in 1918, from Johannesburg, South Africa. The seed was purchased through J. Burt Davy from the Agricultural Supply Association. Three previous introductions of wheat under the name of Golden Ball had been made by the Department from South Africa. These wheats all resemble this introduction, except that they had red instead of white kernels. The Golden Ball is reported to be extensively grown in South Africa and is recognized as a valuable drought-resistant and rust-resistant variety.

Neethling, in 1932 (151), gives a detailed discussion of the history of Golden Ball in South Africa and points out that apparently more than one type has been grown under this name and that their history is uncertain.

*Distribution.*—Grown on a considerable acreage in Manitoba, Canada, and sparingly in North Dakota and South Dakota but was not reported in any of the surveys.

#### KABLA

*Description.*—Plant spring habit, mid-season, tall; stem white, mid-strong; spike awned, oblong-fusiform, mid-dense, nodding; glumes finely pubescent, black, mid-long, mid-wide; shoulders narrow, usually oblique; beaks wide, 1 to 2 mm long, awns black, 6 to 16 cm long; kernels white, mid-long to long, hard, elliptical, humped; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, short.

*History.*—Kabla (reg. no. 221) (215, F.P.I. 7794) was introduced in 1901 by D. G. Fairchild and C. S. Scofield, from Setif, Constantine Province, Algeria, for the United States Department of Agriculture. Concerning the variety they recorded the following information:

"This is one of the wheats commonly grown by Arabs throughout Algeria. As the name Kabla signifies, this is a black-chaffed sort. It is generally considered to be one of the best of the Algerian wheats for adaptability to a wide variety of adverse conditions. When such are favorable it produces grain of excellent quality for macaroni manufacture. Under certain favorable climatic

conditions the chaff loses color somewhat, but under native culture on the gravelly hills of Algeria or in the semiarid plains the purple-black of the chaff is a striking feature. This seed is furnished the department by Mr. G. Ryf, manager of the Geneva Society of Setif. Commonly planted in November or December and harvested in June or July."

Experiments with Kabla wheat in the United States have shown that it is only a fair yielding variety, not superior to Kubanka.

*Distribution*.—Estimated area in 1929, 28,250 acres, in Montana, North Dakota, South Dakota, and Nebraska.

*Synonyms*.—Black Don, Black Durum, Black Emmett Black Swamp, Purple Durum, Red Swamp, Sloat.

#### BARNATKA

*Description*.—Plant spring habit, late, tall; stem white, mid-strong; spike awned, fusiform, mid-dense, nodding; glumes finely pubescent, black, mid-long, mid-wide; shoulders narrow, oblique to elevated; beaks 1 to 2 mm long; awns black, 5 to 15 cm long; kernels red, mid-long to long, hard, elliptical; germ large; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, short.

*History*.—Barnatka was introduced from Russia and distributed for commercial growing by A. L. Hillemann, of Windsor, N.Dak., about 1925. The variety was not pure; the above description is for the predominating type.

*Distribution*.—Estimated area in 1929, 4,425 acres in Stutsman, Pierce, and Wells Counties, N.Dak.

#### EMMER

Emmer is often incorrectly called "speltz" in the United States. The word "emmer" is German, but it has come into use in North America, as there is no English name for this wheat ally. Emmer may be of either winter or spring habit and usually is awned. The culms often are pithy within, and the leaves usually are pubescent. The rachis is brittle. The spikes are very dense and laterally compressed, being narrow when viewed from the face of the spikelet and wide from the edge view. The pedicel (internode of rachis) is short, narrow, and pointed and remains attached to the base of the spikelet which it bears. The spikelets are flattened on the inner side and usually contain two flowers. The kernels, which remain enclosed in the glumes after threshing, are red, long, and slender, with both ends acute.

Emmer is distinguished from spelt by the shorter, denser spikes, which are laterally compressed. The pedicel of emmer is shorter and narrower and is usually attached to the base of the spikelet which it bears, while in spelt the pedicel remains attached to the face of the next lower spikelet. The inner side of the spikelet is flat instead of arched, and the kernel usually is darker red than that of spelt.

It was estimated that about 166,829 acres of emmer were grown in the United States in 1919. At present there is only a small acreage, mostly in South Dakota and North Dakota. In this country it is used as feed for livestock.

#### KEY TO THE VARIETIES OF EMMER

SPIKE AWNED.		
GLUMES GLABROUS.		
GLUMES WHITE ( <i>Triticum dicoccum farrum</i> Boyle).		
SPRING HABIT.		
Straw white.		
Plant early, short.	KNAPLI	Page 145
Straw purple.		
Plant late, mid-tall.	VERNAL	145
GLUMES PUBESCENT.		
GLUMES BLACK ( <i>T. dicoccum atratum</i> AL).		
WINTER HABIT.	BLACK WINTER	145

## DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF EMMER VARIETIES

## KHAPLI

*Description.*—Plant spring habit, early, short; stem white, mid-strong; spike awned, broadly oblong, mid-dense, inclined; glumes glabrous, white, mid-long, narrow; shoulders mid-wide, oblique to elevated; beaks wide, obtuse, 0.5 mm long; awns white, 2 to 12 cm long; kernels red, long, hard, elliptical, acute, humped, curved, usually remaining in the glumes when threshed; germ small; crease narrow to mid-wide, shallow; cheeks usually rounded; brush small, long.

Khapli differs from Vernal chiefly in being earlier and in having shorter stems and wider spikes.

*History.*—A sample of Khapli emmer (reg. no. 222) was first obtained in 1908 by the United States Department of Agriculture from Hoshungabad, Central Provinces, India. Seed was grown at University Farm, St. Paul, Minn., and the variety has proved of interest and value for breeding because of its immunity from stem rust. The variety has yielded well in experiments in South Dakota.

*Distribution.*—Grown at several experiment stations.

## VERNAL (WHITE SPRING)

*Description.*—Plant spring habit, late, mid-tall; stem purple, mid-strong; spike awned, fusiform, mid-dense, nodding; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique; beaks wide, obtuse, 0.5 mm long; awns white, 2 to 12 cm long; kernels red, long, hard, ovate to elliptical, acute, humped, usually remaining in the glumes when threshed; germ small; crease narrow to mid-wide, shallow; cheeks usually rounded; brush small, long.

A spike, glumes, a spikelet, and kernel of Vernal emmer are shown in plate 45, A.

*History.*—The origin of Vernal emmer (reg. no. 223) dates from prehistoric times. In historic times it seems to have been cultivated first in Switzerland. It is not known when the variety was first brought to the United States, but it was grown by farmers in the northern Great Plains States probably as early as 1875.

"Speltz" is the name under which emmer usually is advertised and sold by seedsmen in the Great Plains States. It usually is known by that name on the farms also. This term is incorrectly used, and the name does not exist as a legitimate word in any language. What is meant is the German word *Spelz*, which is spelled differently and which is translated spelt in English. The confusion between emmer and spelt is thought to have arisen in Germany, where considerable quantities of both cereals are grown.

Yaroslav emmer (215, F.P.I. 2789) was obtained from the Government of Yaroslav, Russia, in 1899, by M. A. Carleton, for the United States Department of Agriculture. Experiments with this introduction in the United States have shown it to be practically identical with Vernal emmer.

*Distribution.*—Grown to a slight extent in South Dakota and North Dakota.

*Synonyms.*—"Speltz", White Spring, Yaroslav.

## BLACK WINTER

*Description.*—Plant winter habit, late, tall; stem white, strong; spike awned, broadly fusiform, mid-dense to dense, inclined; glumes pubescent, black, mid-long, mid-wide; shoulders mid-wide, usually elevated; beaks wide, 1 mm long; awns black, 4 to 15 cm long; kernels red, long, hard, elliptical, acute, curved, enclosed in hull when threshed; germ small; crease mid-wide, shallow; cheeks angular; brush small, long.

Black Winter emmer is quite distinct in having pubescent black glumes. Unlike the varieties of spring emmer, this variety is very susceptible to rust. A spike, glumes, a spikelet, and kernels of Black Winter emmer are shown in plate 45, B.

*History.*—Black Winter emmer (reg. no. 224) (215, F.P.I. 11650) was obtained in 1904 from Vilmorin-Andrieux & Cie., Paris, France, by the United States Department of Agriculture. The original importation of 79 pounds of seed was sown in the fall of 1904. From the resulting crop seed was increased

and distributed to experiment stations and to a number of farmers throughout the United States. The results of experiments since that time have been unfavorable. The variety has not proved sufficiently hardy for growing successfully north of Kansas and Wyoming in the Great Plains area and has not been able to compete with other cereals in the southern Great Plains.

Buffum's Improved Winter emmer is identical with the emmer described, but is more uniform. Buffum's Improved Winter emmer was distributed by B. C. Buffum, of Worland, Wyo. When director of the Wyoming Agricultural Experiment Station at Laramie, he received a small quantity of seed of Black Winter emmer from the Division of Cereal Crops and Diseases. After his resignation, he selected and improved the crop. From selected plants of the 1908 crop, 34 bushels were produced in 1909, 710 bushels in 1910, and a crop of 20,000 bushels was estimated in 1911. This seed was widely distributed.

*Distribution*.—Not known to be commercially grown at present.

*Synonym*.—Buffum's Improved Winter emmer.

## POLISH WHEAT

Polish wheat has a spring habit, tall stems, and a pithy peduncle. The spike is awned, large, and lax. The glumes are papery, an inch or more long, and narrow. The length of the glume equals or exceeds the length of the lemmas. The kernel is long and narrow, sometimes nearly a half inch long, is hard and has a shape somewhat similar to that of a kernel of rye.

Polish wheat usually yields less than other adapted varieties. It also is of inferior value for bread or macaroni manufacture. Under other names it is frequently sold at a high price for seed by unscrupulous seedsmen. Only one variety of Polish wheat is grown in the United States. The characters of this variety are shown in the following key:

### KEY TO POLISH WHEAT

SPIKE AWNED.

GLUMES GLABROUS, WHITE.

KERNELS WHITE (*Triticum polonicum levisimum* Haller).

KERNELS LONG TO VERY LONG, HARD.

SPRING HABIT.

WHITE POLISH.

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### DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF POLISH WHEAT

#### WHITE POLISH

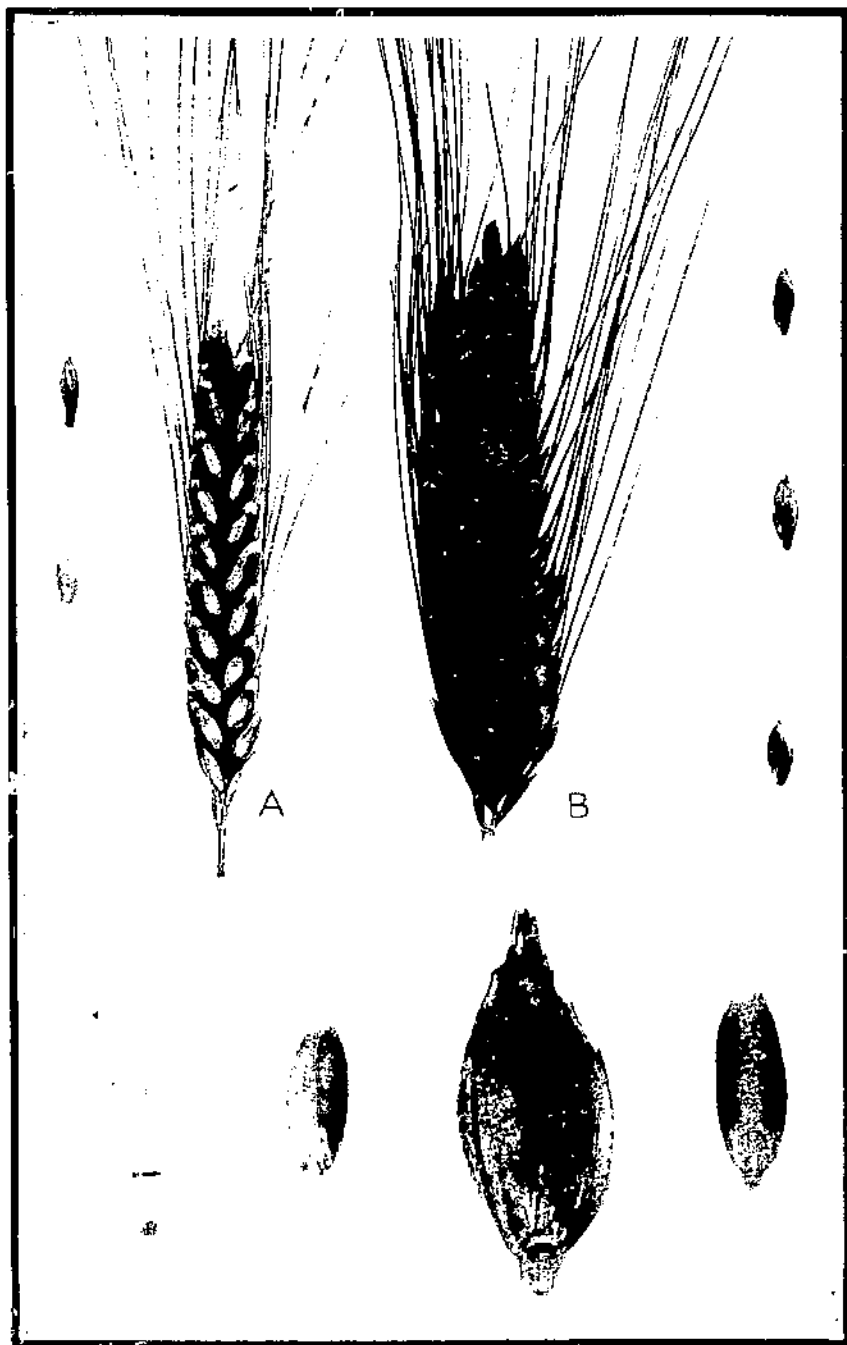
*Description*.—Plant spring habit, early, tall; stem white, weak; spike awned, linear-oblong, lax, nodding; glumes glabrous, white, papery, very long, narrow; shoulders usually wanting; beaks narrow, acute, 0.5 to 1 mm long; awns black, usually deciduous, 4 to 10 cm long; kernels white (amber), very long, hard, elliptical, acute; germ mid-sized; crease narrow, shallow to mid-deep; cheeks usually rounded; brush large, mid-long.

A spike, glumes, and kernels of White Polish wheat are shown in plate 46, A.

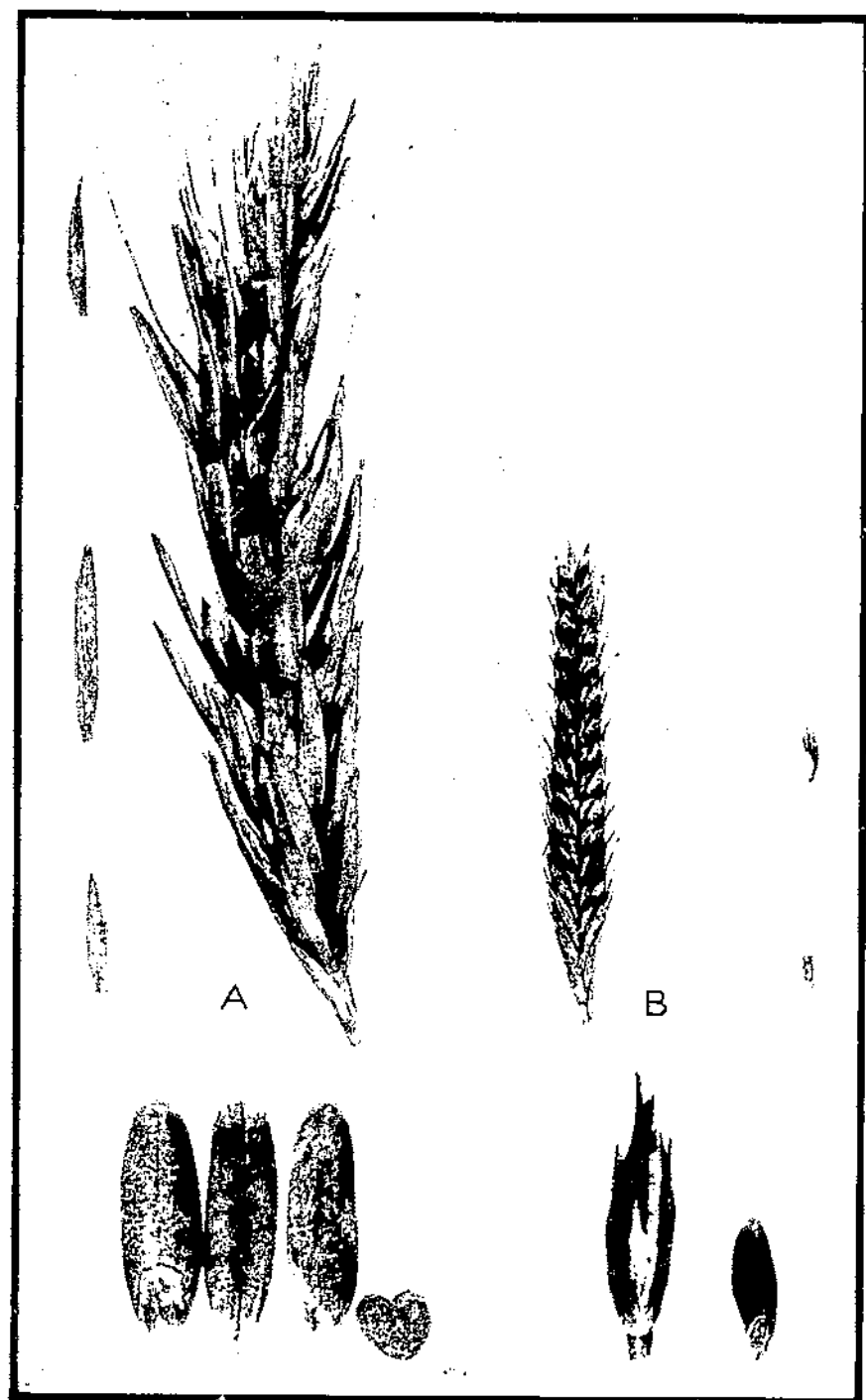
*History*.—White Polish (reg. no. 229) is not definitely known to be of Polish origin, as the name implies. It has been grown in England and other European countries for many years and was early introduced into the United States. It is known to have been grown in Maryland as early as 1845 (196, p. 413). From that time until the present frequent references can be found concerning the variety. It has often been used for exploitation by unscrupulous growers or seedsmen, the seed often being sold for as much as \$1 a pound. It has been tried in most sections of the United States, but has never become established anywhere for more than a year or two. It is usually a poor yielder, although it has produced large yields in some sections.

*Distribution*.—Polish wheat is grown occasionally in Arizona and Oregon and doubtless to a slight extent in many other States.

*Synonyms*.—Belgian rye, Corn wheat, German rye, Giant rye, Goose, Jerusalem rye, Rice wheat, Siberian Cow, Wild Goose.



Vernal (A) and Black Winter (B) emmers: Spikes and glumes natural size; kernels X3.



White Polish wheat (A) and einkorn (B): Spikes and glumes natural size; kernels  $\times 3$ .

## EINKORN

Einkorn, or one-grained wheat, has no English name, but is called einkorn in German, and that name has become fairly well known in North America. The spikes are awned, narrow, slender, and laterally compressed. The spikelets usually contain only one fertile floret, for which reason it is called one-grained wheat. The terminal spikelets are aborted. The palea splits into two parts at maturity. The kernels, which remain in the spikelets after threshing, are pale red, slender, and very much compressed. The kernel crease is almost wanting.

Einkorn is not commercially grown in North America, and the species itself has no economic importance. The form most commonly grown experimentally is distinguished by the following key:

## KEY TO EINKORN

SPIKE AWNED.	
GLUMES GLABROUS.	
GLUMES WHITE ( <i>Triticum monococcum vulgare</i> Koern.).	Page
INTERMEDIATE HABIT.....	EINKORN..... 147

## DESCRIPTION, HISTORY, AND DISTRIBUTION OF THE VARIETY

## EINKORN

*Description.*—Plant winter intermediate habit, very late, short; stem white, fine, strong; spike awned, fusiform, mid-dense, erect; glumes glabrous, yellowish, long, narrow; shoulders narrow, apiculate; beaks narrow, acuminate, 1 to 2 mm long; awns 3 to 10 cm long; kernels red, mid-sized, soft, elliptical, acute, humped, compressed, usually enclosed in glumes; germ small; crease narrow, nearly wanting, shallow; cheeks rounded; brush small, short.

This variety of einkorn remains prostrate during most of the growing season, but usually will produce seed late in the season when sown in the spring. A spike, glumes, a spikelet, and kernels of einkorn are shown in plate 46, B.

*History.*—Einkorn (reg. no. 230) apparently originated in southern Europe in prehistoric times. Seed of this cereal has been introduced into the United States several times, one of the earliest introductions by the Department of Agriculture having been received from Vilmorin-Andrieux & Cie., Paris, France, in 1901, but it is known to have been grown in the United States prior to that time. The strain here described was obtained from Erfurt, Germany, in 1904.

*Distribution.*—Grown by many experiment stations throughout the United States, but not known to be grown commercially.

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# INDEX TO VARIETIES AND SYNONYMS

Recognized varieties are in capitals, and synonyms are in lower case. Of the two page references given for recognized varieties, the first refers to the key and the second to the description, history, etc. Each page reference given for a synonym is to the recognized variety for which the name is a synonym. Where two or more page numbers are given, therefore, the name is a synonym of more than one variety. Botanical names are in italic type, and the page references following them refer only to the keys.

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<sup>20</sup> The Latin names are indexed here for the convenience of those familiar with the classifications of Aelfeld, Koernicke and Werner, and others, and not as representing the conclusions of the writers.

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