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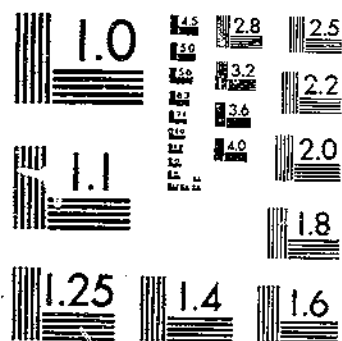
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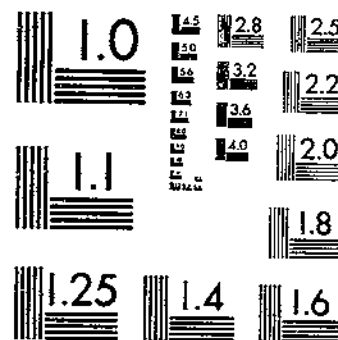
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CLASSIFICATION OF WHEAT VARIETIES GROWN IN THE UNITED STATES IN 1939
CLARK J. H. BAYLES S. B. A. 1 OF 2

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NATIONAL BUREAU OF STANDARDS-1963-A



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

Classification of Wheat Varieties Grown in the United States in 1939¹

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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, whereas 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 certain 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

¹Received for publication August 1, 1941. This bulletin is a revision of and supersedes Department Bulletin 1071, *Classification of American Wheat Varieties*, and Technical Bulletin 159, *Classification of Wheat Varieties Grown in the United States*.

history or distribution. Wheat varieties are most generally designated by names, which are established through publication and usage. 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 (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 insofar as practicable 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 (303),² 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. The following notes, based on the writings of Varro and others, as well as those of Columella, were presented in the translation, in 1745, of Columella's book entitled "Of Husbandry" (64):

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*, *Assyrian*, *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

² *Italic numbers in parentheses refer to Literature Cited, p. 129.*

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 which reason some are called *trimestrian*, some *bimestrian*; and they say, that, in *Buboca*, 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, *tritium* and *adoreum*, or *far*. Columella referred to the *far* as bearded wheat. The grain of *tritium* was separated from the chaff in threshing, whereas that of *far* was not, indicating that the former consisted of true wheats, but the latter was emmer or spelt.

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

Clusian, of a shining, bright, white colour; a bearded wheat, which is called *renuculum*. 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 (207), 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* (138) 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.

Lamarck, in 1786 (132), 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 (212), divided the common wheats into two species, *Triticum vulgare* and *T. touzelle*. The latter consisted of awnless wheat having white kernels.

Schrank, in 1789 (180, 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. hybernium* L. under it as varieties. The second species was *T. spelta* L. and the third *T. dicoccum* Schrank, the cultivated emmer.

Desfontaines, in 1800 (67), established the species *Triticum durum* for the group of wheats having long awns and long vitreous kernels.

Host, in 1805 (113), was the first to include the *Triticum aestivum* and *T. hybernium* of Linnaeus as one species which he called *T. vulgare*. He also described and named the species *T. compactum* to include the club wheats and in addition recognized 10 other species of the genus *Triticum*.

Seringe, in 1819 (185), 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 (141), 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 (142), reedited his classification of 1824, making some changes and adding more varieties.

Seringe, in 1841 (186), 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 (18), classified the wheats into two genera and species, *Triticum vulgare* and *Deina polonica*. The latter contained four subspecies or varieties of Polish wheats, *T. polonicum*, and 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 (106), grouped the wheats into 7 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, and the remaining 555 names were considered as synonyms.

Koernicke, in 1873 (130), and Koernicke and Werner, in 1885 (131), 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 (99), 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 1896 (96), 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 (213), 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 (78), 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.

Henzé, in 1896 (107), 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 (59), keyed 54 varieties of wheat that he was growing in New South Wales, Australia, using the leading plant, spike, and kernel characters. In 1905 (62) he proposed to classify wheat varieties by a microscopic examination of the aleurone layer.

Howard and Howard, in 1909 (115), classified the wheats of India largely according to the methods of Koernicke and Werner and of Eriksson. They (114) also considered in detail the characters used in classification.

Richardson, in 1913 (167), 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 (81), published extensive treatises on the taxonomy of Russian wheat forms.

The Union of South Africa, in 1919 (191), 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 (74), 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 (21), classified and described 48 of the leading wheats of Australia in a manner similar to that used by the writers.

Percival, in 1921 (158), 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 (23), revised and extended the classification of 1920 to include 82 varieties. Data were also presented on the agricultural characters of these varieties.

Zhukovsky, in 1928 (226), described a new species, *Triticum timopheevi* (Zhuk.), which has 14 haploid chromosomes and is very resistant to several diseases.

Newman, in 1928 (149), discussed the value of characters used by Clark, Martin, and Ball (50) 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 (155), published a classification of the wheats grown in Greece.

Miège, in 1930 (143), described the principal varieties of common and durum wheat grown in Morocco.

Vavilov et al., in 1931 (211), published a "contribution to the knowledge of the 28 chromosomes group of cultivated wheats."

Gurney, in 1932 (95), published a key and detailed descriptions for the wheat varieties grown in South Australia.

Histories and descriptions, and colored plates of heads of the wheat varieties developed by Strampelli, are given in the appendix of a report by the National Institute of Genetics as Related to the Cultivation of Cereals in Rome in 1932 (199).

McMillan, in 1933 (140), presented a genealogical chart showing the history of Australian wheat varieties.

Voss, in 1933 (214), described and grouped the wheat varieties of Germany.

Zhukovsky, in 1933 (227), published a botanical classification of the wheat varieties of Anatolia.

Hudson, in 1933-34 (116), described and classified the wheat varieties of England.

Kalt, in 1934 (123), described briefly the wheat varieties grown in Chile.

Flaksberger, in 1935 (82, 83), presented the results of extensive studies on the origin and classification of the species and varieties of wheat of the world.

Jonard, in 1936 (121), classified and gave the origin, synonymy, and description of the common wheats grown in France.

Barbacki et al., in 1937 (29), classified and described the wheats of Poland.

Wenholz et al., in 1938-40 (220), in a series of articles beginning in the November 1, 1938, issue of the Agricultural Gazette of New South Wales, gave a brief history of the named varieties of wheat grown in Australia.

Newman, Fraser, and Whiteside, in 1939 (150), classified and described the spring wheat varieties of Canada and gave a brief account of the origin and distribution of each.

Parera and Palau, in 1939 (156), classified, described, and gave a brief account of the origin of the wheat varieties grown in Argentina.

Flaksberger et al., in 1939 (84), revised and enlarged his earlier publications on the species and varieties of wheat of the world. He and his associates have given more attention to a study of the species and varieties of wheat than other recent workers, and his classification of the species of the genus *Triticum* is followed by the writers.

Patron, in 1940 (156A), described 35 varieties of wheat grown commercially in Argentina.

The adaptation, disease reaction, quality, and a description of the varieties of wheat grown in Chile was presented by the Ministry of Agriculture.^{2a}

^{2a} [CHILE] DEPARTAMENT DE GENETICA FITOTECNICA. [1941.] VARIETADES DE TRIGOS GENETICOS DEL MINISTERIO DE AGRICULTURA. 16 pp. Santiago, Chile.

DOMESTIC CLASSIFICATIONS

Harmon, in 1844 (97), published descriptions and histories of about 30 varieties of wheat that he had grown in Monroe County, N. Y.

Klippart, in 1858 (129), described a large number of wheat varieties grown in Ohio and grouped them into a partly classified order.

Todd, in 1868 (206), 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 (128), 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 (208), 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 (68) and in 1888 (69), published a classification of the wheat varieties being grown at the Ohio Agricultural Experiment Station. This classification was further developed by Hickman (108), who in 1889 divided the varieties into eight morphological groups.

Plumb, in 1889 (159), described a large number of wheat varieties, chiefly American, and gave the histories of many of them.

Blount, in 1892 (31), listed 478 varieties of wheat that he was growing experimentally in New Mexico. Histories of some of these were given.

Carleton, in 1900 (40), 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 (181), 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 (182) 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 (323), 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 (117), 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 1908 (179), published illustrations of 36 varieties of wheat grown by the Kentucky Agricultural Experiment Station.

Noll, in 1913 (152), presented a tabular description of varieties grown by the Pennsylvania Agricultural Experiment Station.

Leighty, in 1914 (137), 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 (177), recorded brief descriptions of the principal wheat varieties of Washington, together with their histories.

Nelson and Osborn, in 1915 (148), gave a brief tabular description of the wheat varieties grown at the Arkansas Agricultural Experiment Station during the period from 1908 to 1914.

Reisner,³ in 1915, compiled much valuable information on the description and history of New York varieties.

Ball and Clark, in 1915 (23), 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 (42), 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 (195), 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 (122), presented a brief key to the groups of common spring and durum wheats grown in experiments in Wyoming.

Ball and Clark, in 1918 (26), published a key to the groups and varieties of durum wheat grown in the United States.

Grantham, in 1918 (94), 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 (57), 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 (53), keyed the groups of common spring and durum wheat grown in experiments in the northern Great Plains area of the United States and gave the histories of the principal varieties.

Stewart, in 1920 (198), presented keys and brief descriptions of the commercial wheat varieties grown in Utah.

Clark, Martin, and Ball, in 1922 (50), presented detailed keys, descriptions, histories, distributions, and synonyms of the wheat varieties grown commercially in the United States.

Schafer, Gaines, and Barbee, in 1926 (178), keyed and presented tabular descriptions of the wheat varieties of Washington.

Hill, in 1930 (111), presented the results of a survey showing the

³ 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.

percentage of the total production for the wheat varieties grown in each county in Oregon in 1929.

Gaines and Schafer, in 1931 (88), 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 (153).

Gaines and Schafer, in 1936 (89), presented results of a survey showing the production of the wheat varieties grown in each county in Washington in 1934.

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 (131) is the most extensive of the earlier studies and the first one that made a definite attempt to describe and classify foreign and domestic farm varieties. Although 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. They, as well as other early investigators, 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. The recent work of Flaksberger and his associates (84) on the classification of species and varieties of the world has been outstanding.

PRESENT INVESTIGATIONS

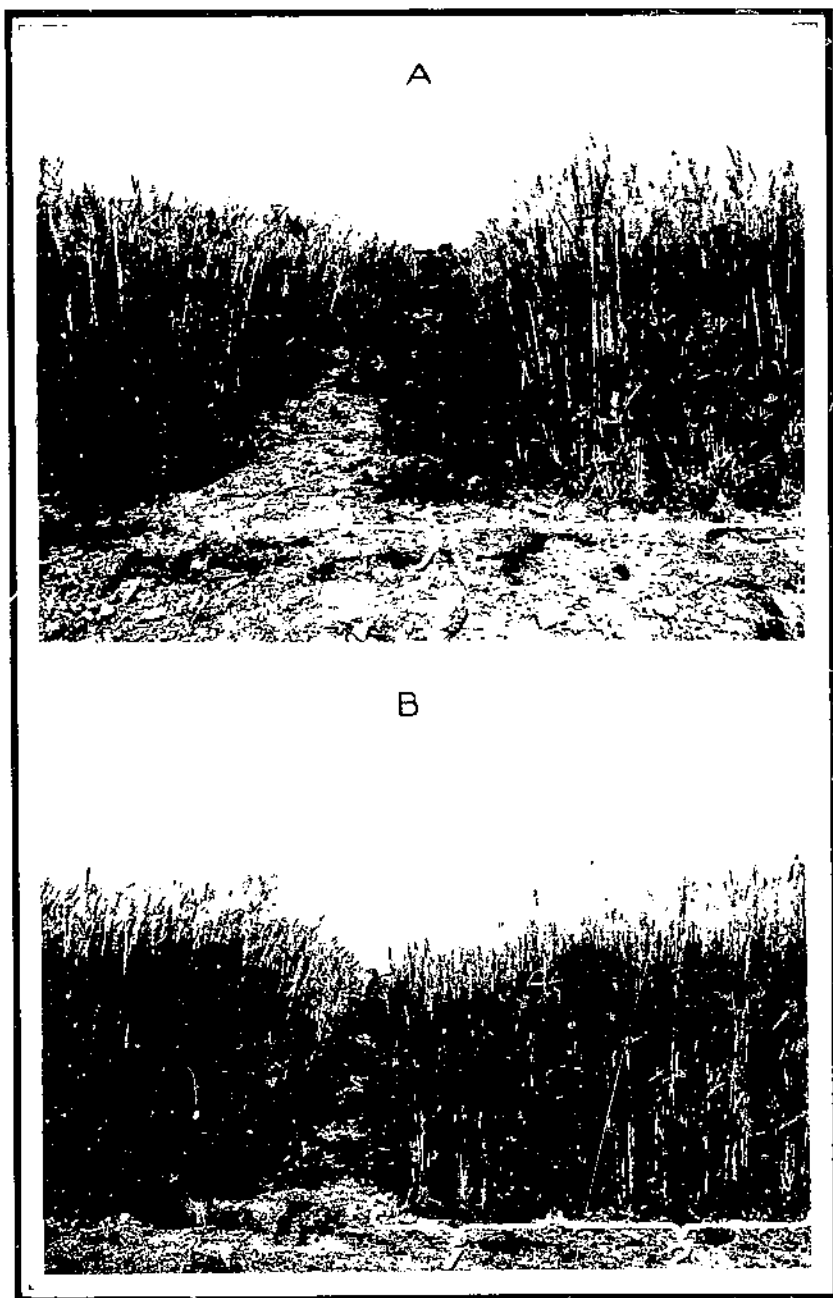
The present investigations were started in 1915^{*} with the object of making a classification of the wheats of the world. During the first 2 years much time was devoted to a study of foreign varieties, and several hundred introductions were added to the large collection of foreign wheats previously 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 (50), presented descriptions, histories, distributions, and synonyms of 230 varieties grown up to 1919. Clark and Bayles, in 1935 (47), included 77 new varieties, and omitted 68 of the 230 varieties no longer grown commercially in the United States, thus making a total of 239 varieties. The present publication includes 47 new varieties, and 74 of the varieties mentioned in Technical Bulletin 459 are omitted. Thus, a total of 212 varieties are discussed in this bulletin.

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 15 years 1915 to 1920 and 1930 to 1939 more than 35,000 separate sowings were made. These were made at experiment stations in all parts of the United States. Nurseries grown from 1936 to 1939, preparatory to the revision of Technical Bulletin 459 (47), were sown at the Pendleton Branch Experiment Station, Pendleton, Oreg.; Washington Agricultural Experiment Station, Pullman, Wash.; Nebraska Agricultural Experiment Station, Lincoln, Nebr.; Oklahoma Agricultural Experiment Station, Stillwater, Okla.; Purdue University Agricultural Experiment Station, Lafayette, Ind.; Ohio Agricultural Experiment Station, Wooster, Ohio; Montana Agricultural Experiment Station, Bozeman, Mont.; and Arlington Experiment Farm, Arlington, Va. 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

^{*}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.



Wheat classification nursery at Corvallis, Oreg., in 1919: *A*, Varieties of winter wheat grown from (1) spring and (2) fall sowing; *B*, varieties of spring wheat grown from (1) spring and (2) fall sowing.

are more distinctly developed. The nurseries 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 pure types. 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 records also show the source of the seed and the original source of the variety. 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 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 hy-

bridization 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.

DESCRIPTION, HISTORY, AND DISTRIBUTION

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 reference 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. The origin and history of the varieties that have appeared in recent years are much more complete than for the older varieties.

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 old 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 cooperation with the Agricultural Marketing Service. By means of these surveys a record of the increase of new varieties and the decrease of old varieties is made possible.

The first survey was made with respect to the 1919 crop and the results were weighted by the preliminary wheat acreage figures reported by the fourteenth United States Census (1920). The resulting estimates were published in Department Bulletin 1074 (50). The results of the second survey, made in 1924, were applied to the wheat acreage figures reported in the Special Agricultural Census of 1925 and the resulting estimates were published in Department Bulletin 1498 (52). Circular 283 (55) gives the results of information obtained from a third survey made in 1929, which were applied to the wheat acreage figures reported in the fifteenth United States Census (1930). Circular 424 (56) gives information resulting from a fourth survey, using the wheat acreage figures of the Special Agricultural Census of 1935 as the base for most of the States. In a few States where abandonment was heavy, the seeded acreage estimates, by counties, prepared by the Division of Crop and Livestock Estimates, Bureau of Agricultural Economics, were used as the base. A fifth survey⁵ was made in 1939 and the results applied to the estimates of seeded acreage, by counties, prepared by the Agricultural Statistics Division, Agricultural Marketing Service. The varietal acreages given in the present bulletin are from this fifth survey.

In 1919, 1924, 1929, 1934, and 1939, respectively, 139, 152, 190, 211, and 207 distinct varieties were reported. Two hundred and eighty-nine distinct varieties were reported in the 5 surveys, the lists not being identical. In the 1939 survey 34 new varieties were reported for the first time and 88 varieties reported in the 1934 survey were not reported in 1939.

The acreage and distribution of the various wheat varieties were determined by means of questionnaires or schedules sent to crop correspondents of the Agricultural Statistics Division, Agricultural Marketing Service. The method of conducting the surveys is described by Clark and Quisenberry (55).

⁵ CLARK, J. A., and QUISENBERRY, K. S. DISTRIBUTION OF THE VARIETIES AND CLASSES OF WHEAT IN THE UNITED STATES IN 1939. Dept. of Agr. Cir. 634. [In press.]

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 (27) 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. It was also published in Department Bulletin 1074 and Technical Bulletin 459.

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, Nebred, Oro, Reward, Redit, and Thatcher.

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 (50) were registered (48) as standard varieties. Thirty-five varieties mentioned in Technical Bulletin 459 that had not been registered were registered as standard varieties (46). Sixty-two varieties originated through introduction, selection, or hybridization have been registered as improved varieties (45, 49, 54).

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 three to six 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, 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 constant differences 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.

Because different strains, particularly of the older varieties, may differ slightly in some characteristics, the C. I.* number of the particular strain described is given, for the first time, in the history of each variety in this bulletin.

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.

* C. I. refers to accession number of the Division of Cereal Crops and Diseases.

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, 64), writing before the beginning of the Christian era, called the spring wheats *trimestrian*, because they matured in 3 months from sowing. Linnaeus (138) 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 *hybernum*. 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 (118, 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. Some 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 grown commercially that are mixtures with respect to growth habit. The different classes for growth habit are not clear cut, as there is a more or less complete series of types from true winter to spring and their expression depends upon temperature, length of day, 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 may be clearly seen for a week or 10 days prior to maturity. When apparent, the color differences are very useful in distinguishing varieties. The color is usually most distinct 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.

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 (131) used color differences in describing many of the varieties with which they worked. Henzé (107, p. 54) pointed out 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 differ-

ences 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 usually 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. The presence or absence of pubescence on the leaves is a useful character in identifying plants of some varieties.

Koernicke and Werner (131) 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, whereas 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, and the 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 sufficiently constant differences for taxonomic purposes.

The terminal leaf of different varieties of wheat is sometimes 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 stri-

gose 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

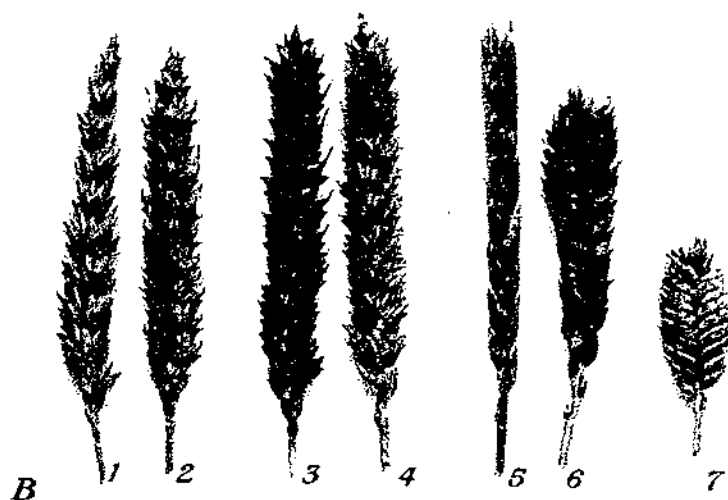
Awns are sometimes of importance agriculturally and usually the character most readily apparent. For these reasons this character is given precedence over all others in preparing the keys. Some earlier writers, as previously stated, used this character for separating so-called species.

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. The awn types are shown in plate 2, A. Awnless varieties have no awnlets or very 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. The length of the awnlets and their relative number is given.

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



Wheat varieties; *A*, Awn types: (1) Supreme, (2) Onas, (3) Thatcher, and (4) Ceres; *B*, spike shapes: (1 and 2) fusiform, (3 and 4) oblong, (5 and 6) clavate, and (7) elliptical.

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, *B*. 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 (107) 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 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 usually 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 (185) separated the common wheats into two groups, having lax and dense spikes, respectively. Koernicke and Werner (131) described the spikes of many varieties according to different degrees of density. Neergaard (146) suggested a formula for use in measuring the density of the spike. Eriksson (78) 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 (107) used the spike density along with spike shape as the leading character in separating varieties. Boshnakian (32) 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 1 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 (107) used essentially these same distinctions in describing his varieties.

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° from the vertical at maturity. Spikes of varieties that are described as inclined usually mature at an angle of approximately 15° to 45° 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 and in the tightness with which they clasp the kernels. These and possibly other characters cause varieties to differ greatly in their resistance to shattering. The durum varieties

usually do not shatter easily. Most commercial varieties of common and club 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, two to five 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 lemma in having its back instead of its face toward the rachilla or axis of the spikelet. Like the lemma, 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 (113) 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. It is given 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 (131).

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.

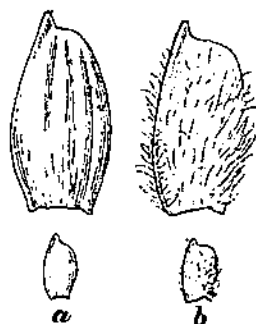


FIGURE 1.—Glume covering: a, Glabrous; b, pubescent. (Natural size and enlarged 3 diameters.)

COLOR

Differences in glume color were early recognized. Lamarek (132) 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 (131). All glumes are classed as white, yellowish, brown, or black.

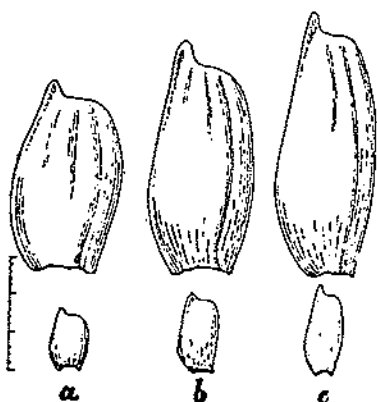
Glumes classed as white may vary in color from a cream or pale-straw color to a dark yellow. Practically no glumes are without color. Within the class, however, there are two rather distinct shades. Some taxonomists have classified them separately as white and yellowish. In the present bulletin, however, 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 the 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

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

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 (107) and Scofield (182) 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.

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). These differences were pointed out by Scofield (182). 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

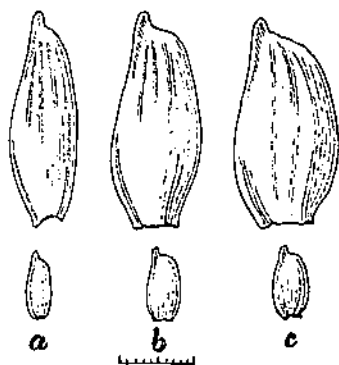


FIGURE 3.—Glume widths: a, Narrow; b, mid-wide; c, wide. (Natural size and enlarged 3 diameters.)

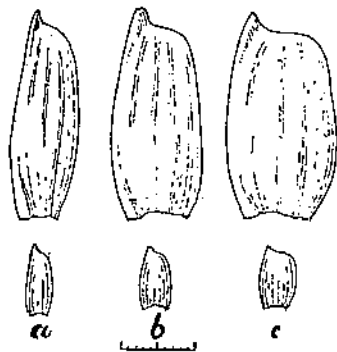


FIGURE 4.—Shoulder widths: a, Narrow; b, mid-wide; c, wide. (Natural size and enlarged 3 diameters.)

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 Koernicke and Werner (131), Hackel (96), and others as side teeth. Scofield (182) 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).

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.

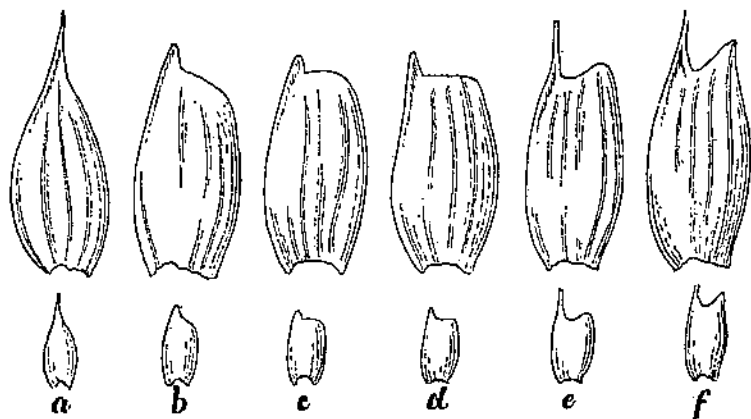


FIGURE 5.—Shoulder shapes: *a*, Wanting; *b*, oblique; *c*, rounded; *d*, square; *e*, elevated; *f*, apiculate. (Natural size and enlarged 3 diameters.)

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 (182) 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.

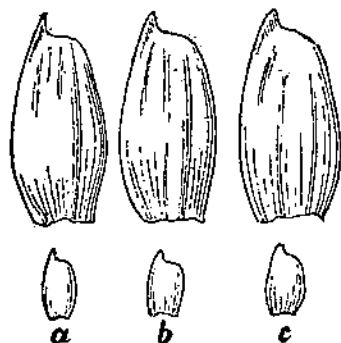


FIGURE 6.—Beak widths: *a*, Narrow; *b*, mid-wide; *c*, wide. (Natural size and enlarged 3 diameters.)

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.

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.

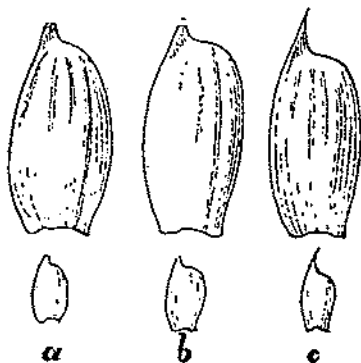


FIGURE 7.—Beak shapes: a, Obtuse; b, acute; c, acuminate. (Natural size and enlarged 3 diameters.)

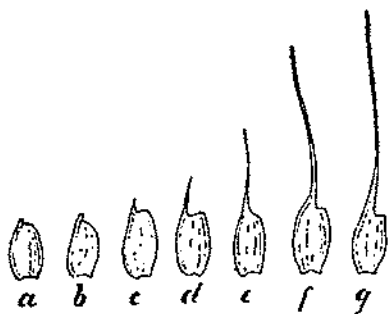


FIGURE 8.—Beak lengths, showing seven variations. (Natural size.)

AWN CHARACTERS

Certain characters of the awn are distinct. Some of these are important in classification, although 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, whereas 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 (131). 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 (131) and by Vilncrin (213) as one of the leading taxonomic characters of wheat. Heuzé (107) and Koernicke and Werner have indicated various shades of white or yellow and of red in the descriptions of the kernel color. Eriksson (78) believed that white wheat becomes red and states that the color of grain is useless in distinguishing a variety. Cobb (59) arranged the wheats he was growing according to the color tint from lightest to darkest. Howard and Howard (115, p. 288) 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, Army, and Olson (101) 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 (131). The writers have grown some purple-kerneled wheats from Ethiopia (Abyssinia), but they are not considered in the present classification.

Kernels of all varieties are grouped into two classes, described as white and red, and, 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 used in this bulletin in describing wheat kernels.

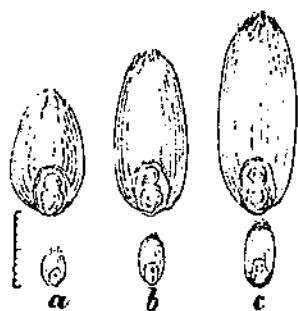


FIGURE 9.—Kernel lengths: a, Short; b, mid-long; c, long. (Natural size and enlarged 3 diameters.)

LENGTH

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

Koernicke and Werner (131), 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 grams. The kernels were described as very small, small, large, and long. Heuzé (107) 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.

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.

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 bread making 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

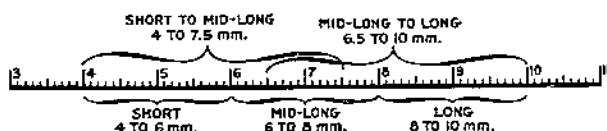


FIGURE 10.—Diagram showing measurements of kernel lengths: Above, major characters; below, minor characters. (Enlarged 10 diameters.)

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 (67) because of the hardness of the kernels. Metzger (141) divided the white-kerneled wheats into two groups on the basis of texture, the starchy ones being considered as yellow. Koernicke and Werner (131) 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 (78), Fruwirth (86), and Howard and Howard (115, p. 232), conclude that kernel texture is useless as a varietal character and that it depends on environment. Hayes, Bailey, Arny, and Olson (101) suggest the terms corneous, subcorneous, 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 two classes and fairly accurately into three 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 "yellowberry," and the kernels are then rather soft.

The difficulty of numerous investigators in determining the kernel

texture has been due to the failure to dissociate softness from starchiness or yellow berry. Freeman (85) 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 "yellowberry," 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 yellowberry.

True kernel texture, therefore, cannot be determined on yellowberry 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 (168) 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. The particle size determination of Cutler and Brinson (65) and the pearling test of Taylor, Bayles, and Fifield (201) are useful in determining the texture of kernels of varieties. Texture in the present studies was determined by cutting kernels not affected by yellowberry and examining the endosperm.

SHAPE

The shape of the kernel 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 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 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.

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 (33) 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

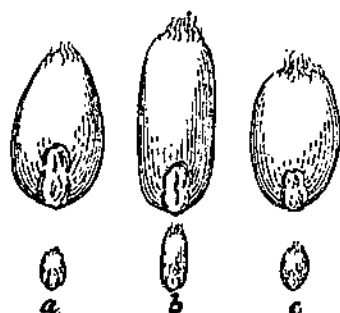


FIGURE 11.—Kernel shapes: a, Ovate; b, elliptical; c, oval. (Natural size and enlarged 3 diameters.)

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 (131) recorded the lengths and widths of the kernels and referred to some as roundish or elongated. Eriksson (78) 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 (107) described the shape of kernels of each variety, using such terms as elongated, short, angular, compressed, ovoid, oblong, and swollen. Scofield (182) 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.

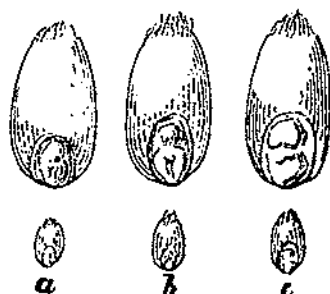


FIGURE 12.—Germ sizes: *a*, Small; *b*, mid-sized; *c*, large. (Natural size and enlarged 3 diameters.)

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, whereas in extremely plump or yellowberry kernels the crease is narrow and shallow, because the space beneath the bran is occupied by large starch cells and air spaces.

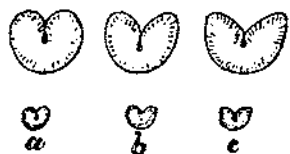


FIGURE 13.—Crease widths: *a*, Narrow; *b*, mid-wide; *c*, wide. (Natural size and enlarged 3 diameters.)

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 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.

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.



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

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 (no longer grown commercially) and the 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. 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, whereas 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.

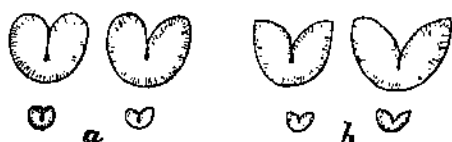


FIGURE 15.—Cheek shapes: *a*, Rounded; *b*, angular. (Natural size and enlarged 3 diameters.)

BRUSH CHARACTERS

The brush of the kernel is the hair at the tip or the end opposite the germ. Cobb (61) 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.

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.

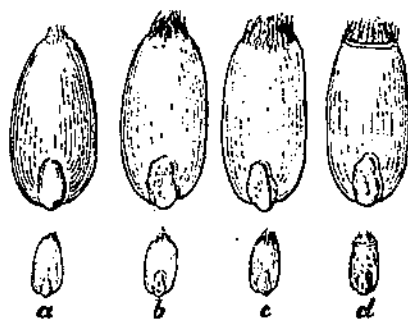


FIGURE 16.—Brush sizes: *a*, Small; *b*, mid-sized; *c*, large; *d*, collared brush. (Natural size and enlarged 3 diameters.)

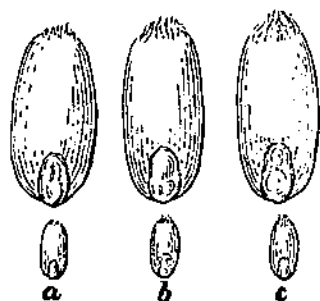


FIGURE 17.—Brush lengths: *a*, Short; *b*, mid-long; *c*, long. (Natural size and enlarged 3 diameters.)

All durum wheats and some varieties of common wheat, such as Red Bobs, have a short brush. Mealy is a variety 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 (61) 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 Goldcoin.

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, 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, and 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 (131) 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 (78), and the relative hardiness of many varieties was given by Koernicke and Werner (131). Clark, Martin, and Parker (51) and Quisenberry and Clark (163) 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, leaf rust, stripe rust, bunt or stinking smut, loose smut, flag smut, powdery mildew, and mosaic. Immunity and resistance can be determined when varie-

ties and hybrids are equally exposed to a disease under conditions favorable for its development. A few varieties are known to be resistant to these diseases and, when known, this fact is noted following the varietal descriptions.

CLASSIFICATION OF THE GENUS TRITICUM

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

Wheat is characterized as a mid-tall annual grass with flat blades and a terminal spike. The spikelets are solitary, one- to five-flowered, sessile, arranged alternately on the nodes of a zigzag, channeled, articulate rachis; 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 (96, pp. 180-187) and recognized by others for many years:

| | | | | | | | |
|-----------------|---|----------------------------|---|----------------|------------------------------|---------------------------|---------------|
| <i>Triticum</i> | { | <i>sativum</i> ----- | { | <i>tenax</i> - | { | <i>vulgare</i> Vill.----- | Common wheat. |
| | | | | | <i>compactum</i> Host. -- | Club wheat. | |
| | | | | | <i>turgidum</i> L. -- | Poulard wheat. | |
| | | | | | <i>durum</i> Desf. -- | Durum wheat. | |
| | | | | | <i>dicoccum</i> Schrank----- | Emmer. | |
| | | | | | <i>spelta</i> L. ----- | Spelt. | |
| | | | | | <i>polanicum</i> L. ----- | Polish wheat. | |
| | | <i>monococcum</i> L. ----- | | | | Einkorn. | |

In recent years the species of wheat have been classified on the basis of chromosome numbers. Sakamura, in 1918 (171), reported the numbers for each of the above species or subspecies and his counts have since been verified by Sax (176), Kihara (124, 125, 126), Watkins (218), and others.

New species of wheat have been described since 1920 and the classification of Flaksberger et al., 1939 (84), includes all those known at the present time. The species recognized by Flaksberger, grouped according to chromosome number, with their common names used in the United States, are as follows:

| <i>Diploid series</i> | <i>Tetraploid series</i> | <i>Hexaploid series</i> |
|--|---|---|
| 14 chromosomes | 28 chromosomes | 42 chromosomes |
| <i>T. spontaneum</i> Flaks., wild einkorn. | <i>T. dicoccoides</i> Körn., wild emmer. | <i>T. spelta</i> L., spelt. |
| <i>T. monococcum</i> L., einkorn. | <i>T. timopheevi</i> Zhuk., timopheevi. | <i>T. vulgare</i> (Vill.) Host. (<i>T. aestivum</i> L.), common wheat. |
| | <i>T. dicoccum</i> (Schrank) Schübl., emmer. | <i>T. compactum</i> Host., club wheat. |
| | <i>T. durum</i> Desf., durum wheat. | <i>T. sphacrococcum</i> Perc., shot wheat. |
| | <i>T. abyssinicum</i> Vav., Abyssinian wheat. | <i>T. macha</i> Dek. et Men., macha. |
| | <i>T. turgidum</i> L., poulard wheat. | |
| | <i>T. polanicum</i> L., Polish wheat. | |
| | <i>T. persicum</i> Vav., Persian wheat. | |

The following key translated from Flaksberger et al. (84) distinguishes the species of *Triticum*.

KEY TO THE SPECIES OF TRITICUM

- I. Spike does not disarticulate at maturity; grain more or less easily threshed by ordinary methods. Free-grained wheats.

A. Glumes coriaceous [firm], shorter than or almost equal to the lemmas; palea of all florets slightly shorter than or equal to the lemma; terminal floret (usually rudimentary) of each spikelet projects beyond the glumes.

1. Spikes awned or awnless; the imbricate [face] surface wider than or equal to the distichous (lateral) surface; glumes with an indistinct, narrow carina [keel], which sometimes disappears at the base of the glume; carina tooth of the glume from short and acute to long and awnlike or tapering into a shortened awn.

a. Spikes awned or awnless; rachis joints of usual width; the imbricate surface of the spike wider than or equal to the distichous surface; in cross section spikes more or less rounded or square; glumes of different shapes, with carina teeth which are sometimes awnlike; glumes often (but not always, as for instance in the Central Asiatic forms and in the branching Vavilov wheat) longitudinally folded and transversely depressed at the base; spikes 5 to 14 cm. long, sometimes longer; density (*D*) from 10 to 38.¹

COMMON SOFT WHEATS—*T. vulgare* Host.

- b. Spikes awned or awnless, differ from the spikes of the preceding species in that they are shorter, wider, thicker, and more dense; length of spike usually not more than three times greater than its thickness; spike 3 to 7 cm. long (rarely longer) and 1 to 2 cm. thick; density of the spike (*D*) from 33 to 54 rachis joints per 10 cm., more commonly density is 40 to 50.

COMMON DWARF WHEATS—*T. compactum* Host.

- c. Spikes awnless or aristulate [short awn]; in the latter case awns firm, squarrose [rough]; spikes shortened as in dwarf wheats, however, their density is 38 to 42; glumes and lemma rounded, distinctly convex to semispherical; grains rounded to almost spherical; in other respects spikes similar to those of soft or dwarf wheats.

INDIAN ROUND-GRAINED WHEATS—*T. sphacrococcum* Perc.

2. Spikes awned, rarely awnless; the distichous surface wider than the front surface, or spikes square in cross section; in Abyssinian forms and in Caucasian wheat the imbricate surface wider than the distichous surface. Glumes firmly coriaceous, distinctly carinate to the base where there are never any longitudinal folds or transverse depressions, so that the characteristic texture and consistency of glumes remain the same to the very base; tooth of the glume from broad, short, somewhat obtuse to acute, or tapering into an awnlike tooth or even an awn.

- a. In general appearance spikes resemble those of soft wheats; the front surface wider than or almost equal to the distichous surface; carina of the glume comparatively narrow; carina tooth acute, awnlike, or tapering into an awn which is somewhat shorter than or equal to the awn of the lemma.

x. Rachis joints of normal width, as in soft wheats (about 2 to 3 mm.); carina tooth of the glume acute or awnlike, tapering into a somewhat shortened awn.

ABYSSINIAN HARD WHEATS—*T. abyssinicum* Vav.

- xx. Rachis joints approximately half as wide as in soft wheats (about 1.5 mm. or less), which makes the spike very flexible; carina tooth of the glume tapers into an awn

¹ Density of the spike (*D*) is usually determined by multiplying the total number of spikelets (minus the terminal spikelet) by 10 and dividing it by the length of the rachis in centimeters, i. e., $D = \frac{(a-1) \times 10}{b}$ where *a* is the number of spikelets and *b* the length of the rachis.

of the same length as or somewhat shorter (by about one-half) than the awn of the lemma; therefore the number of awns on the spike is doubled and it appears densely aristate [awned]. Awnless forms unknown.

PERSIUM OR CAUCASIAN WHEAT—*T. persicum* Vav.

- b. Spikes clearly distinguished from those of soft wheats; the distichous surface wider than or equal to the front surface (compare with soft wheats); awns long, usually longer than the spike, parallel to it or somewhat divergent; awnless forms rare; carina of the glume broad, distinct and strong to the base; carina tooth of the glume broad, comparatively short, somewhat obtuse or acute, but not tapering into an awnlike point.

- x. Glumes oval, elongate-oval, slightly convex, of approximately the same length as lemmas; lemmas navicular [boat-shaped], at the apex gradually tapering into a long awn (rarely into an awnlike point in awnless forms); rachis joints at the place of attachment of spikelets usually almost glabrous or slightly pubescent.

HARD WHEATS—*T. durum* Desf.

- xx. Glumes shortened, oval, definitely convex, shorter than lemmas, covering approximately two-thirds of the latter; main lateral nerve distinct; awns long, longer than the spike, attached directly to the convex glume without gradual tapering, which causes them to break off easily together with a small section of the glume; awnless forms rare; spikes simple or branching; rachis joints of typical forms definitely pubescent at the place of attachment of spikelets; rachis joint bearing the terminal spikelet has a crown of hairs.

TURGIDUM OR ENGLISH WHEATS—*T. turgidum* L.

- B. Glumes membranous or herbaceous (in consistency resembling glumes of oats), of the same length as or longer than lemmas, long, lanceolate, distinctly many-nerved, indistinctly carinate; spikes more or less large, comparatively short awned; the distichous surface wider than or as wide as the front surface.

POLONICUM OR POLISH WHEATS—*T. polonicum* L.

- II. Spikes disarticulate at maturity; usual methods of threshing not effective. Membranous or "polba" wheats.

- A. Spikes compact or lax; the distichous surface wider than the front surface, i. e., spikes compressed, not long in relation to width, awned; awnless forms rare; awns usually long, parallel to the spike; when spike disarticulates the rachis joints remain attached to the spikelets by their upper ends in a handlelike arrangement.

1. The bicarinate (two-keeled) palea does not split into two sections at maturity.

- a. Glumes of different shapes, resembling those of hard wheats but less strongly carinate, compressed; density (*D*) from 21 to 46; when green, spikes resemble those of hard wheats; usually simple but many branching forms are also known; rachis joints pubescent on the edges or almost glabrous; spikelets usually contain two grains; surface lying against the joint convex.—"POLBAS," EMMERS—*T. dicoccum* Schübl.

- b. Glumes wing-shaped, indistinctly carinate (keeled), with the surface of the glume gradually rising into a ridge (here arbitrarily called carina) especially in the upper part of the glume; tooth of the glume broad, triangular, usually in the shape of an equilateral triangle, straight or reflexed, acute, with a smaller tooth next to it; between the teeth there is a more or less acute notch; the bicarinate palea does not split at maturity into two longitudinal sections.

- x. Spikes not long in relation to width, of somewhat pyramidal shape; density (*D*) from 30 to 64; teeth somewhat reflexed; at the base of the tooth the ridge is depressed; instead of a lateral tooth there is a knob; rachis joints

pubescent on the edges; glumes comparatively thin, with a prominent lateral nerve; on the side lying against the rachis spikelets convex or somewhat concave.

TIMOPHEEVI WHEAT—*T. timopheevi* Zhuk.

- xx. Spikes narrow in relation to length; lax (*D*) from 18 to 20; carina tooth triangular; acute or subobtusate, with a smaller tooth next to it; between the teeth there is a more or less acute notch; glumes firm; rachis joints densely pubescent on the angles with long hairs directed upward and forming dense beards at the base of spikelets (in some forms pubescence is less pronounced); spikelets depressed on the side lying against the rachis, in cross section trapeziform.

WILD "POLBAS"—*T. dicoccoides* Körn.

2. The bicarinate palea splits at maturity into two longitudinal sections; spikes small, flat, always awned; density (*D*) from 30 to 55; carina tooth triangular, acute, with a smaller lateral tooth next to it; between the teeth there is an acute notch; broad surface of the spike convex on one side, more or less flat on the other; spikelets usually contain one developed grain (occasionally two grains).
- a. Rachis joints densely pubescent with long hairs directed upward and forming dense beards at the base of the spikelets. There are forms with one-awned and one-grained spikelets (ssp. *aegilopoides* Bal.) as well as with two-awned and usually two-grained ones (ssp. *thaoudar* Reut.).

WILD EINKORN—*T. spontaneum* Flaksb.

- b. Rachis joints almost glabrous or pubescent. In addition to the usual one-awned and one-grained forms, there are two-awned and two-grained ones.

CULTIVATED EINKORNS—*T. monococcum* L.

- B. Spikes lax or compact; glumes broad, broad-cuneate, spatulate; when spikes disarticulate, spikelets remain attached to the lower end of the rachis joints, which lie against the spikelets and do not form a "handle"; however, it sometimes happens that the break occurs in the lower third of the rachis joint; in that case the spike breaks up as in soft wheats; occasionally the spike disarticulates partly as in "polbas," i. e., with the rachis joint forming a "handle" to the spikelet.
1. Spikes awned or awnless; very lax (*D*) from 14 to 22; long in relation to width, in cross section round or almost square; glumes with a short, obtuse carina tooth.-----SPELT—*T. spelta* L.
2. Spikes aristulate; lax (*D*) from 24 to 35 or dense (*D*) from 35 to 52; in appearance resembling either spelt (lax forms) or "polba" (dense forms); glumes with acute carina teeth resembling those of soft wheats.-----MACHA WHEAT—*T. macha* Dek et Men.

Of the 15 species of *Triticum*, only common, club, and durum wheat are grown to any extent in the United States. The varieties of these will be discussed in detail. Only brief mention will be made of the four species, spelt, emmer, Polish, and poulard, grown on a small acreage in the United States for feed for livestock. The other eight species are grown only for experimental purposes and of these only timopheevi, which is of interest to plant breeders because of its resistance to several diseases, and einkorn, of interest because it has only seven haploid chromosomes and is being extensively used in cytogenetic studies, will be discussed.

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



A. Red Winter spelt and B, Vernal emmer: Spikes and glumes natural size; kernels $\times 3$.



A, Alaska (potentially) wheat and B, Timopheevi; Spikes and glumes natural size; kernels $\times 3$.

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, Michigan, and Oregon, and is of the Alstrom variety. The varieties often called "speltz" in this country are not spelt but emmer. Spikes, glumes, a spikelet, and kernels of the Red Winter variety of spelt are shown in plate 3, A.

EMMER

Emmer is often incorrectly called "speltz" in the United States. 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, whereas 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 125,000 acres of emmer were grown in the United States in 1939. At present the acreage is much less. In this country it is used as feed for livestock. A spike, glumes, a spikelet, and kernel of the Vernal variety of emmer are shown in plate 3, B.

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 are 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 very limited acreage of poulard wheat is cultivated in the United States, and the grain is of no commercial value except as feed for stock. A spike, glumes, and kernels of the Alaska variety of poulard wheat are shown in plate 4, A.

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 and this only occasionally in the Western States. A spike, glumes, and kernels of the White Polish variety of Polish wheat are shown in plate 5, *A*.

TIMOPHEEVI

This species, which was only recently discovered by Zhukovsky (226), is of particular interest because of its resistance to several diseases of wheat. It is very highly resistant to stem rust, leaf rust, stinking smut, and mildew. The cytological studies of Kihara (127) have shown that it belongs to the emmer group but contains one genom not present in other species of *Triticum*. It is a late-maturing spring type. The grain does not thresh free of the glumes. The glumes are densely pubescent, and the leaves have hairs on both upper and lower surface. A spike, spikelets, and kernels of timopheevi are shown in plate 4, *B*.

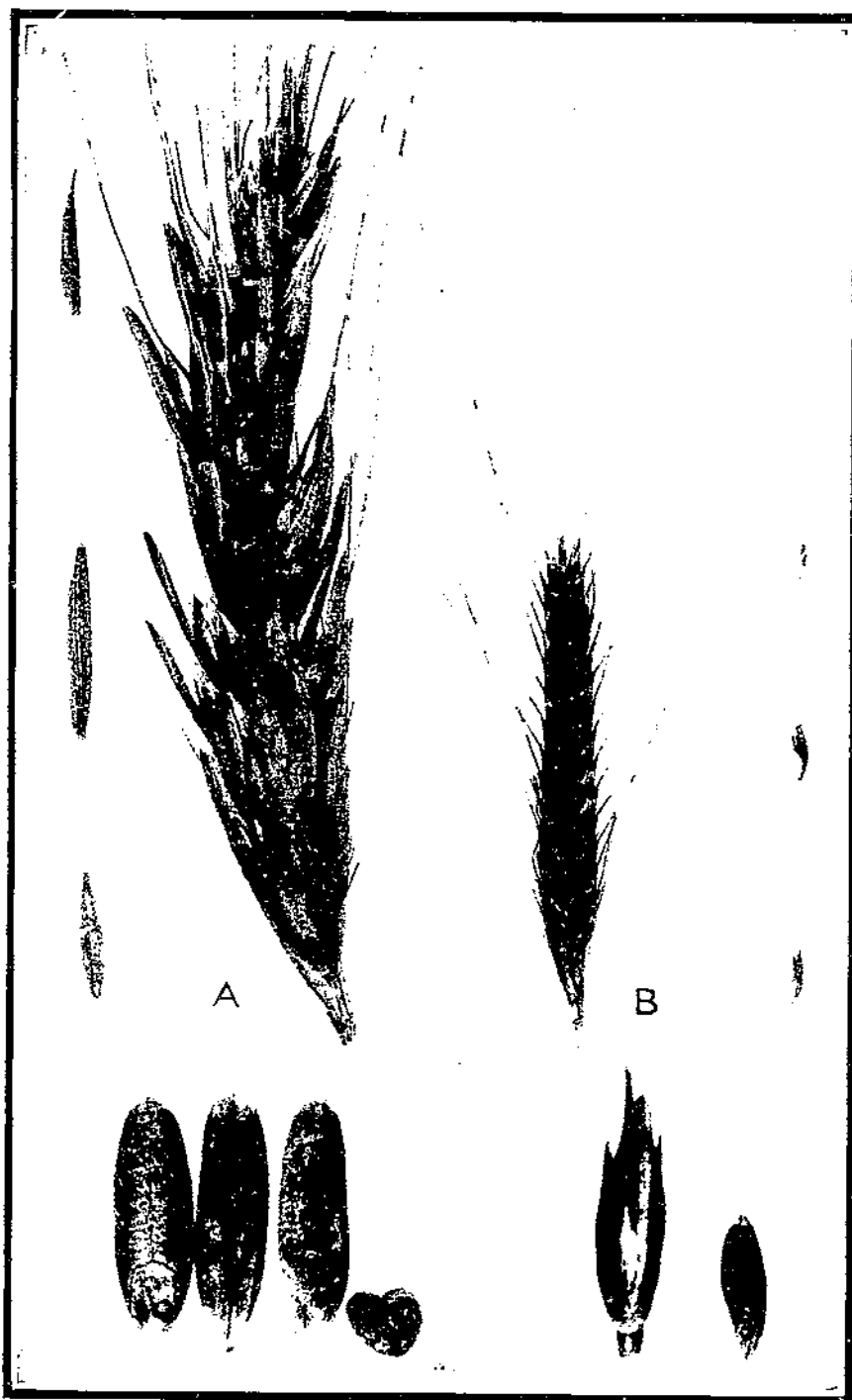
EINKORN

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.

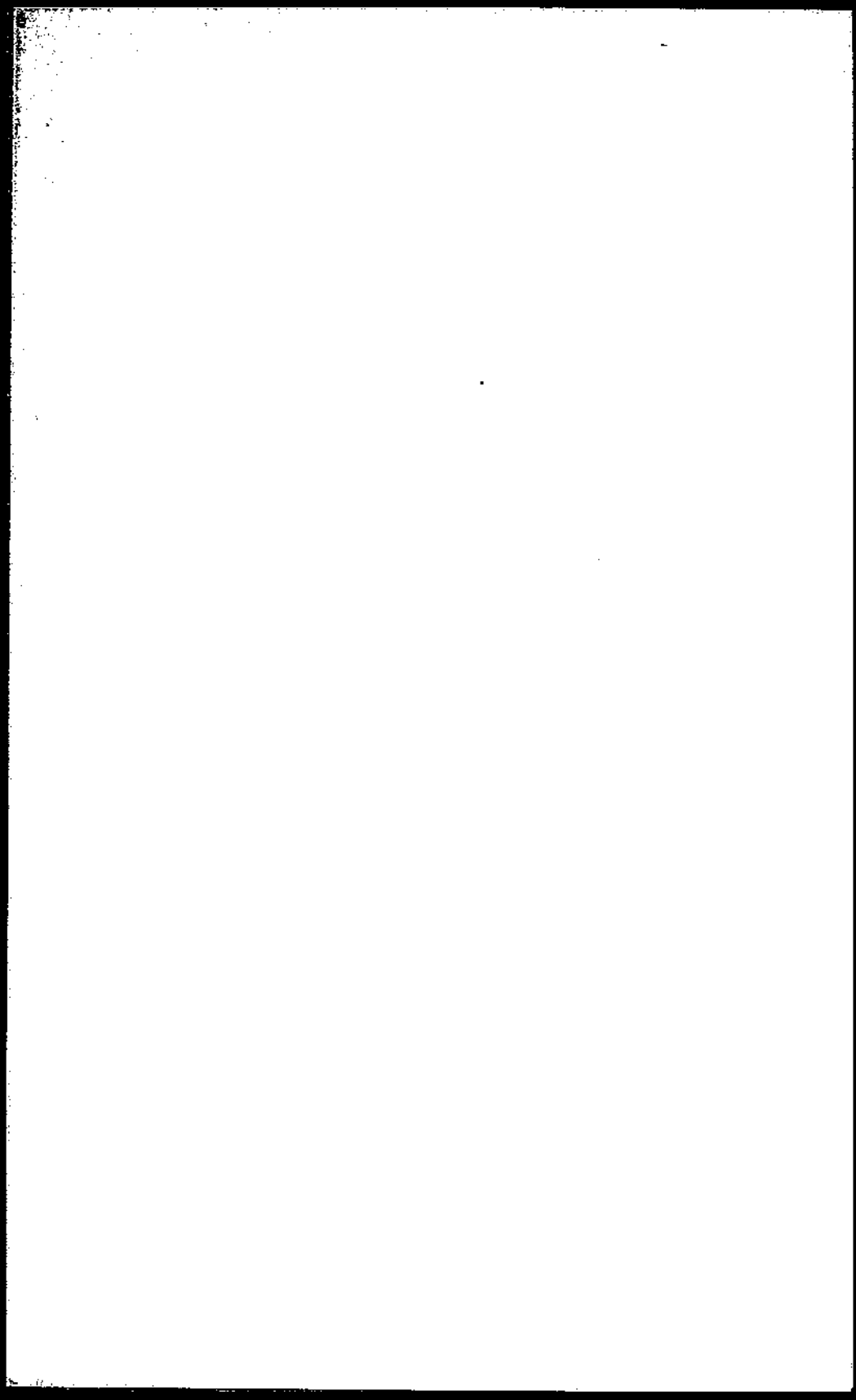
Einkorn is not commercially grown in North America, and the species itself has no economic importance. A spike, glumes, a spikelet, and kernels of einkorn are shown in plate 5, *B*.

COMMON WHEAT

In the *Species Plantarum*, Linnaeus, in 1753 (138), 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 species more commonly recognized as *T. 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. As the name *T. vulgare* is in general use among cereal agronomists the world over,



A, White Polish (Polish) wheat and B, einkorn: Spikes and glumes natural size; kernels $\times 3$.



the writers give preference to that form, which has also been accepted by Flaksberger et al. (84).

Common wheat has 21 chromosomes and is distinguished from club wheat, which it most closely resembles, 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 two to five 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 species. 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 186 varieties cultivated in the United States 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 album* A.L.).

KERNELS SHORT TO MID-LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

Spike fusiform.

Glumes short

Glumes long

Spike oblong.

Keel straight above, shoulders wide

Keel incurved above, shoulders wanting

Spike clavate.

SPRING HABIT.

Spike fusiform.

Plant early, short.

Plant midseason, mid-tall.

Awnlets wanting

Awnlets few, straight

Awnlets many, incurved

Spike oblong.

Plant early to midseason.

Spike awnless.

Spike oblong, fusiform

Spike oblong

Spike apically awnleted

Spike awnleted

Plant late

Spike clavate.

Plant early to midseason.

Spike apically awnleted

Spike awnleted.

Awnlets several, 5 to 15 mm. long

Awnlets several, 5 to 25 mm. long

Plant late.

Culm and spike slightly glaucous

Culm and spike very glaucous

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1a. SPIKE AWNLESS TO AWNLETED—Continued.

2a. GLUMES GLABROUS—Continued.

3a. GLUMES WHITE—Continued.

4a. KERNELS WHITE (*Triticum vulgare albidum* AL.)—Continued.

KERNELS SHORT TO MID-LONG—Continued.

KERNELS SEMIHARD TO HARD.

SPRING HABIT.

Spike fusiform.

Awnlets several, 3 to 7 mm. long.

FLORAR.

Page

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Awnlets several, 5 to 25 mm. long.

FLORENCE (Quality)

55

Spike oblong.

Spike awnless.

WHITE FEDERATION

56

WHITE FEDERATION 38

56

Spike awnleted.

LYNN

56

KERNELS MID-LONG TO LONG.

KERNELS SOFT TO SEMIHARD.

SPRING HABIT.

Spike clavate.

Awnlets several, 5 to 20 mm. long.

CURRAWA

57

Awnlets several, 8 to 40 mm. long.

PILCRAW (Thompson Club)

57

4b. KERNELS RED (*T. vulgare fulvum* AL.).

KERNELS SHORT TO MID-LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

Stem white.

Spike fusiform.

Spike erect, awnlets 2 to 15 mm. long.

RICE

57

Spike inclined, awnlets 5 to 30 mm. long.

EARLY PREMIUM

58

Spike nodding, lax.

LOTHOUSE

58

Plant curly.

Awnlets few, 3 to 10 mm. long.

LEAF

59

Awnlets several, 5 to 25 mm. long.

LEAFLAND

59

Plant midseason, awnlets 3 to 10 mm. long.

WARASH

59

Spike oblong.

Spike erect to inclined.

Glumes with faint black stripes.

CLAREAN

60

Glumes white.

HARVEST QUEEN

60

Spike nodding.

Awnlets straight, 3 to 10 mm. long.

PROSPERITY

61

Awnlets incurved, 5 to 15 mm. long.

FORWARD

61

Spike clavate.

Plant midseason.

VALPRIZE

62

Plant very late.

RED RUSSIAN

62

Stem purple.

Spike fusiform.

Spike lax.

CANAWA

62

Spike mid-dense.

PILHIO

62

FULTZ

63

TRIMMILL

64

ASHLAND

64

FULTZ-MEDITERRANEAN

64

Spike clavate.

INTERMEDIATE HABIT.

Stem white.

Spike fusiform.

Awnlets several, 3 to 10 mm. long.

CARALA

64

Awnlets several, 5 to 20 mm. long.

REDHART

65

Spike fusiform, oblong.

Awnlets several, 5 to 20 mm. long.

HARDRED

65

Stem purple.

Spike fusiform.

Spike erect.

OAKLEY

65

Spike inclined to nodding.

PURPLESTRAW

66

SANFORD

66

GASTA

66

FLINT (Red May)

66

HUSTON

67

KERNELS SEMIHARD TO HARD.

WINTER HABIT.

Spike fusiform.

Awnlets few, 3 to 12 mm. long.

Kernels ovate, germ small.

ALTON (Ghirka Winter)

67

Kernels elliptical, germ mid-sized.

NEWTURK

68

Awnlets several, 3 to 20 mm. long.

RIDIT

68

Kernels short to mid-long; glumes white.

PERROF

68

Kernels mid-long; glumes with black stripes.

CHIEFEAN

69

Spike oblong.

Awnlets several, 3 to 12 mm. long.

MICHUSOF

69

Awnlets several, 5 to 25 mm. long.

MOSIDA

69

SPRING HABIT.

Stem white.

Plant curly to midseason.

Spike awnless.

RED BONS

70

SUPREME

70

Spike awnleted.

Spike fusiform.

Kernels short.

Awnlets 1 to 10 mm. long.

MARQUIS

70

Awnlets 5 to 15 mm. long.

APEX

72

1a. SPIKE AWNLESS TO AWNLETED—Continued.

2a. GLUMES GLABROUS—Continued.

2a. GLUMES WHITE—Continued.

4b. KERNELS RED (*T. vulgare fulvescens* Al.)—Continued.

KERNELS SHORT TO MID-LONG—Continued.

KERNELS SEMIHARD TO HARD—Continued.

SPRING HABIT—Continued.

Stem white—Continued.

Plant early to midseason—Continued.

Spike awnleted—Continued.

Spike fusiform—Continued.

Kernels short to mid-long.

Awnlets 3 to 15 mm. long.

Awnlets 5 to 25 mm. long.

Kernels mid-long.

Awnlets 5 to 20 mm. long.

Spike oblong-fusiform, awnlets 5 to 20 mm. long.

Kernels short, plant short.

Kernels short to mid-long, plant tall.

Plant midseason to late.

Spike fusiform.

Stem purple.

Spike fusiform.

Spike oblong.

Kernels short.

Kernels mid-long.

Spike oblong to subclavate.

KERNELS MID-LONG TO LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

3b. GLUMES BROWN.

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

KERNELS SHORT TO MID-LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

Spike awnless, stem white.

Spike oblong.

Spike clavate.

Spike awnleted.

Spike oblong, stem white.

Spike clavate, stem purple.

Spike dense, erect.

Plant very short, early.

Plant short to mid-tall, midseason.

Spike mid-dense, erect to inclined.

Plant short to mid-tall.

Plant mid-tall to tall.

SPRING HABIT.

Spike fusiform.

Spike oblong.

Plant early to midseason.

Plant late.

Spike oblong to subclavate.

KERNELS SEMIHARD TO HARD.

SPRING HABIT.

Spike mid-dense to lax.

Spike dense.

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

KERNELS SHORT TO MID-LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

Stem white.

Spike fusiform.

Plant midseason.

Plant late.

Spike oblong.

Spike clavate.

Stem purple.

Spike fusiform.

Plant early, mid-tall.

Plant midseason, mid-tall to tall.

Beaks 0.5 mm. long.

Awnlets 3 to 12 mm. long.

Awnlets 5 to 20 mm. long.

Beaks 1 to 1.5 mm. long.

Plant late, tall; awnlets 3 to 12 mm. long.

Spike oblong.

Awnlets low, 3 to 12 mm. long.

Awnlets several, 5 to 25 mm. long.

Spike clavate.

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1a. SPIKE AWNLESS TO AWNLETTED—Continued.

2b. GLUMES PURPLESCENT.

3a. GLUMES WHITE.

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.

Plant early, short.

Plant late, tall.

3b. GLUMES BROWN.

4a. KERNELS WHITE (*T. vulgare delphi* 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.

SPRING HABIT.

KERNELS MID-LONG TO LONG.

KERNELS SEMIHARD TO HARD.

SPRING HABIT.

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

KERNELS SHORT TO MID-LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

Stem white.

Beaks 1 to 3 mm. long.

Beaks 2 to 10 mm. long.

Plant mid-tall.

Plant tall.

Stem purple.

Spike fusiform.

Beaks 1 to 3 mm. long.

Beaks 2 to 8 mm. long.

Plant mid-tall.

Plant midseason.

Plant late.

Plant tall.

Spike oblong; beaks 2 to 10 mm. long.

SPRING HABIT.

Beaks 1 to 3 mm. long.

Beaks 2 to 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 to 2 mm. long.

Spike inclined.

Spike nodding.

Beaks 1 to 5 mm. long.

Beaks 8 to 30 mm. long.

Stem purple.

Beaks 1 to 3 mm. long.

Plant late, tall; glumes with black stripes.

Beaks 2 to 10 mm. long.

Beaks 2 to 25 mm. long.

Plant midseason, mid-tall.

Plant midseason to late, mid-tall to tall.

KERNELS HARD.

Glumes black striped.

Plant very early.

Plant early to midseason.

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1b. SPIKE AWNED—Continued.

2a. GLUMES GLABROUS—Continued.

3b. GLUMES BROWN—Continued.

4b. KERNELS RED (*T. vulgare ferrugineum* Al.)—Continued.

KERNELS MID-LONG TO LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

Stem white.

Stem purple.

Kernels soft; beaks 1 to 8 mm. long.

Kernels semihard; beaks 1 to 2 mm. long.

2b. GLUMES PUBESCENT.

3a. GLUMES WHITE.

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

KERNELS SHORT TO MID-LONG.

KERNELS SOFT TO SEMIHARD.

WINTER HABIT.

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

YORKWIN

Description.—Plant winter habit, midseason, mid-tall, stem white, mid-strong to strong; spike awnleted, fusiform to oblong, mid-dense, inclined; glumes glabrous, white, short, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 to 1 mm. long; awnlets few, 5 to 15 mm. long; kernels white, mid-long, soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of Yorkwin are shown in plate 6, A.

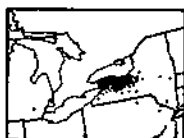


FIGURE 18.—Distribution of Yorkwin wheat in 1939. Estimated area, 122,261 acres.

History.—Yorkwin (C. I. 11855) was selected from a cross between Dietz (Fulcaster) and Goldcoin made in 1919. The last selection was made in 1924, and the strain was distributed to growers in 1935. Prior to being named Yorkwin the strain was known as No. 254A1-101-19. Yorkwin was developed by 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. On account of its winter hardiness

and high yield, it is replacing Goldcoin, Honor, and Forward in New York State.

Distribution.—Estimated area in 1939, 122,261 acres, grown in four States, as shown in figure 18.

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. 4463) has been isolated that is very resistant to some races of bunt.

History.—Martin (C. I. 4636) (reg. 2) was originated from a plant found as a mixture in a field of Clawson by Henry S. Bunnell, of Junius, Seneca County, N. Y., about 1875 (157). Several names were early applied to it. It was called Armstrong by R. T. Holloway, of Penn Yan, Yates County, N. Y., who first distributed it in 1880 (8, 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 (8, p. 666). It was also distributed in 1882 as Landreth, by David Landreth & Son, seedsmen, of Philadelphia, Pa. (157). 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 (7) and was early recognized by the Ohio Agricultural Experiment Station as a synonym for Martin (110).

Distribution.—Estimated area in 1939, 198 acres, grown in Idaho.

* Reg. refers to registration number, explained on p. 141.



A Yorkwin and *B*, White Winter wheats: Spikes and glumes natural size; kernels $\times 3$.



A



B

A, *Wilhelmina* and *B*, *Lemhi* wheats: Spikes and glumes natural size; kernels $\times 3$.

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

GREENSON

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.

As grown commercially, Greenson contains a mixture of red kernels.

History.—The history of Greenson (C. I. 6320) (reg. 4) has been recorded by J. T. Wagoner, county agent of Guilford County, North Carolina (215). George Greenson of that county found a plant of wheat growing beside an old stump in his apple orchard in 1895. He increased the seed and distributed it under the name Wild Goose. After the death of Mr. Greenson in 1898, the variety was called Greenson.

Distribution.—Estimated area in 1939, 10,709 acres, grown in North Carolina.

Synonyms.—Gleason, Greensboro.

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.

Spikes, glumes, and kernels of this variety are shown in plate 6, B.

History.—White Winter (C. I. 5219) (reg. 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 (93). 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 1939, 23,446 acres, grown in western Oregon and Washington and in California. It is one of the principal varieties grown in the Willamette Valley of Oregon.

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

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 wide, obtuse, 0.5 mm. long; awnlets few, 3 to 10 mm.; kernels white, short to mid-long, soft, ovate, slightly humped; germ small; crease mid-wide, and 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 7, A.

History.—Wilhelmina, or Queen Wilhelmina (C. I. 11389) (reg. 279), was developed by Emeritus Prof. L. Broekema (34), 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.—Estimated area in 1939, 36,436 acres, grown in western Oregon, Idaho, and Washington.

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

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 wide, 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 (C. I. 8240) (reg. 280) was selected from Defiance at Davis, Calif., by the California Agricultural Experiment Station in cooperation with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, 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 1933, 15,925 acres, grown in California.

TOUSE

Description.—Plant spring habit, midseason, mid-tall; stem white, slender, very weak; apically awnleted, fusiform, mid-dense, erect to inclined; easily shattered; 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.

History.—Touse (C. I. 6017) (reg. 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 Tonzelle wheat that 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 1869 and one of 123 bushels in January 1870. A small distribution was made in September 1869 chiefly through Senators and Representatives in Congress" (71, pp. 128-129).

Distribution.—Estimated area in 1939, 503 acres, grown in Wyoming and Utah.

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.

History.—Defiance (C. I. 6477) (reg. 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, Escondido, and Regenerated Defiance.

Distribution.—Estimated area in 1939, 10,535 acres, grown in Arizona, Colorado, Idaho, New Mexico, and Oregon.

Synonym.—Pringle's Defiance.

RINK

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 length of the spike.

History.—The origin of Rink (C. I. 5868) (reg. 14) is undetermined. It was reported to have been grown in Washington County, Oreg., since 1909.

Distribution.—Estimated area in 1939, 5,007 acres, grown in western Oregon.

IDAED

Description.—Plant spring habit, early, short; stem white, mid-strong, spike awnless, oblong-fusiform, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; awnlets wanting; kernels white, short, soft to semihard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long.

History.—Idaëd (C. I. 11706) was developed in the coordinated wheat improvement program of the State agricultural experiment stations in the western region and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. It resulted from a cross between Sunset and Boadicea (two Australian varieties) made at Davis, Calif., in 1920. The hybrid was carried in bulk until 1927 when a number of heads were selected. Selection 20172 VII-4, which was later named Idaëd, showed considerable promise and was taken to Moscow, Idaho, for testing in 1931. Its value and adaptation were determined in the coordinated regional program. It was increased by the Idaho Agricultural Experiment Station and distributed in 1938.

Distribution.—Estimated area in 1939, 638 acres, grown in Idaho.

LEMHI

Description.—Plant spring habit, early to midseason, short; stem white, strong; spike awnless, oblong, dense, erect to inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique; beaks wide, obtuse, 0.5 mm. long, awnlets wanting; kernels white, short to mid-long, soft, oval to ovate; germ mid-sized; crease wide, deep; cheeks rounded to angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of Lemhi are shown in plate 7, B.

Lemhi combines the short stiff straw of Federation with the Dicklow characteristic of producing white flour low in carotenoid pigments. It is slightly earlier than Federation.

History.—Lemhi (C. I. 11415) was developed in cooperative investigations of the Idaho Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at the Aberdeen substation, from a cross between Federation and Dicklow made in 1921. The cross was grown in bulk until 1927 when heads were selected. The selection later named Lemhi was grown in the uniform irrigated nursery in the western region in 1931 and was so promising that it was made a uniform variety in field plots in 1935. It was released to growers in the irrigated districts of southern Idaho in the spring of 1939.

Distribution.—Estimated area in 1939, 185 acres, grown in Idaho.

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 8, A.

History.—Onas (C. I. 6221) (reg. 252) was developed (162) by F. Coleman, of Tuela, 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 (P. I.⁹ 40796) in 1918. After having been tested in cooperative experiments in the Pacific Coast States seed was distributed from University Farm at Davis, Calif., in 1923. It was registered as an improved variety in 1926 (49), its superior characters being high yielding capacity and strong stems.

Distribution.—Estimated area in 1939, 38,250 acres, grown in California 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 8, B.

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

History.—Bunyip (C. I. 5125) (reg. 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 × Hornblende)."

"The cross was made in 1897 and named in 1901" (200, p. 189).

Bunyip was first introduced into the United States (P. I. 38345) in May 1914 by the United States Department of Agriculture (219). 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.

Distribution.—Estimated area in 1939, 94,448 acres, grown in California.

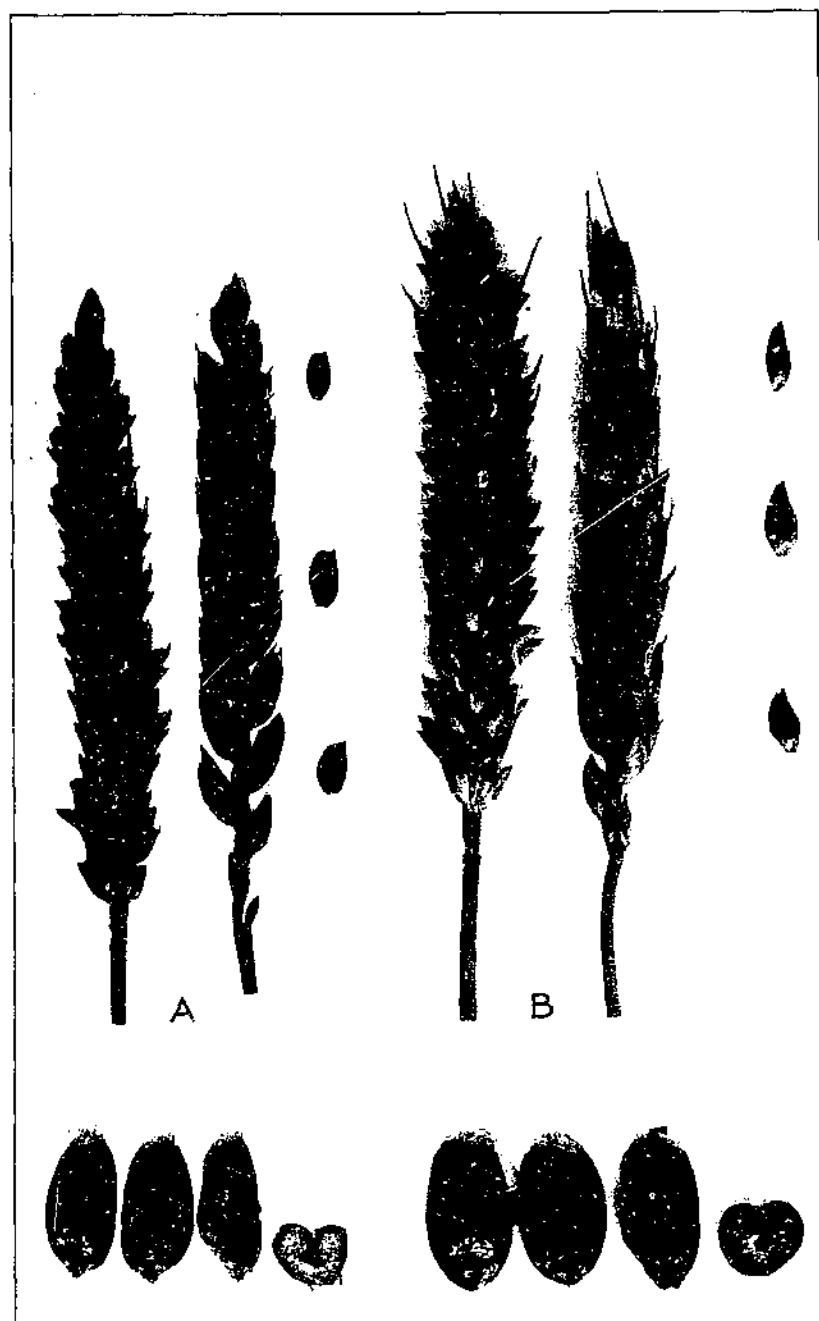
PACIFIC BLUESTEM

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. Spikes, glumes, and kernels of Pacific Bluestem are shown in plate 9, A.

History.—Pacific Bluestem (C. I. 4067) (reg. 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 (60, 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 (20, p. 138; 75, p. 586; 190, p. 176) 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. A more complete history is given in Technical Bulletin 459.

⁹P. I. refers to accession number of the Division of Plant Exploration and Introduction (formerly Foreign Plant Introduction).



A, Oms and B, Bunyip wheats; Spikes and glumes natural size; kernels $\times 3$.



A, Pacific Bluestem and B, Dicklow wheats: Spikes and glumes natural size; kernels $\times 3$.

Distribution.—Estimated area in 1939, 129,782 acres, grown in seven States, as shown in figure 19. A large part of the former acreage of Pacific Bluestem has been replaced by Baart and Federation in recent years.

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

PACIFIC BLUESTEM 37

Description.—Pacific Bluestem 37 is very similar to Pacific Bluestem except in being resistant to some races of bunt.

History.—This strain (C. I. 11903) of Pacific Bluestem is the result of a cooperative program of the California Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Davis, Calif., to develop strains of the important commercial varieties of California resistant to bunt. The original cross, Martin X Pacific Bluestem, was made in 1922. Bunt-resistant lines were backcrossed to Pacific Bluestem 6 times. Following the sixth backcross a composite of 78 resistant F_3 lines was released for production in the foothill area of the Sacramento Valley and in northern California counties in 1937.

Distribution.—Estimated area in 1939, 1,327 acres, grown in California.

MAJOR

Description.—Plant spring habit, early to midseason, mid-tall; stem white, strong; spike apically awnleted, oblong to clavate, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders narrow, oblique to elevated; beaks narrow, acute, 0.5 to 1 mm. long; awnlets few, 3 to 5 mm. long; kernels white, mid-long, soft, ovate; germ mid-sized; crease mid-wide to wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

History.—Major (C. I. 4984) was bred at Dookie Agricultural College, Victoria, Australia, from a cross between Federation and Wallace (162). It was introduced by the United States Department of Agriculture in 1910 as P. I. 42107 (210). The variety was distributed by the Branch Experiment Station at Waterville, Wash., about 1929.

Distribution.—Estimated area in 1939, 5,355 acres, grown in Washington.

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 semihard, 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 (C. I. 4762) (reg. 19) is recorded by Carleton (40, 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 (42, p. 219; 62, p. 4). 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.—Estimated area in 1939, 950 acres, grown in 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.

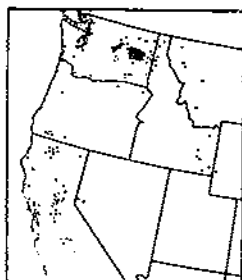


FIGURE 19. — Distribution of Pacific Bluestem wheat in 1939. Estimated area, 129,782 acres.

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 (C. I. 7359) (reg. 281) is a selection from it. Oregon Zimmerman is grown in Oregon under the name "Zimmerman." It has white kernels and should not be confused with the soft red winter variety bearing the latter name.

Distribution.—Estimated area in 1939, 17,402 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.

History.—Surprise (C. I. 2986) (reg. 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 (9):

"My No. 4 (thus numbered only in samples of wheat sent to Professor 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."

Distribution.—Estimated area in 1939, 2,755 acres, grown in Colorado, Idaho, Utah, and Washington, 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.



FIGURE 20.—Distribution of Dicklow wheat in 1939. Estimated area, 139,704 acres.

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 9, B.

History.—Dicklow (C. I. 3063) (reg. 21) was developed by selection and is much more uniform than Surprise. Its origin from Surprise has been recorded by Aicher (17, p. 20) 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 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 most other varieties for the soft-wheat flour trade, because it produces a low-protein, very white flour.

Distribution.—Estimated area in 1939, 139,704 acres, grown in eight States, as shown in figure 20.

Synonyms.—Irwin Dicklow, Jim Holly.

FLOMAR

Description.—Plant spring habit, early to midseason, mid-tall; stem white, mid-strong; spike awnleted, fusiform, lax, erect to inclined, easily shattered; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; awnlets several, 3 to 7 mm. long; kernels white, short to mid-long, hard, ovate; germ mid-sized; crease mid-wide to wide, mid-deep; cheeks angular; brush mid-sized to large, mid-long.

Flomar is resistant to some races of bunt. It shatters easily.

History.—Flomar (C. I. 11707) resulted from a cross between Florence and Marquis made at the Washington State College, Pullman, Wash., in 1925. The selection named Flomar was made in 1929. It was distributed in Pend Oreille County, Wash., in 1933.

Distribution.—Estimated area in 1939, 65 acres, grown in Washington.

FLORENCE (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 Florence are shown in plate 10, A.

Florence is resistant to some races of bunt.

History.—Florence (C. I. 4170) (reg. 23) (P. I. 38349) was introduced from Australia in 1914 by the United States Department of Agriculture and was tested at experiment stations in the Western States, but results did not warrant its distribution for commercial growing. It was, however, used extensively in the breeding program because of its bunt resistance. It is a parent of the Redit, Rival, and Flomar varieties, and is said to be a parent of the variety Carleeds. This variety under the name Quality was distributed by Luther Burbank, of Santa Rosa, Calif., in 1918 (36), as one of his productions and was grown in the United States for several years before it was recognized as being identical with the Australian variety Florence. The Pillsbury Flour Mills Co., of Minneapolis, Minn., distributed seed under the name of Quality or Burbank's Quality in North Dakota, South Dakota, and Minnesota in 1923.

Florence was produced by William Farrer, of New South Wales, Australia, as the result of a successful attempt to produce a bunt-resistant variety. The cross was made in 1901 and Florence was reported to have been distributed in 1907. According to Sutton (200), its pedigree is as follows:

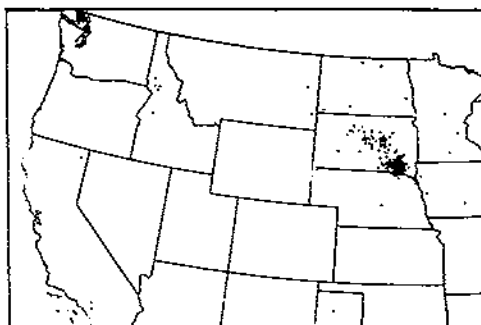
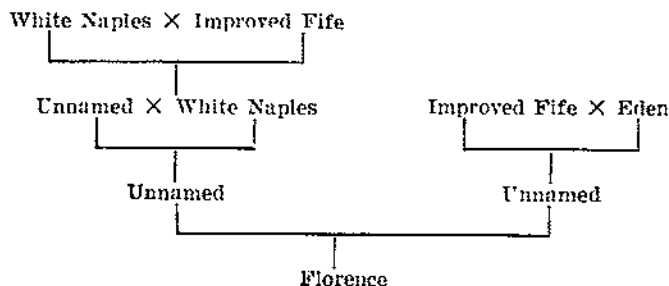


FIGURE 21.—Distribution of Florence wheat in 1939. Estimated area, 142,298 acres.



Distribution.—Estimated area in 1939, 142,298 acres, grown in nine States, as shown in figure 21.

Synonyms.—Burbank's Quality, Quallintine, Quality, Russian Quallintine, Siberian, Sommers 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, semihard 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 10, B.

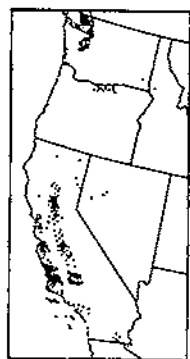


FIGURE 22.—Distribution of White Federation wheat in 1939. Estimated area, 227,704 acres.

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 (C. I. 4981) (reg. 25) is a selection from Federation (140). The following sentence indicates its origin: "The seed (hard kernels selected from Federation by Mr. J. T. Pridham, 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" (14, 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 (161).

It was introduced into the United States by the United States Department of Agriculture (210) in 1916 (P. I. 42104) from Victoria, Australia. It was first grown at the Sherman Branch Experiment 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 (57, p. 24).

Distribution.—Estimated area in 1939, 227,704 acres, grown in six States, as shown in figure 22.

WHITE FEDERATION 38

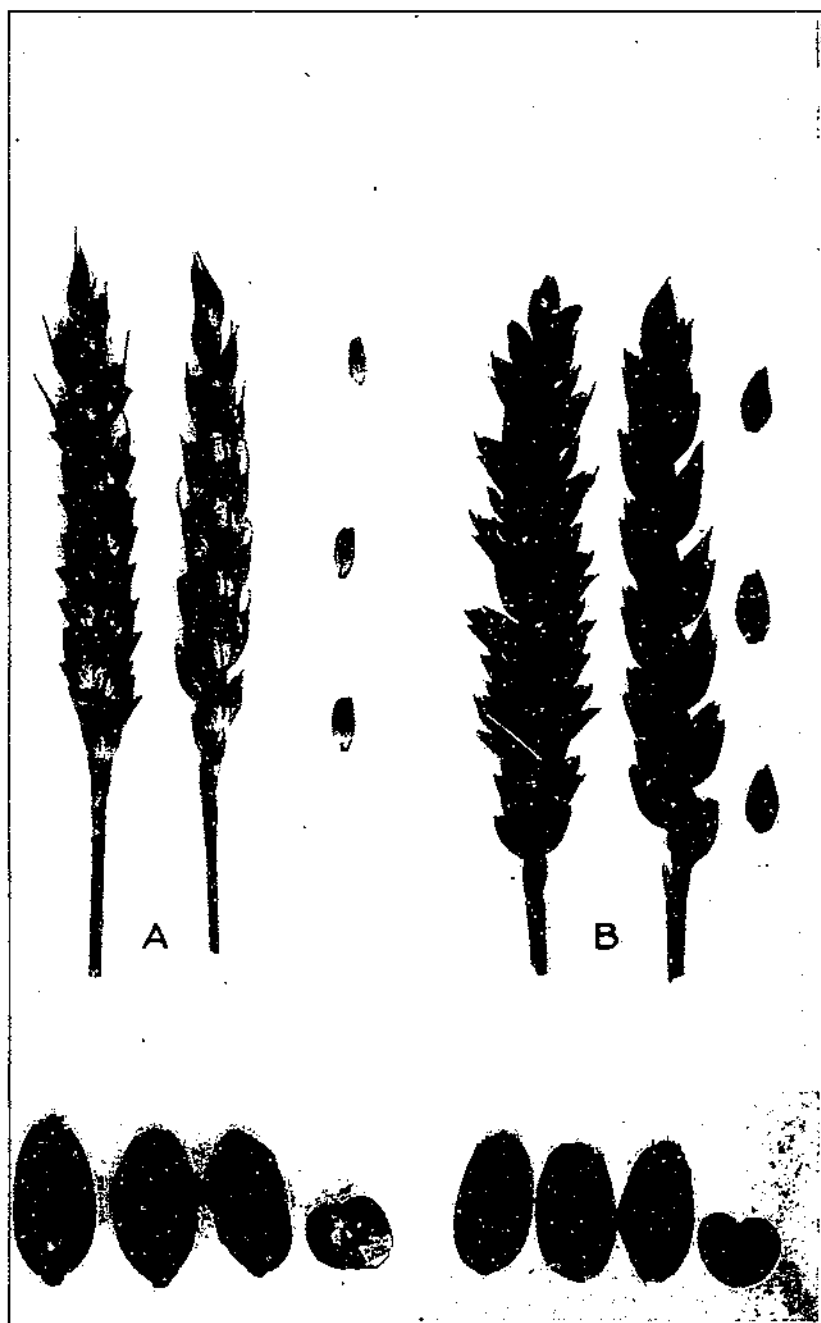
Description.—This variety is very similar to White Federation except in being resistant to stem rust and some races of bunt.

History.—This strain (C. I. 11906) of White Federation was developed in co-operative investigations of the California Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Davis, Calif. A program was begun in 1922 to develop, by backcrossing, strains of the important commercial wheat varieties in California that would be resistant to bunt. In 1930, a similar project was begun to add stem rust resistance to the most important varieties. White Federation 38 is the result of backcrossing Martin × White Federation 5 times with White Federation to obtain bunt-resistant White Federation and backcrossing Hope × White Federation 4 times with White Federation to obtain rust-resistant White Federation. Each backcross was made to segregates resistant to bunt or stem rust, depending on the cross. The bunt-resistant and stem-rust-resistant strains were then crossed and 182 of the F_2 segregates, homozygous for resistance to both diseases, were bulked and increased in 1938. The variety was distributed to growers in the fall of 1939.

Distribution.—Estimated area in 1939, 38 acres, all in California.

LYNN

Description.—Plant spring habit, midseason, mid-tall to tall; stem white, glaucous, strong; spike awnleted, linear oblong, mid-dense, erect; glumes glabrous,



A, Florence and B, White Federation wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Rice and *B*, Loup wheats; Spikes and glumes natural size; kernels $\times 3$.

yellowish white, mid-long, mid-wide; shoulders narrow to mid-wide, oblique to elevated; beaks mid-wide, obtuse, 1 mm. long; awnlets few, 2 to 15 mm. long; kernels white, short, semihard to hard, ovate; germ mid-sized; crease mid-wide, deep; cheeks angular; brush mid-sized, mid-long, collared.

History.—Lynn (C. I. 6346) (reg. 26) probably is a selection from Defiance or Surprise. According to R. B. Luther, Templeton, Calif., it was first propagated by Lynn Bros., of Paso Robles, Calif., about 1914.

Distribution.—Estimated area in 1939, 115 acres, grown in California.

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 wide, 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 Buart, the spring variety most extensively grown in central Washington. It is resistant to powdery mildew.

History.—According to Scott (183), Currawa (C. I. 4982) (reg. 282) 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 (P. I. 42105) was first introduced into the United States by the United States Department of Agriculture from 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.—Estimated area in 1939, 6,258 acres, grown in central Washington.

PILERAW (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 Pileraw (C. I. 5540) (reg. 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 Pileraw Enormous and distributed it.

Distribution.—Estimated area in 1939, 26,743 acres, grown in Washington, California, and Oregon.

Synonyms.—Pileraw Enormous, Thompson, Thompson Club, White Russian.

RICE

Description.—Plant winter habit, very early (except in Northern States), short to mid-tall; stem white, mid-strong; spike awnleted, fusiform, dense, erect; glumes glabrous, white, short to mid-long, narrow to mid-wide; shoulders narrow, oblique to slightly elevated; beaks obtuse, 0.5 to 1 mm. long; awnlets few, 2 to 15 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. Spikes, glumes, and kernels of Rice are shown in plate 11, A.

The plants of Rice are of a pale-green color as contrasted with the dark green of most varieties. Under some conditions it appears to make a more rapid growth in the spring. It heads about a week earlier than Trumbull at Columbia, Mo., but when grown in the Northern States, they head on about the same date.

History.—The origin of Rice (C. I. 5734) (reg. 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." (154, p. 657), and it also was mentioned in that year by C. S. Plumb (159, p. 310) in a paper entitled "The Wheats of the World," read at the Batavia Institute.

Rice is very similar if not identical with the variety Zimmerman, which 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 (112). References in literature show that it was widely grown in Maryland, Virginia, and Pennsylvania about 1850, and that it was an important variety in Kansas in the early nineties. In the South Central States, the name Red May is applied to a variety apparently identical with Rice.

Distribution.—Estimated area in 1939, 40,149 acres, grown in Arkansas, Illinois, Kentucky, Missouri, North Carolina, Tennessee, and West Virginia.

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

EARLY PREMIUM

Description.—Early Premium is very similar to Rice in all taxonomic characters, although it may be a day or two earlier.

History.—Early Premium (C. I. 11858) was selected from a field of "May" wheat (probably Rice) on the farm of J. A. Houston, Platte County, Mo., in 1924. It was found by the Missouri Agricultural Experiment Station, Columbia, Mo., to be about 8 days earlier than such varieties as Fulcaster and was increased and distributed in the fall of 1937 (79).

Distribution.—Estimated area in 1939, 46,970 acres, grown in Missouri and Illinois.

Synonym.—Missouri Early Premium.

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 Kofed 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 (C. I. 3275) (reg. 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 16 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. Although the above statement shows that the wheat originally was whitekerneled, the wheat grown at Nephi, Utah, since 1904 is redkerneled.

Distribution.—Estimated area in 1939, 4,022 acres, grown in Idaho.

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 11, B. Leap is resistant to loose smut.

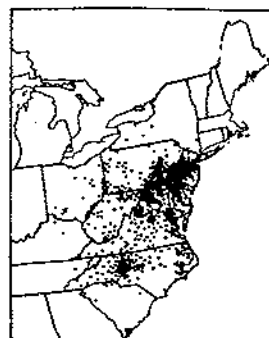


FIGURE 23.—Distribution of Leap wheat in 1939. Estimated area, 669,509 acres.

History.—Leap (C. I. 4823) (reg. 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 (135, p. 44).

Distribution.—Estimated area in 1939, 669,509 acres, grown in 12 States, as shown in figure 23.

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

LEAPLAND

Description.—Leapland is similar to Leap in appearance except in having awnlets, several, 5 to 25 mm. long, and in being taller and more uniform. Its growth is more prostrate from spring seeding, but from fall seeding it appears to make a more rapid growth early in the spring and has produced higher yields than Leap in Maryland.

History.—Leapland (C. I. 11762) was the best line developed from 2,000 spaced plants of Leap grown at the Maryland Agricultural Experiment Station, College Park, Md., in 1924. It was distributed to farmers in 1932.

Distribution.—Estimated area in 1939, 4,736 acres, grown in Maryland and Virginia.

WABASH

Description.—Plant winter habit, midseason, mid-tall to tall; stem white, mid-strong to strong; spike awnleted, fusiform, lax, nodding; glumes glabrous, white, mid-long, mid-wide; shoulders wide, square; beaks mid-wide, obtuse, 0.5 mm. long; awnlets several, 3 to 10 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. Spikes, glumes, and kernels of Wabash are shown in plate 12, A.

Wabash is very resistant to leaf rust in the mature plant stage and to many races in the seedling stage. It is also resistant to mosaic but is susceptible to flag smut and loose smut.

History.—Wabash (C. I. 11384) (reg. 324) was selected from C. I. 5308 in cooperative investigations at the Purdue University Agricultural Experiment Station. C. I. 5308 originated from a single head received by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, from the Missouri Agricultural Experiment Station in 1913. This head apparently was from a natural hybrid between Fultz and

an unknown variety, as its progeny segregated for leaf rust resistance, chaff color, and other characters. A number of leaf-rust-resistant selections were made from it. The one named Wabash was last selected in 1924 and was carried in early tests as C. I. 5309-Wh.-1-1-1. It has been a high yielding strain and was approved for distribution in the fall of 1938 by the Indiana and Illinois Agricultural Experiment Stations.

Distribution.—Estimated area in 1939, 649 acres, grown in Illinois and Indiana.

Synonym.—Accession 33.

CLARKAN

Description.—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, oblong-fusiform, mid-dense, inclined; glumes glabrous, white, sometimes with faint black stripes, mid-long, mid-wide; shoulders mid-wide to wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; awnlets few, 1 to 8 mm. long; kernels red, mid-long, soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, short to mid-long. Spikes, glumes, and kernels of Clarkan are shown in plate 12, B.

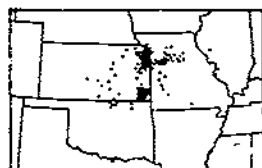


FIGURE 24.—Distribution of Clarkan wheat in 1939. Estimated area, 144,565 acres.

Clarkan is moderately resistant to flag smut but is susceptible to mosaic and very susceptible to loose smut and bunt. The grain of Clarkan is of unusually high test weight.

History.—Clarkan (C. I. 8858) (reg. 316) was developed by a private wheat breeder, Earl G. Clark, of Sedgwick, Kans., from a natural hybrid found in a field of Blackhull in 1916. It probably was a Blackhull × Harvest Queen cross.

Clarkan resulted from a plant selected in 1921 and was first known as Clark's No. 40. The variety was tested by the Kansas Agricultural Experiment Station and was not distributed by Mr. Clark until 1934 when it was recommended by that station for growing in eastern Kansas. It was registered as an improved variety in 1935 (45).

Distribution.—Estimated area in 1939, 144,565 acres, grown in Kansas, Oklahoma, Missouri, and Illinois, as shown in figure 24.

Synonym.—Clark's No. 40.

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 13, A.

History.—The history of Harvest Queen (C. I. 5314) (reg. 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.

Distribution.—The estimated area of Harvest Queen decreased from 1,007,600 acres in 1919 to 177,923 acres in 1939. The latter acreage was grown in six States, as shown in figure 25.

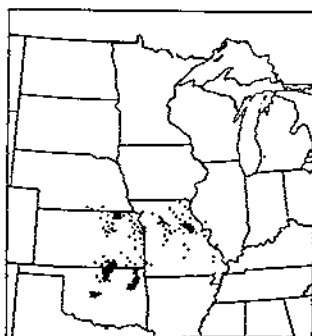


FIGURE 25.—Distribution of Harvest Queen wheat in 1939. Estimated area, 177,923 acres.



A, Wabash and *B*, Clarkan wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Harvest Queen and B, Forward wheats: Spikes and glumes natural size; kernels $\times 3$.

Synonyms.—Black Sea, Canadian, 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.

History.—Prosperity (C. I. 5380) (reg. 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.¹⁰ 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 (104). The name "Prosperity" came into use for the variety about 1895 (13). 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.—Estimated area in 1939, 16,214 acres, grown in Illinois and Missouri.

Synonyms.—American Bronze, Dutch, Hundred Mark, International No. 8, Invincible, Michigan Red, 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 13, B.

Forward differs from Prosperity in being earlier and in having shorter beaks and longer awnlets, sometimes incurved. It is resistant to several races of loose smut.

History.—Forward (C. I. 6031) (reg. 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:¹¹

"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.



Figure 26.—Distribution of Forward wheat in 1939. Estimated area, 320,179 acres.

¹⁰ Printed letterheads of Mr. Jones.

¹¹ Correspondence of the Division of Cereal Crops and Diseases dated March 19, 1921.

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

Distribution.—The estimated area in 1939, 320,179 acres, grown in 12 States, as shown in figure 26.

VALPRIZE

Description.—Plant winter habit, midseason, mid-tall; stem white and purple, strong; spike awnleted, clavate, dense, erect; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to rounded, keels tend to incurve; beaks wide, obtuse, 0.5 to 1 mm. long; awnlets few, 3 to 12 mm. long; kernels light red, mid-long, soft, elliptical, broad and somewhat flattened; germ large; crease wide, deep; cheeks angular; brush mid-sized, mid-long.

History.—Valprize (C. I. 11539) is a selection from a cross between Valley and Grandprize made in 1912. The final selection was made in 1920. It was developed by 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. Valprize was distributed to growers in 1931.

Distribution.—Estimated area in 1939, 17,435 acres, grown in New York and Michigan.

RED RUSSIAN

Description.—Plant winter habit, very 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.

History.—Red Russian (C. I. 4509) (reg. 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" (87, p. 5). Because of lack of winter hardiness, susceptibility to bunt, and poor grain quality, the acreage of Red Russian is decreasing.

Distribution.—The estimated area of Red Russian decreased from 154,900 acres in 1919 to 11,340 acres in 1939. The latter acreage was in Idaho, Washington, and Oregon.

Synonyms.—Australian Club, German Red, Montana Deal, Red Walla, Squarehead.

CANAWA

Description.—Plant winter habit, midseason, mid-tall; stem purple and white, mid-strong; spike awnleted, fusiform, lax, inclined to nodding; glumes glabrous, white, short, narrow to mid-wide; shoulders wanting to narrow, oblique to rounded; beaks mid-wide, obtuse, 0.5 mm. long; awnlets few, 5 to 15 mm. long; kernels red, short to mid-long, soft to semihard, ovate; germ mid-sized; crease narrow to mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

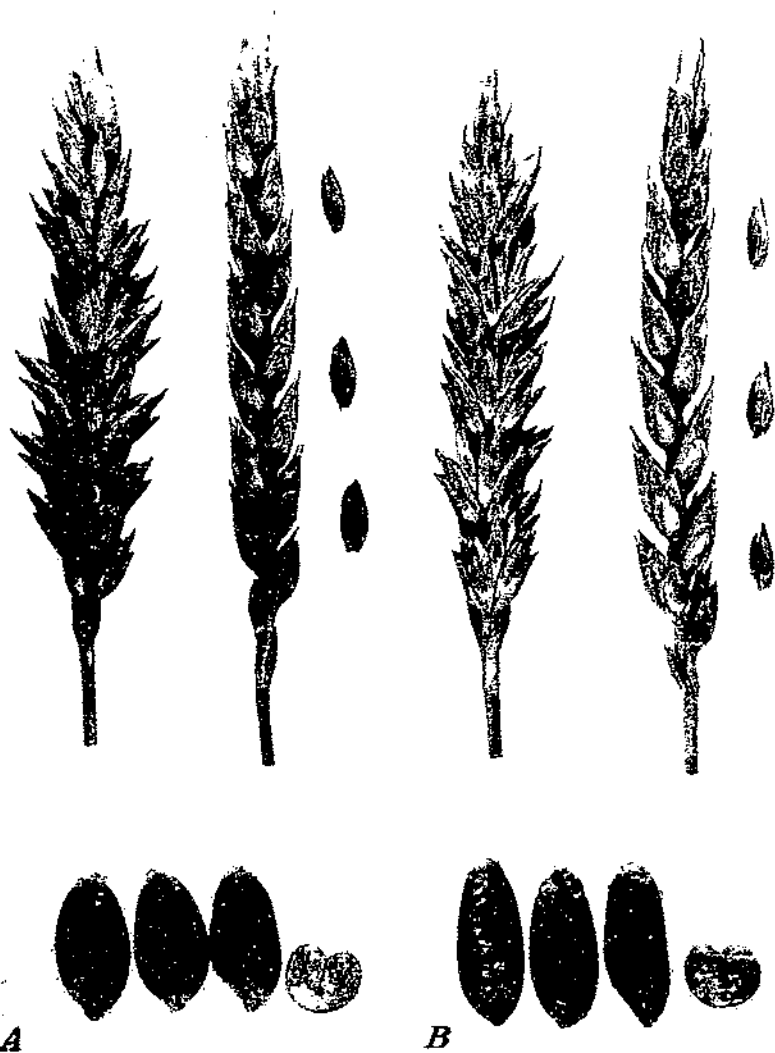
The variety is very susceptible to loose smut.

History.—Canawa (C. I. 11854) (reg. 319) was developed from 1 of 125 heads selected in 1921 from a variety called Canada Hybrid at the Agricultural Experiment Station, Morgantown, W. Va. (90). It was carried as I-22-1125 until 1936, when it was named and distributed.

Distribution.—Estimated area in 1939, 2,628 acres, grown in West Virginia.

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-long,



A, Fultz and B, Redhart wheats: Spikes and glumes natural size; kernels $\times 3$.

soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long.

History.—Fulhio (C. I. 6999) (reg. 231) was developed at the Ohio Agricultural Experiment Station (202) from a plant selected from Fultz. The selection was made at Wooster, Ohio, in 1912. 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 (49) 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.—Estimated area in 1939, 868,743 acres, grown in seven States, as shown in figure 27.

Synonym.—Ohio No. 127.

FULTZ

Description.—Plant winter habit, mid-season, mid-tall; stem purple, mid-strong; spike awnleted, fusiform-oblong, mid-dense, inclined; 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 14, 1.

It is almost impossible to distinguish Fulhio, Trumbull, and Ashland from Fultz.

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

History.—The origin of Fultz (C. I. 1923) (reg. 48) wheat has been recorded by Carleton (42, pp. 199-200), as follows:

"In 1862, in Millin 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.—Estimated area in 1939, 1,455,911 acres, grown in 17 States, as shown in figure 28.

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

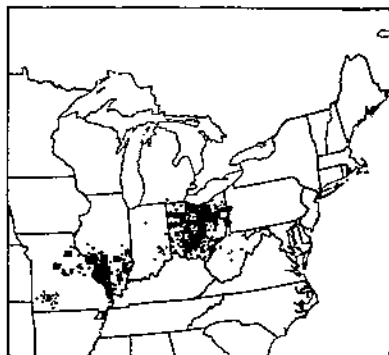


FIGURE 27.—Distribution of Fulhio wheat in 1939. Estimated area, 868,743 acres.

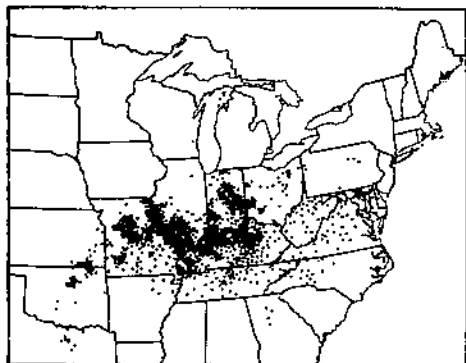


FIGURE 28.—Distribution of Fultz wheat in 1939. Estimated area, 1,455,911 acres.

TRUMBULL

Description.—Trumbull differs from Fultz in being pure for winter habit; it is slightly taller and later, and has slightly stronger and less purple stems. It is resistant to several races of loose smut.

History.—Trumbull (C. I. 5657) (reg. 50) was developed at the Ohio Agricultural Experiment Station, Wooster, Ohio, from a plant selected from Fultz. The selection was grown at the Ohio Agricultural Experiment Station as early as 1908. After 8 years of experiments with the variety at Wooster, C. G. Williams wrote as follows regarding it:

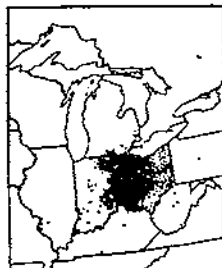


FIGURE 29.—Distribution of Trumbull wheat in 1939. Estimated area, 1,255,464 acres.

"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" (225, p. 466).

Distribution.—Estimated area in 1939, 1,255,464 acres, grown in seven States, as shown in figure 29.

ASHLAND

Description.—According to the Kentucky Agricultural Experiment Station (15), "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 (C. I. 6692) (reg. 49) 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.—Estimated area in 1939, 396 acres, grown 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.

History.—The origin of Fultz-Mediterranean (C. I. 4811) (reg. 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 1908. The variety was evidently named by that firm, and it is claimed by them to have originated from a cross between Fultz and Mediterranean (80, p. 8).

Fultz-Mediterranean shows no indication of having been derived from Mediterranean, although it has many of the characters of Fultz.

Distribution.—Estimated area in 1939, 7,713 acres, grown in Illinois, Indiana, Michigan, Missouri, North Carolina, 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.

CARALA

Description.—Carala is very similar to Purplestraw except in having stronger white stems and in giving higher yields. It is adapted for growing in the same areas as Purplestraw.

History.—Carala (C. I. 12184) was selected from Alabama Bluestem, a strain of the Purplestraw variety, by the North Carolina Agricultural Experiment

Station in 1929 and was designated as Alabama Bluestem 89 in early tests. It was distributed to farmers in the fall of 1940.

Distribution.—Distributed to farmers in the lower Piedmont and Coastal Plain area of North Carolina in the fall of 1940.

Synonym.—Alabama Bluestem 89.

REDHART

Description.—Plant spring intermediate habit, early to 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 to semihard, elliptical; germ mid-sized; crease mid-wide, deep; cheeks angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of Redhart are shown in plate 14, B.

History.—Redhart (C. I. 8898) (reg. 283) was selected from the southern Flint or Red May wheat by Coker's Pedigreed Seed Co., Hartsville, S. C. It was first distributed in 1921. Redhart 3 (C. I. 11860) was developed from a cross between Redhart and a variety named Golden Chaff. Redhart 3, Redhart 4 (C. I. 12003), and Redhart 5 (C. I. 12004) are reselections of the same line and are earlier than Redhart.

Distribution.—Estimated area in 1939, 276,442 acres, grown in North Carolina, South Carolina, Georgia, Virginia, and Missouri, as shown in figure 30.

Synonym.—Golden Grain.

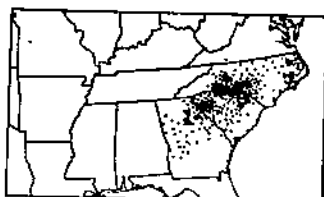


FIGURE 30.—Distribution of Redhart wheat in 1939. Estimated area, 276,442 acres.

HARDIRED

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

Hardired is resistant to mildew and moderately resistant to leaf rust. It has erect stiff straw which is shorter than that of Purplestraw. The kernels are semihard.

History.—Hardired (C. I. 12183) was developed by the Coker's Pedigreed Seed Co., Hartsville, S. C., from a cross between Early Red May and a selection from Hope × Hussar made in 1932, by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Manhattan, Kans. It was designated as Coker 39-3 until it was named and distributed in the fall of 1940.

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 (C. I. 6301) (reg. 45) is undetermined. The variety was grown by the Kentucky Agricultural Experiment Station as early as 1891 (21, 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 1939, 657 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. Plate 15, B, shows spikes, glumes, and kernels of this variety.

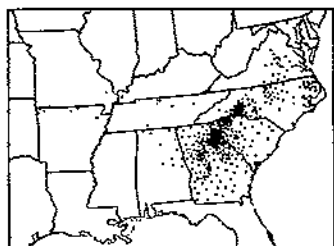


FIGURE 31.—Distribution of Purplestraw wheat in 1939. Estimated area, 298,035 acres.

History.—The origin of Purplestraw (C. I. 1915) (reg. 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" (170, p. 103).

It has been an important wheat in the southeastern United States for more than 125 years.

Distribution.—Estimated area in 1939, 298,035 acres, grown in eight States, as shown in figure 31.

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

SANFORD

Description.—Sanford is very similar to Purplestraw in plant and kernel characteristics, but is moderately resistant to leaf rust and has given higher yields in tests at the Georgia Experiment Stations.

History.—Sanford (C. I. 12026) was developed in cooperative investigations of the Georgia Agricultural Experiment Station at Experiment, Ga., and the Division of Cereals (Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture). It is the result of backcrossing leaf rust resistant selections from Kaured X Purplestraw to Purplestraw twice. Two selections, H264-1-2-3-3-3 and H264-1-2-3-3-5, which appeared to be identical in plant characters, yield, and quality, were bulked and increased in 1940. The variety was named Sanford and distributed to Georgia farmers in the fall of 1940.

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.

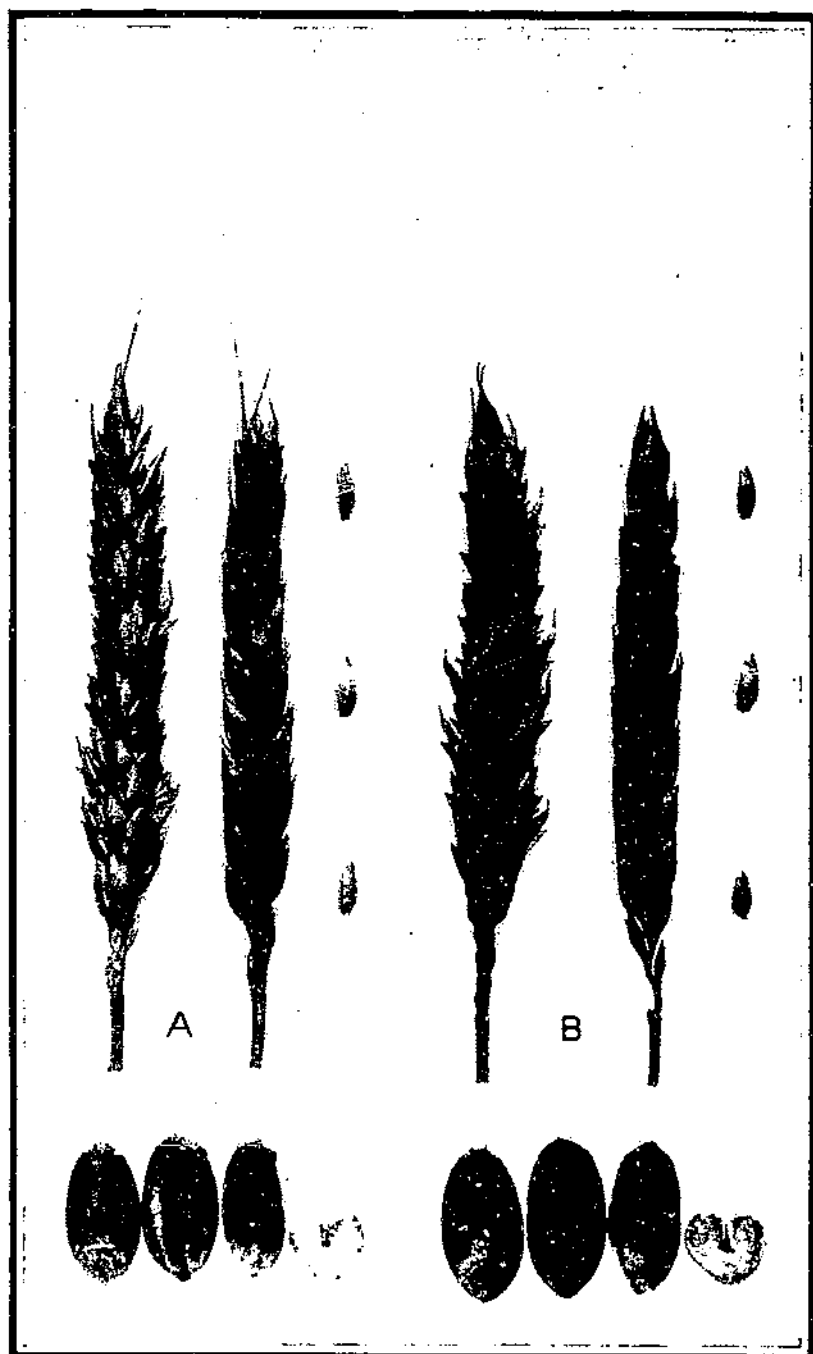
History.—According to Bledsoe (30), Gasta (C. I. 11398) (reg. 268) was developed from a head selected from Purplestraw at the Georgia Agricultural Experiment Station, Experiment, Ga. The selection was made in 1921 and was first distributed for commercial growing in 1931. It was registered (45) as an improved variety in 1931 because of its higher yields and greater resistance to loose smut as compared with Purplestraw.

Distribution.—Estimated area in 1939, 3,426 acres, grown in Georgia and South Carolina.

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. Spikes, glumes, and kernels of Flint wheat are shown in plate 15, A.

History.—The origin of Flint (C. I. 6307) (reg. 47) wheat is undetermined.



A, Flint, and B, Purplestraw wheats: Spikes and glumes natural size; kernels $\times 3$.

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 (97, 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 (128, 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.

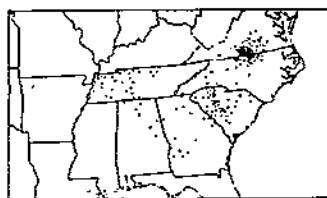


FIGURE 32.—Distribution of Flint wheat in 1939. Estimated area, 134,849 acres.

Early May was listed as a variety grown in Iowa as early as 1852 (77, p. 341) which later became an important variety in that State (70, 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 (5). Much of the Flint wheat now grown is known as "Red May" or "Little Red."

Distribution.—Estimated area in 1939, 134,849 acres, grown in seven States, as shown in figure 32.

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 (G. I. 5208) (reg. 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.

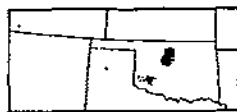


FIGURE 33.—Distribution of Alton wheat in 1939. Estimated area, 140,705 acres.

Distribution.—Estimated area in 1939, 12,456 acres, grown in western Oregon.

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

ALTON (GHIRKA WINTER)

Description.—Plant winter habit, midseason, mid-tall; stem white, weak to 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.

History.—Alton (C. I. 1438) (reg. 55) was introduced by the United States Department of Agriculture (210) as Gbirka Winter in December 1900 from Altonau, near Melitopol in northern Taurida, Russia (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.

The name Alton was substituted for Gbirka Winter to avoid confusion with the variety of spring wheat known as Gbirka Spring. The name Alton is derived from Altonau, the original source of the seed.

Distribution.—Estimated area in 1939, 140,705 acres, grown in Oklahoma, Colorado, and Texas, as shown in figure 33.

Synonyms.—Gbirka Winter, Smooth Head.

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 bread making. Spikes, glumes, and kernels are shown in plate 18, A.

History.—Newturk (C. I. 6935) (reg. 245) 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 were sent to the Judith Basin Branch Station, Moccasin, Mont., in 1920. One of these selections (166B-1-6) proved most promising and was named Newturk. Seed of the Newturk variety was distributed for commercial growing in 1926 when it was registered (49) as an improved variety. Its superior characters are good yield and quality and resistance to shattering.

Distribution.—Estimated area in 1939, 49,470 acres, grown in Montana.

Synonym.—Beardless Turkey.

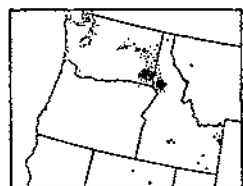


FIGURE 34.—Distribution of Redit wheat in 1939. Estimated area, 132,526 acres.

elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of Redit are shown in plate 16, B.

History.—Redit (C. I. 6703) (reg. 248) was developed from a cross between Turkey and Florence made in 1915 at the Washington Agricultural Experiment Station, Pullman, Wash. A selection made in 1919 resulted in the Redit variety. It was distributed for commercial growing in Washington in 1923 and was registered (49) as an improved variety in 1926. The superior characters are resistant to many races of bunt and to shattering.

Distribution.—Estimated area in 1939, 132,526 acres, grown in Washington, Idaho, Montana, and Oregon, as shown in figure 34.

Synonyms.—Selection C, Smoothless.

PURKOF

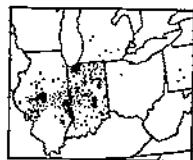
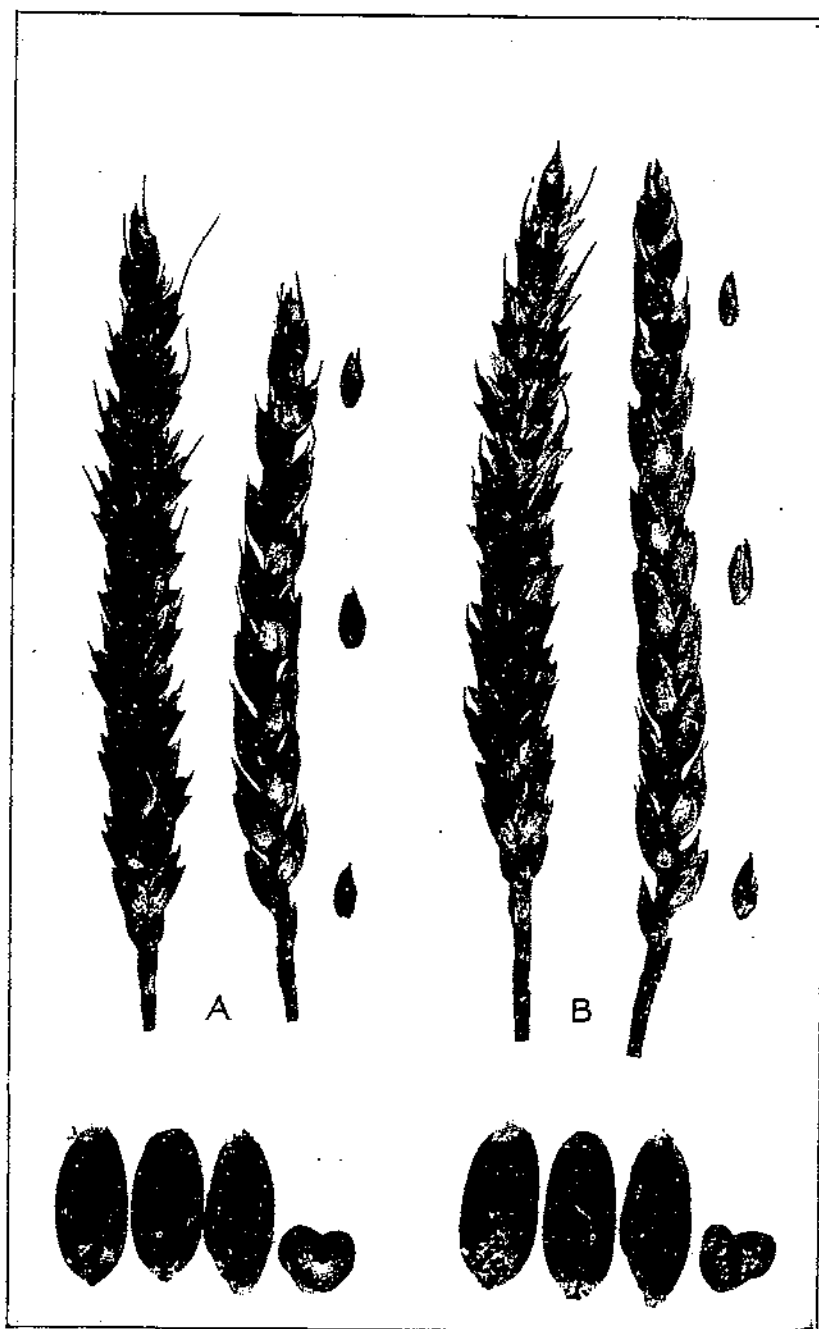


FIGURE 35.—Distribution of Purkof wheat in 1939. Estimated area, 355,647 acres.

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 to hard, ovate to elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of Purkof are shown in plate 17, A.



A, Newturk and B, Ridit wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Purkof and B, Chiefkan wheats: Spikes and glumes natural size; kernels $\times 3$.

History.—Purkof (C. I. 8381) (reg. 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 (54) as an improved variety in 1929. Its superior characters are high yield, outstanding winter hardiness, resistance to shattering, and some resistance to leaf rust.

Distribution.—Estimated area in 1939, 355,647 acres, grown in five States, as shown in figure 35.

CHIEFKAN

Description.—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awnleted, fusiform-oblong, mid-dense to lax, inclined; glumes glabrous, white, usually with black streaks, mid-long, mid-wide; shoulders mid-wide, oblique to square; beaks wide, obtuse, 0.5 mm. long; awnlets several, 3 to 15 mm. long, partly incurved; kernels red, mid-long, hard, ovate to elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long. Kernels of Chiefkan usually sway-backed, i. e. have a depression on the back midway between the brush and germ. Spikes, glumes, and kernels of Chiefkan are shown in plate 17, B.

Chiefkan is moderately resistant to leaf and stem rust but is very susceptible to loose smut and bunt. It has a high test weight and has given good yields during the brief period since it was first distributed. It differs in bread-baking characteristics from typical hard red winter wheat and is generally disliked by millers in the hard winter wheat area. Kanhull, a sister selection, differs from Chiefkan in having longer, narrower glumes, taller straw, and longer heads, in being later, and in giving lower yields. As the small acreage of Kanhull is being replaced by Chiefkan and the two are difficult to distinguish in the field, the acreage reported as Kanhull is included with Chiefkan.

History.—Chiefkan (C. I. 11754) was bred by Earl G. Clark, of Sedgwick, Kans., who also developed Blackhull and Clarkan wheats. It is reported by him to be from a Blackhull \times soft wheat hybrid recombined with Superhard Blackhull (44). The first cross was made in 1916. The selection which resulted in Chiefkan was made in 1926 and was first distributed in 1935.

Distribution.—Estimated area in 1939, 478,219 acres, grown in six States, as shown in figure 36.

Synonyms.—Chiefton, Kanhull.

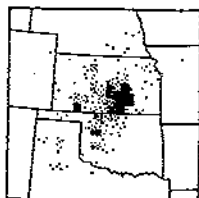


FIGURE 36.—Distribution of Chiefkan wheat in 1939. Estimated area, 478,219 acres.

MICHIKOF

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 rounding; brush mid-sized, mid-long. Spikes, glumes, and kernels of Michikof are shown in plate 18, A.

History.—Michikof (C. I. 6990) (reg. 233) was developed (222) 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 (49) as an improved variety in 1926, its superior characters being high yield, winter hardiness, and high test weight.

Distribution.—Estimated area in 1939, 93,178 acres, grown in Indiana, Illinois, and Ohio.

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 wide, 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 18, B.

History.—Mosida (C. I. 6688) (reg. 247) was produced from a cross made at the Colorado Agricultural Experiment Station between Fultzo-Mediterranean and Turkey in 1916. The segregating 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 (49) 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 1939, 23,504 acres, grown in Idaho, Oregon, Washington, and Montana.

Synonym.—Beardless Turkey.

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 (C. I. 6255) (reg. 56) was originated from a head selection made in a field of Bobs wheat by Seager Wheeler in 1910 at Maple Grove Farm, Rosthern, 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 (37). A fuller history of this variety has been recorded by Buller (35, pp. 253-275). It is evidently the result of a natural field hybrid between Bobs and a red-kernelled variety. Early Triumph, a selection made from Red Bobs by Seager Wheeler at Rosthern, 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 1939, 9,793 acres, grown in Montana, Idaho, Washington, Colorado, and Oregon.

Synonym.—Early Triumph.

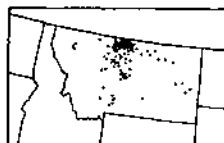


FIGURE 37.—Distribution of Supreme wheat in 1939. Estimated area, 110,018 acres.

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 19, A.

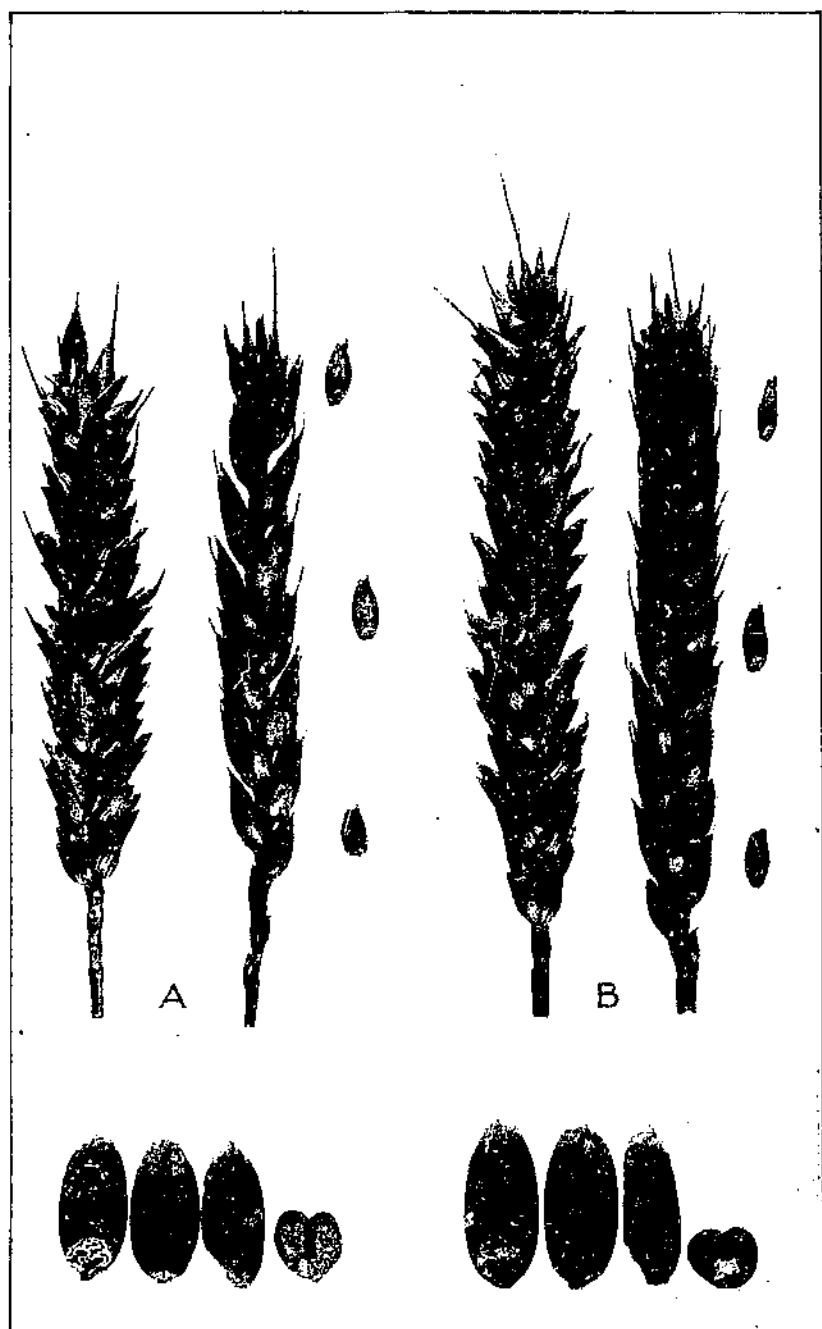
History.—Supreme (C. I. 8026) (reg. 257) is a selection from Red Bobs made by Seager Wheeler at Rosthern, Saskatchewan, Canada. The variety has been grown commercially in Canada since 1922 and in Montana since 1924, seed having been obtained by the Montana Agricultural Experiment Station, Bozeman, Mont., in March 1922. It was registered in 1927 (54) as an improved variety because it outyielded Marquis in Montana, is 4 to 7 days earlier, and has stronger stems.

Distribution.—Estimated area in 1939, 110,018 acres, grown in Montana, as shown in figure 37.

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. Spikes, glumes, and kernels are shown in plate 19, B.

History.—Marquis (C. I. 3641) (reg. 57) is of hybrid origin, having been originated by the cerealists of the Dominion Department of Agriculture at the



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



A Supreme and *B*. Marquis wheats: Spikes and glumes natural size; kernels $\times 3$.

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 (174, 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

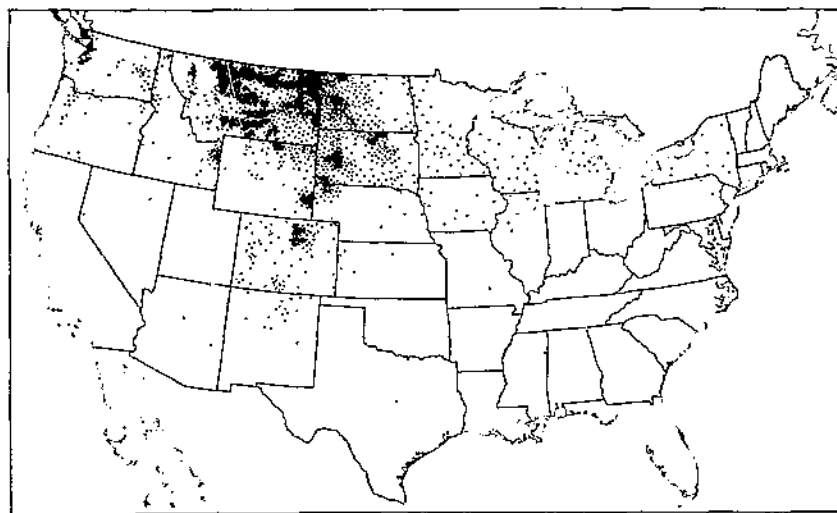


FIGURE 38.—Distribution of Marquis wheat in 1939. Estimated area, 3,224,867 acres.

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 garden on the Central Experimental Farm. Even then, however, its fine qualities were only partly known, and it was not until the cerealist's baking tests of 1907 were completed that he decided to send out this wheat for trial in Saskatchewan. Its success in the prairie country was phenomenal."

Marquis wheat was first sent to the Prairie Provinces of Canada in 1907, where it was thoroughly tested at experiment stations. At Indian Head and Rosthern, Saskatchewan, and at Brandon, Manitoba, it very significantly out-yielded all other varieties. By 1911 the variety had become commercially established in Canada.

Attention was first attracted to Marquis wheat in the United States through its having won premiums at several expositions. Seed was introduced by the United States Department of Agriculture in 1912 and 1913, and the variety was thoroughly tested at numerous experiment stations in the spring-wheat sections. These and other experiments, reported by Ball and Clark (24, 25), proved the variety to be widely adapted. In the meantime, in consequence of much publicity, a strong demand for seed arose. A considerable quantity was brought into the country for sowing in 1913. Much larger quantities were imported in 1914. The importations of these 2 years, with the seed home-grown in 1913, were sufficient to sow about half a million acres in 1914. Most of the imported seed was sold in Minnesota, North Dakota, and Montana. Smaller quantities were sold in other spring-wheat States. In this way the Marquis variety became widely distributed in a very short time. In 1919, only 7 years after its introduction, it made up at least 60 percent, or nearly 12,000,000 acres, of the total spring-wheat acreage of the United States. For more than 15 years it was the most extensively grown spring wheat. Following the severe rust epidemic of 1935, much of the acreage of Marquis was replaced by Thatcher.

Distribution.—Estimated area in 1939, 3,224,867 acres, grown in 22 States, as shown in figure 38.

APEX

Description.—Plant spring habit, midseason, short to mid-tall; stem white, mid-strong; spike awnleted, fusiform, mid-dense, erect; glumes glabrous, white, short to mid-long, mid-wide; shoulders wide, oblique to rounded; beaks wide, obtuse, 0.5 to 1 mm. long, awnlets several, 5 to 15 mm. long; kernels red, short, hard, ovate; germ mid-sized; crease narrow to mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

Apex is resistant to stem rust and loose smut and to some races of bunt. Its bread-making quality is satisfactory.

History.—Apex (C. I. 11636) (reg. 320) was developed from a cross between an F₁ plant of H-44 × [Marquis-Tumillo × Kanred-Marquis] and Marquis made in 1927 at the University of Saskatchewan, Saskatoon, Saskatchewan, Canada. Marquis thus entered the parentage four times. Apex was released for commercial growing in 1937 when about 1,500 acres were grown in Saskatchewan. It was registered as an improved variety in 1937 (45).

Distribution.—Estimated area in 1939, 637 acres, grown in Montana and North Dakota.

GARNET

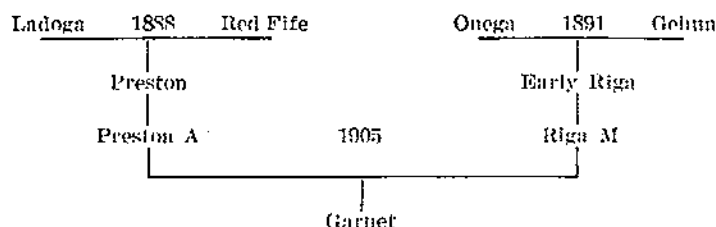
Description.—Plant spring habit, early, short to mid-tall; stem white, slender, weak to mid-strong; spike awnleted, fusiform, mid-dense to lax, inclined, easily shattered; glumes glabrous, white, long, narrow; shoulders wanting to rounded; beaks narrow, acute, 1 mm. long; awnlets several, 3 to 15 mm. 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 (C. I. 8181) (reg. 290) 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 (54) in 1928 because of its early maturity, good yield, and strength of straw.

The parentage of Garnet has been recorded by Newman and Whiteside (151) 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 1939, 4,010 acres, grown in South Dakota, Montana, Idaho, Maine, and Minnesota.

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 wide, 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 and moderately resistant to hessian fly. The grain produces a yellowish flour and in that respect is undesirable. The variety, as shown by Powers (169), is not entirely stable. Spikes, glumes, and kernels of Marquillo are shown in plate 20, A.

History.—Marquillo (C. I. 6887) (reg. 237) was produced in cooperative experiments between the Minnesota Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at University Farm, St. Paul, Minn. It is the result of a cross between Marquis and Inramillo durum made in 1914. The selection II-15-44, later named Marquillo, was made in 1918 and was first distributed in 1928. It was registered in 1926 (49) 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 1939, 143,698 acres, grown in Minnesota, South Dakota, North Dakota, Iowa, and Wisconsin, as shown in figure 39.

Synonym.—Minnesota No. 2202.

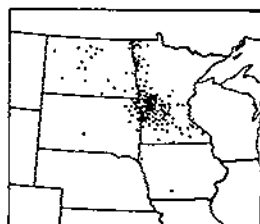


FIGURE 39.—Distribution of Marquillo wheat in 1939. Estimated area, 143,698 acres.

CARLEEDS (NORDHOUGEN)

Description.—Plant spring habit, early to midseason; mid-tall to tall; leaves pubescent; stem white, mid-strong; spike awnleted, fusiform, mid-dense, erect, easily shattered; glumes glabrous, yellowish white, 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, hard, elliptical; germ mid-sized; crease wide, mid-deep; cheeks angular; brush large, mid-long. Spikes, glumes, and kernels of Carleeds are shown in plate 21, A.

Carleeds is resistant to stem rust but susceptible to leaf rust. Its test weight is somewhat low. The kernels appear to be somewhat softer than those of the leading varieties of hard red spring wheat, and, in commercial tests, the gluten characteristics are said to be different from those of the better varieties.

History.—The origin of Carleeds (C. I. 11801) is uncertain. It was developed by Carl Nordhousen, of Leeds, N. Dak., and distributed in 1936. Mr. Nordhousen states that he is not certain regarding the exact parentage, as he did not make a record of his crosses, but thinks it may be the result of crossing two selections from a Hope X Marquis hybrid and in turn crossing a selection from this double cross with Florence. The variety appears to have the resistance of Hope to stem rust.

Distribution.—Estimated area in 1939, 90,958 acres, grown in North Dakota, South Dakota, Minnesota, and Montana.

Synonym.—Nordhousen.

THATCHEE

Description.—Plant spring habit, early to midseason, short to mid-tall; stem white, strong; spike awnleted, oblong to fusiform, mid-dense, erect; glumes glabrous, white (with coffee-colored stains), short to mid-long, mid-wide; shoulders mid-wide, rounded to square to elevated; beaks narrow, obtuse to acute, 0.5 to 1 mm. long; awnlets many, 5 to 20 mm. long, incurved; kernels

light red, short, hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized to large, mid-long. Spikes, glumes, and kernels of Thatcher are shown in plate 20, B.

Thatcher is resistant to stem rust but is susceptible to leaf rust. It has a short stiff straw and is resistant to lodging. It has strong gluten and is very satisfactory for bread making.

History.—Thatcher (C. I. 10003) (reg. 277) was developed in cooperative experiments of the Minnesota Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. It is the result of a so-called double cross, i. e., from a cross between a selection of Marquis \times Junillo, and a selection of Marquis \times

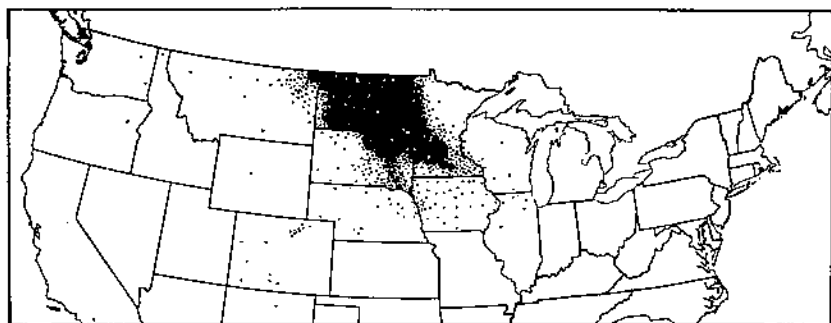


FIGURE 40.—Distribution of Thatcher wheat in 1939. Estimated area, 5,524,631 acres.

Kanred made in 1921 at University Farm, St. Paul, Minn. The plant selection, which resulted in Thatcher, was made in 1925 and was first grown in field plots in 1929 (100). It was distributed for commercial growing and was registered as an improved variety in 1934 (45).

Thatcher proved to be very resistant to stem rust in the severe epidemics of 1935 and 1937, and its acreage increased very rapidly both in the United States and in Canada, where it was officially approved for distribution in 1937.

Distribution.—Estimated area in the United States in 1939, 5,524,631 acres, grown in 15 States, as shown in figure 40. It was estimated (184) that 8,979,400 acres were grown in Canada in 1939.

GREAT NORTHERN (BRANDON 123)

Description.—Plant spring habit, midseason, mid-tall to tall; stem white, mid-strong; spike awnleted, fusiform-oblong, mid-dense, inclined; glumes glabrous, white, short, narrow; shoulders mid-wide, rounded to elevated; beaks narrow, obtuse, 1 mm. long; awnlets several, 5 to 20 mm. long; kernels red, short to mid-long, hard, ovate; germ small; crease mid-wide to wide, shallow; cheeks angular; brush mid-sized, mid-long.

Great Northern as commercially grown is a mixture of different types. It is for the most part resistant to stem rust and contains a predominance of strains resistant to leaf rust.

History.—This variety (C. I. 11937), later called Great Northern, is believed to have escaped or to have been obtained from the Dominion Experimental Farm, Brandon, Manitoba, about 1935 or 1936. It was increased by three growers, one an employee of the Great Northern Railway. It is apparently similar to, if not identical with, a Hope \times Marquis selection known as Brandon 123, although pubescent glume types are in the original increase, indicating that Reward was an admixture or may have entered into the parentage. A strain sold by the New Day Seed Co., at Fargo, N. Dak., under the name Newmarq appears to be identical with Great Northern. The variety sold under the synonyms of Newmarq and Brandon 123 does not contain the pubescent mixture.

Distribution.—Estimated area in 1939, 11,698 acres, grown in North Dakota, Minnesota, and Montana.

Synonyms.—Brandon 123, Newmarq, Northwestern.



Marquillo and B, Thatcher wheats; Spikes and glumes natural size; kernels $\times 3$.



A, Carleeds and B, Renown wheats: Spikes and glumes natural size; kernels $\times 3$.

POWER

Description.—Power is slightly shorter and has a more erect spike than Red Fife, and the kernels are slightly shorter.

History.—Power (C. I. 3697) (reg. 59) was originated by James Holes, of Fargo, N. Dak., from a single plant of Red Fife wheat found growing in an oat field about 1885 (23, p. 11). Some of this seed was obtained by J. B. Power, of Power, N. Dak., who increased it and distributed it in large quantities under the name of Power Fife. This strain was grown by the North Dakota Agricultural Experiment Station and known as "Station No. 66." A number of plant selections were made from it at the North Dakota Agricultural Experiment Station in 1892. One of these, known as "North Dakota No. 213" (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 1939, 1,017 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 Macquis in being taller and later, with kernels slightly longer and more pointed.

History.—Red Fife (C. I. 3329) (reg. 59) 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 Buller (35, 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 (173, pp. 216-217) and another (C. I. 2463) by the United States Department of Agriculture in the same year (23, 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 (58).

Distribution.—The area of Red Fife decreased from 749,000 acres in 1919 to 3,884 acres in 1939. In the latter year it was reported in Montana, North Dakota, South Dakota, and Maine.

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

RENOVN

Description.—Plant spring habit, early to midseason, short to mid-tall; leaves pubescent; stem purple, mid-strong; spike awnleted fusiform, mid-dense, erect; glumes (glaucous and light green) glabrous, white, mid-long, mid-wide; shoulders mid-wide to wide, rounded; beaks wide, acute, 0.5 mm. long; awnlets few, 2 to 10 mm. long; kernels dark red, short, hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of Renown are shown in plate 21, B.

Renown is resistant to stem rust, bunt, and powdery mildew and is moderately resistant to leaf rust.

History.—Renown (reg. 325) was produced at the Dominion Rust Research Laboratory, Winnipeg, Manitoba, from a cross between H-44 (a sister selection of Hope) and Reward made in 1926. The selection (Rust Laboratory No. 716A) (C. I. 11769), which was later named Renown, was made in 1927. About 6,000 acres were grown in Canada in 1937. The seed released in 1937 was

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CLASSIFICATION OF WHEAT VARIETIES GROWN IN THE UNITED STATES IN 1939
CARRIS J. A. BAYLES B. B. 2 OF 2

of slightly inferior grain quality and higher in carotenoid content than most hard red spring wheat varieties, but a reselection (Rust Laboratory 716-6) (C. I. 11947) made in 1932 was found in experimental tests to be more satisfactory and was released in 1939. Renown was registered as an improved variety in 1939 (45).

Distribution.—Estimated area in 1939, 51,506 acres, grown in Minnesota, Montana, North Dakota, and South Dakota.

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.

History.—Ruby (C. I. 6047) (reg. 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 Butler (35, p. 186) as follows:

Gehun (f) × Onega (m)-----W. T. Macoun, 1891.

Downy Riga (f) × Red Fife (m)-----C. E. Saunders, 1905.

Ruby

Distribution.—Estimated area in 1939, 4,602 acres, grown in Minnesota, North Dakota, South Dakota, Wisconsin, Wyoming, and Utah.

Synonyms.—Disco, Golden.

REGENT

Description.—Plant spring habit, early to midseason, mid-tall; stem purple, mid-strong; spike awnleted, oblong, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders narrow, wanting to oblique; beaks narrow, acute, 0.5 mm. long; awnlets few, 2 to 12 mm. long; kernels dark red, mid-long, hard, ovate; germ small; crease wide, deep; cheeks angular; brush mid-sized, mid-long.

Regent is resistant to stem rust, leaf rust, and bunt and, based on experimental tests, appears to be of high quality for bread making.

History.—Regent (C. I. 11860) (reg. 327) was developed from a cross between H-44 and Reward made in 1926 at the Dominion Rust Research Laboratory at Winnipeg, Manitoba. Selection R. L. 975.1, which resulted in Regent, was made in 1932 (150). It was first released in 1939, when about 11,000 bushels were distributed in Manitoba and eastern Saskatchewan. It was registered as an improved variety in 1939 (45).

Distribution.—Grown in the United States mainly in experimental plots in 1939.

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 (C. I. 4800) (reg. 66) 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 (221).

Distribution.—Estimated area in 1939, 2,671 acres, grown in Colorado.

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 (C. I. 6203) (reg. 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" (117, 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 1939, 474 acres, grown in Indiana.

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

REX

Description.—Plant winter habit, early, short to mid-tall; stem white, strong; spike awnless, oblong, mid-dense, inclined; glumes glabrous, brown, short to mid-long, mid-wide to wide; shoulders wide, rounded to square; beaks wide, obtuse, 1 mm. long; awnlets usually wanting or 1 to 3 mm. long; kernels yellowish white, short to mid-long, soft, oval; germ mid-sized; crease wide, mid-deep; cheeks rounded; brush mid-sized, mid-long. Spikes, glumes, and kernels of Rex are shown in plate 22, A.

Rex is resistant to some races of bunt and is very resistant to lodging and shattering. Grain of Rex grinds into flour with very fine particles.

History.—Rex (C. I. 10055) (reg. 276) was developed at the Sherman Branch Experiment Station, Moro, Oreg., and the Pendleton Branch Experiment Station, Pendleton, Oreg., in cooperative experiments of the Oregon Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. It was selected from a cross between White Odessa and Hard Federation which was made in 1921. The plant selection that resulted in Rex was made in 1926. It was found to carry the factors from White Odessa for resistance to some races of bunt. It was released for commercial growing in 1933 and was registered as an improved variety in 1934 (45). Because of its resistance to lodging, shattering, and some races of bunt and its combination of early maturity and winter hardiness, all of which result in good yields, the acreage of Rex has increased rapidly in the Pacific Northwest.

Rex was found not to be pure for plant height and a strain (Rex M1) pure for the shorter and earlier type was increased and distributed in the fall of 1938.

Distribution.—Estimated area in 1939, 370,159 acres, grown in Oregon, Washington, and Idaho, as shown in figure 41.

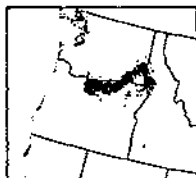


FIGURE 41.—Distribution of Rex wheat in 1939. Estimated area, 370,159 acres.

ABCO

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 wide, 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 (C. I. 8246) (reg. 285) resulted from a cross between Arcadian and Hard Federation made at the Sherman Branch Experiment Station, Moro, Oreg., in 1919. Selections from the cross 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.

Distribution.—Estimated area in 1939, 547 acres, grown in Oregon and Missouri.

Synonym.—Pecavet.

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 toessian fly in California. Spikes, glumes, and kernels of Dawson wheat are shown in plate 22, B.

History.—Dawson (C. I. 3342) (reg. 69) was originated by Robert Dawson, of Paris, Ontario, Canada (188, 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" (189, p. 11).

Distribution.—Estimated area in 1939, 379,556 acres, grown in six States, as shown in figure 42.

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.

History.—Honor (C. I. 6161) (reg. 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. It was selected from Dawson and during the experimental stages was known as Cornell Selection 522-68.

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 (169), of Bergen, N. Y.

Distribution.—Estimated area in 1939, 37,073 acres, all grown in New York.

ATHENA

Description.—Plant winter habit, early, very short; stem purple, very strong; spike awnleted, oblong-clavate, dense, erect; glumes glabrous, brown, short to mid-long, wide; shoulders mid-wide, rounded to oblique; beaks wide, obtuse, 0.5 mm. long; awnlets several, 5 to 15 mm. long; kernels white, short to mid-long, soft, broadly ovate; germ large; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

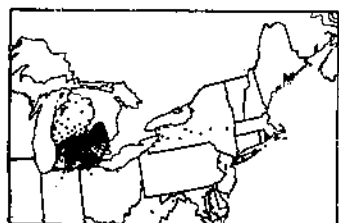


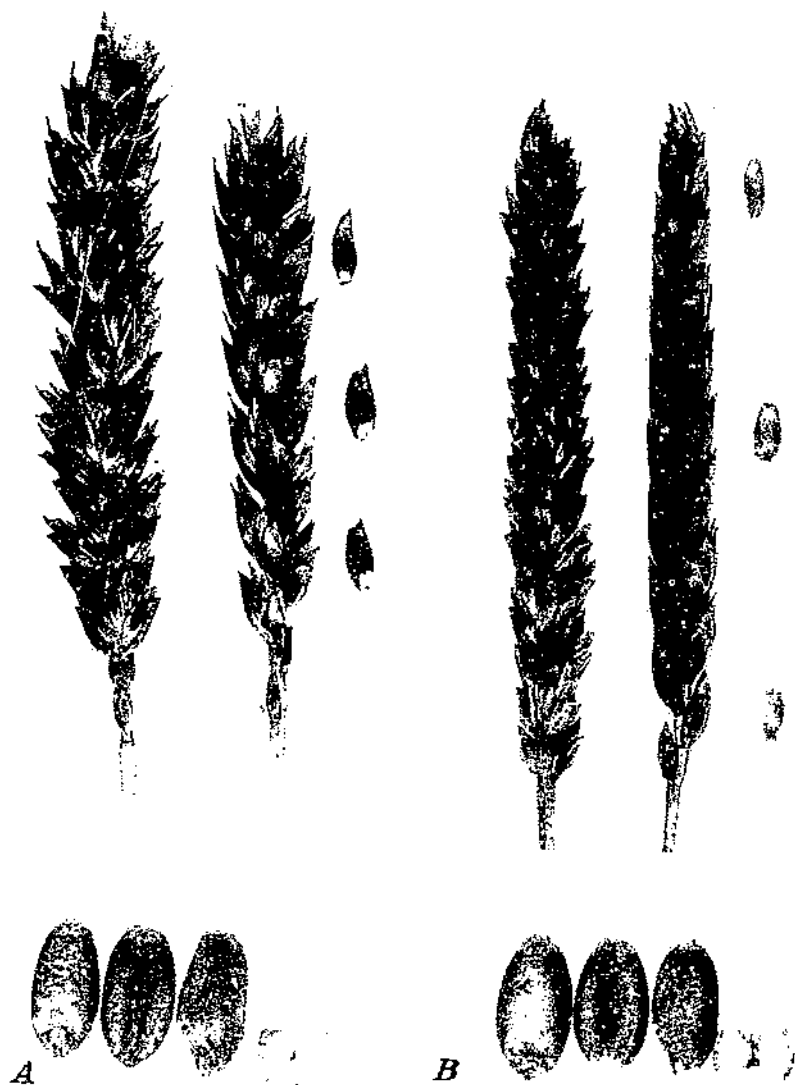
FIGURE 42.—Distribution of Dawson wheat in 1939. Estimated area, 379,556 acres.



A

B

A, *P* Δ and *B*, Dawson wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Goldcoin and B, Federation wheats: Spikes and glumes natural size; kernels $\times 3$.

History.—Athena (C. I. 11693) was developed in cooperative investigations of the Oregon Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. The cross, Goldcoin \times Federation, was made at Moro in 1919. A selection 1993A2-13 (C. I. 8247) was released in Umatilla County, Oregon, in 1930 but was found not pure for growth habit. A reselection (C. I. 11693) made at the Pendleton Branch Experiment Station in 1931 is pure for this character.

Distribution.—Estimated area in 1939, 1,079 acres, grown in Oregon and Washington.

Synonym.—Fortyfold-Federation.

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.

History.—Seventy-five heads were selected from a field of Goldcoin at the Sherman Branch Experiment 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 named Golden (C. I. 10063) (reg. 286) and was distributed to farmers in Union County and in Morrow County, Oregon, in 1930 and in Latah County, Idaho, in 1931.

Distribution.—Estimated area in 1939, 38,522 acres, grown in Oregon, Washington, and Idaho.

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

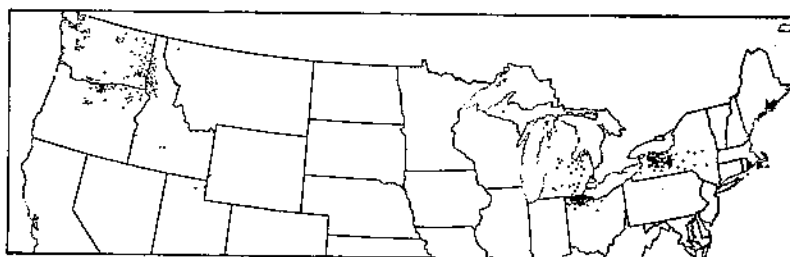


FIGURE 43.—Distribution of Goldcoin wheat in 1939. Estimated area, 267,501 acres.

white, short to mid-long, soft, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks 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 23, A.

History.—Goldcoin (C. I. 4158) (reg. 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 (19, 153) in 1855:

"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." For a more complete history, especially of the synonyms of Goldcoin, see Technical Bulletin 459 (47).

Distribution.—Estimated area in 1939, 267,501 acres, grown in nine States, as shown in figure 43. The acreage has decreased greatly in recent years.

Synonyms.—Alundance, Clawson, Eldorado, Fortyfold, Gold Bullion, Golden Chaff, Gold Medal, Goldmine, Improved No. 6, International No. 6, Junior No. 6, Klondike, New Soules, Niagara, Number 6, Oregon Goldmine, Plymouth Rock, Prizetaker, Prizewinner, Rochester No. 6, Soules, Superlative, Twentieth Cen-

tury, White Century, White Clawson, White Eldorado, White Rock, White Russian, White Soules, White Surprise, Winter King.

EICKMEYER

Description.—Plant winter habit, midseason, mid-tall to tall; stem purple, strong; spike awnleted, clavate, mid-dense, erect to inclined; glumes glabrous, brown; long, mid-wide; shoulders narrow, oblique; beaks wide, obtuse, 1 mm. long; awnlets several, 8 to 12 mm. long; kernels white, mid-long, soft, oval to elliptical; germ mid-sized; crease wide, mid-deep to deep; cheeks angular; brush mid-sized, mid-long, collared.

The variety as grown commercially is not entirely pure for head type. It is less susceptible to shattering than Goldcoin.

History.—Eickmeyer (C. I. 12035) resulted from a plant selected from a field of Goldcoin by A. K. Eickmeyer, a farmer living near Deer Park, Wash., about 1918. The plant was saved because it appeared to be less susceptible to shattering than most plants in the field. This strain, which had pubescent chaff, was distributed to neighbors but was not popular because of the pubescent chaff. About 1924 Mr. Eickmeyer selected a plant with glabrous chaff from his field and increased it. This is the type grown at present. Its characteristics indicate that the variety resulted from a natural cross between Goldcoin and Jones Fife.

Distribution.—Estimated area in 1939, 5,244 acres, grown in Washington.

Synonyms.—Improved Fortyfold, Shatterproof Fortyfold.

ALLEN

Description.—Plant spring habit, midseason to late, tall; stem white, mid-strong; spike awnleted, linear-fusiform, 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 (C. I. 5407) (reg. 76) is undetermined. It has been grown in Washington and Idaho since about 1900.

Distribution.—Estimated area in 1939, 631 acres, grown in Washington.

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 23, B.

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 (C. I. 4734) (reg. 77), according to Richardson (167, reprint, pp. 124-126), "was produced by the late Mr. Farrer, wheat experimentalist, of New South Wales (Australia), from a cross between Purplestarr [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

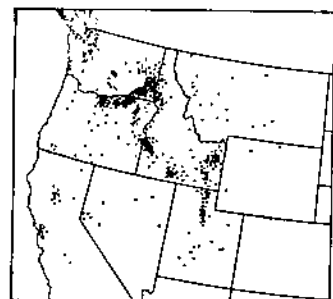


FIGURE 44.—Distribution of Federation wheat in 1939. Estimated area, 591,941 acres.

many triumphs in wheat breeding, for none of his many successful crossbred wheats have enjoyed such a wide measure of popularity as Federation."

Federation was first introduced into the United States by the United States Department of Agriculture (210, P. I. 38347) in 1914 from Western Australia.

The variety first showed promise in nursery experiments at the Sherman Branch Experiment Station, Moro, Oreg., in 1916. The first distribution to farmers for commercial growing was from that station in the spring of 1920.

Distribution.—Estimated area in 1939, 591,941 acres, grown in eight States, as shown in figure 44.

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 wide, 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 (C. I. 8276) (reg. 287) 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 1939, 59 acres, grown in Idaho.

Synonym.—Power's Club.

ERECT

Description.—Plant spring habit, early to midseason, short to mid-tall, stem white, strong; spike apically awnleted, oblong to sub-clavate, dense, erect; glumes glabrous, brown, mid-long, mid-wide; shoulders mid-wide, ablique to rounded; beaks wide, obtuse, 0.5 to 1 mm. long; awnlets wanting to few, 3 to 5 mm. long; kernels white, mid-long, soft, elliptical; germ mid-sized; crease wide, deep; cheeks angular; brush mid-sized to large, mid-long.

History.—Erect (C. I. 11544) (reg. 318) was developed in cooperative experiments of the Utah Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Logan, Utah. It resulted from a cross between Dicklow and Hard Federation made in 1920. The plant from which Erect descended was selected in 1930. In early tests it was grown as Q 231. Erect was distributed for commercial growing in 1934 and was registered as an improved variety in 1936 (45).

Distribution.—Estimated area in 1939, 4,971 acres, grown in Utah.

RAMONA

Description.—Plant spring habit, early, short; stem white, mid-strong; spike awnless, fusiform-oblong, mid-dense to lax, erect; glumes glabrous, brown, short, wide; shoulders wide, square; beaks mid-wide, obtuse, 0.5 mm. long; awnlets wanting; kernels white, mid-long, semihard, ovate; germ mid-sized to large; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, mid-long.

History.—Ramona (C. I. 8241-1) (reg. 317) was developed in cooperative experiments of the California Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Davis, Calif. It is the result of a cross between Hard Federation and Bunyip made in 1917. Plant selection B 537 (C. I. 8241) was made in 1922. A reselection, B 537-1 (C. I. 8241-1) was made in 1926. Although the name Ramona has been applied to both selections, only the latter is being grown at the present time. It was distributed for commercial growing in 1935 and was registered as an improved variety in 1936 (45). Seed of the parents was secured from the Panama-Pacific International Exposition at San Francisco, Calif., in 1915 from the New South Wales, Australia, exhibit.

Distribution.—Estimated area in 1939, 8,682 acres, grown in California.

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.

History.—Hard Federation (C. I. 4980) (reg. 79) was originated by selection from Federation in Australia. The following history was recorded (*Id.*, 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 introduced from New South Wales, Australia, in August 1915, by the United States Department of Agriculture (219, P. I. 41079). It was first grown at the Sherman Branch Experiment Station, Moro, Oreg., in 1916. Experiments conducted in Oregon and California from 1917 to 1919 (57, pp. 12-17) showed it to be a high-yielding, dry-land wheat, and it was distributed for commercial growing in 1920.

Distribution.—Estimated area in 1939, 6,799 acres, grown in four States, California, Idaho, Nevada, and Washington.

HARD FEDERATION 31

Description.—This selection differs from Hard Federation in being 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 (C. I. 8255) (reg. 288) proved to be the best of 85 head selections made from a field of Hard Federation on the Sherman Branch Experiment Station, Moro, Oreg., in 1921. It was distributed for growing in the Grande Ronde Valley of eastern Oregon in 1928, where it has replaced the Hard Federation variety.

Distribution.—Estimated area in 1939, 8,981 acres, grown in Oregon.

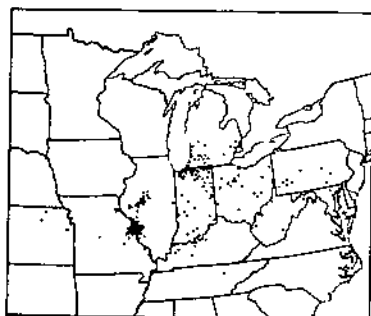


FIGURE 45.—Distribution of Red Wave wheat in 1939. Estimated area, 167,632 acres.

RED WAVE

Description.—Plant winter habit, mid-season 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. Spikes, glumes, and kernels of this variety are shown in plate 24, A.

History.—Red Wave (C. I. 3500) (reg. 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 (104, 1908).

Distribution.—Estimated area in 1939, 167,632 acres, grown in 12 States, as shown in figure 45.

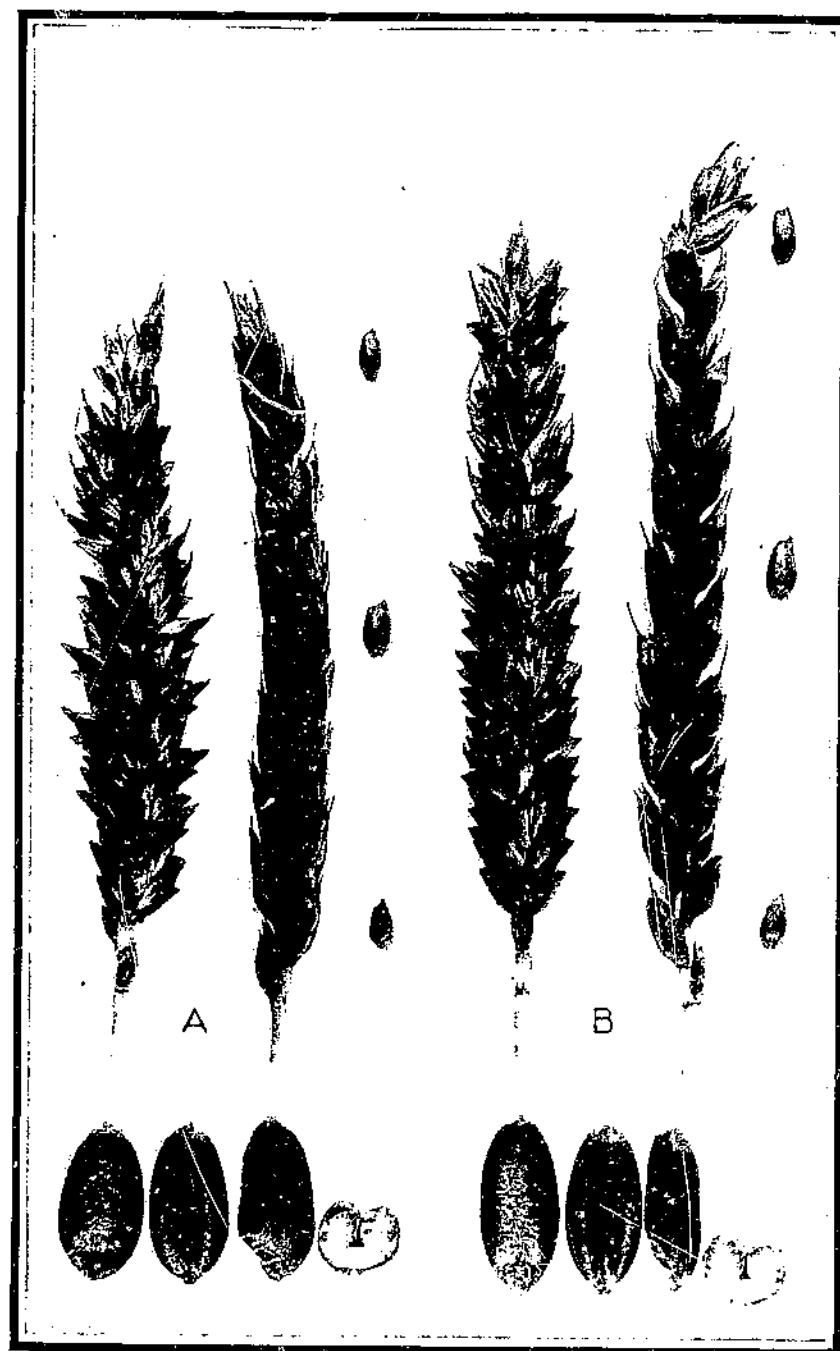
Synonyms.—Advance, Indiana Red Wave, Jones Red Wave, Old Dutch, Red Chaff, Red Ivory, Red Wafer, Ruble, Rust Proof, Waif, Waverly, World's Fair.



A

B

A, Red Wave and *B*, Purdue No. 1 wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Currell and B, Poole wheats; Spikes and glumes natural size;
kernels $\times 3$.

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.

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.

History.—Odessa (C. I. 4475) (reg. 85), according to Carleton (40, p. 53), is of Russian origin. Several introductions have been made. The variety was grown in Minnesota as early as 1865.

An anonymous author (3, p. 238) in 1869 wrote regarding this variety as follows:

"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, 4 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." For a history of several later introductions, see Technical Bulletin 459 (47).

Distribution.—Estimated area in 1939, 188 acres, grown in Idaho and Wyoming.

Synonym.—Grass.

PURDUE NO. 1

Description.—Plant winter habit, midseason, mid-tall; stem white, mid-strong to strong; spike awnleted, oblong, mid-dense, erect to inclined; glumes glabrous, brown, sometimes with black stripes, mid-long, mid-wide; shoulders wide, rounded to square; beaks mid-wide, obtuse, 0.5 mm. long; awnlets several to many, 5 to 25 mm. long, partly incurved; kernels light red, mid-long, soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, short. Spikes, glumes, and kernels of Purdue No. 1 are shown in plate 24, B.

Purdue No. 1 is somewhat resistant to leaf rust but is susceptible to flag smut and loose smut. The bulk variety is unsuited to mosaic but some selections that appear very similar to the mass type are resistant. It is also resistant to winter-killing by both low temperature and heaving.

History.—Purdue No. 1 (C. I. 11880) is from a cross between Michigan Amber and Rudy made at the Purdue University Agricultural Experiment Station, Lafayette, Ind., in 1909. The selection that resulted in Purdue No. 1 was made in 1925. It was first grown on farms in 1934.

Distribution.—Estimated area in 1939, 54,277 acres, grown in Indiana, Illinois, and Ohio.

SQUAREHEADS MASTER

Description.—Plant winter habit, very late, mid-tall; stem white, strong; spike awnleted, clavate, dense, erect; glumes glabrous, brown, mid-long, wide; shoulders wanting to narrow, oblique; beaks wide, obtuse, incurved, 1 mm. long; awnlets few, 1 to 10 mm. long; kernels red, mid-long, soft, broadly ovate; germ small to mid-sized, abrupt; crease mid-wide, mid-deep; cheeks angular; brush large, mid-long.

Differs from Red Russian principally in having brown glumes.

History.—Squareheads Master (C. I. 4298) (reg. 89) is an English variety, and the history of its introduction to the Pacific Northwest is not known. A sample introduced from England in 1911 by the United States Department of Agriculture is very similar to several selections the writers have made of the mixtures in Red Russian fields in Washington and also to a selection from a field of Red Russian made by Glenn Roundtree, Boistfort, Lewis County, Wash., who increased it about 1920. In England, Squareheads Master is reported to have been selected by Mr. Teverson from Scholey's Squarehead, and is probably the result of a natural cross between Scholey's and Golden Drop (76); Raynbird & Co., (164, p. 33).

Distribution.—Estimated area in 1939, 643 acres, grown in western Washington.
Synonyms.—Australian Club, Brown Squarehead, Red Chaff, Red Russian.

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.

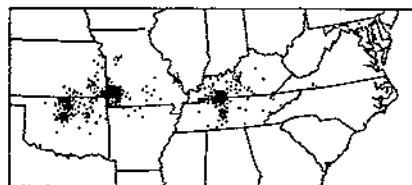


FIGURE 46.—Distribution of Currell wheat in 1939. Estimated area, 440,550 acres.

Spikes, glumes, and kernels of this variety are shown in plate 25, A.

History.—The history of Currell (C. I. 3323) (reg. 90) has been recorded by Carleton (42, p. 202) as follows:

"Currell Prolific wheat was selected by Mr. W. E. 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 1939, 440,550 acres, grown in nine States, as shown in figure 46.

Synonyms.—Currell's Prolific, Dumber, Gill, Golden Chaff, Pearl Prolific, Perfection, Prettybone, Prolific, Red Odessa, Red Gill, Red Prolific, Tennessee Prolific.

BALDROCK

Description.—Plant winter habit, midseason, mid-tall to tall; stem purple, mid-strong to strong; spike awnleted, fusiform, mid-dense, inclined to 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. Spikes, glumes, and kernels of Baldrock are shown in plate 26, A.

History.—Baldrock (C. I. 11538) (reg. 271) was produced (72) 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 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 (45) as an improved variety in 1932 because of its resistance to lodging and good yields under Michigan conditions.

Distribution.—Estimated area in 1939, 108,664 acres, grown in Michigan and Indiana, as shown in figure 47.

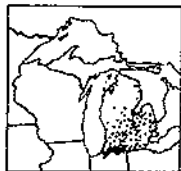


FIGURE 47.—Distribution of Baldrock wheat in 1939. Estimated area, 108,664 acres.

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 from Red Wave by its purple stems. The kernels are rather narrow, flattened, and rounded in outline. Spikes, glumes, and kernels of Poole wheat are shown in plate 25, B.

History.—The origin of Poole (C. I. 3488) (reg. 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 (134, p. 15).

Harvest King was distributed by J. A. Everitt & Co. (80, pp. 4-7), seedsmen, of Indianapolis, Ind., from 1894 to about 1900. There is no information regarding the origin of the variety, and it probably is only a lot of seed of the Poole variety renamed by the Everitt Seed Co., as such renaming was a common practice of that firm. As the wheat was widely advertised under this name, it is now grown nearly as widely as Harvest King and other names as under the name Poole itself.

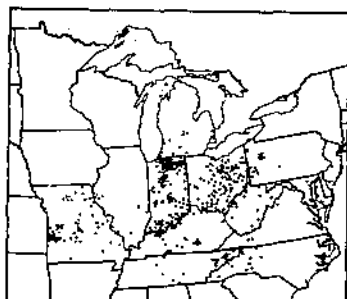


FIGURE 48.—Distribution of Poole wheat in 1939. Estimated area, 368,512 acres.

Lifter, Nissley, Nissley's Hybrid, Ocean Wave, Red Amber, Red California, Red Chaff, Red Fultz, Red King, Red Russell, Royal Red Clawson, Sweet Water Valley, Wagner, Winter King.

PORTAGE

Description.—Portage is very similar to Poole except for a slightly stiffer straw.

History.—Portage (C. I. 5654) (reg. 93) is the result of a plant selected from Poole and developed at the Ohio Agricultural Experiment Station. It was distributed about 1916 (224, pp. 478-481).

Distribution.—Estimated area in 1939, 6,812 acres, grown in Ohio.

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 (C. I. 11397) (reg. 290) 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 1939, 9,409 acres, grown in Virginia.

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 (C. I. 5928) (reg. 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 E. 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" (63, p. 7).

This variety was grown by the Ohio Agricultural Experiment Station as early as 1888 (108, p. 29). It was distributed widely by Peter Henderson & Co. (104), seedsmen, of New York City, and J. A. Everitt & Co. (80), seedsmen, of Indianapolis, Ind., in the early nineties.

Distribution.—Estimated area in 1939, 3,559 acres, grown in Kentucky and Missouri.

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.

History.—In 1851, the Rural New Yorker gave the following account of the origin of China (C. I. 180) (reg. 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 Landsville, Pa., distributed the variety in that State under the name Pennsylvania Bluestem.

Distribution.—Estimated area in 1939, 4,877 acres, grown in Maryland.

Synonyms.—Bluestem, Lebanon Valley, Mortgage Lifter, Pennsylvania Bluestem.

RED MAY (MICHIGAN AMBER)

Description.—Plant winter habit, 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 15 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. Spikes, glumes, and kernels of Red May wheat are shown in plate 26, B.

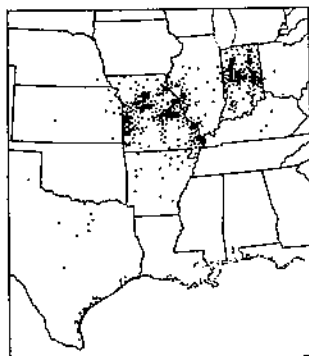


FIGURE 40.—Distribution of Red May wheat in 1939. Estimated area, 594,566 acres.

History.—Red May (C. I. 5336) (reg. 97) is believed to be identical with or descended from the Red or Yellow Lammas. Several writers have suggested the identity. Tracy (208, p. 396) mentions Yellow Lammas as being a synonym of Red May. Lammas was mentioned by Koernicke and Werner (131, pp. 253, 290) as being a very old English wheat grown prior to 1639. 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 Cubell (38, p. 14), was grown in Virginia as early as 1764. A more recent history of Red May indicates that it was originated by General Harmon from the Virginia May (a white-kernelled wheat) about 1830 (97, p. 226). This wheat has been grown quite widely under the name Red May since 1845.

Although more commonly used, especially in Indiana, 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 is the name under which the variety is grown in Missouri. It was reported as one of the highest yielding wheats at the Missouri Agri-



A. Baldrock and B, Red May wheats; Spikes and glumes natural size; kernels $\times 3$.



A

B

A, Thorne and *B*, Triplet wheats: Spikes and glumes natural size; kernels $\times 3$.

cultural Experiment Station in 1911 (145, p. 211). The writers' specimens are the same as Red May, except that the heads are slightly more erect.

Orange wheat was reported as having been introduced into Monroe County, N. Y., from Virginia in 1845 (98, p. 286). In 1857 Klippart (129) 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 was reported as one of the excellent-yielding awnless varieties of wheat for Missouri in 1910 (66, p. 67). For a more complete history of the synonyms of Red May, see Technical Bulletin 459 (47).

Distribution.—Estimated area in 1939, 591,566 acres, grown in nine States, as shown in figure 49.

Synonyms.—Beechwood, Canadian Hybrid, Early Harvest, Early May, Early Ripe, Enterprise, Jones Longberry, Mammoth Ball, May, Michigan Amber, Michigan Wonder, Orange, Pride of Indiana, Purdue No. 4, Red Amber, Red Cross, Red Republic, Republican Red.

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 wide, 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 (C. I. 6163) (reg. 253) was originated in cooperative experiments of the department of plant breeding of Cornell University and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. The selection was made at Ithaca, N. Y., in 1912, from the variety known as "Tennessee Fultz." It was registered in 1926 (49). Shepherd has been grown commercially since 1923 in areas of Illinois where these diseases occur.

Distribution.—Estimated area in 1939, 238 acres, all in Illinois.

THORNE

Description.—Plant winter habit, midseason, mid-tall; stem faint purple, mid-strong to strong; spike awnleted, oblong to fusiform, mid-dense, erect to inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders mid-wide, oblique; beaks wide, obtuse, wanting to 0.5 mm. long; awnlets several, 5 to 25 mm. long; kernels red, mid-long, soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long. Spikes, glumes, and kernels of Thorne are shown in plate 27, A.

Thorne is resistant to the races of loose smut commonly found in Ohio. It is also resistant to mosaic.

History.—Thorne (C. I. 11856) (reg. 323) was bred from a cross between Portage and Fulcaster made at the Ohio Agricultural Experiment Station at Columbus, Ohio, in 1917. The bulk material was taken to the Experiment Station at Wooster, Ohio, where the selection that resulted in Thorne was made in 1922. It was carried as T. N. 1006 until 1936, when it was reselected and increased under the name Thorne. Seed was distributed to a select group of farmers for increase in the fall of 1937 (133). It was registered as an improved variety in 1938 (45).

Distribution.—Estimated area in 1939, 3,239 acres, grown in Ohio, Indiana, and Illinois.

Synonym.—T. N. 1006.

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-size; 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 (C. I. 3393) (reg. 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. (40). It was advertised and distributed by Peter Henderson & Co. (104), 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 1939, 10,880 acres, grown in Michigan, New York, Ohio, Pennsylvania, and West Virginia.

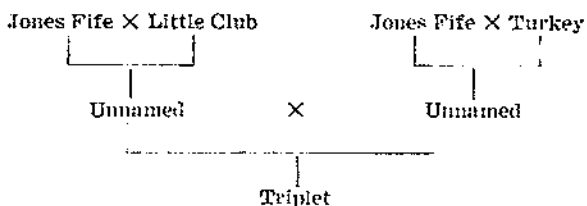
Synonyms.—Clawson, Early Red Clawson, Zeller's Valley.

TRIPLET

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.

Triplet 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 27, B. shows spikes, glumes, and kernels of Triplet.

History.—Triplet (C. I. 5408) (reg. 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.

Distribution.—Estimated area in 1939, 93,850 acres, grown in Washington, Idaho, Oregon, and Montana.

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 (C. I. 3358) (reg. 109) was distributed by the United States Department of Agriculture in 1885 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" (39, 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 1939, 676 acres, grown in Pennsylvania.

Synonyms.—German Amber, 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,

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; 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.

History.—Jones Fife (C. I. 4468) (reg. 110) was originated by A. N. Jones, of Newark, Wayne County, N. Y., in 1880.¹² According to Carleton (42, 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.—Estimated area in 1939, 64,821 acres, grown in Colorado, Idaho, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, Montana, Tennessee, and Washington.

Synonyms.—Burbank's Super, Canadian Hybrid, Crail Fife, Fife, Fishhead, Jones Winter Fife, Silver King, Super, Velvet Chaff, Winter Fife.

REWARD

Description.—Plant spring habit, early, short to mid-tall; stem white, mid-strong but easily crinkled at the nodes; spikes awnleted, fusiform, mid-dense, erect to inclined; glumes pubescent, white, sometimes black striped, short, mid-wide; shoulders mid-wide, oblique to elevated; beaks wide, 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 28, A.

History.—Reward (C. I. 8182) (reg. 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 (54) in 1928, its advantages being early maturity, 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 1939, 197,308 acres grown in five States, as shown in figure 50.

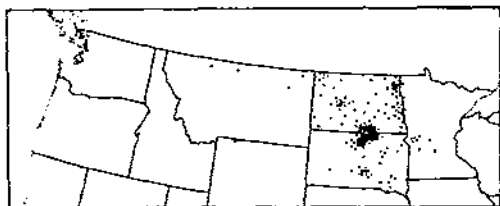


FIGURE 50.—Distribution of Reward wheat in 1939. Estimated area, 197,308 acres.

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

¹² Printed stationery of A. N. Jones.

0.5 mm. long; awnlets few, 3 to 15 mm. long; kernels red, 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.

History.—Haynes Bluestem (C. I. 2374) (reg. 111) was first developed through selection by L. H. Haynes (193), 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 semihard 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. * * *

A more complete history of this variety is given in Department Bulletin 1074 (50).

Distribution.—Estimated area in 1930, 1,282 acres, grown in Minnesota and North Dakota.

Synonyms.—Bluestem, Bolton Bluestem, Marvel Bluestem, Minnesota No. 169, Velvet Bluestem.

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. Its weak straw is a serious objection, however.

History.—Galgalos (C. I. 2398) (reg. 113, P. I. 9872) was introduced in 1903 by the United States Department of Agriculture (210) 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 1930, 19,209 acres, grown in Oregon and California.

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. It is resistant to powdery mildew. Spikes, glumes, and kernels of Sonora wheat are shown in plate 28, B.

History.—Sonora (C. I. 3036) (reg. 114) was brought to the United States from Magdalena Mission, northern Sonora, Mexico, where it has been grown since about 1770.¹² 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.

Distribution.—Estimated area in 1930, 23,250 acres, grown in Arizona, California, Idaho, Nevada, New Mexico, Oregon, and Utah.

Synonyms.—Ninety-Day, Red Chaff, White Sonora.

¹² Verbal statement of W. W. Mackie, January 22, 1919.



A



B

A, Reward and *B*, Sonora wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Balet and B, Kawvale wheats; Spikes and glumes natural size; kernels $\times 3$.

SONORA 37

Description.—Sonora 37 is very similar to Sonora except in being resistant to some races of bunt.

History.—This strain (C. I. 11902) of Sonora is the result of a cooperative program of the California Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Davis, Calif., to develop strains of the important commercial varieties of California resistant to bunt. The original cross, Martin × Sonora, was made in 1922. Bunt-resistant lines were backcrossed to Sonora six times. Following the sixth backcross a composite of 71 resistant F₃ lines was released for production in the Sacramento Valley in 1937.

Distribution.—Estimated area in 1939, 241 acres, grown in California.

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 (C. I. 4876) (reg. 115) was originated by A. N. Jones, of Le Roy, N. Y., between 1900 and 1908. It was distributed by Peter Henderson & Co. (194), 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.

Distribution.—Estimated area in 1939, 7,331 acres, grown in Pennsylvania, Tennessee, and Alabama.

Synonyms.—Bull Moose, Golden Chaff, New Genesee, St. Louis Grandprize, Velvet Head.

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 bumped; germ small to mid-sized; crease mid-wide, mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

Propo (C. I. 1970) (reg. 121) is distinct from the other wheats in the group in having faintly purple stems.

History.—This variety was first known as Proper, for which the following history was recorded in 1879 (165):

"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 Gammitz (187, p. 318) of the California Agricultural Experiment Station:

"Of Propo, R. M. Shackleford, 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 (165), 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 12 of the 14 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 1939, 392 acres, grown in California.

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; 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 29, A.

History.—Baart (C. I. 1097) (reg. 123) was received as Early Baart with four other varieties (210, P. I. 5073) 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 introductions of wheat from South Africa, varieties have been obtained that are identical with Baart. The name "Baart" is Dutch for bearded. The variety was introduced to Australia from the Cape Colony, South Africa, about 1880 (183).

Neethling, 1932 (147), 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 established 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 889,325 acres in 1939, grown in 11 States, as shown in figure 51.

Synonyms.—Arizona Baart, Columbia, Diener Hybrids, Diener No. 18, Early Baart, White Columbia.

BAART 38

Description.—This variety is very similar to Baart except in being resistant to stem rust and to some races of bunt.

History.—This strain (C. I. 11907) of Baart was developed in cooperative investigations of the California Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Davis, Calif. A program was begun in 1922 to develop, by backcrossing, strains of the important commercial wheat varieties in California that would be resistant to bunt. Later a similar project was begun to add stem rust resistance to the most important varieties. Baart 38 is the result of backcrossing Martin×Baart 6 times with Baart to obtain a bunt-resistant Baart and backcrossing Hope×Baart 4 times with Baart to obtain a rust-resistant Baart. Each backcross was made on segregates resistant to bunt or stem rust depending on the cross. The bunt-resistant and stem rust-resistant strains were then crossed and 157 of the F_2 segregates resistant to both diseases were bulked and increased in 1938. The variety was distributed to growers in the fall of 1939.

Distribution.—Estimated area in 1939, 120 acres, all in California.

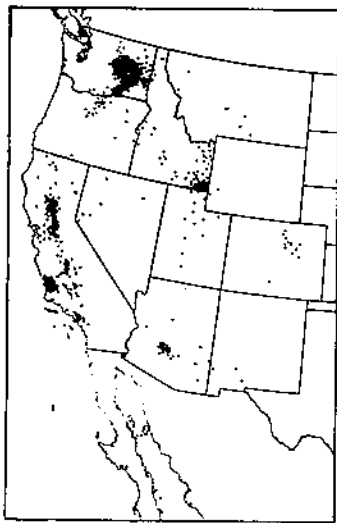


FIGURE 51.—Distribution of Baart wheat in 1939. Estimated area, 889,325 acres.

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 (C. I. 5644) (reg. 126) has been reported by C. G. Williams (225), 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 1908 under the number 6100, along with other head rows of Gipsy, Fultz, Poole, and other varieties.

"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.

"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 1930, 29,665 acres, grown in Ohio, Indiana, and Michigan.

Synonym.—Number 6100.

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, ovate, humped; germ mid-sized; crease mid-wide, shallow to mid-deep, pitted; cheeks usually rounded; brush small, mid-long.

History.—The origin of Gipsy (C. I. 3436) (reg. 127) is undetermined. It was grown in Missouri as early as 1877 (6) and at the Ohio Agricultural Experiment Station by 1888 (69, p. 28). There is a tradition that the name was given the variety because it was first obtained from a gypsy.

Distribution.—Estimated area in 1930, 9,186 acres, grown in Kansas and Ohio.

Synonyms.—Defiance, Egyptian, Farmers Friend, Gipsy Queen, Golden Straw, Grains of 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.

History.—Valley (C. I. 5921) (reg. 128) was obtained by the Ohio station from Elias Terter, Pleasant Plain, Ohio, in 1883 and grown by them for the first time in 1884 (69, p. 35). It is "said to have originated in the Scioto Valley, Ohio" (109, 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 Everett 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 1930, 8,643 acres, grown in Missouri and Ohio.

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. A spike, glumes, and kernels of Kawvale wheat are shown in plate 29, B.

This variety is more winter hardy than most of the other soft or semihard red winter wheats. It is resistant to loose smut and is somewhat resistant to leaf

and stem rust and to hessian fly. Flour from Kawvale is more granular than from typical varieties of soft wheat and is not satisfactory for making cakes and pastries.

History.—Kawvale (C. I. 8180) (reg. 265) was developed at the Kansas Agricultural Experiment Station, Manhattan, Kans., in co-operative experiments with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. The selection was made in 1918 from Indiana Swamp, a synonym of Valley. The variety was registered in 1929 (54) and released for commercial growing in the fall of 1932.

Distribution.—Estimated area in 1939, 1,219,226 acres, grown in six States, as shown in figure 52.

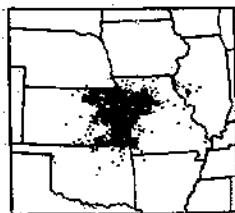


FIGURE 52.—Distribution of Kawvale wheat in 1939. Estimated area, 1,219,226 acres.

caster grown in Ohio. Ottawa, Ohio.

Distribution.—Estimated area in 1939, 5,393 acres, grown in Ohio.

RED INDIAN

Description.—Red Indian is similar to Fulcaster except for having shorter and stronger and less purple stems.

History.—The history of Red Indian (C. I. 8382) (reg. 294) is undetermined. It is a distinct strain of Fulcaster obtained in September 1927 from C. O. Pierman,

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 (C. I. 2008) (reg. 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 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, Arlington, Va.

Distribution.—Estimated area in 1939, 25,764 acres, grown in Delaware and Maryland.

FULCASTER

Description.—Plant winter habit, midseason, mid-tall to tall; stem purple, mid-strong to 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. 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 30, A.

History.—According to Carleton (40, p. 70), "Fulcaster (C. I. 4862) (reg. 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 ex-

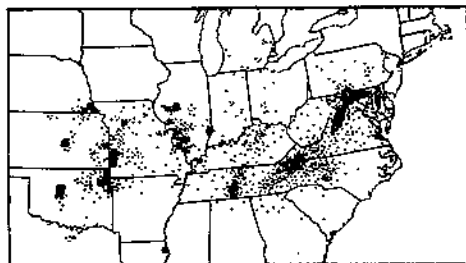
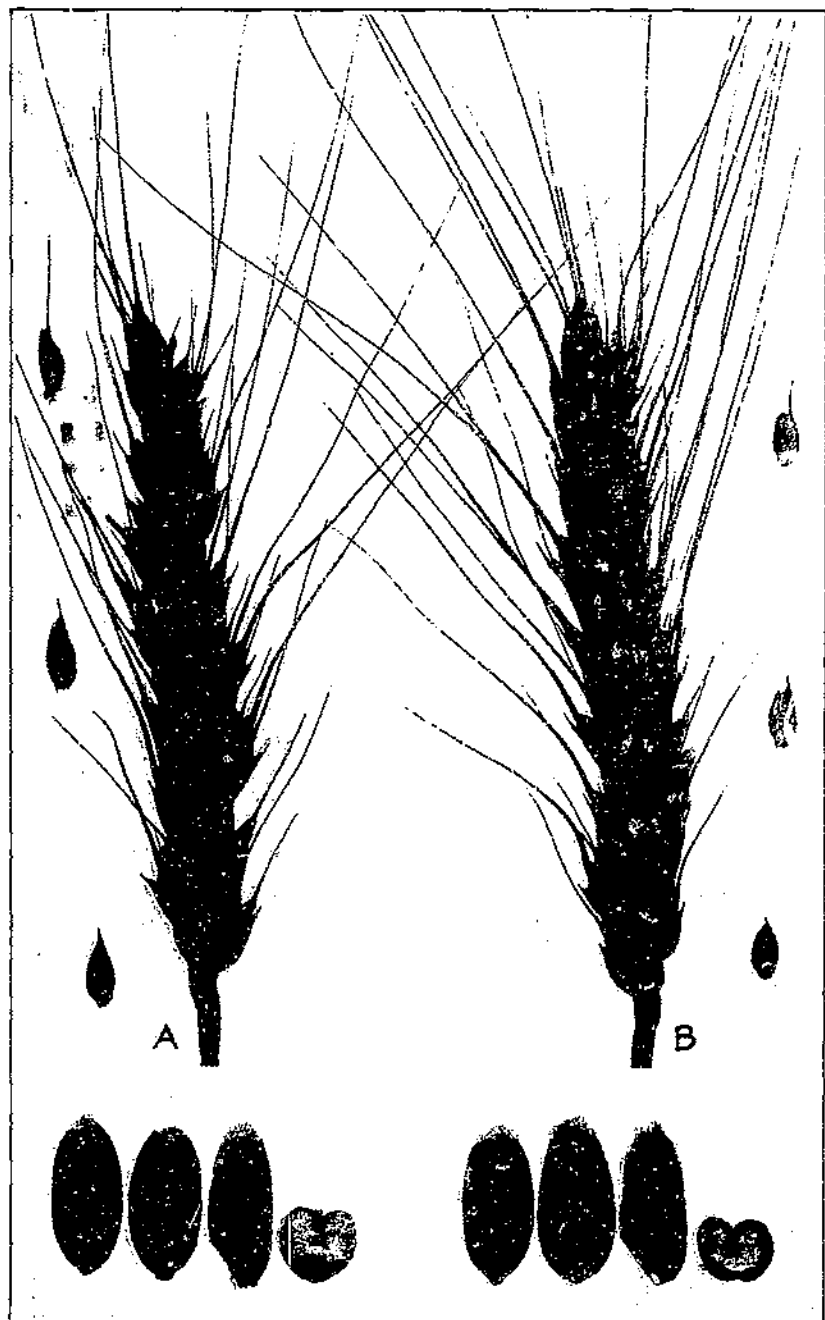


FIGURE 53.—Distribution of Fulcaster wheat in 1939. Estimated area, 1,223,308 acres.



A, Fulcaster and B, Nittany wheats: Spikes and glumes natural size; kernels $\times 3$.
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periments of the Ohio station in 1884. The same wheat, however, apparently soon came to be called Dietz Longberry (11, p. 591) and was later known as Dietz Longberry Red (39, 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 (28, 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 Department Bulletin 1074 (50), many extravagant claims were made for it by Mr. Stoner and agents who handled the seed.

Distribution.—Estimated area in 1939, 1,223,308 acres, grown in 22 States, as shown in figure 53.

Synonyms.—Acme, Acme Bred, Bearded Bluestem, Bearded Purplestraw, Blankenship, Blue Ridge, Bluestem, Canadian, Champion, Corn, Cumberland Valley, Dietz, Dietz Longberry, Dietz Longberry Red, Duffy, Ebersole, Egyptian Amber, Eversole, Farmers Friend, Georgia Red, Golden Chaff, Golden King, Greening, Improved Acme, Ironclad, Jokisch, Kansas Mortgage Lifter, Kentucky Giant, Lancaster, Lancaster-Fulcaster, Lincoln, Martha Washington, Michigan Red Line, Moore's Prolific, Number 10, Price's Wonder, Rattle Jack, Red Wonder, Stoner (Eden, Famine, Forty-to-One, Goose, Half Bushel, Kentucky Wonder, Marvelous, Millennium, Millennium Dawn, Miracle, Multiplier, New Light, New Marvel, Peck, Russellite, Russell's Wonder, Stooling, Three Peck, Two Peck, Wonderful), Turkish Amber, Tuscan Island, Winter King.

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 (C. I. 10047) (reg. 295) 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.

Distribution.—Estimated area in 1939, 97,151 acres, grown in Virginia, North Carolina, and West Virginia.

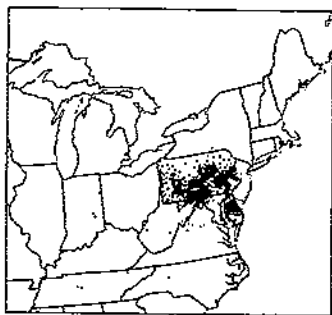


FIGURE 54.—Distribution of Nittany wheat in 1939. Estimated area, 504,972 acres.

and slightly longer beaks, and in producing higher yields under Pennsylvania conditions.

History.—Nittany (C. I. 6962) (reg. 254) was developed (219) by the Pennsylvania Agricultural Experiment Station, State College, Pa. It is the result of a plant selection from Fulcaster made in 1909. This variety has been grown commercially in Pennsylvania since 1918 as Penn. No. 44, or Nittany. It was registered (54) in 1927.

Distribution.—Estimated area in 1939, 504,972 acres, grown in 10 States, as shown in figure 54.

Synonym.—Penn. No. 44.

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 30, B.

This variety differs from Fulcaster in being later and taller, in having more oblong spikes

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 bunt, shatters easily, and is of inferior quality. It is moderately resistant to hessian fly.

History.—Marvel (C. I. 8876) (reg. 296) was 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 1939, 33,938 acres, grown 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. Java is moderately resistant to hessian fly.

History.—Java (C. I. 4906) (reg. 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 Utica, said to have come from Switzerland.'"

A Siberian variety was also reported from Farmville, Va., in 1849 (144, 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 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 (129, 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 (70, 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* (2):

"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 1899 Wallaces' *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 (12). 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 Wallaces' Farmer entered into an active campaign for the distribution of Java wheat. The variety thus became quite widely grown in that State. In 1920 Wallaces' Farmer published a brief history of the cultivation of Java wheat in Iowa (16).

A sample obtained by the Illinois Agricultural Experiment Station from a farmer living near Sidney, Ill., in 1912 was increased and distributed in 1917 as Illinois No. 1.

An early strain of Java, known as Kearney County, is grown in western Nebraska to a limited extent.

Distribution.—Estimated area in 1939, 21,988 acres, grown in Illinois, Indiana, Iowa, Nebraska, and Wisconsin.

Synonyms.—Black Tea, Canadian Club, China Tea, Dixie, Early Iowa, Early Java, Ghirka, Illinois No. 1, Kearney County, 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 powdery mildew and moderately 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 and of poor grain and texture.

History.—Progress (C. I. 6902) (reg. 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 in 1916. It was distributed for commercial growing in 1921. It was registered as an improved variety in 1926 (49) because of its high yield at the Ashland and Marshfield stations and its resistance to stem rust.

Distribution.—Estimated area in 1939, 57,637 acres, grown in Wisconsin, North Dakota, Illinois, Iowa, Minnesota, and Maine.

Synonyms.—Canadian Progress, Nordhogen, Prosper.

MARMIN

Description.—Plant winter habit, midseason, mid-tall; stem white, weak; spike awned, fusiform, mid-dense to lax, inclined; glumes glabrous, yellowish white, mid-long, narrow; shoulders wanting to narrow, oblique; beaks 1 to 2 mm. long; awns 4 to 8 cm. long; kernels red, mid-long, semihard to hard, ovate to elliptical; germ small; crease narrow, shallow; cheeks rounded to square; brush small, mid-long.

Marmin is similar to Minturki in winter hardiness and in resistance to stem rust and bunt. It has a higher test weight, slightly harder kernels, and lower carotenoid content in the grain.

History.—Marmin (C. I. 11502) (reg. 328) was developed in cooperative experiments of the Minnesota Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. It is the result of a cross between Minturki (winter) and Marquis (spring) made at St. Paul in 1922. During the testing period it was designated as IL-22-38, Minn. No. 2614.

The variety was named and about 1,300 bushels of seed were distributed to farmers in the fall of 1940.

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, semihard to hard, ovate to elliptical; germ small; crease narrow, mid-deep; cheeks rounded; brush small, mid-long.

Yogo is very winter hardy, resistant to some races 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 (C. I. 8033) (reg. 272) was produced from a cross (Minturki × Beloglina) × Buffum 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, Bureau of Plant Industry, 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 (45) as an improved variety. The superior characters were high yield, winter hardiness, and bunt resistance.

Distribution.—Estimated area in 1939, 34,794 acres, grown in Montana, Washington, and Idaho.

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 31, A.

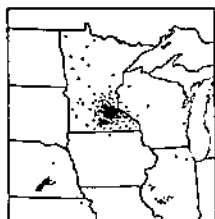


FIGURE 55.—Distribution of Minturki wheat in 1939. Estimated area, 152,855 acres.

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 (C. I. 6155) (reg. 139) is the result of a cross between Odessa and Turkey, made at the Minnesota Agricultural Experiment Station, University Farm, St. Paul, in 1902. 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 1910 (102, pp. 17-28) when it was first distributed.

Distribution.—Estimated area in 1939, 152,855 acres, grown in six States, as shown in figure 55.

Synonym.—Minnesota No. 1507.

SHERMAN

Description.—Plant winter habit, midseason, mid-tall; stem white, weak to mid-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 8 to 30 mm. long; awns 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 races of bunt.

History.—Sherman (C. I. 4430) (reg. 249) was developed in cooperative experiments between the Oregon Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at the Sherman Branch Experiment Station at Moro. It is the result of a double cross between Budapest × Turkey and Zimmerman × Turkey, made about 1908. The selection resulting in Sherman was made in 1915 at Moccasin, Mont. It was distributed in southern Idaho by the Idaho Agricultural Experiment Station in 1928.

Distribution.—Estimated area in 1939, 2,543 acres, grown in southern Idaho.

UKRAINKA

Description.—Plant winter habit, midseason to late, tall; stem purple, weak to mid-strong; spike awned, fusiform, mid-dense to lax, inclined to nodding; glumes glabrous, white, sometimes with black stripes, mid-long, mid-wide; shoulders narrow to mid-wide, oblique to elevated; beaks 1 to 3 mm. long; awns

3 to 8 cm. long, usually purple; kernels red, mid-long, hard, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded to angular; brush mid-sized to large, mid-long.

History.—Ukrainka (C. I. 8859) was introduced from the Union of Soviet Socialist Republics by the Amtorg Corporation in 1927 and seed was given to the United States Department of Agriculture. Seed was sent to Royal Oakes, of Bluffs, Ill., in the fall of 1927. He later distributed the variety to his neighbors. The variety had been introduced previously and tested by the United States Department of Agriculture but was not considered of enough value to warrant distribution. Ukrainka originated as a selection (0246) from the Hungarian variety Banat, made in 1915 at the Mironov Plant Breeding Station in the Ukraine, U. S. S. R.

Distribution.—Estimated area in 1929, 8,307 acres, grown in Illinois and Oklahoma.

WISCONSIN PEDIGREE NO. 2

Description.—Plant winter habit, midseason, mid-tall; stem faintly purple, slender, weak; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, narrow to mid-wide; shoulders wanting to narrow, oblique; beaks 2 to 8 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 mid-long.

The variety differs from Turkey in sometimes having faintly purple stems and slightly softer kernels.

History.—Wisconsin Pedigree No. 2 (C. I. 6633) (reg. 148) is a selection of Turkey developed by the Wisconsin Agricultural Experiment Station and distributed by it in 1918.

Distribution.—Estimated area in 1939, 10,382 acres, grown in Illinois.

COOPERATORKA

Description.—Plant winter habit, midseason, mid-tall to tall; stem faintly purple, weak to 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 less winter hardy. It is also resistant to some races of bunt.

History.—Cooperatorka (C. I. 8861) (reg. 299) was introduced from the Odessa Experiment Station, Union of Soviet Socialist Republics, in 1923 by 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., introduced the variety from the U. S. S. R. in 1927. He increased the seed and sold it as Kooperatka in Kansas. The acreage now grown is the result of this latter distribution.

Distribution.—Estimated area in 1939, 250 acres, grown in Kansas.

Synonyms.—Kooperatka, Kooperatorka, Russian Turkey.

SIBLEY 81

Description.—Plant winter habit, midseason, mid-tall; stem purple, weak to mid-strong; spike awned, fusiform, mid-dense; inclined; glumes glabrous, white, mid-long, narrow to mid-wide; shoulders mid-wide, wanting to oblique to square; beaks 2 to 25 mm. long; awns 3 to 8 cm. long, sometimes purple; kernels red, mid-long, semihard to hard, elliptical; germ small to mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-wide, mid-deep. The variety shatters easily. It is resistant to some races of bunt.

History.—Several hundred heads were selected from a field of Sibley at the Oklahoma Agricultural Experiment Station in 1921. In 1927 a number of wheats including selection 81 from Sibley were tested on the farm of Earl

¹⁴ WOODRUFF, R. M. 23-page pamphlet on wheat varieties. [No date.] Pratt, Kans.

Estl at Carrier, Okla. This selection showed up well and was distributed in 1930 as Sibley 81 (C. I. 10084).

Distribution.—Estimated area in 1939, 74,077 acres, grown in Oklahoma.

IOWIN

Description.—Plant winter habit, midseason to late, mid-tall to tall; stem purple and white, mostly purple, weak to 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.

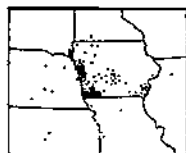


FIGURE 56.—Distribution of Iowin wheat in 1939. Estimated area, 107,206 acres.

Iowin differs from Turkey in being taller and later, in having longer beaks, purple stems, and slightly softer kernels, and in being moderately resistant to stem rust.

History.—Iowin (C. I. 10017) (reg. 267) was developed by the Iowa Agricultural Experiment Station. It is the result of a plant selection from Theiss wheat and was first commercially grown and registered (45) in 1930. The advantages of Iowin are stem rust resistance and high yield under Iowa conditions.

Distribution.—Estimated area in 1939, 107,206 acres, grown in seven States, as shown in figure 56.

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 (C. I. 8856) (reg. 297) was selected from a field of Blackhull in 1921 by A. P. Haeblerle, of Clearwater, Kans. Owing to various vicissitudes seed increase was slow. In 1928 Mr. Haeblerle 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 1939, 329,095 acres, grown in Kansas, Oklahoma, Texas, and Nebraska, as shown in figure 57.

Synonyms.—Early Hardy (Blackhull), Early Russian, Haeblerle, Haeblerle's Early.

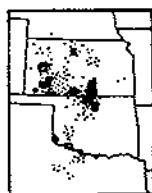


FIGURE 57.—Distribution of Early Blackhull wheat in 1939. Estimated area, 329,095 acres.

BLACKHULL

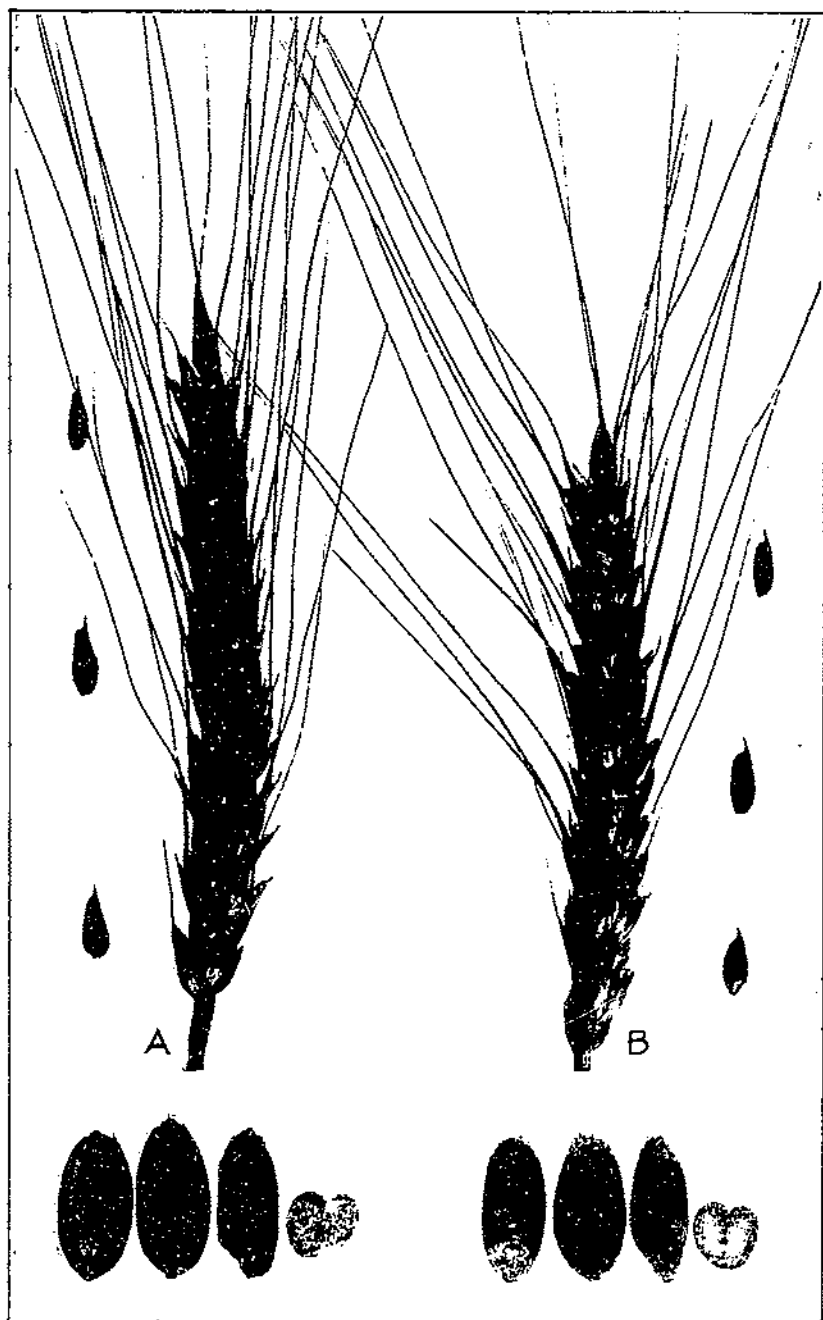
Description.—Plant winter habit, early to midseason, mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, usually with black stripes, mid-long, mid-wide; shoulders wanting to narrow, oblique; beaks 1 to 3 mm. long; awns 2 to 7 cm. long, sometimes black; 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 31, 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 (C. I. 6251) (reg. 142) was originated by Earl G. Clark (43), 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."

Blackhull was first distributed by Mr. Clark in the fall of 1917. A selected strain was distributed as Superhard Blackhull in 1925. As it usually is not possible to tell this strain from Blackhull, it is considered a synonym of that variety.

Distribution.—Estimated area in 1939, 8,127,624 acres, grown in 10 States, as shown in figure 58.



A, Mintucki and B, Blackhull wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Relief and B, Clayenne wheats; Spikes and glumes natural size; kernels $\times 3$.

Synonyms.—Black Chaff, Clark's Black Hull, Clark's Black Hulled, Superhard, Superhard Blackhull.

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, white, mid-long, mid-wide; shoulders wanting to narrow, oblique to elevated; beaks 1 to 4 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 races of bunt. Spikes, glumes, and kernels of Relief are shown in plate 32, A.

History.—Relief (C. I. 10032) (reg. 274) was developed from a cross between Hussar and a selection from Turkey

(Utah No. 26) made in 1925 at 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 races 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 (205) and was registered (45) as an improved variety.

Distribution.—Estimated area in 1939, 45,382 acres, grown in southern Idaho and Utah.

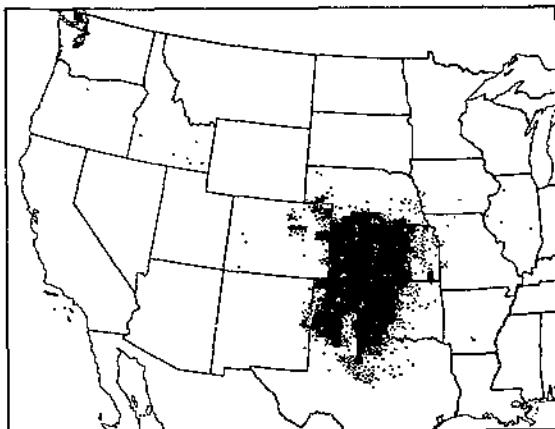


FIGURE 58.—Distribution of Blackhull wheat in 1939. Estimated area, 8,127,624 acres.

CHEYENNE

Description.—Plant winter habit, mid-season, short to mid-tall; stem white, slender, mid-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 4 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. Spikes, glumes, and kernels of Cheyenne are shown in plate 32, B.

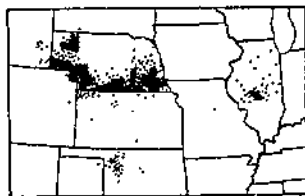


FIGURE 59.—Distribution of Cheyenne wheat in 1939. Estimated area, 743,525 acres.

in the fall of 1927 and distributed to farmers in 1930 as Nebraska No. 50. It was registered (45) as an improved variety in 1931 because of its stiff straw, resistance to shattering, and high yields. The seed originally distributed became

This variety differs from Turkey principally in having shorter and stronger stems, denser and more erect spikes, wider shoulders, and shorter beaks, and in being somewhat more susceptible to stem rust. The bread-baking characteristics also are slightly different, a longer mixing time being required for Cheyenne.

History.—Cheyenne (C. I. 8885) (reg. 260) is the result of a plant selected from Crimean (C. I. 1435) in 1922 at the Nebraska Agricultural Experiment Station, Lincoln, Nebr. The new variety was included in plot tests at Lincoln

mixed, and a purified seed supply was named Cheyenne and made available in 1933.

Distribution.—Estimated area in 1939, 743,525 acres, grown in nine States, as shown in figure 59.

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 33, A.

History.—Turkey (C. I. 1538) (reg. 143) is the name most commonly used for the Crimean group of hard winter wheats grown in the United States. Many

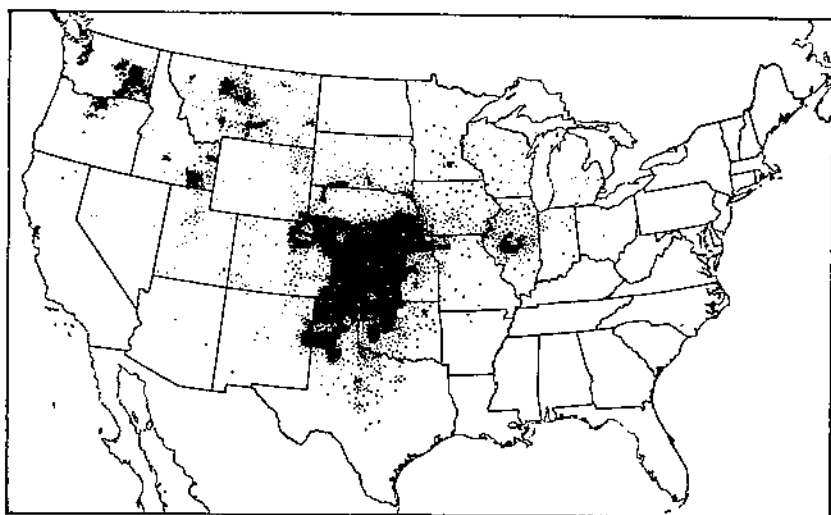


FIGURE 60.—Distribution of Turkey wheat in 1939. Estimated area, 12,637,403 acres.

histories of this wheat have been written. That recorded by Carleton (41, 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 Krinka (Crimean), Kharkof, Beloglina, Ulu, 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 Molochan 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.¹²

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 (210, P. I. 5035) from Kurman-Kemelchi, 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 (210, P. I. 5041, C. I. 1442). Two other strains (P. I. 7467, C. I. 1583; and P. I. 7786, C. I. 2193, or C. I. 6206) were obtained in 1901 through A. Boenike, president of the Kharkof Agricultural Society. The latter of these two introductions contained a considerable portion of long-beaked strains more similar to Belogina than the true Kharkof. A fourth lot of Kharkof (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 hardiness 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 Ratekin 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 1939, including that grown under the name Kharkof and many other synonyms, is shown in figure 60. Turkey is the most widely grown variety and was reported from 26 States. In 1939 it occupied 12,637,403 acres, or 19.77 percent of the total wheat acreage. In 1919 it occupied 21,598,200 acres, comprising 26.93 percent of all wheat.

In 1939 Kharkof was reported in 11 of the 26 States reporting Turkey, the total estimated area being 120,974 acres. This is only 0.96 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, Ulta, Wisconsin No. 18, World's Champion, Zuni.

EAGLE CHIEF

Description.—Eagle Chief is a mixture or a segregating population from a field cross of Turkey and Fulkaster or some other soft wheat.

History.—About 1902 the Santa Fe Railway 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 (C. I. 8868) (reg. 300), Mr. Hyde says:¹³

"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 area in 1939, 46,064 acres, grown in Oklahoma and Kansas.

¹² Letter on Eagle Chief Wheat by C. H. Hyde, Alva, Okla., August 25, 1930.

ILRED

Description.—This selection from Turkey differs only in having slightly softer kernels and in being more uniform under Illinois conditions.

History.—Ilred (C. I. 8219) (reg. 232) is the result of a plant selected from Turkey in 1910 at the Illinois Agricultural Experiment Station (196), Urbana, Ill. It was first grown commercially in 1923 as Turkey 10-110. It was registered (49) in 1926 because of its high yields in experiments at Urbana.

Distribution.—Estimated area in 1939, 3,801 acres, grown in Illinois.

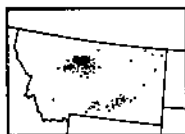
Synonym.—Turkey 10-110.

IOTURK

Description.—Ioturk is similar to Turkey except for being slightly later and in being resistant to some races of bunt.

History.—Ioturk (C. I. 11388) (reg. 206) 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 (45) as an improved variety in 1930 because of its high yields in experiments at Ames.

Distribution.—Estimated area in 1939, 16,405 acres, grown in Iowa, Kansas, and Missouri.



KARMONT

Description.—Karmont is similar to Turkey. It is a hardy, high-yielding strain in Montana.

History.—Karmont (C. I. 6700) (reg. 244) was developed in cooperative experiments of the Montana Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at the Judith Basin Branch Station, Moccasin, Mont. It is the result of a head selection made from Kharkof (C. I. 1583) in 1911. Karmont was grown commercially in Montana for the first time in 1921. It was registered (49) in 1926 because of its high-yielding ability under Montana conditions.

Distribution.—Estimated area in 1939, 114,148 acres, grown in Montana, as shown in figure 61.

MONTANA NO. 36

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 (C. I. 5549) (reg. 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 1939, 24,500 acres, grown in Montana.

NEBRASKA NO. 60

Description.—Nebraska No. 60 is nearly identical with Turkey in all taxonomic characters but will produce heads when seeded later in the spring than Turkey.

History.—Nebraska No. 60 (C. I. 8250) (reg. 147) is a selection of Turkey wheat developed at the Nebraska Agricultural Experiment Station. It was distributed for commercial growing in the fall of 1918 because of its relatively high yields.

Distribution.—Estimated area in 1939, 430,051 acres, grown in Nebraska, Kansas, Colorado, South Dakota, and Wyoming, as shown in figure 62.

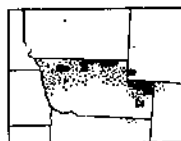
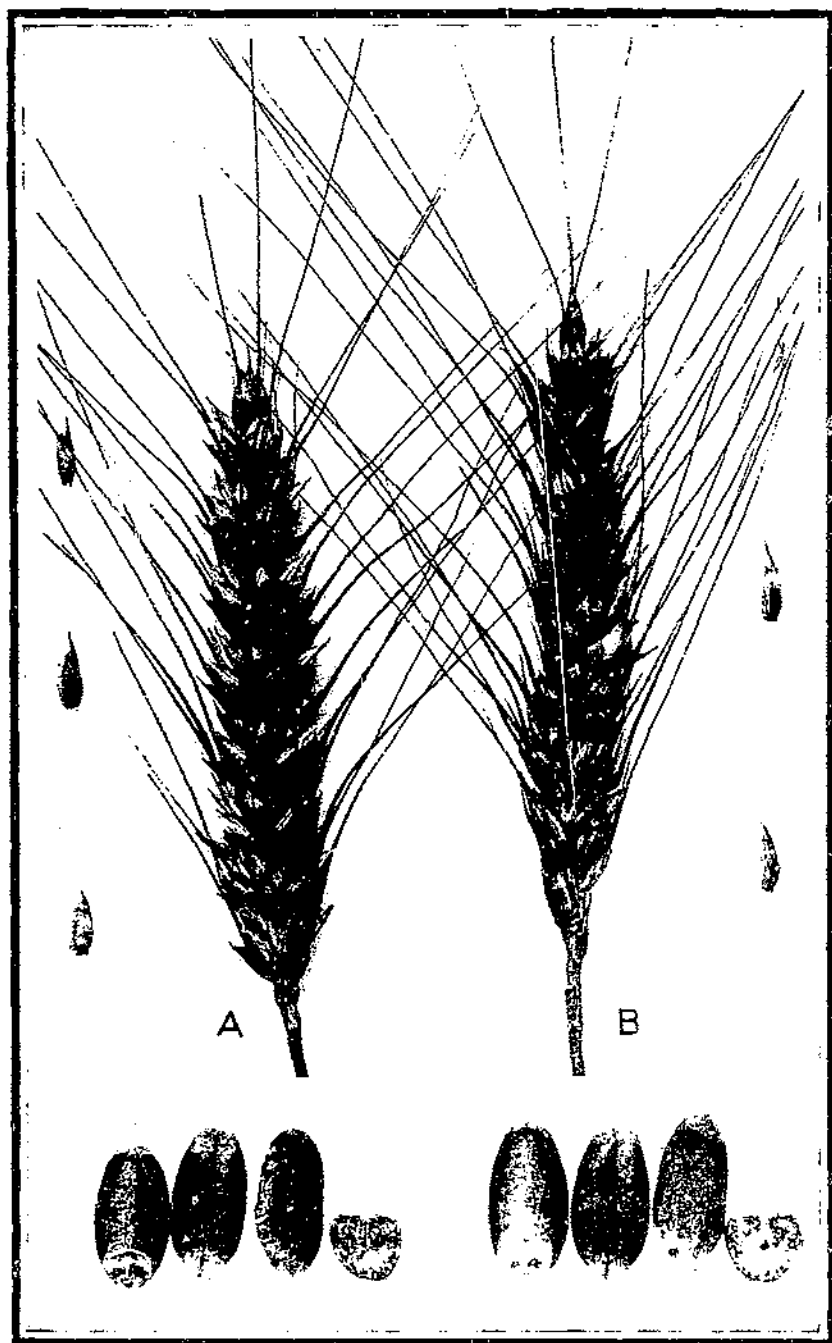


FIGURE 62.—Distribution of Nebraska No. 60 wheat in 1939. Estimated area, 430,051 acres.

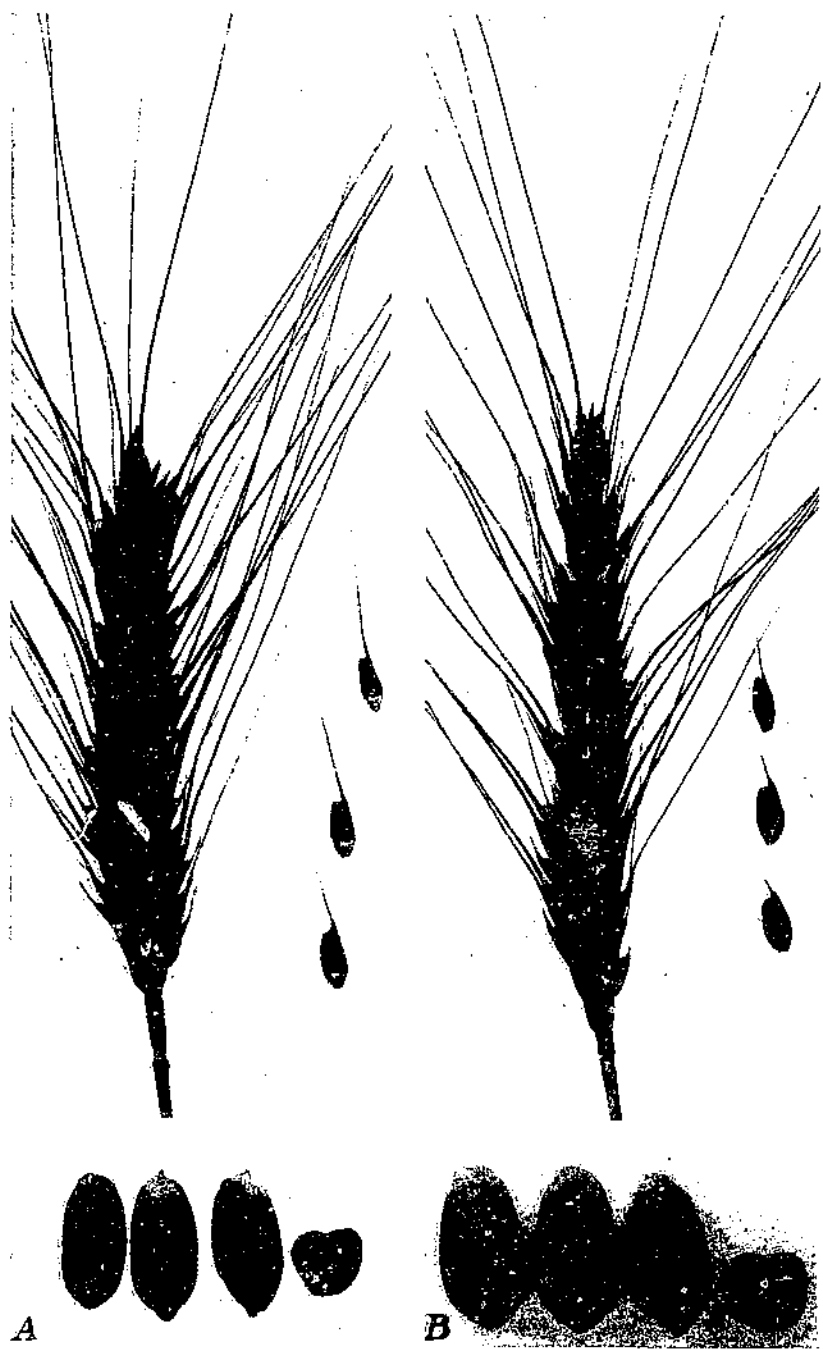
RIO

Description.—Rio differs from Turkey only in having slightly shorter stems and in being resistant to many forms of bunt.

History.—Rio (C. I. 10061) (reg. 275) is the result of a head selected from



A, Turkey and B, Kaured wheats; Spikes and glumes natural size; kernels X 3.



A, Tenmarq and B, Cores wheats: Spikes and glumes natural size; kernels $\times 3$.

Argentina (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 at Moro, Oreg., in cooperative investigations between the Oregon Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. It is resistant to many races 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.—Estimated area in 1939, 18,361 acres, grown in Oregon and Washington.

NEBRED

Description.—Plants of Nebred differ from those of Turkey in being slightly earlier, shorter, and stronger and in having a glaucous color. Nebred is resistant to the races of bunt known to be present in Nebraska and is winter hardy. It is susceptible to stem and leaf rust but seems to be able to produce a better crop when infected than many other varieties.

History.—Nebred (C. I. 10094) (reg. 321) was developed in cooperative experiments of the Nebraska Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. The original selection was made in 1924 from a plot of Turkey (S. Dak. 144, C. I. 3634) at Lincoln. Seed for the plot had been inoculated with *Tilletia levis*, and an epidemic of stem rust also was created in the spring. Heads were selected from plants free of bunt and that showed the lowest infection of rust. In succeeding years these selections were inoculated with bunt, and only the resistant ones were continued. Nebred (Nebraska No. 1063) was named in the fall of 1938 when about 1,100 bushels were distributed. It was registered as an improved variety in 1938 (45).

Distribution.—Estimated area in 1939, 7,770 acres, grown in Nebraska.

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 races of bunt.

History.—Oro (C. I. 8220) (reg. 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 in cooperative investigations between the Oregon Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at the Sherman Branch Experiment 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 (54) as an improved variety in 1928 because of its high yields, stiff straw, and resistance to bunt.

Distribution.—Estimated area in 1939, 54,288 acres, grown in Oregon, Washington, and 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. Spikes, glumes, and kernels of Tenmarq are shown in plate 34, A.

Tenmarq differs from Kanred in being earlier and less winter hardy and in having stronger stems and shorter kernels, as well as resistance to some races of stem and leaf rust.

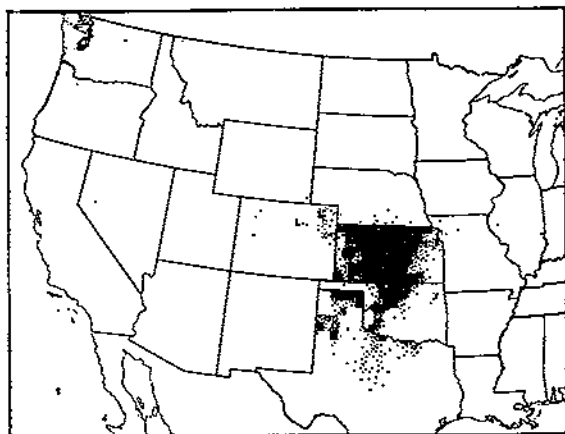


FIGURE 63.—Distribution of Tenmarq wheat in 1939. Estimated area, 3,522,378 acres.

Distribution.—Estimated area in 1939, 3,522,378 acres, grown in 10 States, as shown in figure 63.

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 races of both leaf and stem rust. It is equal to Turkey in milling and bread-making value. A spike, glumes, and kernels of Kanred are shown in plate 33, B.

History.—Kanred (C. I. 5146) (reg. 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 the botany department of the Kansas Agricultural Experiment Station (172). 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

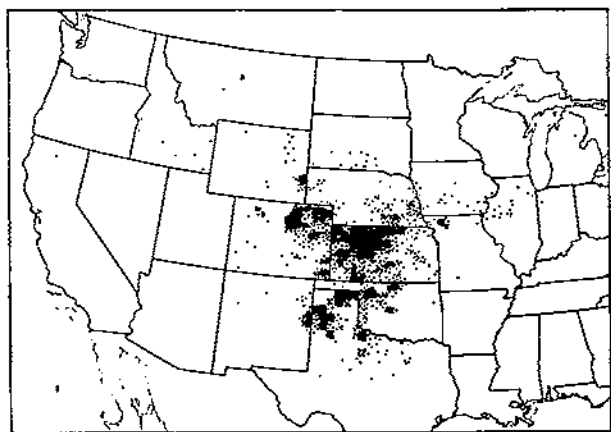


FIGURE 64.—Distribution of Kanred wheat in 1939. Estimated area, 1,585,573 acres.

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 100,300 acres and in 1924, 4,314,962 acres. In 1939 the estimated area was 1,538,573 acres, as shown in figure 64. It was grown in 17 States.

Synonym.—P-762.

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 Utah Kanred (C. I. 11608) (reg. 302).

Distribution.—Estimated area in 1939, 48,382 acres, grown in Utah and Idaho.

Synonym.—Kanred.

STURGEON

Description.—Plant spring habit, early to midseason, short to mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense to lax, inclined; glumes glabrous, white, mid-long, narrow; shoulders narrow, rounded to elevated; beaks 1 to 3 mm. long; awns 3 to 8 cm. long; kernels red, short, semihard to hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush small to mid-sized, mid-long.

Sturgeon is resistant to powdery mildew.

History.—Sturgeon (C. I. 11703) (reg. 278) was produced by the Wisconsin Agricultural Experiment Station (Peninsular Branch) at Sturgeon Bay, Wis. It is the result of a cross between Progress and Marquis made in 1924. The plant selection that resulted in Sturgeon was made in 1927. It was included in field plots in 1931 and was distributed for commercial growing and was registered as an improved variety in 1934 (45).

Sturgeon was distributed to replace Progress, which makes flour of poor bread-baking quality. Sturgeon kernels more nearly resemble those of Marquis than those of the Progress parent, but flour from Sturgeon does not equal that from Marquis in baking quality.

Distribution.—Estimated area in 1939, 5,459 acres, grown in Illinois and Wisconsin.

KOMAR

Description.—Komar differs from Ceres in having shorter beaks (1 to 3 mm. long), weaker stems, slightly greater resistance to stem rust, and slightly harder kernels.

History.—Komar (C. I. 8004) (reg. 270) was produced (246) from the same cross between Marquis and Kofa from which Ceres was selected. The cross was made in 1918 at the North Dakota Agricultural Experiment Station, Fargo. The selection designated as 1656,84, which resulted in Komar, was made in 1923.

Komar was distributed by the Iowa Agricultural Experiment Station in 1930 and by the Colorado Agricultural Experiment Station in 1931, but it is no longer

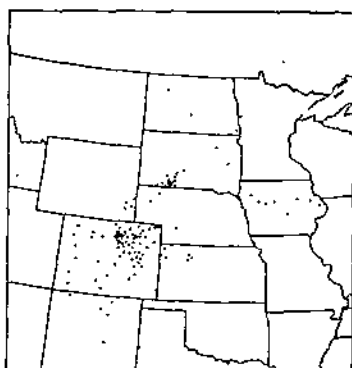


FIGURE 65.—Distribution of Komar wheat in 1939. Estimated area, 107,158 acres.

recommended in Colorado because of its kernel, which is objectionable to the grain trade. It was registered (45) as an improved variety in 1931 because of its high yields under Iowa conditions and its resistance to stem rust.

Distribution.—Estimated area in 1939, 107,158 acres, grown in 10 States, as shown in figure 65.

Synonyms.—No. 1656, N. D. Ns. No. 1656.84.

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.

History.—Preston (C. I. 3328) (reg. 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. For a more complete history of Preston, see Technical Bulletin 459.

Distribution.—The estimated area of Preston decreased from 2,233,200 acres in 1919 to 18,600 acres in 1939. The latter acreage was grown in Illinois, Iowa, Minnesota, Montana, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming.

Synonyms.—Bearded Fife, Blue Ribbon, Climax, Golden Drop, Golden Fife, Johnson, Johnson's Early Fife, Minnesota No. 138, Red Fife, Velvet Chaff.

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.

Ceres is moderately resistant to stem rust and drought and is a high-yielding wheat of good quality for bread making. It also is damaged less by grasshoppers than most other hard red spring and durum varieties. A spike, glumes, and kernels of Ceres wheat are shown in plate 34, B.

History.—Ceres (C. I. 6900) (reg. 241) was developed (216) at the North Dakota Agricultural Experiment Station from a cross between Marquis and Kota made in

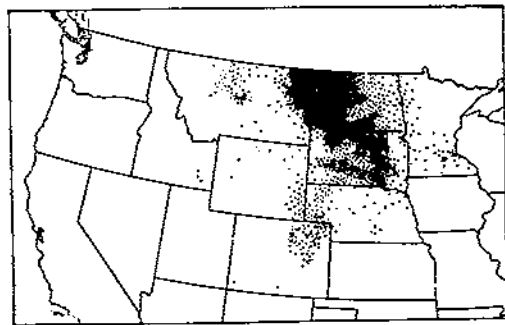


FIGURE 66.—Distribution of Ceres wheat in 1939. Estimated area, 3,583,500 acres.

1918. It was registered (49) and distributed in North Dakota in 1926 and has been widely grown because of its resistance to stem rust and drought, early maturity, high yield, and good quality. It is, however, susceptible to bunt and loose smut.

Distribution.—Estimated area in 1939, 3,583,500 acres, grown in eight States, as shown in figure 66.

CORONATION

Description.—Plant spring habit, midseason, mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense, erect to inclined; glumes glabrous, white to yellowish, often with dark blotches, mid-long, mid-wide; shoulders narrow, rounded to elevated; beaks narrow, acute, 3 to 10 mm. long; kernels red, short to mid-long, hard, ovate to elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks angular to rounded; brush mid-long to long.

Coronation is resistant to stem rust, leaf rust, and moderately resistant to some races of loose smut and bunt. Its quality characteristics are different from those of Marquis, and it is recommended for distribution only in eastern Manitoba and Ontario.

History.—Coronation (C. I. 11475) (reg. 326) was developed from a cross between Pentad (red durum) and Marquis made in 1925 at the Dominion Rust Research Laboratory, Winnipeg, Manitoba. Selection R. L. 729, later named Coronation, was made in 1927. It escaped from the Winnipeg station and was grown on farms in 1935 but was not officially released until 1937.

Distribution.—Estimated area in 1939, 2,182 acres, grown in North Dakota.

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.

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 somewhat resistant to stem rust and drought but is very susceptible to loose smut and leaf rust.

History.—Kota (C. I. 5878) (reg. 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 Monad 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 (217, 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. I. 10214.¹⁶ The unpublished 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 Jalmer Herre, Kelso, N. Dak., who was the first farmer to increase it.

Distribution.—Estimated area in 1939, 8,772 acres, grown in Minnesota, South Dakota, Colorado, and New Mexico.

Synonym.—R. B. R. 3.

RIVAL

Description.—Plant spring habit, midseason, mid-tall; stem white, mid-strong, leaves pubescent; spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, rounded to elevated; beaks 3 to 20 mm. long; awns 3 to 8 cm. long; kernels red, mid-long, hard, ovate; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush mid-sized to large, mid-long. A spike, glumes, and kernels of Rival are shown in plate 35, A.

Rival is resistant to stem and leaf rust and to several races of bunt. It is a high-yielding variety of good quality but is somewhat susceptible to shattering.

¹⁶ Correspondence with J. A. Clark, Division of Cereal Crops and Diseases, dated April 18, 1919.

History.—Rival (C. I. 11708) (reg. 320) is a selection from a cross made in 1929 between Ceres and a Hope × Florence hybrid. It was developed in co-operative experiments of the North Dakota Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture. Strain 9.54.2.13, given Ns. No. 2034, was one of the best of many selections tested from this cross and named Rival. About 725 bushels were distributed in the spring of 1939.

Distribution.—According to the results from the varietal survey, the estimated area in 1939 was 1,011 acres, grown in North Dakota and South Dakota.

PILOT

Description.—Plant spring habit, midseason, mid-tall; leaves pubescent; stem purple, weak; spike awned, fusiform, mid-dense to lax, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, rounded to elevated; beaks 2 to 8 mm. long; awns 3 to 8 cm. long; kernels red, mid-long, hard, ovate; germ small; crease mid-wide, mid-deep; cheeks angular; brush mid-sized, mid-long. A spike, glumes, and kernels of Pilot are shown in plate 35, B.

Pilot is resistant to stem rust and to many races of bunt. It is not pure for resistance to leaf rust and powdery mildew but resistant types predominate. It is a high-yielding wheat of good milling and bread-making quality.

History.—Pilot (reg. 322) was developed by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the North Dakota and other State agricultural experiment stations cooperating in the regional hard red spring wheat improvement program. It is the result of a cross between Hope and Ceres made at Mandan, N. Dak., in 1926. The selection (C. I. 11428, N. No. 1098) was made in F₂ in 1928. Reselections were made in 1933 at Langdon, N. Dak. Eighty of 100 head selections grown in 1934 were composited for increase as N. No. 1098A. Nine of the stem-rust-resistant high-yielding selections grown during the rust epidemics of 1935 were composited for increase as N. No. 1098B. It was registered as an improved variety in 1938 (45).

Approximately 1,500 bushels of seed of a bulk of N. No. 1098 and N. No. 1098A and 80 bushels of N. No. 1098B were distributed in North Dakota for seedling in 1939. Selection N. No. 1098-13 (C. I. 11945), which is pure for resistance to leaf rust and mildew, is being increased for distribution to replace the earlier increases which are not pure for resistance to these two diseases.

Distribution.—According to the varietal survey the estimated area in 1939 was 1,993 acres, grown in North Dakota, South Dakota, and Montana.

HOPE

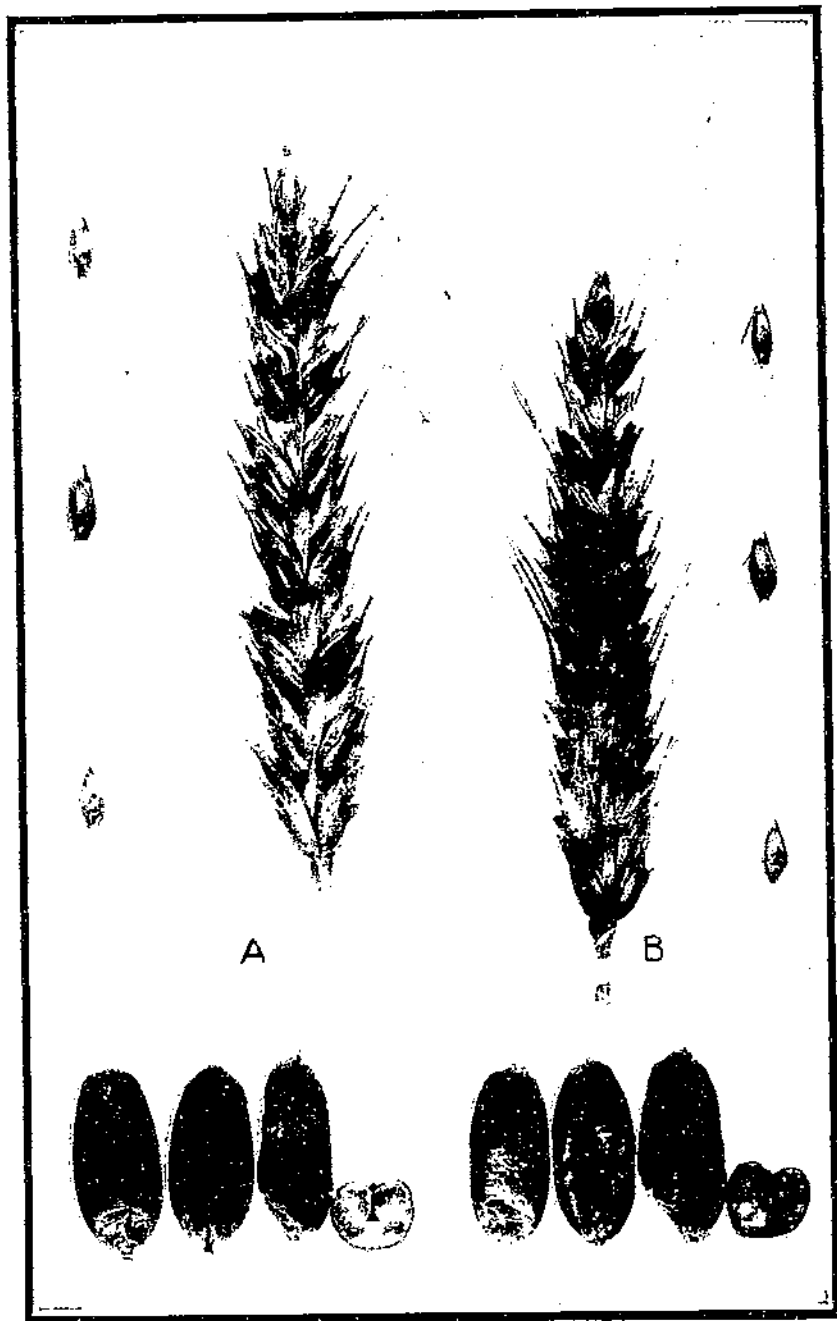
Description.—Plant spring habit, midseason, mid-tall; leaves pubescent; stem purple, mid-strong; spike awned, fusiform, mid-dense, erect to inclined, very resistant to shattering; glumes glabrous, white, mid-long, mid-wide to wide; shoulders mid-wide, rounded to elevated; beaks 2 to 10 mm. long; awns 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 powdery mildew. From spring seedling it also is very resistant to bunt. It is susceptible to frost and heat injury and to the black-chaff disease.

History.—Hope (C. I. 8178) (reg. 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, Bureau of Plant Industry, United States Department of Agriculture. 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 (49) in 1928 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.



A, Rival and B, Pilot wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Rudy and B, Nigger wheats: Spikes and glumes natural size; kernels $\times 3$.

Distribution.—Estimated area in 1939, 32,446 acres, grown in Minnesota, North Dakota, South Dakota, Iowa, Wisconsin, Arizona, and Idaho.

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 shorter beaks. A spike, glumes, and kernels of Nigger are shown in plate 36, B.

History.—"Nigger (C. I. 5366) (reg. 157) wheat is said to have been first distributed from the farm of a colored man in Darke County, Ohio" (109, p. 4). It was grown in experiments by the Ohio Agricultural Experiment Station as early as 1884.

Distribution.—Estimated area in 1939, 123,949 acres, grown in six States, as shown in figure 67.

Synonyms.—Winter Green, Winter John, Winter King.

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 (C. I. 8869) (reg. 202) was developed at the Ohio Agricultural Experiment Station. It is the result of a selection from Nigger made in 1918. It was registered (54) and distributed for commercial growing in 1928.

Distribution.—Estimated area in 1939, 5,479 acres, grown in Ohio and Illinois.

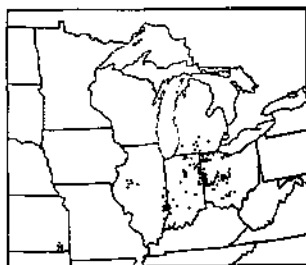


FIGURE 67.—Distribution of Nigger wheat in 1939. Estimated area, 123,949 acres.

RUDY

Description.—Plant winter habit, midseason to late, mid-tall to tall; stem purple, 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 36, A.

History.—The origin of Rudy (C. I. 4873) (reg. 155) has been recorded by Carleton (40, 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.

Distribution.—Estimated area in 1939, 229,060 acres, grown in seven States, as shown in figure 68.

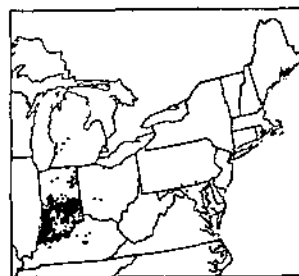


FIGURE 68.—Distribution of Rudy wheat in 1939. Estimated area, 229,060 acres.

Distribution.—Estimated area in 1939, 229,000 acres, grown in seven States, as shown in figure 68.

Synonyms.—Anti-Rust, Black Mediterranean, Early Rudy, Kentucky Giant, Queen of New York.

DIXON (HUMPBACK II)

Description.—Plant spring habit, late, tall; stem white, mid-strong; spike awned, fusiform, lax, inclined; glumes glabrous, yellowish bronze, 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 bronze color, and the absence of shoulders on the glumes, and the wide, lax spikes. The kernels have a smaller brush and germ than found in Humpback. Dixon is moderately resistant to hessian fly.

History.—The origin of Dixon (C. I. 6049) (reg. 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. (204, 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 1939, 3,570 acres, grown in Nebraska and Wyoming.

Synonyms.—Ghirka, Humpback II, Johnson, Smooth Humpback.

REQUA

Description.—Plant winter habit, midseason, mid-tall; stems purple and white, very weak; spike awned, oblong-fusiform, lax, nodding; glumes glabrous, brown, long, narrow to mid-wide; shoulders narrow, rounded to oblique; beaks 2 to 10 mm. long; awns 3 to 8 cm. long; kernels white, mid-long, soft, ovate to elliptical; germ small; crease narrow, mid-deep; cheeks rounded; brush small, mid-long.

History.—Requa (C. I. 11554) was developed from heads selected in 1926 from a field of Turkey by E. Requa, a farmer living near Pomeroy, Wash. It was increased and distributed about 1931. The original increase was segregated for red and white kernels, and Mr. Requa increased and distributed a white grain type about 1935. Characteristics of the selection and the fact that Mr. Requa grew Goldecoin in the hay strip around his fields indicate that Requa was from a natural cross between Turkey and Goldecoin.

Distribution.—Estimated area in 1939, 1,138 acres, grown in Washington and Idaho.

MACKEY

Description.—Plant spring habit, midseason, mid-tall; stem white, mid-strong; spike awned, oblong-fusiform, mid-dense, inclined; glumes glabrous, brown, mid-long, mid-wide; shoulders narrow, wanting to oblique; beaks 3 to 20 mm. long; awns 3 to 6 cm. long; kernels white, mid-long, soft, ovate; germ mid-sized; crease wide, mid-deep; cheeks angular; brush small to mid-sized, mid-long.

History.—The following history of Mackey (C. I. 10028) was reported by A. F. Serd,¹ of Midvale, Idaho. A neighbor by the name of James McRoberts picked four or five heads from a field of Canadian Club in 1901 or 1902. He increased the seed in his garden, and, when he sold his farm in the spring of 1906, the seed was given to William Mackey, who planted 12 acres that year. Mr. Mackey distributed the variety, and it became known as Mackey wheat. The identity of the parent variety, Canadian Club, is not known.

Distribution.—Estimated area in 1939, 833 acres, grown in Idaho.

¹ Letter from A. F. Serd, dated May 30, 1939.

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, mid-long, 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 (C. I. 6282) (reg. 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.—Estimated area in 1939, 167 acres, grown in Idaho.

Synonym.—Canadian Spring.

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 poulard 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 (C. I. 6247) (reg. 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 (197, 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 (198, p. 25).

Distribution.—Estimated area in 1939, 50 acres, grown in Utah.

ILLINOIS NO. 2

Description.—Plant winter habit, midseason, mid-tall; stem white, mid-strong; spike awned, fusiform, mid-dense to lax, nodding; glumes glabrous, brown, mid-long, narrow; shoulders narrow, wanting to oblique; beaks 1 to 2 mm. long; awns 3 to 6 cm. long; kernels light red, short to mid-long, soft, elliptical; germ mid-sized; crease mid-wide, mid-deep; cheeks rounded; brush mid-sized, short.

This variety is resistant to winter injury from heaving and low temperatures and is somewhat resistant to leaf and stem rust. It is very susceptible to the rosette stage of the wheat mosaic and to flag smut.

History.—Illinois No. 2 (C. I. 11537) is a selection from Indiana Swamp (Valley) made at the Illinois Agricultural Experiment Station in 1915. It was distributed in the fall of 1932. A selection (D-47) from this variety, resistant to mosaic, has been named Prairie.

Distribution.—Estimated area in 1939, 11,511 acres, grown in Illinois.

Synonym.—Progeny No. 2.

GOENS

Description.—Plant winter habit, early to midseason, mid-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 37, A.

History.—Goens (C. I. 4857) (reg. 172), under the names Red Chaff and Red Chaff Bearded, has long been known in the United States. According to Klippart, in 1857 (129, 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 afterward 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."

Distribution.—Estimated area in 1939, 92,648 acres, grown in Ohio, Indiana, and Michigan.

Synonyms.—Baldwin, Cummings, Dunlap, Dunlop, Early Red, Early Ripe, Going, Hall, Miller's Pride, Owen, Red Chaff, Red Chaff Bearded, Red Hall, Russian Red Chaff, Shelby Red Chaff.

DIEHL-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 37, B.

History.—Diehl-Mediterranean (C. I. 1395) (reg. 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 (104, 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 (10). 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 1939, 9,499 acres, grown in Michigan, Tennessee, Virginia, Delaware, and Pennsylvania.

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 (C. I. 5737) (reg. 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

¹ Correspondence of the Division of Cereal Crops and Diseases. March 1, 1922.



A, Goeng and *B*, Diehl-Mediterranean wheats: Spikes and glumes natural size; kernels $\times 3$.

Diehl-Mediterranean and also different from any other wheat grown in the United States under the name of Russian.

Distribution.—Estimated area in 1939, 25,337 acres, grown in Illinois and Michigan.

Synonym.—Hardy Northern.

IOBRED

Description.—Plant winter habit, midseason to late, mid-tall to tall; stem white, mid-strong; spike awned, fusiform, mid-dense, erect to inclined, easily shattered; glumes glabrous, brown, sometimes black, 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.

Iobred is moderately resistant to leaf and stem rust, but is susceptible to shattering.

History.—Iobred (C. I. 6934) (reg. 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 Banat (Iowa No. 1661) made in 1915. It was first distributed for commercial growing in 1923 and was registered (49) as an improved variety in 1926.

Distribution.—Estimated area in 1939, 488,074 acres, grown in seven States, as shown in figure 69.

Synonyms.—Hybrid, Iowa Bred, Red Russian.

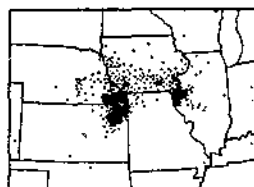


FIGURE 69.—Distribution of Iobred wheat in 1939. Estimated area, 488,074 acres.

BRILL

Description.—Plant winter habit, early to midseason, short to mid-tall; stem white and purple, weak; spike awned, fusiform, mid-dense, inclined to nodding; glumes glabrous, yellowish brown, mid-long, narrow; shoulders wanting to rounded; beaks 1 to 5 mm. long; awns 3 to 6 cm. long; kernels red, mid-long, hard, elliptical; germ mid-sized; crease mid-wide, shallow to mid-deep; cheeks rounded; brush mid-sized, mid-long.

Brill is somewhat resistant to yellowberry, scab, leaf rust, stem rust, flag smut, and winter injury. It is susceptible to mosaic.

History.—Brill (C. I. 11853) was the best of 6,000 selections made from Turkey in 1922 in cooperative investigations between the Illinois Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Urbana, Ill. The selections were made as part of a search for strains resistant to scab. Brill was designated as Illinois No. 131 until it was named and distributed in the fall of 1936.

Distribution.—Estimated area in 1939, 7,748 acres, grown in Illinois.

ASHKOF

Description.—Plant winter habit, midseason to late, mid-tall to tall; stem white, mid-strong, spike awned, fusiform, mid-dense to lax, inclined to nodding, easily shattered; glumes glabrous, light brown, sometimes black striped, mid-long, narrow to mid-wide; shoulders wanting to narrow, rounded to elevated; beaks 1 to 5 mm. 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 races of bunt.

History.—Ashkof (C. I. 6680) (reg. 235) was developed at the Ashland Branch Station of the Wisconsin Agricultural Experiment Station. It is a selection from Mulakof made 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 (49), 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 1939, 10,785 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 (C. I. 11508) (reg. 303) 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."¹⁹

It was grown widely in Garfield County, Okla., in 1932.

Distribution.—Estimated area in 1939, 7,756 acres, grown in Oklahoma.

Synonyms.—Enid Strain, Red Krienke.

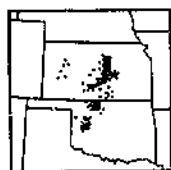


FIGURE 70.—Distribution of Redhull wheat in 1939. Estimated area, 154,807 acres.

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 (C. I. 11534) (reg. 304) is reported to have been developed from a brown-glumed selection from a field of Blackhull at Haven, Kans., by F. E. Tonn in 1921.²⁰ Seed was increased and sold by R. M. Woodruff, of Pratt, Kans.

Distribution.—Estimated area in 1939, 154,807 acres, grown in Kansas and Oklahoma, as shown in figure 70.

Synonyms.—Bartels Best, Bronze Turkey, Cleathers Red, Conoway, Ironclad Blackhull, Nick Special, Red Chaff, Rupp.

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. The variety is resistant to powdery mildew.

History.—Ladoga (C. I. 4795) (reg. 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 1893, in the hope that it would provide a wheat ripening earlier than Red Fife (175). By 1893, 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.

Distribution.—Estimated area in 1939, 6,351 acres, grown mostly under the name Spring Turkey in South Dakota.

Synonym.—Spring Turkey.

¹⁹ Letter from Fred Moehle, route 1, Enid, Okla., dated March 17, 1934.

²⁰ Woodruff, R. M., 23-page pamphlet on wheat varieties. No date. Pratt, Kans.

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 (C. I. 6551) (reg. 305) is a spring wheat that was commonly grown during the nineties but has largely gone out of cultivation. The origin of the variety is undetermined.

Distribution.—Estimated area in 1939, 8,470 acres, grown in Colorado and Nebraska.

Synonyms.—Red Mediterranean, Texas Red.

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 (C. I. 8265) (reg. 255) was developed (136) by the Texas Agricultural Experiment Station at Substation No. 6, from a plant selected from Mediterranean in 1918. The variety was distributed for commercial growing in 1926 and was registered (54) in 1927, because of its high yields in experiments at Denton, its resistance to leaf rust, and because its stems were stronger than those of Mediterranean.

Distribution.—Estimated area in 1939, 33,648 acres, grown in Texas.

MEDITERRANEAN

Description.—Plant winter habit, midseason, tall; stem purple, weak to mid-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 38, A.

History.—Reference to the Mediterranean (C. I. 5303) (reg. 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 (97, p. 228) it was introduced into Maryland from the Mediterranean Sea

region in 1837. In 1863 it was recorded (139, p. 501) 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 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. Many other selections from the Mediterranean area, like Denton, are resistant to leaf rust.

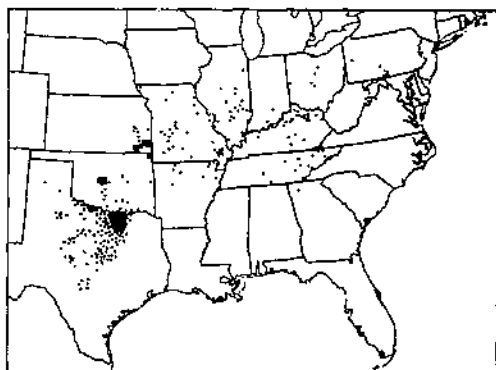


FIGURE 71.—Distribution of Mediterranean wheat in 1939. Estimated area, 387,338 acres.

Distribution.—Estimated area in 1939, 387,338 acres. This acreage was reported from 15 States, as shown in figure 71.

Synonyms.—Acme, Bluestem, Farmers Trust, Great Western, Key's Prolific, Lancaster Red, Lehigh, Miller, Miller's Pride, Missouri Bluestem, Mortgage Lifter, Red Chaff, Red Mediterranean, Red Sea, Red Top, Rocky Mountain, Standby, Swamp.

RED ROCK

Description.—Red Rock is similar to Mediterranean except for having stronger stems, a slightly longer, wider, and laxer spike, and a harder kernel having a wider and deeper crease. It yields better than Mediterranean in Michigan. A spike, glumes, and kernels of Red Rock are shown in plate 38, B.

History.—Red Rock (C. I. 5597) (reg. 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. In 1914, 60 bushels were sent out by the experiment station to as many farmers, 1 bushel being furnished each farmer (194, p. 81).

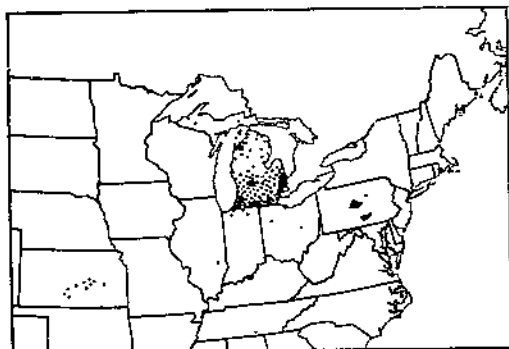


FIGURE 72.—Distribution of Red Rock wheat in 1939. Estimated area, 160,141 acres.

Distribution.—Estimated area in 1939, 160,141 acres, grown in seven States, as shown in figure 72.

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 some races of rust.

History.—Berkeley Rock (C. I. 8272) (reg. 307) was developed (73) at the Michigan Agricultural Experiment Station 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 1939, 6,765 acres, grown in Michigan.

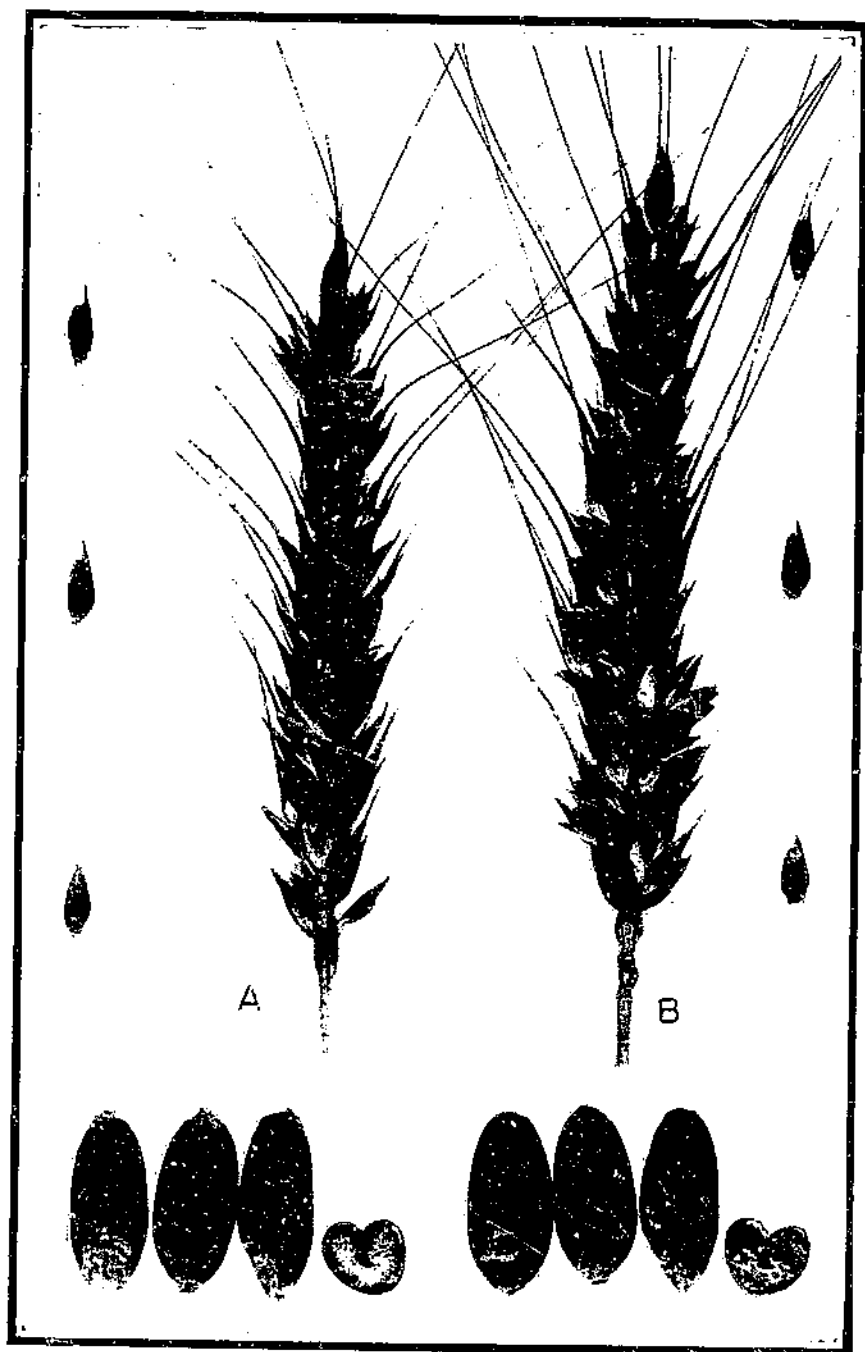
KRUSE

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 rust.

History.—Kruse (C. I. 11524) 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 Fife and Kanred.

Distribution.—Estimated area in 1939, 390 acres, grown in Kansas.



A, Mediterranean and B, Red Rock wheats: Spikes and glumes natural size; kernels $\times 3$.

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, oblong, or sometimes clavate or club-shaped, short, usually less than $2\frac{1}{2}$ 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 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 bread making and is used largely for biscuits 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.

Figure 73 shows the distribution of club wheats in the United States in 1939.

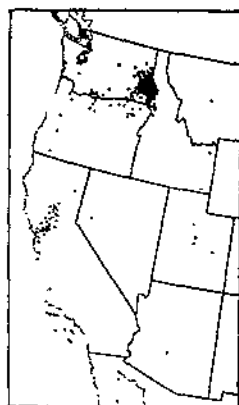


FIGURE 73.—Distribution of club wheats in 1939. Estimated area, 411,282 acres.

KEY TO THE VARIETIES OF CLUB WHEAT

| | | |
|---|-------------|-----|
| 1a. SPIKE AWNLESS. | | |
| 2a. GLUMES GLABROUS. | | |
| 3a. GLUMES WHITE. | | |
| 4a. KERNELS WHITE (<i>T. compactum humboldtii</i> Koern.). | | |
| KERNELS SOFT TO SEMIHARD. | | |
| WINTER HABIT. | | |
| Awnlets 1 to 5 mm. long; plant very short | ALICE | 120 |
| Awnlets 2 to 10 mm. long; plant mid-tall to tall | HYBRID 128 | 120 |
| Awnlets 3 to 15 mm. long; plant mid-tall to tall | HYMAR | 120 |
| | ALMT | 121 |
| INTERMEDIATE HABIT. | | |
| Plants short; glumes and kernels very short | HYBRID 143 | 121 |
| SPRING HABIT. | | |
| Plant short, early; spike oblong-clavate | POSO | 121 |
| Plant tall, midseason; spike elliptical-clavate | BIG CLUB | 121 |
| | BIG CLUB 37 | 122 |
| KERNELS SEMIHARD TO HARD. | | |
| SPRING HABIT. | | |
| Spike elliptical. | HYBRID 53 | 122 |
| 4b. KERNELS RED (<i>T. compactum wernerianum</i> Koern.). | | |
| KERNELS SOFT TO SEMIHARD. | | |
| SPRING HABIT. | | |
| 3b. GLUMES BROWN. | HYBRID 123 | 122 |
| 4a. KERNELS WHITE (<i>T. compactum refutum</i> Koern.). | | |
| KERNELS SOFT TO SEMIHARD. | | |
| SPRING HABIT. | | |
| Spike oblong-lusiform; glumes dark brown. | | |
| Spike mid-dense | FLOOD | 123 |
| Spike dense | JESSIE | 123 |
| Spike clavate. | | |
| Glumes light brown. | | |
| Plant short to mid-tall | UNION | 123 |
| Plant mid-tall. | REDCHAFF | 123 |
| Glumes bluish brown | BLUECHAFF | 123 |
| 1b. SPIKE AWNED. | | |
| 2a. GLUMES GLABROUS. | | |
| 3a. GLUMES WHITE. | | |
| 4a. KERNELS WHITE (<i>T. compactum erinaceum</i> Koern.). | | |
| KERNELS SEMIHARD TO HARD. | | |
| SPRING INTERMEDIATE HABIT | UTAC | 124 |

DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF
CLUB WHEAT VARIETIES

ALICEL

Description.—Plant winter habit, midseason, very short; stem white and purple, very strong; spike awnleted, elliptical, dense, erect; glumes glabrous, white, short, mid-wide; shoulders wanting to narrow, oblique; beaks mid-wide, obtuse, 0.5 mm. long; awnlets wanting to few, 1 to 5 mm. long; kernels white, short to mid-long, soft, ovate, irregular, humped, flattened; germ small to mid-sized; crease mid-wide, mid-deep; cheeks rounded to angular; brush mid-sized, mid-long.

History.—Alicel (C. I. 11700) was developed in cooperative investigations of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the Oregon Agricultural Experiment Station, from a cross between Goldcoin and Hybrid 128 made at the Sherman Branch Experiment Station in 1919. Selection 1998A5-1—1 made in 1924 was distributed in the Grande Ronde Valley in eastern Oregon in the fall of 1932. Alicel was found to be not pure for plant height and color of stems, and plant selections were made from it at the Pendleton Field Station in 1932. One of the selections (C. I. 11755) pure for plant height and light purple stems has been named Elgin.

Distribution.—Estimated area in 1939, 2,506 acres, grown in Oregon.

Synonym.—Fortyfold-Hybrid 128 (white chaff).

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 rounded; 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; cheeks angular; brush small, mid-long.

Hybrid 128 is high yielding but is very susceptible to rust.

Spikes, glumes, and kernels of Hybrid 128 wheat are shown in plate 39, A.

History.—Hybrid 128 (C. I. 4512) (reg. 190) was originated at the Washington Agricultural Experiment Station, Pullman, Wash. Its history has been recorded by Schafer and Gaines (177, p. 81) as follows:

"Hybrid 128 is a cross between Jones Winter Pife 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 (192). 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 (193).

Distribution.—Estimated area in 1939, 46,362 acres, grown in Washington, Oregon, and Idaho. The acreage has decreased greatly in recent years, having been displaced by new high-yielding, rust-resistant varieties equally desirable in other respects.

Synonyms.—Washington Hybrid 128, White Hybrid.

HYMAR

Description.—Hymar is very similar to Hybrid 128 except in having slightly more and longer awnlets and in being slightly later. It is resistant to several races of rust.

History.—Hymar (C. I. 11005) (reg. 311) was developed in cooperative experiments of the Washington Agricultural Experiment Station and the Di-

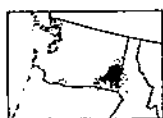


FIGURE 74.
Distribution
of Hymar
wheat in
1939. Esti-
mated area,
120,919 acres.



A

B



A, Hybrid 128 and B, Abit wheats: Spikes and glumes natural size; kernels $\times 3$.

vision of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Pullman, Wash. It is the result of a cross between Hybrid 128 and Martin made in 1923. The plant selection that resulted in Hyman was made in 1930. It was distributed for commercial production in the fall of 1935 and was registered as an improved variety in 1935 (45).

Distribution.—Estimated area in 1939, 126,919 acres, grown in Washington, Idaho, and Oregon, as shown in figure 74.

ALBIT

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 races of bunt but has a slightly lower test weight and is more susceptible to shattering than Hybrid 128. Spikes, glumes, and kernels of Albit wheat are shown in plate 39, B.

History.—Albit (C. I. 8275) (reg. 258) was developed by the Washington Agricultural Experiment Station in experiments cooperative with the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, from a cross made 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 (54) as an improved variety in 1927.

Distribution.—Estimated area in 1939, 125,776 acres, grown in Washington, Idaho, and Oregon, as shown in figure 75.



FIGURE 75.—
Distribution
of Albit
wheat in
1939. Esti-
mated area,
125,776 acres.

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 (C. I. 4160) (reg. 193) was originated at the Washington Agricultural Experiment Station from a cross between White Truck 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.—Estimated area in 1939, 1,089 acres, grown in Oregon.

Synonym.—Shot Club.

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 (C. I. 8891) (reg. 310) was developed by the California Agricultural Experiment Station from a cross between Little Club and Claremont, an Australian variety of common wheat. It was distributed for growing in Solano County, California, in 1930.

Distribution.—Estimated area in 1939, 23,126 acres, grown in California.

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.

The shape of the spike is very similar to that of Hybrid 128.

History.—Big Club (C. I. 4257) (reg. 192) is reported to have been introduced into Oregon about 1870 from Chile (4). 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 (75, p. 586).

Regarding the history of Big Club, Hendry²¹ 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 1824-1830. 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.—Estimated area in 1939, 34,321 acres, grown in California and Idaho.

Synonyms.—Big Four, Chile Club, Crookneck Club, Montezuma Club, Oregon Club, Salt Lake Club.

BIG CLUB 37

Description.—Big Club 37 is very similar to Big Club except in being resistant to some races of bunt.

History.—This strain (C. I. 11901) of Big Club is the result of a cooperative program of the California Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, at Davis, Calif., to develop strains of the important commercial varieties of California resistant to bunt. The original cross, Martin × Big Club, was made in 1922. Bunt-resistant lines were backcrossed to Big Club 6 times. Following the sixth backcross a composite of 77 resistant F₂ lines was released in 1937 for production in the Sacramento Valley.

Distribution.—Grown in the Sacramento Valley of California since 1938.

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 (C. I. 4510) (reg. 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 in 1939, 2,876 acres, grown in Oregon.

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 (C. I. 4511) (reg. 197) was originated at the Washington Agricultural Experiment Station from a cross between Jones Fife and Little Club, made by W. J. Spillman in 1899. The variety was distributed by the Washington station in 1907, after early trials had indicated that it was a good yielding variety.

²¹ Letter from G. W. Hendry, Berkeley, Calif., dated March 7, 1934.

Distribution.—Estimated area in 1939, 4,322 acres, grown in Washington.
Synonyms.—Red Hybrid, Red Walla.

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 (C. I. 11436) (reg. 312) 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. It was distributed in western Oregon in the fall of 1929.

Distribution.—Estimated area in 1929, 906 acres, grown in western Oregon.

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.

History.—The origin of Jenkin (C. I. 5177) (reg. 198) is undetermined. It is known to have been grown in the vicinity of Wilbur, Lincoln County, Wash., about 1895 (120). 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 and Rex.

Distribution.—Estimated area in 1939, 16,110 acres, grown in Idaho, Washington, and Oregon.

Synonym.—Jenkin's Club.

UNION

Description.—Union is similar to Redchaff except in having shorter straw.

History.—Union (C. I. 13704) is the best of many head selections made in 1923 from a field of Redchaff. It was carried as Redchaff selection 13 in tests at the Eastern Oregon Branch Livestock Experiment Station, Union, Oreg., and was distributed by that station in the Grande Ronde Valley of eastern Oregon in 1936.

Distribution.—Estimated area in 1939, 974 acres, grown in Oregon.

REDECHAFF

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.

History.—The origin of Redchaff (C. I. 4241) (reg. 199) is undetermined. According to Hunter (119, p. 24), it was an important variety of club wheat in the Columbia Basin of Oregon and Washington in 1907.

Distribution.—Estimated area in 1939, 3,744 acres, grown in Oregon.

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; beak 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 (C. I. 5256) (reg. 200) was recorded² 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 it 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 1939, 810 acres, grown in Oregon.

Synonym.—Blue Chaff Calvert Club.

UTAC

Description.—Plant spring intermediate habit, midseason to late, mid-tall to tall; stem white, mid-strong; spike awned, elliptical, dense, erect to inclined; glumes glabrous, white, mid-long, mid-wide; shoulders narrow, wanting to oblique; beaks 1 to 5 mm. long; awns 2 to 5 cm. long; kernels white, mid-long, semihard to hard, ovate, humped; germ mid-sized; crease wide, mid-deep to deep; cheeks angular; brush mid-sized, short to mid-long.

History.—Utac (C. I. 10045) was developed by the Utah Agricultural Experiment Station at Logan, Utah. It is the result of a cross between Dicklow and Sevier made about 1923. It was distributed to farmers in Utah about 1928.

Distribution.—Estimated area in 1939, 3,960 acres, grown in Utah and Idaho.

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

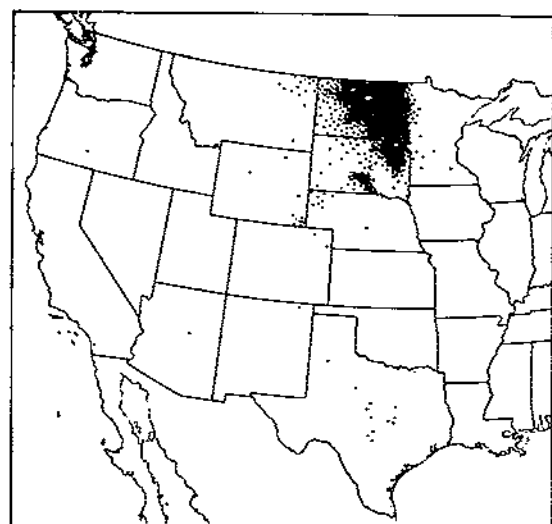


FIGURE 76.—Distribution of durum wheat in 1939.
Estimated area, 3,372,405 acres.

varieties. The spikes, however, usually are much thinner, the glumes are longer, and the kernels are longer, more slender, and usually much harder.

² Correspondence with Ira P. Whitney, county agricultural agent, Eugene, Oreg., dated October 17, 1921.

Durum wheat has been widely grown in the United States only during the past 40 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 rapidly increased. The distribution of durum wheat in 1939 is shown in figure 76. The durums furnish the great bulk of the world's supply of wheat for the manufacture of semolina, macaroni, and spaghetti. The production of durum wheat in the United States made possible a large macaroni industry, which until recently has used about one-third of the national production of this wheat. The remainder has been exported, used by mills or bakeries for mixing with wheats or flours, and utilized as feed for livestock.

The varieties that are commercially grown are distinguished by the accompanying key.

KEY TO THE VARIETIES OF DURUM WHEAT

| | | |
|---|--------------|-----|
| 1a. SPIKE AWNED. | | |
| 2a. GLUMES GLABROUS. | | |
| 3a. GLUMES WHITE. | | |
| 1a. AWNS WHITE. | | |
| 5a. KERNELS RED <i>Triticum durum affine</i> Koern. | PENTAD | 125 |
| KERNELS MID-LONG, HARD. | | |
| 4b. AWNS BLACK. | | |
| 5a. KERNELS WHITE <i>T. durum leucomelan</i> AL. | P'ELISS | 126 |
| KERNELS VERY LONG, HARD. | | |
| 3b. GLUMES YELLOW. | | |
| 4a. AWNS WHITE. | | |
| 5a. KERNELS WHITE <i>T. durum kosterianum</i> Host. | | |
| KERNELS LONG, HARD. | | |
| Spike fusiform. | | |
| Plant mid-tall; beaks 1-2 mm. long | ACHE. | 126 |
| | MONAD. | 127 |
| Plant tall; beaks 1-5 mm. long | ARSACTEA | 127 |
| | MINDUM | 127 |
| Spike oblong; plant tall. | | |
| Beaks 1-2 mm. long | KUBANKA. | 128 |
| | NODAR | 128 |
| 2b. GLUMES PUBESCENT. | | |
| 3a. GLUMES WHITE. | | |
| 1a. AWNS BLAV. | | |
| 5a. KERNELS WHITE <i>T. durum melanopus</i> AL. | GOLDEN BALL. | 129 |
| KERNELS LONG, HARD. | | |
| 3b. GLUMES BLACK. | | |
| 4a. AWNS BLACK. | | |
| 5a. KERNELS WHITE <i>T. durum luganogense</i> Desc. | KABLA | 129 |
| KERNELS LONG, HARD. | | |

DESCRIPTION, HISTORY, DISTRIBUTION, AND SYNONYMY OF DURUM WHEAT VARIETIES

PENTAD (D-5)

Description.—Plant spring habit, midseason, mid-tall; stem white, mid-strong, spike awned, fusiform, mid-dense, inclined; glumes glabrous, white, mid-long, mid-wide; shoulders mid-wide, oblique to elevated; beaks 1 to 2 mm. long; awns white, 5 to 15 cm. long; kernels red, mid-long, hard, ovate, truncate tip, humped; germ mid-sized; crease mid-wide, shallow; cheeks angular; brush mid-sized, short.

Pentad is distinct from all other commercial varieties of durum wheat grown in the United States because of its rust resistance, white glumes, and red kernels.

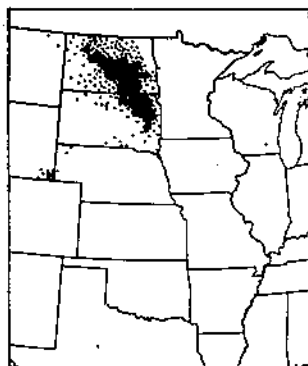


FIGURE 77.—Distribution of Pentad wheat in 1939. Estimated area, 613,082 acres.

The kernels are smaller, squarer at the brush end, and more pointed at the germ end than kernels of the other durum varieties. Experiments have shown it to be the most rust-resistant variety of durum wheat grown in the United States, and therefore it yields well under conditions favoring rust. Its quality has been found inferior, however, to that of other durum varieties. A spike, glumes, and kernels of Pentad wheat are shown in plate 40, A.

History.—Pentad (C. I. 3322) (reg. 209) was introduced from Russia in 1903 by the North Dakota Agricultural Experiment Station. It was distributed in North Dakota in 1911. Because of its rust resistance it gained popularity and has been widely grown in the spring-wheat area from late seedling. Because of its poor quality its production has been opposed by many agencies. The name Pentad was first recorded by Trowbridge (209, p. 17) in 1920.

Distribution.—Estimated area in 1939, 613,082 acres, grown in eight States, as shown in figure 77.

Synonyms.—D-5, D life, Durum No. 5, Ladd Durum, Red Durum, Resistant Fife, Rust Proof.

PELISS

Description.—Plant spring habit, midseason, tall; stem white, mid-strong; spike awned, broadly fusiform, mid-dense, inclined; glumes glabrous, white, long, wide; shoulders narrow to mid-wide, oblique to elevated; beaks 1 to 5 mm. long; awns black, 6 to 18 cm. long; kernels white, very long, hard, elliptical, curved, humped; germ mid-sized; crease mid-wide, mid-deep; cheeks angular; brush small, short.

Peliss is distinct from Kubanka in having white rather than yellowish glumes, black awns, and very long kernels that are somewhat curved. A spike, glumes, and kernels of Peliss are shown in plate 40, B.

History.—Peliss (C. I. 1584) (reg. 210) (210, P. I. 5380) was introduced from Mustapha, Algiers, Algeria, by the United States Department of Agriculture, in 1900. The variety, presumably of Spanish origin, is widely distributed throughout northern Africa, where it is grown under many different names. According to Scofield (181, p. 38), the original seed was obtained from a man named Pelissier, who lived near Ponts des Issers in the western part of the Province of Oran and who improved the yield of this variety by selection. In the United States the variety was first called Pelissier, but the shorter and simpler form, Peliss, was substituted in 1920.

Distribution.—Estimated area in 1939, 13,186 acres, grown in Montana, North Dakota, and South Dakota.

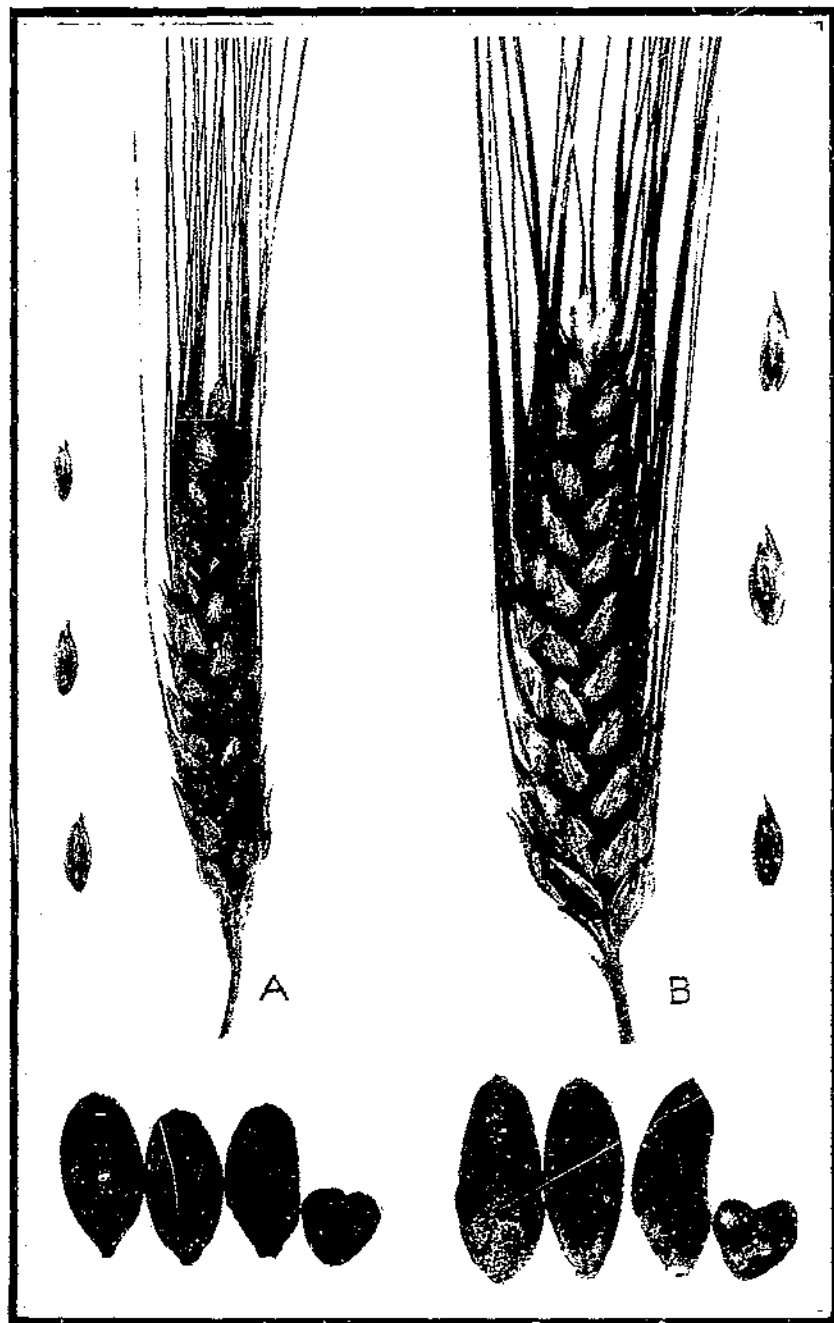
Synonyms.—Black-Bearded durum, Pelissier.

ACME

Description.—Plant spring habit, midseason, mid-tall; stem white, weak to mid-strong; spike awned, fusiform, mid-dense, inclined to nodding; glumes glabrous, yellowish, mid-long, mid-wide; shoulders mid-wide, usually oblique; beaks broad, incurved, 7 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.

History.—Acme (C. I. 5284) (reg. 211) originated as a plant selection from Kubanka (C. I. 1516) made by 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



A, Pentad and B, Poïss wheats: Spikes and glumes natural size; kernels $\times 3$.



A, Kubanka and B. Mindum wheats : Spikes and glumes natural size ; kernels $\times 3$.

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 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 1939, 2,565 acres, grown in South Dakota and Wyoming.

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 (C. I. 3320) (reg. 212) was introduced in 1903 from the Saratov Government, Russia, 100 versts east of Volga (P. I. 10207), by the North Dakota Agricultural Experiment Station. Seed of the variety was distributed 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 (26, 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 (92), county agent, of Statsman County, N. Dak., reported finding the variety commercially grown in that county from one-half bushel of seed originally furnished O. J. Seiler, of Statsman County, by Professor Bolley in 1911. August Clemens, of Lenton 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 Statsman County in the spring of 1920.

Distribution.—Estimated area in 1939, 3,647 acres, grown in North Dakota and South Dakota.

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 (C. I. 1494) (reg. 213) was first introduced by the United States Department of Agriculture in 1864 (166). It was grown in 1865 with other varieties of wheat on what are now the grounds of the Department of Agriculture, near Fourteenth Street, Washington, D. C. (26, p. 3). 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 (40, 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. Oiam, 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.

A more complete history is given in Technical Bulletin 459.

Distribution.—Estimated area in 1939, 6,842 acres, grown in Texas and North Dakota.

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 41, B.

History.—Mindum (C. I. 5296) (reg. 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. It was distributed to farmers in 1917, and was named Mindum (a contraction of Minnesota durum) in 1918 (102, p. 33).

Distribution.—Estimated area in 1939, 756,329 acres, grown in five States, as shown in figure 78.

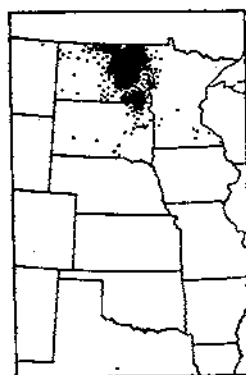


FIGURE 78.—Distribution of Mindum wheat in 1939. Estimated area, 756,329 acres.

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 41, A.

History.—Kubanka (C. I. 1440) (reg. 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 Orelsk Territory, Russia (210, P. I. 5639). 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.

Distribution.—Estimated area in 1939, 431,630 acres, grown in five States, as shown in figure 79. Much of the acreage reported only as durum also is Kubanka.

Synonyms.—Beloturka, Gharovka, Pererodka, Taganrog, Yellow Gharovka.

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 yellowberry. The quality of the grain for the manufacture of semolina and macaroni also is less desirable than that of Kubanka.

History.—Nodak (C. I. 6519) (reg. 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. It was distributed for commercial production in 1923 and registered (39) in 1926. Its superior characters are high yield and resistance to stem rust.

Distribution.—Estimated area in 1939, 4,389 acres, grown in North Dakota and South Dakota.

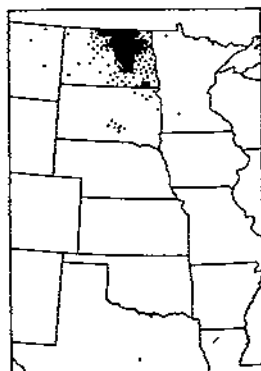


FIGURE 79.—Distribution of Kubanka wheat in 1939. Estimated area, 431,630 acres.

GOLDEN BALL

Description.—Plant spring habit, midseason, 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, very long, hard, ovate, humped; germ large; crease mid-wide, shallow to mid-deep; cheeks angular; brush small, short.

Golden Ball is resistant to most races of rust. It is not of good quality for the manufacture of macaroni.

History.—Golden Ball (C. I. 6227) (reg. 220) (210, P. I. 46766) was introduced by the United States Department of Agriculture in 1918, from Johannesburg, South Africa. 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 (147), 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.—Estimated area in 1939, 30,000 acres, grown in North Dakota, South Dakota, Montana, and Minnesota.

Synonyms.—Solid Stem Durum, Spanish, Viking.

KAHLA

Description.—Plant spring habit, midseason, 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.—Kahla (C. I. 5529) (reg. 221) (210, P. I. 7794) was introduced in 1901 by D. G. Fairchild and C. S. Seafeld, from Serif, Constantine Province, Algeria, for the United States Department of Agriculture.

Distribution.—Estimated area in 1939, 785 acres, grown in Nebraska.

Synonyms.—Black Don, Black Durum, Black Emmett, Black Swamp, Purple Durum, Red Swamp, Sloat.

LITERATURE CITED

- (1) ANONYMOUS.
1837. ITALIAN AND SIBERIAN SPRING WHEAT. *Genesee Farmer and Gard. Jour.* 7: 117.
- (2) ———
1867. JAVA WHEAT. *Genesee Farmer* (2) 22: 173.
- (3) ———
1869. SUCCESS OF THE ODESSA WHEAT. *Deitz's Expt. Farm Jour.* 1 (11): 238.
- (4) ———
1875. "CLUB WHEAT." *Pacific Rural Press* 10 (4): 57.
- (5) ———
1875. VARIETIES OF FALL WHEAT. *Rural New Yorker* 32: 186-187. [Reprinted from *Farmer's Advocate and Home Mag.*, London, Ont., 1875. Original not seen.]
- (6) ———
1879. A GOOD VARIETY OF WHEAT. [Gypsy.] *Rural New Yorker* 38: 687, illus.
- (7) ———
1879. YELLOW MISSOURI, SILVER CHAFF, AND SWAMP WHEATS. *Rural New Yorker* 38: 570, illus.
- (8) ———
1882. MARTIN'S AMBER WHEAT. *Rural New Yorker* 41: 666, illus.

- (9) ANONYMOUS—Continued.
1883. PRINCE'S SURPRISE-WYSOR'S EUREKA WHEATS, ETC. Rural New Yorker 42: 50.
- (10) ———
1884. THE CROSS-BRED DIEHL-MEDITERRANEAN WHEAT. Rural New Yorker 43: 587.
- (11) ———
1883. NEW (?) WHEATS. Rural New Yorker 47: 591, illus.
- (12) ———
1901. EARLY JAVA WHEAT. Wallaces' Farmer 26: 1335.
- (13) ———
1902. "PROSPERITY" WHEAT. Country Gent. 67: 450.
- (14) ———
1914. "HARD FEDERATION" [WHEAT]. Agr. Gaz. N. S. Wales 25: 664.
- (15) ———
1920. NEW WHEAT VARIETIES. A BRIEF SUMMARY OF THE WORK OF THE STATE EXPERIMENT STATIONS IN BREEDING AND INTRODUCING NEW WHEAT STRAINS. Amer. Miller 48 (11): 1197-1198.
- (16) ———
1920. THE STORY OF EARLY JAVA AND MARQUIS WHEAT. Wallaces' Farmer 45 (4): 279.
- (17) AICHER, L. C.
1920. GROWING IRRIGATED GRAIN IN SOUTHERN IDAHO. U. S. Dept. Agr. Farmers' Bul. 1103, 28 pp., illus.
- (18) ALEFELD, FREDERICH.
1866. LANDWIRTSCHAFTLICHE FLORA ODER DIE NUTZBAAREN KULTIVIRTEN GARTEN- UND FELDGEWÄCHSE MITTELEUROPA'S . . . 363 pp. Berlin.
- (19) ALLEN, R. L.
1885. NEW AMERICAN FARM BOOK. New ed., rev. and enl. by L. F. Allen. 539 pp. New York.
- (20) APPLETON, F. G.
1855. [WHEAT. LETTER FROM SAN JOSÉ, SANTA CLARA COUNTY, CALIFORNIA.] U. S. Comm. Patents Rpt. 1854 (Agr.): 138.
- (21) AUSTRALIA, INSTITUTE OF SCIENCE AND INDUSTRY.
1920. A CLASSIFICATION AND DETAILED DESCRIPTION OF SOME OF THE WHEATS OF AUSTRALIA. Austral. Inst. Sci. and Indus. Bul. 18, 48 pp., illus.
- (22) AUSTRALIA, SPECIAL COMMITTEE ON SEED IMPROVEMENT.
1923. A CLASSIFICATION AND DETAILED DESCRIPTION OF THE MORE IMPORTANT WHEATS OF AUSTRALIA. Austral. Inst. Sci. and Indus. Bul. 26, WHEATS OF AUSTRALIA. Austral. Inst. Sci. and Indus. Bul. 26, 72 pp., illus.
1915. VARIETIES OF HARD SPRING WHEAT. U. S. Dept. Agr. Farmers' Bul. 680, 20 pp., illus.
- (24) ——— and CLARK, J. ALLEN.
1916. EXPERIMENTS WITH MARQUIS WHEAT. U. S. Dept. Agr. Bul. 400, 40 pp., illus.
- (25) ——— and CLARK, J. ALLEN.
1916. MARQUIS WHEAT. U. S. Dept. Agr. Farmers' Bul. 732, 8 pp., illus.
- (26) ——— and CLARK, J. ALLEN.
1918. EXPERIMENTS WITH DURUM WHEAT. U. S. Dept. Agr. Bul. 618, 64 pp., illus.
- (27) ——— and CLARK, J. ALLEN.
1918. NAMING WHEAT VARIETIES. Amer. Soc. Agron. Jour. 19: 89-94.
- (28) ——— and LEIGHTY, CLYDE E.
1916. ALASKA AND STONER, OR "MIRACLE" WHEATS. TWO VARIETIES MUCH MISREPRESENTED. U. S. Dept. Agr. Bul. 357, 28 pp., illus.
- (29) BARBACKI, S., LEWICKI, S., MRCZYŃSKI, K., and SLABOŃSKI, A.
1937. PSZENICE POLSKIE (OPIS DMIAN Z KLUCZEM DO OZNACZANIA) [POLISH WHEATS . . .] Bibliot. Pulańska, Państ. Inst. Nauk. Gosp. Wiejsk. Puławach Biblioth. Inst. Natl. Polon. Econ. Rurale Puławy No. 15, 163 pp., illus.
- (30) BLEDSOE, R. P.
1932. A NEW WHEAT FOR GEORGIA WITH SUGGESTIONS FOR CULTURE. Gr. Expt. Stu. Bul. 171, 16 pp., illus.

- (31) BLOUNT, AINSWORTH E.
1892. EXPERIMENTS WITH WHEAT. N. Mex. Agr. Expt. Sta. Bul. 8, 25 pp.
- (32) BOSHAKIAN, SARKIS.
1917. THE COMPARATIVE EFFICIENCY OF INDEXES OF DENSITY, AND A NEW COEFFICIENT FOR MEASURING SQUAREHEADEDNESS IN WHEAT. Amer. Soc. Agron. Jour. 9: 231-247, illus.
- (33) ———
1918. THE MECHANICAL FACTORS DETERMINING THE SHAPE OF THE WHEAT KERNEL. Amer. Soc. Agron. Jour. 10: 205-209, illus.
- (34) BROEKEMA, L.
1899. DE DUIVENDALTARWE EN DE SPIJKTARWE NOGMAALS MET SQUAREHEAD GEKRUIST. Orgaan van der Vereeniging van Oud-Leerlingen der Rijks-Landbouwhoogeschool. No. 128, 4 pp., illus.
- (35) BULLER, A. H. REGINALD.
1919. ESSAYS ON WHEAT. 339 pp., illus. New York.
- (36) BURBANK, LUTHER.
1918. NEW STANDARD GRAINS. 3 pp., illus. Santa Rosa, Calif.
- (37) BURNS, WAITER NODLE.
1919. HOW WHEELER SELECTED RED BOBS [WHEAT]. Natl. Alfalfa Jour. 5 (6): 5, illus.
- (38) CARELL, N. F.
[n. d.] EARLY HISTORY OF AGRICULTURE IN VIRGINIA. 41 pp. Washington, D. C.
- (39) CALDWELL, WILLIAM H.
1890. TESTS OF VARIETIES. 1889. Pa. Agr. Expt. Sta. Rpt. 1889 (2): 18-41.
- (40) CARLETON, M. A.
1900. THE BASIS FOR THE IMPROVEMENT OF AMERICAN WHEATS. U. S. Dept. Agr., Div. Veg. Physiol. and Path. Bul. 24, 87 pp., illus.
- (41) ———
1915. HARD WHEATS WINNING THEIR WAY. U. S. Dept. Agr. Yearbook 1914: 391-420, illus.
- (42) ———
1916. THE SMALL GRAINS. 699 pp., illus. New York.
- (43) CLARK, EARL G.
[1919.] CLARK'S BLACK HULL SEED WHEAT. [1] p. Sedgwick, Kans.
- (44) ———
1936. CLARK'S BLACKHULL SEED FARM. THREE NEW BEARLESS WHEATS. 1 p. Sedgwick, Kans.
- (45) CLARK, J. ALLEN.
1930-40. REGISTRATION OF IMPROVED WHEAT VARIETIES, V-XIII. Amer. Soc. Agron. Jour. 22: 1041-1042, 1930: 23: 1010-1012, 1931: 24: 975-978, 1932: 27: 71-75, 1935: 28: 86-88, 1017-1018, 1936: 29: 1031-1032, 1937: 30: 1037-1042, 1938: 32: 72-75, 1940.
- (46) ———
1936. REGISTRATION OF STANDARD WHEAT VARIETIES, II. Amer. Soc. Agron. Jour. 28: 64-65.
- (47) ——— and BAYLES, B. B.
1935. CLASSIFICATION OF WHEAT VARIETIES GROWN IN THE UNITED STATES. U. S. Dept. Agr. Tech. Bul. 459, 164 pp., illus.
- (48) ——— LOVE, H. H., and GAINES, E. F.
1926. REGISTRATION OF STANDARD WHEAT VARIETIES. Amer. Soc. Agron. Jour. 18: 920-922.
- (49) ——— LOVE, H. H., and PARKER, J. H.
1926. REGISTRATION OF IMPROVED WHEAT VARIETIES. Amer. Soc. Agron. Jour. 18: 922-935.
- (50) ——— MARTIN, J. H. and BALL, C. R.
1922. CLASSIFICATION OF AMERICAN WHEAT VARIETIES. U. S. Dept. Agr. Bul. 1074, 238 pp., illus.
- (51) ——— MARTIN, J. H., and PARKER, J. H.
1926. COMPARATIVE HARDNESS OF WINTER-WHEAT VARIETIES. U. S. Dept. Agr. Cir. 378, 20 pp., illus.
- (52) ——— MARTIN, J. H., QUISENBERRY, K. S., HOOKER, J. R., LEIGHTY, C. E., and DUBOIS, C. N.
1929. DISTRIBUTION OF THE CLASSES AND VARIETIES OF WHEAT IN THE UNITED STATES. U. S. Dept. Agr. Bul. 1498, 68 pp., illus.

- (53) CLARK, J. ALLEN, MARTIN, J. H., and SMITH, R. W.
1920. VARIETAL EXPERIMENTS WITH SPRING WHEAT ON THE NORTHERN GREAT PLAINS. U. S. Dept. Agr. Bul. 878, 48 pp., illus.
- (54) ——— PARKER, J. H., and WALDRON, L. R.
1927-29. REGISTRATION OF IMPROVED WHEAT VARIETIES. II-IV. Amer. Soc. Agron. Jour. 19: 1037-1040, 1927; 20: 1318-1322, 1928; 21: 1172-1174, 1929.
- (55) ——— and QUISENBERRY, K. S.
1933. DISTRIBUTION OF THE VARIETIES AND CLASSES OF WHEAT IN THE UNITED STATES IN 1920. U. S. Dept. Agr. Cir. 283, 76 pp., illus.
- (56) ——— and QUISENBERRY, K. S.
1937. DISTRIBUTION OF THE VARIETIES AND CLASSES OF WHEAT IN THE UNITED STATES IN 1934. U. S. Dept. Agr. Cir. 424, 68 pp., illus.
- (57) ——— STEPHENS, DAVID E., and FLORELL, VICTOR H.
1920. AUSTRALIAN WHEAT VARIETIES IN THE PACIFIC COAST AREA. U. S. Dept. Agr. Bul. 877, 25 pp., illus.
- (58) CLARKE, J. W.
1860. CHARACTERISTICS OF "FIFE" SPRING WHEAT. Country Gent. 16 (18): 282-283.
- (59) COBB, N. A.
1896. NOTES ON THE COLOUR OF THE GRAIN IN DIFFERENT VARIETIES OF WHEAT. Agr. Gaz. N. S. Wales 7: 517-520.
- (60) ———
1901. THE CALIFORNIA WHEAT INDUSTRY. N. S. Wales Dept. Agr. Misc. Pub. 519, 32 pp., illus.
- (61) ———
1902. COMPARATIVE OBSERVATIONS ON THE BRUSH OF ABOUT FIFTY VARIETIES OF WHEAT. Agr. Gaz. N. S. Wales 13: 647-649, illus.
- (62) ———
1905. UNIVERSAL NOMENCLATURE OF WHEAT. N. S. Wales Dept. Agr. Misc. Pub. 539, 75 pp., illus.
- (63) COLLINS, E. H.
1898. THE RED RUSSIAN WHEAT. Ind. Farmer 33 (34): 7.
- (64) COLUMELLA, L. JUNIUS MODERATUS.
1745. OF HUSBANDRY . . . TRANSL. INTO ENGLISH WITH SEVERAL ILLUSTRATIONS FROM PLINY, CATO, VARRO, PALLADIUS, AND OTHER ANCIENT AND MODERN AUTHORS. 600 pp. London.
- (65) CUTLER, G. H., and BRINSON, G. A.
1935. THE GRANULATION OF WHOLE WHEAT MEAL AND A METHOD OF EXPRESSING IT NUMERICALLY. Cereal Chem. 12: 120-129, illus.
- (66) DEMAREE, F. H.
1910. WHEAT GROWING IN MISSOURI. Mo. Agr. Expt. Sta. Cir. 43, pp. 65-68, illus.
- (67) DESFONTAINES, RENATO.
1800. FLORA ATLANTICA . . . t. 1. Paris.
- (68) DEVOL, W. S.
1887. REPORT OF SUPERINTENDENT OF FIELD EXPERIMENTS. EXPERIMENTS WITH WHEAT. Ohio Agr. Expt. Sta. Ann. Rpt. (1886) 5: 11-64.
- (69) ———
1888. REPORT OF SUPERINTENDENT OF FIELD EXPERIMENTS. EXPERIMENTS WITH WHEAT. Ohio Agr. Expt. Sta. Ann. Rpt. (1887) 6: 11-99.
- (70) DODGE, J. R., *ed.*
1869. THE STATE REPORTS OF AGRICULTURE. U. S. Commr. Agr. Rpt. 1868: 472-529.
- (71) ———
1872. TESTS OF DEPARTMENT SEEDS. U. S. Commr. Agr. Rpt. 1871: 125-142.
- (72) DOWN, E. E., and BROWN, H. M.
1932. BALD ROCK WHEAT. Mich. Agr. Expt. Sta. Spec. Bul. 223, 19 pp., illus.
- (73) ——— BROWN, H. M., PATTEN, A. J., WINTER, O. B., and COONS, G. H.
1928. INVESTIGATION ON WINTER WHEATS IN MICHIGAN. Mich. Agr. Expt. Sta. Tech. Bul. 88, 35 pp., illus.
- (74) DUCELLIER, L.
1920. LES BLÉS DU SARRAZ. 56 pp., illus. Alger.
- (75) DUNN, H. D.
1867. CALIFORNIA—HER AGRICULTURAL RESOURCES. U. S. Commr. Agr. Rpt. 1866: 581-610.

- (76) DUNN, H. H., ed.
[1920.] DUNNS ON SEED WHEAT. 15 pp. Salisbury [Eng.].
- (77) ELLMAKER, ENOS.
1853. [WHEAT. LETTER FROM JEFFERSON COUNTY, IOWA.] U. S. Commr. Patents Rpt. 1852 (pt. 2, Agr.): 341-342.
- (78) ERIKSSON, JAKOB.
1895. BETRÄGGE ZUR SYSTEMATIK DES KULTIVIRTEN WEIZEN. Landw. Vers. Stat. 45: 37-135.
- (79) ETHERIDGE, W. C., and HELM, C. A.
1938. WHEAT IN MISSOURI. Mo. Agr. Expt. Sta. Bul. 398, 41 pp., illus.
- (80) EVERITT, J. A.
[1899?] SOW EVERITT'S IMPROVED SEED WHEAT AND IMPROVE YOUR CROPS. 16 pp. Indianapolis, Ind.
- (81) FLAKSBERGER, K. [A.]
1915. DETERMINATION OF WHEATS. Trudy Prikl. Bol. i Selekt. (Bul. Appl. Bot. Genet. and Plant Breeding) 8: 9-210, illus. [In Russian. English summary, pp. 175-209.]
- (82) [FLAKSBERGER, C. A.]
1935. [WHEATS.] [Leningrad] Inst. Zashch. Rast. (Lenin Acad. Agr. Sci., U. S. S. R., Inst. Plant Protect.) Monog. 1. 260 pp., illus. [In Russian.]
- (83) ———
1935. [CEREALS.—WHEAT.] Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Indus., Flora of Cultivated Plants, 434 pp., illus.
- (84) ——— ANTONOV, V. I. and V. E. BAKHTEY, F. H., and MORDVINKIN, V. I.
1939. KEY TO TRUE CEREALS. WHEAT, RYE, BARLEY, OATS. The People's Commissariat of Agriculture of the U. S. S. R. Lenin Mem. All-Union Acad. Agr. Sci., Inst. Plant Cult., 416 pp., illus.
- (85) FREEMAN, GEORGE F.
1918. PRODUCING BREAD MAKING WHEATS FOR WARM CLIMATES . . . Jour. Hered. 9: 211-226, illus.
- (86) FRUWIRTH, C., et al.
1907. DIE ZÜCHTUNG DER VIER HAUPTGETREIDEARTEN UND DER ZUCKERRÜBE. 380 pp., illus. Berlin. In Die Züchtung der Landwirtschaftlichen Kulturpflanzen, Bd. 4.
- (87) GAINES, E. F.
1919. TWO IMPORTANT VARIETIES OF WINTER WHEAT. A COMPARISON OF RED RUSSIAN AND HYBRID 128. Wash. Agr. Expt. Sta. Pop. Bul. 116, 7 pp., illus.
- (88) ——— and SCHAFER, E. G.
1931. WHEAT VARIETIES OF WASHINGTON IN 1929. Wash. Agr. Expt. Sta. Bul. 256, 23 pp., illus.
- (89) ——— and SCHAFER, E. G.
1936. WHEAT VARIETIES IN WASHINGTON IN 1934. Wash. Agr. Expt. Sta. Bul. 338, 24 pp., illus.
- (90) GARBER, R. J., and BENNETT, L. S.
1936. CANAWA—A NEW VARIETY OF SOFT RED WINTER WHEAT. West Va. Agr. Expt. Sta. Bul. 272, 8 pp., illus.
- (91) GARMAN, H.
1898. WHEAT. Ky. Agr. Expt. Sta. Bul. 77, pp. 107-122.
- (92) GOODHUE, R. S.
1920. D-1 WHEAT IN STEVENS COUNTY. Dakota Farmer 40 (24): 2019.
- (93) GOUDY, W. H.
1856. [WHEAT. LETTER FROM BUTTEVILLE, MARION COUNTY, OREGON TERRITORY.] U. S. Commr. Patents Rpt. 1855: 196.
- (94) GRANTHAM, A. E.
1918. WHEAT INVESTIGATIONS—VARIETIES. Del. Agr. Expt. Sta. Bul. 121, 49 pp., illus.
- (95) GURNEY, H. C.
1932. A CLASSIFICATION OF SOUTH AUSTRALIAN WHEAT VARIETIES. So. Austral. Depts. Agr. Jour. 35: 1178-1196, illus.
- (96) HACKEL, EDUARD.
1896. THE TRUE GRASSES. Transl. from Die Natürlichen Pflanzenfamilien by F. Lamson-Scribner and Effie A. Southworth. 288 pp., illus. Westminster.

- (97) HARMON, RAWSON.
1844. REPORT OF EXPERIMENTS ON THE VARIETIES OF WHEAT CULTIVATED IN THE STATE OF NEW YORK. N. Y. State Agr. Soc. Trans. (1843) 83: 217-231.
- (98) HARMON, R., JR.
1847. WHEAT EXPERIMENTS. Amer. Agr. 6 (9): 285-286.
- (99) HART, C. D.
1885. LANDWIRTSCHAFTLICHE SAMENKUNDE. . . Bd. 1. Berlin.
- (100) HAYES, H. K., AUSEMUS, E. R., STARKMAN, E. C., BAILEY, C. H., WILSON, H. K., BAMBERG, R. H., MARKLEY, M. C., CRIM, R. F., and LEVINE, M. N.
1936. THATCHER WHEAT. Minn. Agr. Expt. Sta. Bul. 325, 36 pp., illus.
- (101) ——— BAILEY, C. H., ARNY, A. C., and OLSON, P. J.
1917. THE COLOR CLASSIFICATION OF WHEAT. Amer. Soc. Agron. Jour. 9: 281-284.
- (102) ——— and GARBER, R. J.
1919. BREEDING SMALL GRAINS IN MINNESOTA. PT. I. TECHNIQUE AND RESULTS WITH WHEAT AND OATS. Minn. Agr. Expt. Sta. Bul. 182, 44 pp., illus.
- (103) HAYNES, L. H.
[1895?] HAYNES' BLUESTEM. 11 pp. Fargo, N. Dak.
- (104) HENDERSON, PETER & CO.
1884-1910. [SEED CATALOGUE.] 1884, 1889, 1890, 1891, 1892, 1894, 1896, 1897, 1899, 1903, 1908, 1910. New York.
- (105) HENDRY, G. W.
1931. THE ADOBE BRICK AS A HISTORICAL SOURCE. Agr. Hist. 5: 110-127.
- (106) HEUZÉ, GUSTAVE.
[1872.] LES PLANTES ALIMENTAIRES, t. 1. Paris.
- (107) ———
1896. LES PLANTES CÉRÉALES. Ed. 2, t. 1. Paris.
- (108) HICKMAN, J. F.
1889. REPORT OF THE AGRICULTURIST. I. EXPERIMENTS WITH WHEAT. Ohio Agr. Expt. Sta. Ann. Rpt. (1888) 7: 26-58.
- (109) ———
1889. SEED WHEAT. Ohio Agr. Expt. Sta. Cir. 3, pp. 3-5. [Reprint.]
- (110) ———
1900. FIELD EXPERIMENTS WITH WHEAT. Ohio Agr. Expt. Sta. Bul. 118, pp. 213-238.
- (111) HILL, D. D.
1930. A CEREAL VARIETY SURVEY OF OREGON. Oreg. Agr. Expt. Sta. Cir. 97, 16 pp., illus.
- (112) HOFFMAN, WILLIAM C.
1858. THE ZIMMERMAN WHEAT. Country Gent. 1858, 1 (3): 35.
- (113) HOST, N. T.
1895. ICONES ET DESCRIPTIONES GRAMINUM AUSTRIACORUM. v. 3. Vindobonae.
- (114) HOWARD, ALBERT, and HOWARD GABRIELLE, L. C.
1909. THE VARIETAL CHARACTERS OF INDIAN WHEATS. India Dept. Agr. Mem., Bot. ser. 2 (7): 1-65.
- (115) ——— and HOWARD GABRIELLE, L. C.
[1909.] WHEAT IN INDIA. . . . 288 pp., illus. Calcutta.
- (116) HUDSON, P. S.
1934. ENGLISH WHEAT VARIETIES. Zschr. Züchtung (A) 19: 57-108, illus.
- (117) HUME, A. N., CENTER, O. D., and HEGNAUER, L.
1908. VARIETY TESTS OF WHEAT. Ill. Agr. Expt. Sta. Bul. 121, pp. 71-92, illus.
- (118) HUNT, THOMAS F.
1909. THE CEREALS IN AMERICA. 421 pp., illus. New York and London.
- (119) HUNTER, BYRON.
1907. FARM PRACTICE IN THE COLUMBIA BASIN UPLANDS. U. S. Dept. Agr. Farmers' Bul. 294, 30 pp., illus.
- (120) ———
1909. SELECTION OF WHEAT SEED. Northwest Hort. 22 (8): 178-179.
- (121) JONARD, PIERRE.
1936. ESSAI DE CLASSIFICATION DES BLÉS TENDRE CULTIVÉ EN FRANCE. . . . [France] Min. de l'Agr. Centr. Natl. Rech. Agron. Monog. 3, 264 pp., illus.

- (122) JONES, JENKIN W.
1916. CEREAL EXPERIMENTS ON THE CHEYENNE EXPERIMENT FARM, ARCHEL, WYO. U. S. Dept. Agr. Bul. 430, 40 pp., illus.
- (123) KALT, BELTRÁN.
1934. VARIEDADES DE TRIGOS CULTIVADAS EN CHILE. [Chile] Min. de Agr. Bol. 3: [7]-42, illus.
- (124) KIHARA, H.
1919. ÜBER CYTOLOGISCHE STUDIEN BEI EINIGEN GETREIDEARTEN. I. SPEZIES-BASTARDE DES WEIZENS UND WEIZENROGGEN-BASTARD. Bot. Mag. [Tokyo] 33: 17-38, illus.
- (125) ————
1921. ÜBER CYTOLOGISCHE STUDIEN BEI EINIGEN GETREIDEARTEN. III. ÜBER DIE SCHWANKUNGEN DER CHROMOSOMENZAHLEN BEI DEN SPEZIES-BASTARDEN DER TRITICUM-ARTEN. Bot. Mag. [Tokyo] 35: 19-44, illus.
- (126) ————
1924. CYTOLOGISCHE UND GENETISCHE STUDIEN BEI WICHTIGEN GETREIDE-ARTEN MIT BESONDERER RÜCKSICHT AUF DAS VERHALTEN DER CHROMOSOMEN UND DIE STERILITÄT IN DEN BASTARDEN. Mem. Col. Sci. Kyoto Imp. Univ. (B) 1: 1-200.
- (127) ————
1934. A NEW FOURTH GENOM IN WHEAT. Fifth Pacific Sci. Cong. Proc. (1933) 4: 2573-2577.
- (128) KILLERREW, J. B.
1877. WHEAT CULTURE IN TENNESSEE. 253 pp., illus. Nashville, Tenn.
- (129) KLIPPAERT, JOHN H.
1858. AN ESSAY ON THE ORIGIN, GROWTH, DISEASES, VARIETIES, ETC., OF THE WHEAT PLANT. Ohio State Bd. Agr. Ann. Rpt. (1857) 12: 562-816.
- (130) KOERNICKE, FRIEDRICH.
1873. SYSTEMATISCHE ÜBERSICHT DER CEREALLEN UND MONOCARPISCHEN LEGUMINOSEN IN ÄHREN, RISPEN, FRÜCHTEN, UND SAMEN. 55 pp., illus. Bonn.
- (131) ———— and WERNER, HUGO.
1883. HANDBUCH DES GETREIDEBAUES. 2 v. Berlin.
- (132) LAMARCK, J. B. M. DE.
1786. ENCYCLOPÉDIE MÉTHODIQUE BOTANIQUE. t. 2. Paris.
- (133) LAMB, C. A.
1938. THORNE WHEAT. Ohio Agr. Expt. Sta. Spec. Cir. 55, [4] pp., illus.
- (134) LAZENBY, W. R.
1885. WHEAT EXPERIMENTS. Ohio Agr. Expt. Sta. Ann. Rpt. (1884) 3: 12-62.
- (135) LEAP, J. S.
1918. ORIGIN OF LEAP'S PROLIFIC WHEAT. Southern Planter 79 (1): 44.
- (136) LEIDICH, A. H., MANGELSDORF, P. C., and DUNKLE, P. B.
1928. DENTON WHEAT, A NEW VARIETY FOR NORTH TEXAS. Tex. Agr. Expt. Sta. Bul. 398, 20 pp., illus.
- (137) LEIGHTY, C. E.
1914. WINTER-WHEAT VARIETIES FOR THE EASTERN UNITED STATES. U. S. Dept. Agr. Farmers' Bul. 616, 14 pp., illus.
- (138) LINNÉ [LINNAEUS], CARL VON.
1753. SPECIES PLANTARUM. t. 1. Holmiae.
- (139) LIPPINCOTT, JAMES S.
1863. GEOGRAPHY OF PLANTS . . . WITH REMARKS ON THE PRODUCTION OF NEW VARIETIES OF WHEAT. . . . U. S. Commr. Agr. Rpt. 1863: 464-525.
- (140) McMILLAN, J. R. A.
1933. VARIETIES OF WHEAT IN AUSTRALIA; A CATALOGUE WITH PEDIGREE OR SOURCE, AND A GENEALOGICAL CHART SHOWING THE RELATIONSHIPS OF THE MORE IMPORTANT VARIETIES. Austral. Council Sci. & Indus. Res. Bul. 72, 28 pp.
- (141) METZGER, J.
[1824.] EUROPÄISCHE CEREALLEN. 74 pp., illus. Mannheim.

- (142) METZGER, J.
1841. DIE GETREIDEARTEN UND WIESENGRÄSER IN BOTANISCHER UND
ÖKONOMISCHER HINSICHT BEARBEITET. 256 pp. Heidelberg.
[Not seen.]
- (143) MIEGE, EM.
1930. LES PRINCIPALES VARIÉTÉS DE BLÉS CULTIVÉS AU MAROC.
[Morocco] Dir. Gén. de l'Agr. Com. et Colon., Serv. Agr. et
Amélior. Agr., 38 pp., illus. Casablanca.
- (144) MORTON, W. S.
1850. [WHEAT. LETTER FROM CUMBERLAND COUNTY, VA.] U. S. Commr.
Patents Rpt. 1849 (pt. 2 Agr.): 131-136.
- (145) MUMFORD, F. B.
1912. REPORT OF THE DIRECTOR [1910]-11. Mo. Agr. Expt. Sta. Bul.
101: [203]-236, illus.
- (146) NEERGAARD, TH. VON.
1887. NORMALSYSTEM FÖR BEDÖMANDE AF AXETS MORFOLOGISKA SAMN-
ANSÄTTNING HOS VERA SÄDESLAG. All. Svenska Utsädesför.
årberättelse 1887: 87. [Not seen.]
- (147) NEETHLING, J. H.
1932. WHEAT VARIETIES IN SOUTH AFRICA; THEIR HISTORY AND DEVELOP-
MENT UNTIL 1912. So. Africa Dept. Agr. Sci. Bul. 108, 41 pp.
- (148) NELSON, MARTIN, and OSBORN, L. W.
1915. REPORT OF CULTURAL AND VARIETY TESTS WITH WHEAT. Ark. Agr.
Expt. Sta. Bul. 121, 31 pp.
- (149) NEWMAN, L. H.
1928. CLASSIFICATION OF CANADIAN SPRING WHEAT VARIETIES. Canad. Seed
Growers' Assoc. Plant Breeders' series No. 1. 29 pp., illus.
- (150) ——— FRASER, J. G. C., and WHITESIDE, A. G. O.
1936. HANDBOOK OF CANADIAN SPRING WHEAT VARIETIES. Canada Dept.
Agr. Pub. 538 (Farmers' Bul. 18), 51 pp., illus.
- (151) ——— and WHITESIDE, A. G. O.
1927. GARNET WHEAT. Canada Dept. Agr. Bul. 83 (n.s.), 76 pp., illus.
- (152) NOLL, CHARLES F.
1913. VARIETY TESTS OF WHEAT. In Agr. Expt. Sta. Bul. 125, pp. 43-56.
- (153) NORTHWEST CROP IMPROVEMENT ASSOCIATION.
1933. DICTIONARY OF SPRING WHEAT VARIETIES, 1933. 74 pp., illus.
Minneapolis.
- (154) P., M. F.
1893. NEW VARIETIES OF WHEAT. [Letter] Cult. and Country Gent. 48
(1594): 657.
- (155) PAPADAKIS, J. S.
1929. FORMES GRECQUES DE BLÉ. Min. Agr. Sta. de l'Amélior. des Plantes
[Salonique] Bul. Sci. [1], 61 pp., illus.
- (156) PARERA, MANUEL F., and PALAU, ALFREDO.
1939. DIFERENCIACIÓN DE LAS VARIEDADES DE TRIGO POR SUS CARACTERÍSTICAS
DE GLUMA Y GRANO. Argentina Comisión Nac. de Granos y
Elevadores Pub. 42, 198 pp., illus.
- (156A) PATRÓN, ROBERTO RISSO.
1940. DESCRIPTION OF 35 VARIETIES OF WHEAT IN ARGENTINA. La Plata
Univ. Nac., Facultad de Agron. Rev. 24: [57]-233, illus.
- (157) PERCEY, HENRY.
1833. THE ORIGIN OF THE LANDBETH WHEAT. Rural New Yorker 42:
670.
- (158) PERCIVAL, J.
1921. THE WHEAT PLANT: A MONOGRAPH. 463 pp., illus. London.
- (159) PLUMB, C. S.
1839. THE WHEATS OF THE WORLD. N. Y. State Agr. Soc. Trans. (1833-
86) 34: 308-314.
- (160) POWERS, L.
1922. CYTOLOGIC AND GENETIC STUDIES OF VARIABILITY OF STRAINS OF
WHEAT DERIVED FROM INTERSPECIFIC CROSSES. Jour. Agr. Res. 44:
797-831, illus.
- (161) PRIDHAM, J. T.
1916. THE PROPORTION OF GRAIN TO STRAW IN VARIETIES OF WHEAT. Agr.
Gaz. N. S. Wales 27: 229-231.

- (162) PRIDHAM, J. T.
1927. VARIETIES OF WHEAT IN NEW SOUTH WALES. N. S. Wales Dept. Agr. Farmers' Bul. 158, 41 pp., illus.
- (163) QUISENBERRY, K. S., and CLARK, J. A.
1930. HARDNESS AND YIELD OF WINTER WHEAT VARIETIES. U. S. Dept. Agr. Cir. 141, 31 pp., illus.
- (164) RAYNBIRD & Co.
[n. d.] DESCRIPTIVE CATALOG OF SEED CORN AND FARM SEEDS. 42 pp. Basingstoke, [England].
- (165) REED, CHARLES F.
1879. PROPER AND PRIDE OF BUTTE WHEATS. Pacific Rural Press 18 (18): 280.
- (166) REID, GEORGE.
1866. SPRING WHEATS. U. S. Commr. Agr. Rpt. 1865: 27.
- (167) RICHARDSON, A. E. Y.
1912-13. WHEAT AND ITS CULTIVATION. Victoria Dept. Agr. Jour. 10: 91-101, 181-191, 201-208, 265-274, 329-338, 457-465, 543-552, 604-707, 1912: 11: 38-56, 65-88, 129-141, 193-205, 414-431, ill. 1913. [Reprinted as Victoria Dept. Agr. Bul. 22 (n. s.), 160 pp., illus. 1913.]
- (168) ROBERTS, H. F.
1910. A QUANTITATIVE METHOD FOR THE DETERMINATION OF HARDNESS IN WHEAT. Kans. Agr. Expt. Sta. Bul. 167, pp. 371-390, illus.
- (169) ROGERS, C. A.
[1920.] HONOR WHEAT. [3] pp. Bergen, N. Y.
- (170) RUFFIN, EDMUND.
1871. MANAGEMENT OF WHEAT HARVEST. Amer. Farmer 6 (12): 453-460. [Reprinted in U. S. Commr. Patents Rpt. 1850 (pt. 2, Agr.): 102-113.]
- (171) SAKAMURA, T.
1918. KURZE MITTEILUNG ÜBER DIE CHROMOSOMENZAHLEN UND DIE VERWANDTSCHAFTSVERHÄLTNISSE DER TRITICUMARTEN. Bot. Mag. [Tokyo] 32: 151-153.
- (172) SALMON, S. C.
1919. ESTABLISHING KANBEE WHEAT IN KANSAS. Kans. Agr. Expt. Sta. Cir. 74, 16 pp., illus.
- (173) SAUNDERS, CHARLES E.
1907. THE ORIGIN OF RED FIFE WHEAT. [Canada] Parliament, House of Commons Jour. v. 40, pt. 3, App. 2, pp. 216-217.
- (174) ———
1912. REPORT OF THE DOMINION CEREALIST. Canada Expt. Farms Rpts. 1911-12: 113-137.
- (175) SAUNDERS, WILLIAM.
1893. LABOGA WHEAT. Canada Cent. Expt. Farm Bul. 18, 14 pp.
- (176) SAX, K.
1921. CHROMOSOME RELATIONSHIP IN WHEAT. Science (n. s.) 54: 413-416.
- (177) SCHAFER, E. G., and GAINES, E. F.
1915. WASHINGTON WHEATS. Wash. Agr. Expt. Sta. Bul. 121, 16 pp., illus.
- (178) ——— GAINES, E. F., and BARBER, O. E.
1926. WHEAT VARIETIES IN WASHINGTON. Wash. Agr. Expt. Sta. Bul. 207, 31 pp., illus.
- (179) SCHERFFUS, W. H., and WOOSLEY, H.
1908. WHEAT. 1. TEST OF VARIETIES. 2. CHEMICAL STUDY OF VARIETIES. Ky. Agr. Expt. Sta. Bul. 135, pp. 325-340, illus.
- (180) SCHIRANK, F. VON P.
1789. BAIERISCHE FLORA. 2 v. München.
- (181) SCOFIELD, CARL S.
1902. THE ALGERIAN DURUM WHEATS: A CLASSIFIED LIST, WITH DESCRIPTIONS. U. S. Dept. Agr., Bur. Plant Indus. Bul. 7, 48 pp., illus.
- (182) ———
1903. THE DESCRIPTION OF WHEAT VARIETIES. U. S. Dept. Agr., Bur. Plant Indus. Bul. 47, 19 pp., illus.
- (183) SCOTT, R. C.
1932. WHEAT VARIETIES IN SOUTH AUSTRALIA. So. Austral. Dept. Agr. Bul. 272, 11 pp.

- (184) SEARLE GRAIN COMPANY, LIMITED.
1939. DISTRIBUTION OF THE IMPORTANT VARIETIES OF WHEAT SEEDED IN WESTERN CANADA IN 1939. *In* Grain Market Features With Wheat Varieties Sup., v. 9, No. 14 [6] pp., illus. Winnipeg, Manitoba.
- (185) SERINGE, N. C.
1819. MONOGRAPHIE DES CÉRÉALES DE LA SUISSE. 244 pp., illus. Berne and Leipsic.
- (186) ———
1841-42. DESCRIPTIONS ET FIGURES DES CÉRÉALES EUROPÉENNES. Ann. Sci. Phys. et Natl. Soc. Roy. Agr. Lyon 4: 321-384, illus., 1841; 5 (2): 103-196, illus., 1842.
- (187) SHAW, G. W., and GAUMNITZ, A. J.
1911. CALIFORNIA WHITE WHEATS. Calif. Agr. Expt. Sta. Bul. 212, pp. 315-394, illus.
- (188) SHAW, THOMAS, and ZAVITZ, C. A.
1892. EXPERIMENTS WITH WINTER WHEAT. Ontario Agr. Col. Expt. Sta. Bul. 79, 11 pp.
- (189) ——— and ZAVITZ, C. A.
1893. EXPERIMENTS WITH WINTER WHEAT. Ontario Agr. Col. Expt. Sta. Bul. 90, 13 pp.
- (190) SHOWERS, THOMAS.
1853. [WHEAT. LETTER FROM SALEM COUNTY, N. J.] U. S. Commr. Patents Rpt. 1852 (pt. 2 Agr.): 175-178.
- (191) SOUTH AFRICA, DEPARTMENT OF AGRICULTURE.
1919. NOMENCLATURE OF WHEATS GROWN IN SOUTH AFRICA. Union So. Africa Dept. Agr. Bul. 1. 15 pp.
- (192) SPILLMAN, W. J.
1909. APPLICATION OF SOME OF THE PRINCIPLES OF HEREDITY TO PLANT BREEDING. U. S. Dept. Agr., Bur. Plant Indus. Bul. 165, 74 pp., illus.
- (193) ———
1909. THE HYBRID WHEATS. Wash. Agr. Expt. Sta. Bul. 89, 27 pp., illus.
- (194) SPRAGG, F. A., and CLARK, A. J.
1916. RED ROCK WHEAT. Mich. Agr. Expt. Sta. Cir. 31, 7 pp., illus.
- (195) STANTON, T. R.
1916. CEREAL EXPERIMENTS IN MARYLAND AND VIRGINIA. U. S. Dept. Agr. Bul. 336, 52 pp., illus.
- (196) STARK, R. W.
1926. PRODUCTIVENESS OF VARIETIES OF WINTER WHEAT IN ILLINOIS. Ill. Agr. Expt. Sta. Bul. 276, pp. 1-25, illus.
- (197) STEWART, GEORGE.
1919. THE VARIETIES OF SMALL GRAINS AND THE MARKET CLASSES OF WHEAT IN UTAH. Amer. Soc. Agron. Jgs 11: 163-169.
- (198) ———
1920. A VARIETY SURVEY AND DESCRIPTIVE KEY OF SMALL GRAINS IN UTAH. Utah Agr. Expt. Sta. Bul. 174, 35 pp., illus.
- (199) [STRAMPELLI.]
1932. TAVOLE A COLORI DI FRUMENTI GRANOTURCHI E ORZI STRAMPELLI. *In* Istituto Nazionale di Genetica per la Cerealicoltura in Roma. Origini, Sviluppo, Lavori e Risultati. Appendix.
- (200) SUTTON, GEORGE L.
1910. VARIETIES OF WHEAT RECOMMENDED BY THE DEPARTMENT OF AGRICULTURE. Agr. Gaz. N. S. Wales 21: 183-193; 282-288; 593-598, illus.
- (201) TAYLOR, J. W., BAYLES, B. B., and FIFELED, C. C.
1939. A SIMPLE MEASURE OF KERNEL HARDNESS IN WHEAT. Amer. Soc. Agron. Jour. 31: 775-784.
- (202) THATCHER, L. E.
1923. BETTER WHEAT FOR OHIO FARMS. Ohio Agr. Expt. Sta. Monthly Bul. 8: 110-116, illus.
- (203) THEOPHRASTUS.
1916. ENQUIRY INTO PLANTS. . . With an English translation by Sir Arthur Hort. v. 2. London and New York.

- (204) THOMAS, LEVI M.
1916. THE ORIGIN, CHARACTERISTICS, AND QUALITY OF HUMPHACK WHEAT. U. S. Dept. Agr. Bul. 478. 4 pp., illus.
- (205) TINGEX, D. C., and WOODWARD, R. W.
1935. RELIEF WHEAT. Utah Agr. Expt. Sta. Bul. 264. 12 pp., illus.
- (206) TODD, S. E.
1868. THE AMERICAN WHEAT CULTURIST. 482 pp., illus. New York.
- (207) TOURNEFORT, JOSEPH PITTS.
1719. INSTITUTIONES REI HERBARIÆ. t. 1. Parisiis.
- (208) TRACY, S. M.
1881. VARIETIES OF WHEAT. Mo. State Bd. Agr. Annu. Rpt. (1880-81) 15: 393-426.
- (209) TROWBRIDGE, P. F.
1920. REPORT OF THE DIRECTOR. N. Dak. Agr. Expt. Sta. Bul. 186, 23 pp., illus.
- (210) UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY.
1900-1920. INVENTORY OF SEEDS AND PLANTS IMPORTED BY THE OFFICE OF FOREIGN SEED AND PLANT INTRODUCTION. . . [1898]-Dec. 31, 1918. Nos. 1-57. [S. P. I.] Nos. 1-46950.
- (211) VAVILOV, N. I., FORTUNATOVA, O. K., JACURZINER, M. M., PALMOVA, E. T., NIKOLAENKO, E. I., STOLETOVA, E. A., VERKHOVSKAYA, K. A., SCHREIBER, L. L., and SYROVATSKY, S. G.
1931. THE WHEATS OF ABYSSINIA AND THEIR PLACE IN THE GENERAL SYSTEMS OF WHEATS. A CONTRIBUTION TO THE KNOWLEDGE OF THE 28 CHROMOSOMES GROUP OF CULTIVATED WHEATS. 236 pp., illus. Leningrad. (Trudy Prikl. Bot. i Selekt. [Bul. Appl. Bot. Genet. and Plant Breeding] Sup. 51.)
- (212) VILLARS, DOMINIQUE.
1787. HISTOIRE DES PLANTES DE DAUPHINÉ. t. 2. Grenoble.
- (213) VILMORIN, H. L. DE.
1850. CATALOGUE MÉTHODIQUE ET SYNONYMIQUE DES FROMENTS. . . 76 pp., illus. Paris.
- (214) VOSS, J.
1933. MORPHOLOGIE UND GRUPPIERUNG DER DEUTSCHEN WEIZENSORTEN. Mitt. Biol. Reichsanst. Land u. Forstw. 45. 112 pp., illus.
- (215) WAGONER, J. J.
1938. GREENON WHEAT. In Guilford County Agriculture Past-Present-Future. 27 pp. Bd. County Commrs. and Bd. Agr., Guilford County, N. C.
- (216) WALDBON, L. R.
1926. HYBRID SELECTIONS OF MARQUIS AND KOTA WHEATS. A COMPARATIVE STUDY WITH REGARD TO DISEASE RESISTANCE, YIELD, AND BAKING QUALITY. N. Dak. Agr. Expt. Sta. Bul. 200, 64 pp., illus.
- (217) ——— and CLARK, J. A.
1919. KOTA, A RUST-RESISTING VARIETY OF COMMON SPRING WHEAT. Amer. Soc. Agron. Jour. 11: 187-195, illus.
- (218) WATKINS, A. E.
1924. GENETIC AND CYTOLOGICAL STUDIES IN WHEAT. I. Jour. Genetics 14: 129-171, illus.
- (219) WATTS, R. L.
1922. VARIETY TESTS AND IMPROVEMENT OF SMALL GRAINS. Pa. Agr. Expt. Sta. Bul. 170: 7-8.
- (220) WENHOLZ, H., FRIDHAM, J. T., YEARS, C. K., and CURETIS, W. M.
1938-40. WHEAT VARIETIES IN AUSTRALIA. Agr. Gaz. N. S. Wales 49: 583-586, 649-652, 1938: 50: 13-17, 73-74, 86, 137-135, 181-184, 236-238, 284, 308-311, 361-365, 417-420, 539-543, 1939: 51: 11-14, 30, 65-68, 132-137, 195-198, illus., 1940.
- (221) WHEELER, SEAGER.
1916. IMPROVING CROPS BY SEED SELECTION. HOW THE WORLD'S BEST WHEAT HAS BEEN DEVELOPED. Grain Growers' Guide [Winnipeg] 9 (7): 8-9, illus.
- (222) WIANCKO, A. T.
1923. NICHKOFF WHEAT. Ind. Agr. Expt. Sta. Cir. 112, 4 pp., illus.
- (223) WILLIAMS, C. G.
1905. EXPERIMENTS WITH WINTER WHEAT. Ohio Agr. Expt. Sta. Bul. 165, pp. 37-65, illus.

- (224) WILLIAMS, C. G.
1916. WHEAT EXPERIMENTS. Ohio Agr. Expt. Sta. Bul. 298, pp. 447-484, illus.
- (225) ———
1920. THE GLADDEN AND OTHER VARIETIES OF WHEAT. Ohio Farmer 146 (6): 3.
- (226) ZHUKOVSKY, P. M.
1928. A NEW SPECIES OF WHEAT. Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding) 19 (2): 59-66, illus. [In Russian. English summary, pp. 65-66.]
- (227) ———
1933. LA TURQUIE AGRICOLE (PARTIE ASIATIQUE—ANATOLIE), pp. 155-224, illus. Moscou and Leningrad. [In Russian. French summary, pp. 800-820.]

INDEX TO VARIETIES AND SYNONYMS ²³

Recognized varieties are in capitals, varietal synonyms are in capitals and lower case, and common names of species are in small capitals. 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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²³ The Latin names are indexed here for the convenience of those familiar with the classifications of Alefeld, Koernicke and Werner, and others, and not as representing the conclusions of the writers.

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