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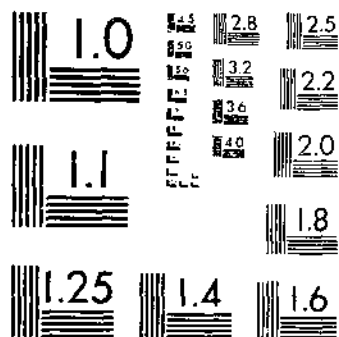
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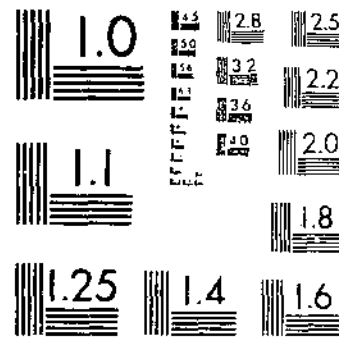
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DESCRIPTION AND PEDIGREES OF NINE VARIETIES OF LETTUCE
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Description and Pedigrees of Nine Varieties of Lettuce

By ROSS C. THOMPSON, *senior horticulturist*,¹ and EDWARD J. RYDER, *geneticist, Crops Research Division, Agricultural Research Service*²

As a result of research headed by the late senior author, 17 varieties of lettuce were developed and released over a 30-year period. This bulletin contains descriptions and pedigrees of nine of these varieties, some of which have already become commercially acceptable; others show promise. Most of the breeding work was done at the Plant Industry Station of the United States Department of Agriculture at Beltsville, Md. Since 1955, the project has been located at the United States Agricultural Research Station at Salinas, Calif.

These varieties include five crisphead—Lakeland, Climax, Golden State (includes four strains: A, B, C, and D), Vanguard, and Merit; one butterhead, Midas; and three loose-leaf varieties—Slobolt, Salad Bowl, and Ruby. The Golden State strains, Vanguard, and Climax were released jointly by the United States Department of Agriculture and the California Agricultural Experiment Station. Lakeland was released jointly with the Wisconsin Agricultural Experiment Station. The other varieties were released by the United States Department of Agriculture.

CRISPHEAD VARIETIES

The pedigrees of the crisphead varieties include several common breeding lines, one of which occurs in all histories, and a few others which occur in all histories except that of Merit. Brief descriptions of these lines follow:

152—A slow-bolting selection of the Grand Rapids type from a hybrid between Grand Rapids and Giant Summer, a French butterhead, back-

¹ Retired July 31, 1958; deceased June 5, 1960.

² Grateful acknowledgment is made to the California Agricultural Experiment Station at Davis, the Wisconsin Agricultural Experiment Station at Madison, the Grower-Shipper Vegetable Association of Salinas, Calif., the All-America Selections Council, and various seed companies. Additional agencies and many persons, including fellow researchers, seedsmen, growers, and aides have cooperated in the development and release of the lettuce varieties discussed in this bulletin.

crossed to Grand Rapids. This is not the same as Imperial 152. (See Slobolt pedigree, fig. 18.)

699—A selection from a cross between Cosbia and Imperial 847, distinguished among the lines of the cross by its large size and slow-bolting rate.

770—A line, originally numbered 10899, obtained from T. W. Whitaker; a slow bolter from which Imperial 456 was derived.³

14787—A slow-bolting line obtained from T. W. Whitaker; the original line from which the variety Great Lakes was derived.³

2600—An F_1 selection from a hybrid between lines 699 and 770; a large slow-bolting type.

Descriptions and pedigrees of other varieties developed and released by this Department and cooperating agencies have been published. Jagger and coworkers⁴ described the early Imperial strains of lettuce in 1941. Bohn and Whitaker⁵ described Great Lakes and other Imperials in 1951. The history and development of downy mildew resistant lettuce was published by Whitaker and coworkers⁵ in 1958.

2750—An F_1 selection from a hybrid between lines 152 and 14787; a slow-bolting type.

4157—An F_3 line from a hybrid between lines 2600 and 2750: it is slow bolting, resistant to tipburn and rib discoloration, and has a high edible quality.

4160, 4183— F_1 lines from a hybrid between lines 2600 and 2750, similar to 4157, but somewhat larger.

Figure 1 shows the relationships among the above lines.

One line, 5192, appears only in the Vanguard pedigree (fig. 2). It was derived from a hybrid in which *Lactuca virosa* L., *L. sativa* L., and *L. serriola* L. were parents. This line has some desirable characteristics, including a tendency for basal leaves to hold good green color at maturity longer than any strains of *L. sativa*, and thick crisp leaves that are higher in eating quality and have a larger root system than any other commercial crisphead lettuce. The pedigree of this line is complex and merits a detailed description.

Lactuca serriola crosses readily with *L. sativa*. A four-way hybrid involving line 14787 (see above) and the three *L. serriola* Plant Introductions (P.I. Nos. 114535, 114512, and 125819) were, therefore, easily obtained as shown in figure 2. However, neither species crosses readily

³ BOHN, G. W., and WHITAKER, T. W. RECENTLY INTRODUCED VARIETIES OF HEAD LETTUCE AND METHODS USED IN THEIR DEVELOPMENT. U.S. Dept. Agr. Cir. 881, 27 pp., illus. 1951.

⁴ JAGGER, I. C., WHITAKER, T. W., USELMAN, J. J., and OWEN, W. M. THE IMPERIAL STRAINS OF LETTUCE. U.S. Dept. Agr. Cir. 596, 15 pp., illus. 1941.

⁵ WHITAKER, T. W., BOHN, G. W., WELCH, J. E., and GROGAN, R. G. HISTORY AND DEVELOPMENT OF HEAD LETTUCE RESISTANT TO DOWNY MILDEW. Amer. Soc. Hort. Sci. Proc. 72: 410-416, illus. 1958.

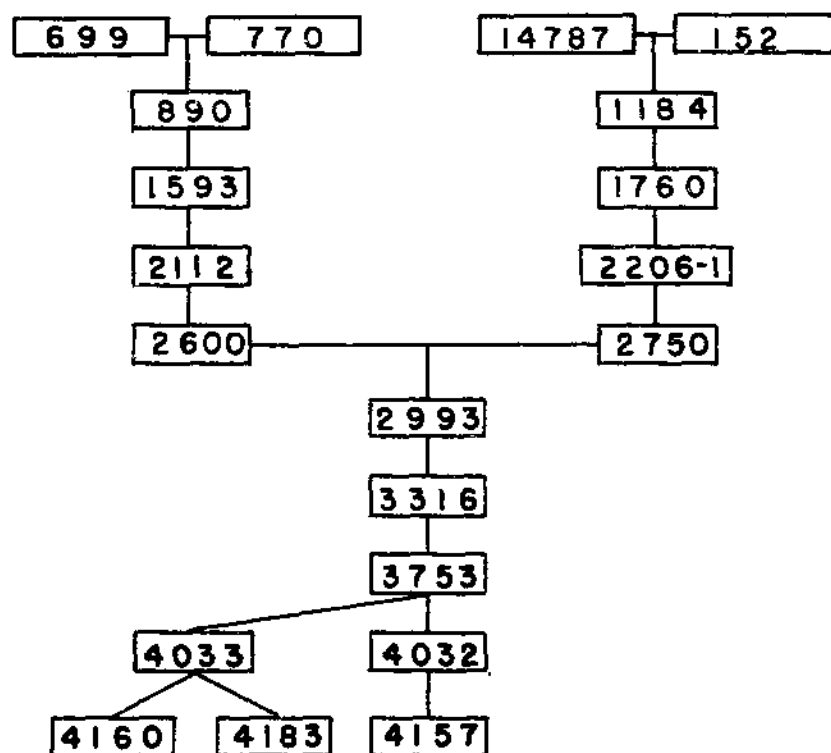


FIGURE 1.—Pedigree leading to lines 4157, 4160, and 4183. Line 4157 is a parent of Climax, Vanguard, and the Golden States. Line 4160 appears in the pedigree of Climax, and line 4183 was further selected to give Lakeland.

with the wild species *L. virosa* (P.I. 125130), although all three species have the same number of chromosomes. The F_1 hybrid itself: $[(114512 \times (125819 \times 114535))] \times 14787 \times 125130$ grew normally, but it was sterile. The application of colchicine to the F_1 (numbered 1237) doubled the number of chromosomes, giving a fertile amphidiploid (4N). A selection from this plant was crossed with the variety Red Besson. A diploid selection from this cross was then crossed to a Great Lakes type selection. After a single backcross, five generations of selection gave the line 5192.

The following crisphead varieties were derived from the above 10 lines:

Lakeland

Lakeland was developed as a slow-bolting, tipburn resistant variety for the eastern part of the United States (fig. 3). It is a medium-sized, medium-green variety with black seeds. The leaves are relatively smooth and moderately ruffled.

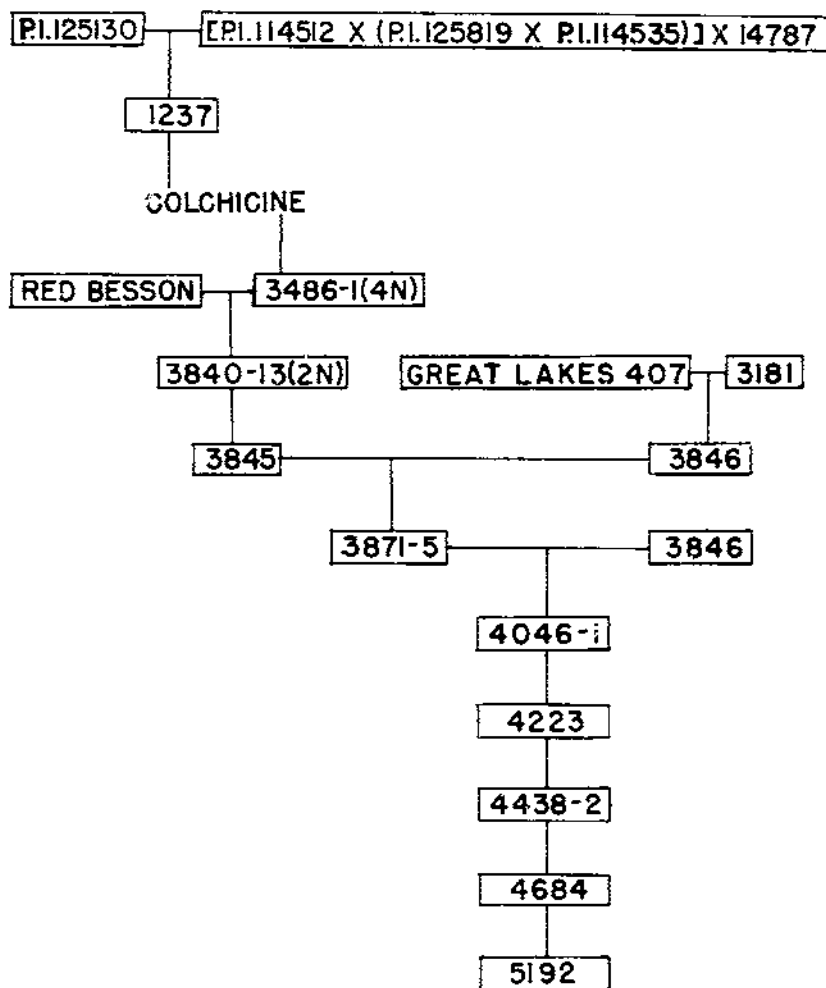


FIGURE 2.—Pedigree of line 5192. This line is a parent of Vanguard. P.I. 125130 is a strain of the wild species *Lactuca virosa*. P.I. 114512, P.I. 114535, and P.I. 125819 are strains of *L. serriola*. (2N and 4N refer to the ploidy state.)

The variety was released jointly by the U.S. Department of Agriculture and the Wisconsin Agricultural Experiment Station and is best adapted to lettuce-growing areas of that State. Lakeland (fig. 4) is resistant to tiplurn and rib discoloration in Wisconsin and is much slower bolting than Great Lakes 659 and Imperial 456.⁶ (The slower bolting rate makes seed growing more difficult than with other varieties.) In cooler weather Lakeland will not reach the desired marketable size.

⁶ Personal communications from W. H. Gahelman of the University of Wisconsin to the senior author on August 5, 1955, and August 9, 1957.

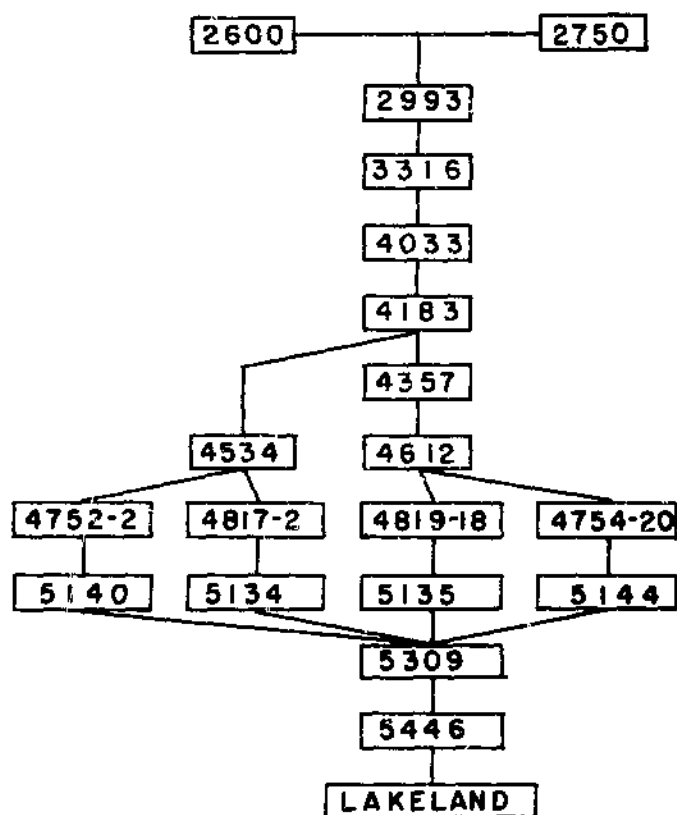


FIGURE 3.—Pedigree of the crisphead variety Lakeland.

Lakeland was selected for 10 generations after the cross 2750×2600 and tested as USDA 5446 before being released in 1957.

Climax

Climax (fig. 5) is a large, dark-green, fairly slow-bolting lettuce with black seeds. The leaves are thick and moderately savoyed and serrated (fig. 6). It is resistant to tipburn and rib discoloration.

Climax appears to be best adapted to the winter growing conditions of the Imperial Valley of California, particularly if planted late enough to prevent bolting during extremely hot weather. Compared with Imperial 101 and Great Lakes strains, Climax has high quality and vigor. It does not appear to be well adapted to the Salinas-Watsonville district, and its adaptation in other areas is not yet known.

The variety was derived from the hybrid 4157×4160 and has been tested since 1955 as USDA 5550. It was released in 1958.

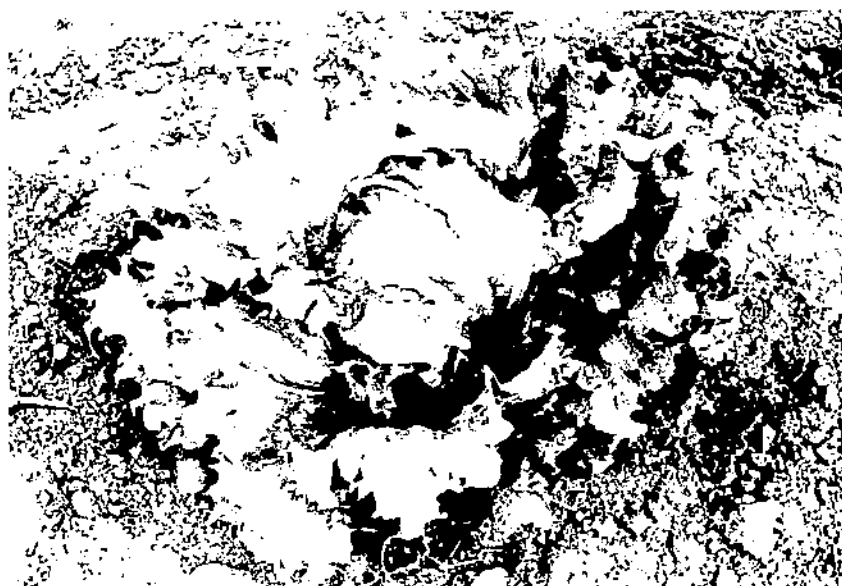


FIGURE 1. Field collection.

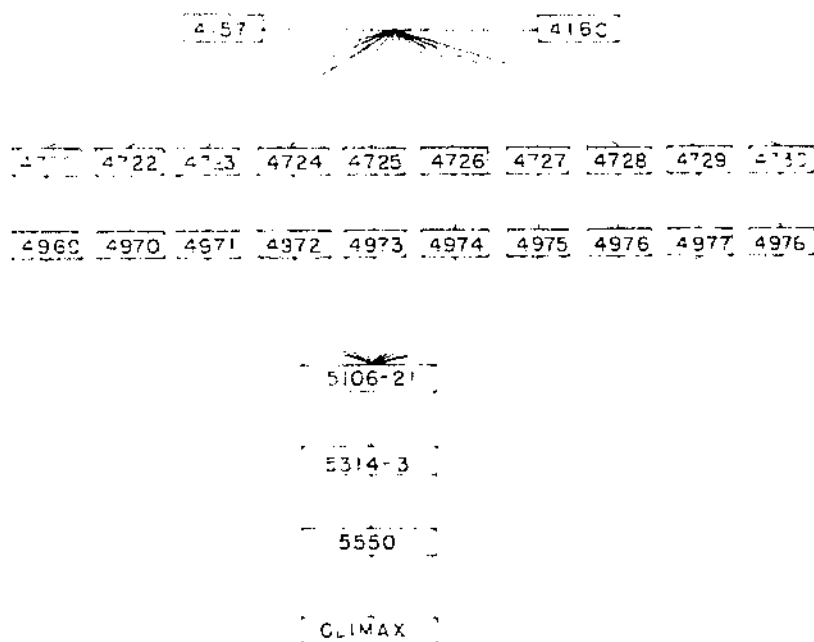


FIGURE 2. Field collection map of area 416C.

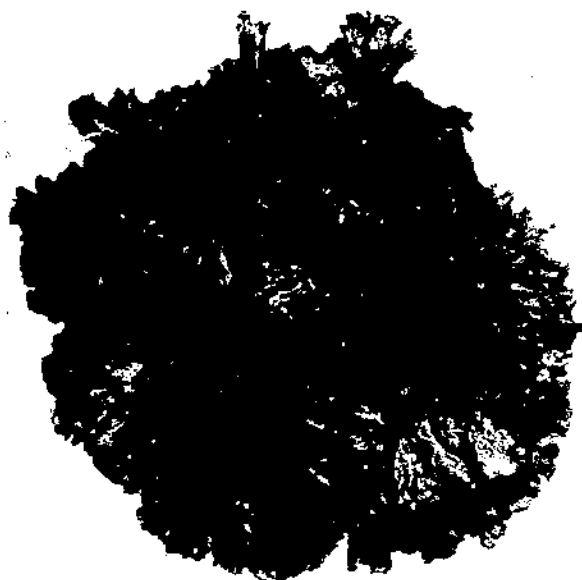


FIGURE 6.—Climax lettuce.

Golden State strains

Four strains of this variety have been released: Golden State A, Golden State B, Golden State C, and Golden State D. They were originated at the Plant Industry Station at Beltsville, Md., and further developed in California to provide a high quality lettuce that would attain good size under conditions where Great Lakes strains would be too small.

The Golden State strains were derived from the hybrid Great Lakes 407×4157, which was made in 1952. The lines 6064 (A), 6065 (B), 6067 (D), and 6068 (C) were selected in the F_1 generation and tested for 2 years before being released in 1958. The development of the four strains is shown in figure 7.

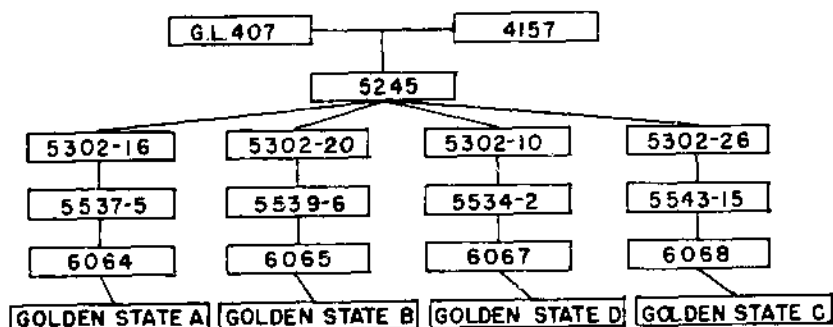


FIGURE 7.—Pedigree of the Golden State strains of crisphead lettuce.

The leaves of all four Golden State strains are broad at the base, and the butts do not have the spidery appearance of Great Lakes strains. Golden State A (fig. 8) and B (fig. 9) have cores of medium diameter; C and

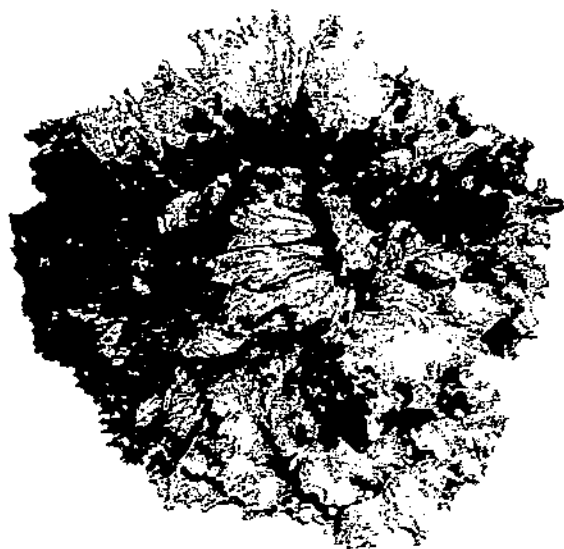


FIGURE 8—Golden State A lettuce.

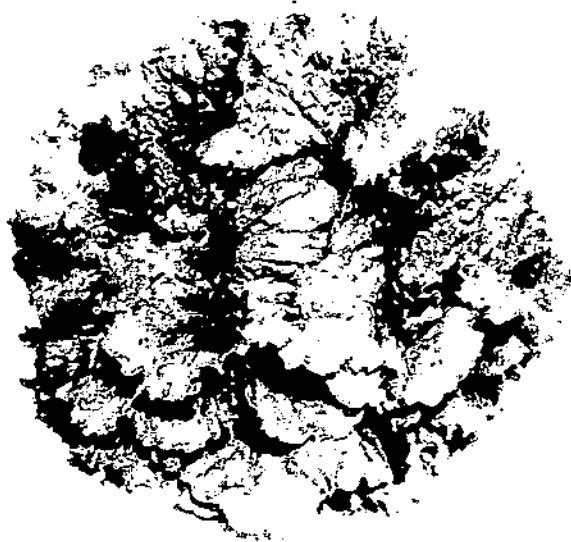


FIGURE 9—Golden State B lettuce.

D, have large cores. The leaves are moderately savoyed and frilled and have relatively flat ribs. The frame leaves of Golden State C (fig. 10) are relatively short, compared with those of the other Golden State strains and with Great Lakes. Golden State D has the smoothest and least frilled leaves and the least cover over the head, but all have better cover than Great Lakes 118.

The Golden State strains are large, medium-green, slow-bolting, and tipburn resistant. Golden State D (fig. 11) has white seeds; the others have black seeds. All have good edible quality, creamy-colored interior leaves, which are well folded and all are resistant to seed dormancy at high temperatures. Seed yields are high.

On the basis of tests and observations so far, Golden State C appears to be particularly well suited for early spring harvest in the Salinas-Watsonville district, since it attains good size in cool weather. Golden State D may be better suited to late spring and early summer harvest in that district. Golden State A and B are poor in size and color in the Salinas-Watsonville district and may be better adapted to the winter season in the Imperial Valley. Several more years of growing under various conditions will be needed to determine the optimum place for each strain.

Vanguard

Vanguard is the only lettuce variety known to have the wild species *Lactuca virosa* in its ancestry (fig. 12). The cross was originally made



FIGURE 10.—Golden State C lettuce.



FIGURE 11.—Golden State D lettuce.

to incorporate into a commercial head lettuce the wild parent's more robust root system and ability to hold lower leaves.

Vanguard is a very large, dull-green, fairly slow-bolting lettuce with black seeds. The frame leaves are large and they cover the head well. The leaves are thick and tender, slightly savoyed, with slightly ruffled nonfrilled edges. The heads are broad at the base and well colored around the core, which is very large (fig. 13). The ribs are relatively flat.

The interior color is very creamy, and the leaves are well folded. Eating quality is excellent. Seed yield is high, and the seeds are resistant to dormancy.

The tests on this variety have been limited, so that its range of adaptation has not been definitely determined. It has shown some tendency to puffiness in warmer environments in the Salinas Valley during the summer, and has been somewhat subject to rib discoloration and tipburn. Reports from Arizona, Texas, and Florida indicate it has some promise in those areas.

Vanguard was released as an F_4 in 1958. It was still variable, providing an opportunity for seedsmen to select better adapted types. It was derived from the hybrid 5550-1 X 5504. 5550 was the strain later named Climax; 5504 was an F_3 mass selection from the hybrid 4157 X 5192.

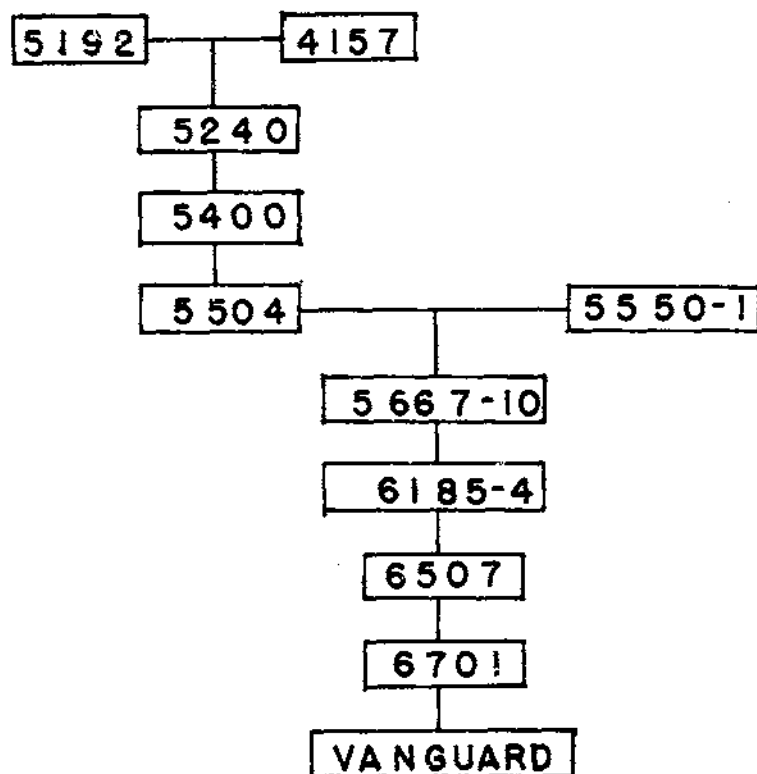


FIGURE 12.—Pedigree of the crisphead variety Vanguard. Line 5550 was later released as the variety Climax.

Merit

The variety Merit is an early lettuce with black seeds. The leaves are coarsely toothed. Under ideal conditions it is dark green with large well-shaped heads. Under unfavorable conditions, the color is poor and the heads may be small.

The outstanding characteristic of Merit is its moderate resistance to big vein, fewer heads showing symptoms than other crisphead varieties under the same conditions.

Merit was released in 1957 after being tested as USDA 3186. It was derived from five generations of single plant and mass selection from three hybrids: 949 X 152 and its reciprocal, and 951 X 152, as shown in figure 14. The line 152 was described earlier. Line 949 was a selection from a hybrid between Cosbia and Imperial 847, and 951 was a selection from a complex hybrid involving five varieties (New York, Hanson, Iceberg, Paris White Cos, and Imperial 44). Merit is illustrated in figure 15.

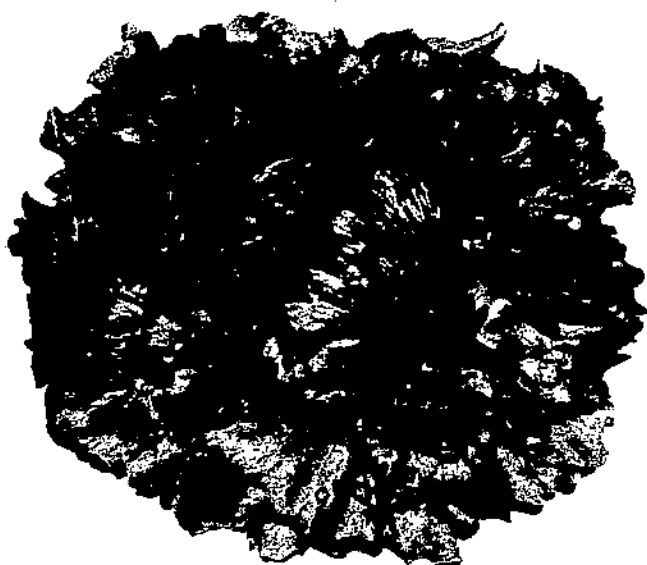


FIGURE 13. Variegated lettuce.

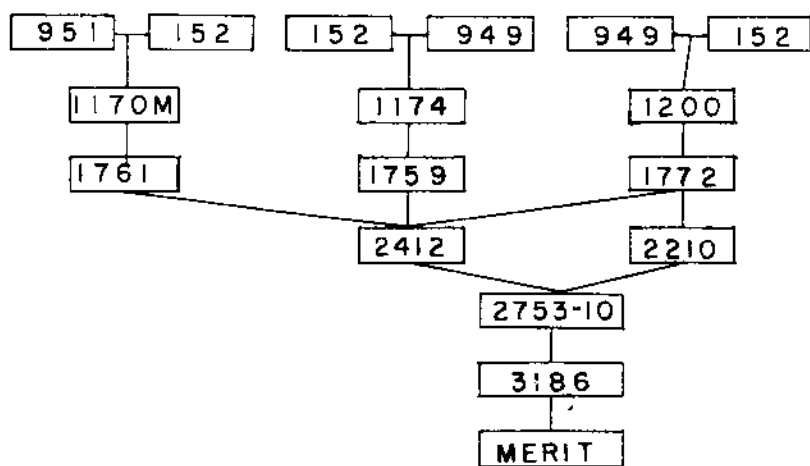


FIGURE 14. Pedigree of the crisphead variety Merit.

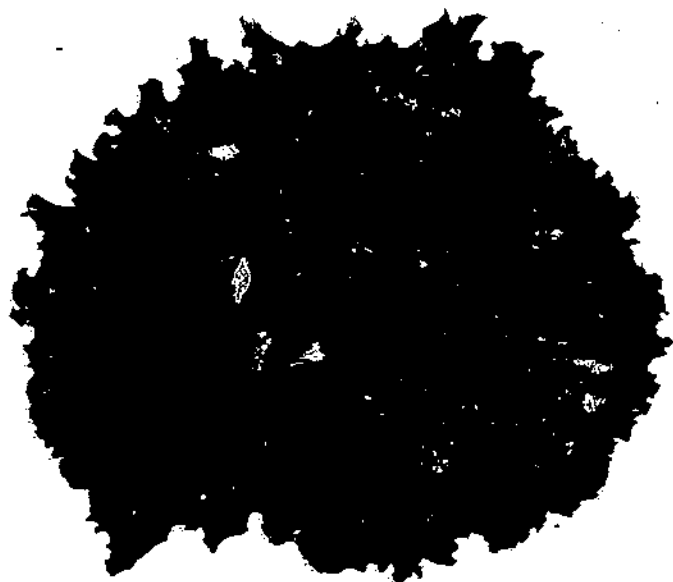


FIGURE 15.—Merit lettuce.

BUTTERHEAD VARIETY

Midas

Midas was developed to provide a slow-bolting butterhead variety, particularly for the important butterhead lettuce areas of the East (fig. 16).

Midas is a large, medium early, light-green lettuce with white seeds. The leaves are moderately savoyed and of excellent eating quality. Although it is a very slow bolter, the seed yield is good. Midas matures a few days later than Big Boston or White Boston and is larger and somewhat more savoyed than either (fig. 17).

Midas was released in 1954 after being tested as USDA 4013, which was the F_2 generation from the hybrid Unrivalled X 1175. Unrivalled is an old butterhead variety; line 1175 was a selection from line 152 and was similar to Slobolt.

LOOSE-LEAF VARIETIES

Slobolt

Until recently, growing summer lettuce in the home gardens of the East and South had been difficult, even as an early spring crop, because of the heat which promoted premature bolting in the popular leaf varieties, such as Grand Rapids, Black Seeded Simpson, and Prizehead. Slobolt, Salad Bowl, and Ruby are extremely slow-bolting varieties designed to overcome this difficulty. They are all widely adapted for home garden

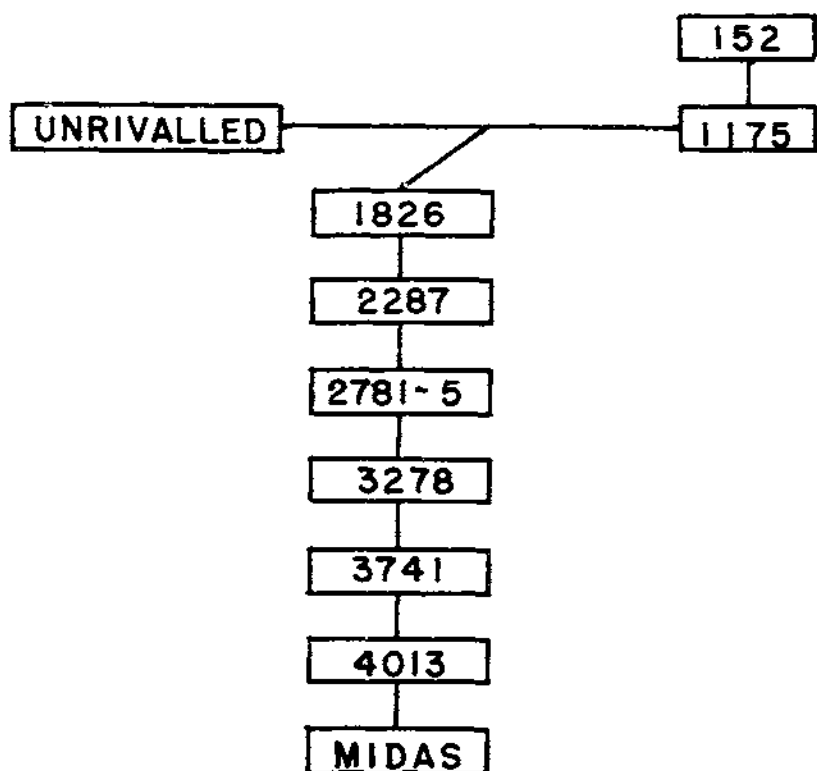


FIGURE 16.—Pedigree of the butterhead variety Midas.

and local market garden production. The pedigree of Slobolt is shown in figure 18.

Slobolt is a slow-bolting, medium-sized summer lettuce with black seeds (fig. 19). The leaves are light green, frilled, and highly savoyed. It was released in 1944 as a selection from line 152, which in turn was a selection of the Grand Rapids type.

Salad Bowl

Salad Bowl is a large, medium-green, medium-early, slow-bolting lettuce with black seeds. The leaves are long and deeply lobed.

The variety was released in 1950, and received a Gold Medal in the All-America Trials of 1951. It was derived from the hybrid 1885 X 1893 (fig. 20). The female parent came from a cross involving 152, 109, and the variety Australian. Line 109 was derived from a complicated hybrid involving four varieties; line 1893, from the hybrid Australian X 1703. The male parent has a pedigree involving six varieties. Salad Bowl is shown in figure 21.

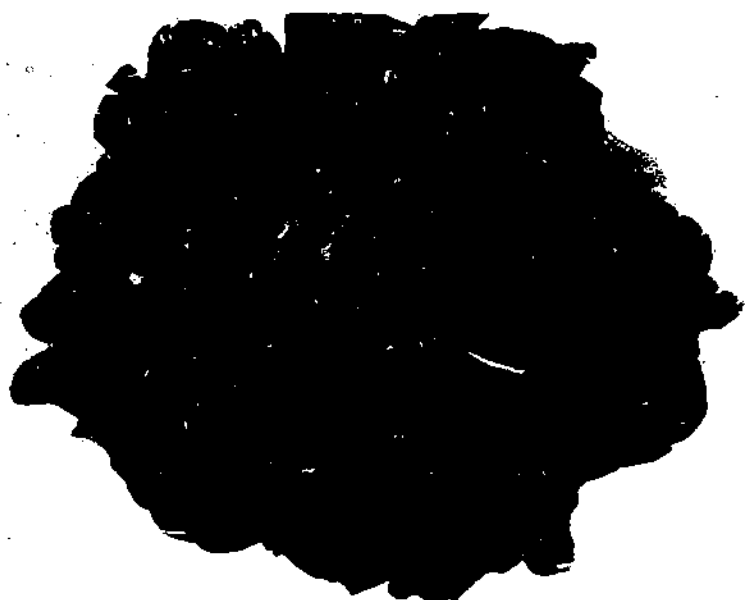


FIGURE 17.—Midas lettuce.

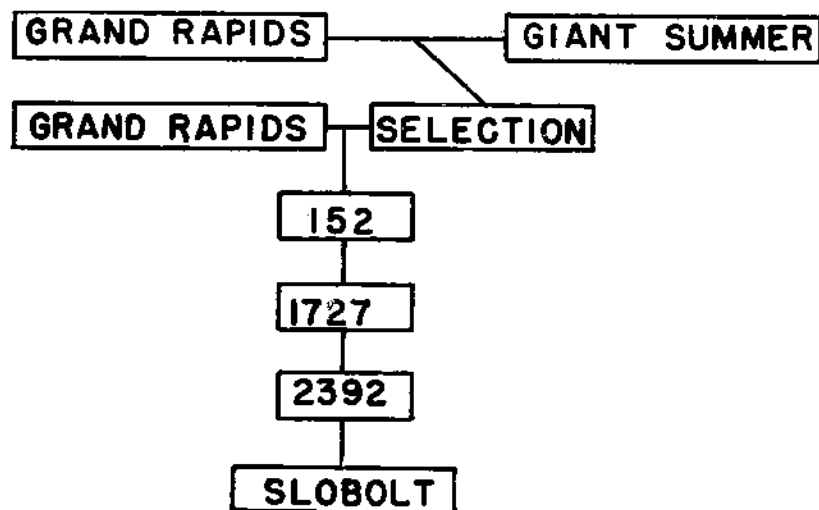


FIGURE 18.—Pedigree of the leaf variety Slobolt.

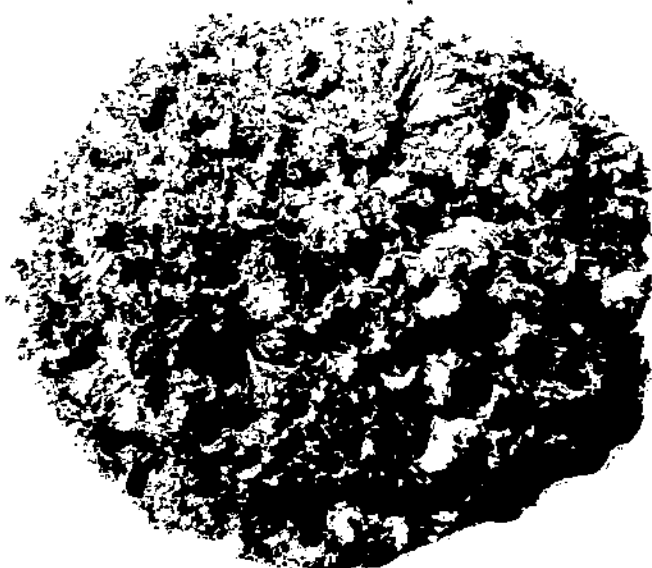


FIGURE 19. Slobod lettuce.

GRAND RAPIDS X GIAN ² SUMMER		ICEBERG X HANSON	
ICEBERG X	NEW YORK X HANSON) X	109	152
PARIS WHITE	(MIGNONETTE X NEW YORK)		
AUSTRALIAN	1703	AUSTRALIAN	SELECTION
1893		1895	
	2478		
	3784		
SALAD BOWL			

FIGURE 20. Percentage of leaf area in Salad Bowl.

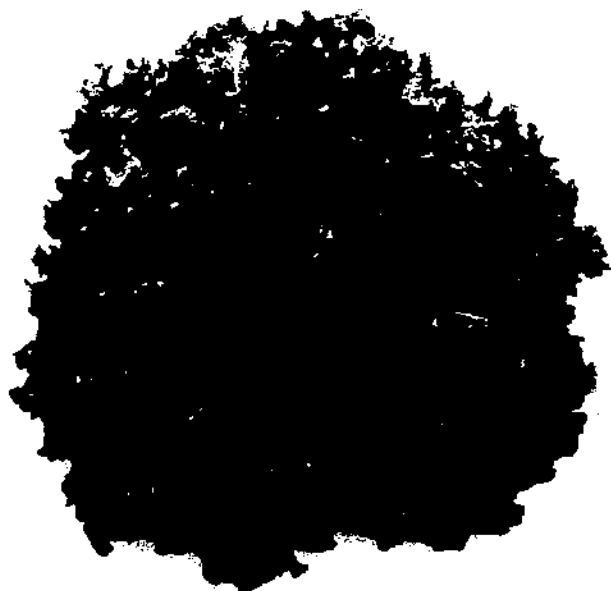


FIGURE 21.—Salad Bowl lettuce.

Ruby

Ruby is a bright red, large, midseason, slow-bolting lettuce with black seeds. The leaves are frilled and savoyed and of good edible quality. It won a Bronze Medal in the 1954 All-America Trials.

The variety was released in 1956 after being tested as USDA 5391, an F_6 from the hybrid 545-4-1 X 4309 (fig. 22). The former was the F_4 from the hybrid Hanson X P.I. 114608, a butterhead type introduction. Line 4309 was the F_2 from the hybrid [650-1-3 X (3095 X 3288)] X 3779. Line 650-1-3 came from a hybrid between two red strains. Line 3095 is derived from the hybrid 10899 X 951. Line 3288 comes from a hybrid involving line 152, and several other strains. Line 3779 is derived from the hybrid Parsley X 152. Ruby is illustrated in figure 23.

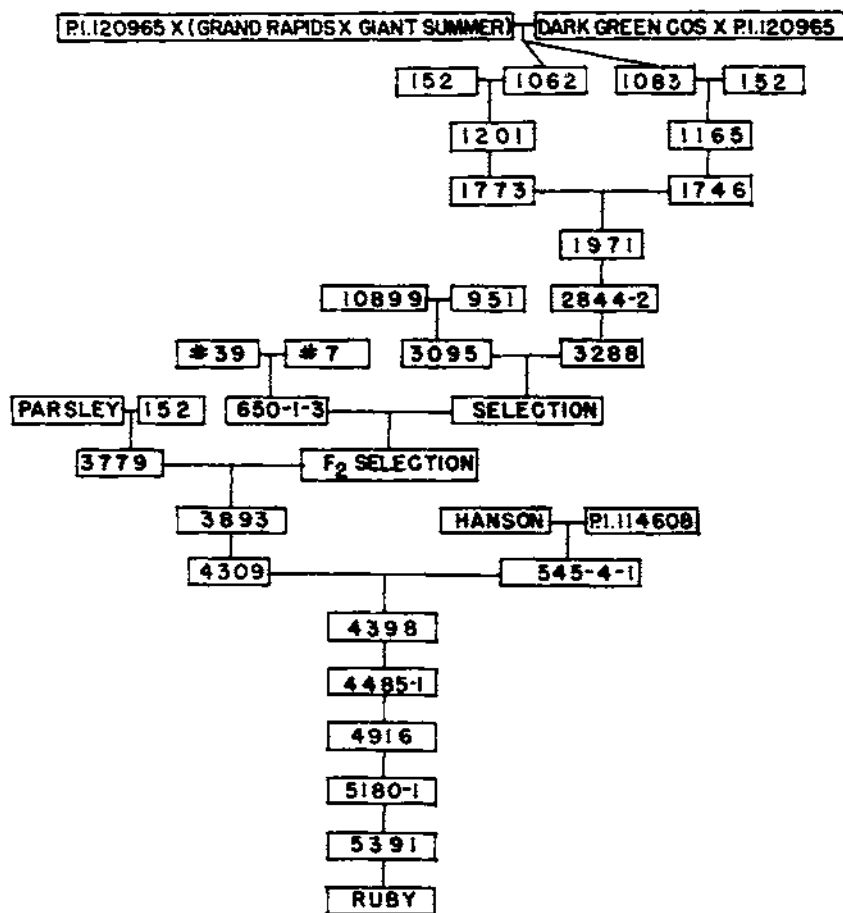


FIGURE 22.—Pedigree of the red-leaf variety Ruby.

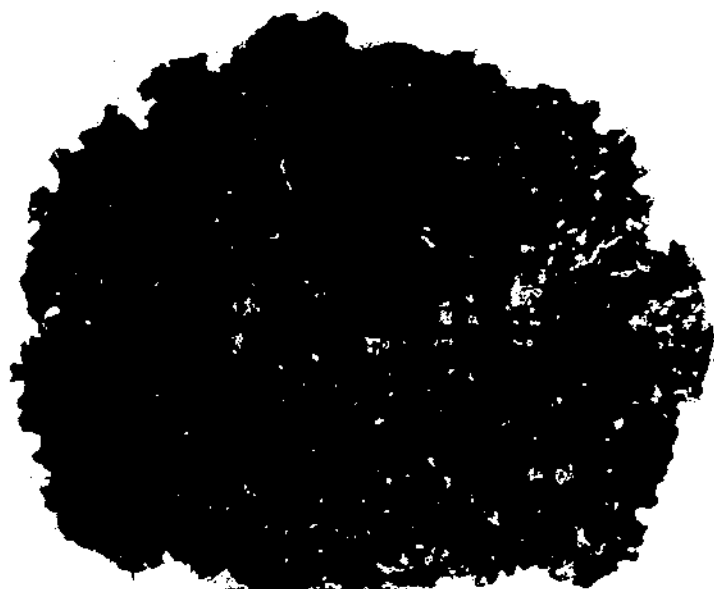


FIGURE 23.— Ruby lettuce.

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