

Sunhigh appears to be quite promising but has not been tested at this Station long enough for proper evaluation. Herb-hale, a new local variety of the Sunhigh season has been quite promising. July Elberta, of about the same season, is winning friends among commercial growers and will probably continue to give strong

competition to any new variety of its season.

While other new varieties and selections are under trial, it is obvious that there is room for much improvement in peach varieties for this area. In fact, every variety now grown commercially or under trial has at least one serious weakness which limits its usefulness.



Strawberry Breeding

By The U. S. Department of Agriculture

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The objectives of the strawberry breeding work are to reduce the economic hazards of the grower and to obtain varieties better adapted to specific uses. The losses to growers that breeding might help to lessen are chiefly those which are the result of injury by disease, drought and cold.

Resistance to leaf scorch, leaf spot, red stele root disease, and virus diseases have been obtained through the use of

varieties and species. Howard 17 (*Premier*) has been a good source of resistance to leaf spot and leaf scorch, though at the present time a strain of the leaf spot fungus seems to attack it severely in some locations. Red stele resistance has been obtained from Aberdeen and from importations from Scotland. Virus resistance has been obtained from Blakemore, probably through its Howard 17 parent.

Increased firmness has been obtained from Missionary and higher dessert quality from Royal Sovereign, Fairfax, Marshall, Euresko, Ettersbug 80, and a combination of Howard 17 and Missionary. Finer preserving varieties have been secured by crossing Howard 17 x Mission-

ary and from Blakemore x Marshall. Finer freezing varieties have been derived from Redheart, Blakemore, Missionary, and Marshall.

Breeding For Resistance to Red Stele

At present an important objective in the breeding work is high resistance to the red stele root disease. When the seriousness of the disease throughout the northern United States first became apparent, tests of seedlings indicated that some could not be infected. The Temple, a cross of Aberden x Fairfax, was selected, named, and introduced in cooperation with the University of Maryland as highly resistant. Other seedlings, selected at about the same time and considered immune, have taken the disease when grown under field conditions. This is thought to have been caused by the presence of other strains of the fungus, or to unusually favorable conditions for infection by the fungus, or to faulty methods of testing for resistance. In 1946 small areas in one field of Temple showed the disease, though it did not cause any commercial loss.

When breeding for resistance to this disease first started, potted seedlings were inoculated in the greenhouse with the red stele organism. Mr. J. B. Demaree inoculated some 8,000 seedlings several times one winter. Next, co-operating with the University of Maryland, tens of thousands of seedlings were planted in infested fields in eastern Maryland. Finally, following the lead of George F. Waldo at Corvallis, Oregon, the seedlings were planted in infested soil in greenhouse benches for winter growing. This practice has been followed for three

years at Beltsville, Maryland. This winter (1946-47) some 50,000 seedlings are being planted in the benches. The plants are set $1\frac{1}{2} \times 1\frac{1}{2}$ inches, 64 to the square foot. Thus, a planting of 50,000 can be put in 1,800 square feet of bench, or less than $\frac{1}{50}$ th of an acre. The fungus is held dormant by high temperatures through the late fall which stimulate vigorous plant growth. A 16-hour day is given the seedlings whenever needed to keep them growing vigorously. When the roots have penetrated deeply, the temperatures are lowered and the soil kept wet. After the disease has spread freely, the root system of each seedling is examined and infected plants are discarded. The highly resistant plants are fruited in the field and only those with good fruit characteristics are saved.

Breeding For Firmness and Quality

Breeding for resistance to the red stele disease is only one part, though an important part, of the strawberry breeding work. From the beginning of the program, firmness and high dessert quality have been emphasized. The Blakemore, Fairmore, and Fairfax are examples of the increased firmness, while Dorsett, Fairfax, Redheart, Massey, Fairpeake, and Suwanee possess high dessert quality. Beginning in the 1920's, a great many selections have been tested for preserving and freezing qualities. The Blakemore is now the standard preserving variety of eastern States and the Midland is one of the best freezing varieties for the package trade. Current crosses now under test are Midland x Tennessee Shipper for still firmer shipping and better freezing berries, and Midland x Suwannee and Fairpeake x Suwannee for better flavored

commercial varieties. Crosses for high vitamin content are Fairpeake x US-2153 (US-261 x Redheart) and Fairpeake x Oregon-1574.

The Use of Wild Plants as Parents

For high aroma, the diploid everbearing wood strawberry (*Fragaria vesca* var. *sempreflorens*) has been used. Dr. Haig Dermen doubled the chromosome number to make a tetraploid form. This was crossed with the ordinary garden strawberry and the best hexaploids saved. A population of the best hexaploids pollinated by the ordinary garden strawberry has given septaploids that are productive and have the high aroma of the *F. vesca* parent. These varieties have, for the most part, been very soft.

For use of the wild meadow or field strawberry, hardy selections from North Dakota, Iowa, and other western States have been crossed with named varieties. Hardiness of plant to low winter temperatures and of flowers to frost, as well as earliness of ripening, are some characteristics being incorporated into commercial varieties.

Cooperative Breeding Work

The work at Beltsville, Md., is integrated with cooperative work with the North Carolina Experiment Station at Raleigh and Willard, N.C. There high flavor and increased firmness are especially important. The use of selfing as a method of breeding is being tested and crosses for large size of fruit are being made. The large, high-flavored Massey is a recent introduction resulting from this work.

At Corvallis, Oreg., in cooperation with the Oregon Experiment Station, extensive breeding for red stele disease resistance, for virus resistance, and for preserving and freezing varieties is in progress. The Brightmore as a virus-resistant preserving variety has been introduced by George F. Waldo there recently.

At the U. S. Horticultural Field Station at Cheyenne, Wyoming, extensive breeding for winter hardiness has resulted in the introduction of 3 varieties for that area, so hardy that no mulch is necessary for winter protection. *Fragaria ovalis*, the western North American field strawberry, has been used as the source of hardiness in this work.

Testing of New Selections

Testing of selections has been done by cooperators in many States. N. H. Loomis of the U. S. Department of Agriculture Station at Meridian, Miss., tested US-2183, which was named Suwannee and is recommended as a home garden berry for the deep South and northward to Maryland. Paul H. Shepard of the Mountain Grove Fruit Station, Missouri, M. M. Parker of the Virginia Truck Experiment Station, A. L. Dacy of the Essex County Agricultural School, Hathorne, Mass., D. F. Jones and associates of the New Haven, Conn., Station and many others have made trials of new selections for many years. Without such generous cooperation the work would have been far more restricted in usefulness.

