Fruit and Vegetable Varieties: New and More Marketable

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The abundance and variety of fruits and vegetables in grocery stores and roadside markets is the result of several centuries of plant introductions from Europe, Asia, and Central and South America, and of several decades of scientific plant breeding. Earliest inhabitants of North America found only a few fruits, such as blueberries, blackberries, and strawberries, and none of the vegetable crops grown for market today. Most of our important fruit and vegetable crops were imported early on by the Indians from Central and South America and by the European colonists.

In recent years, agricultural scientists have extended the number and variety of fruits and vegetables we take for granted in the marketplace. They carefully select plant parents, apply pollen from one plant to another, and patiently evaluate millions of hybrid offspring in search of better plants. These plant breeders, who work for USDA's Agricultural Research Service (ARS), State universities and experiment stations, and private industry, have made tremendous improvements during the last 85 years using the tools of modern genetics. Today, our fruits and vegetables are flavorful, nutritious, pest-free, and essential to our health. We consume more and more of them each year—now about 400 pounds per person.

Meeting Producer Requirements

The public and private fruit and vegetable breeders also must serve the producers. New varieties are needed that have high yields, ship well, and have tolerance to insects, diseases, nematodes, and air pollutants. Tolerance to cold, heat, and drought are equally important, and many of our new varieties have these characteristics.

New Vegetable Varieties

Potatoes

Today's potato varieties are good examples of scientific achievement through plant breeding. By collecting wild relatives in Peru where potatoes are thought to have originated, we now have varieties adapted to specific production areas in the United States and specific uses—for baking, french fries, chipping, and dehydration. Potatoes and potato products have become increasingly important in our diets. On average, each American now consumes about 140 pounds of potatoes per year.
Carrots
The carrot, which originated in Afghanistan, is now considered an essential vegetable in our diet and is the leading plant source of vitamin A. New varieties with greatly increased vitamin A content have been jointly developed by ARS and State scientists. These new carrot varieties are freely available to developing countries worldwide, where vitamin A deficiency is much more common than in the United States. In addition, carrots are an important source of fiber that reduces cholesterol in the bloodstream.

Lettuce
Varieties introduced from the ARS lettuce-breeding program at Salinas, CA, now account for about 60 percent of U.S. lettuce acreage. Lettuce was introduced from the Mediterranean area, but our present varieties bear little resemblance to the original wild types that were nonheading and bitter. Fortunately, our breeders were developing improved lettuce varieties long before the recent year-round public interest in fresh salads.

Cucumbers and Onions
The cucumber introduced from India and the onion introduced from Afghanistan also have been greatly improved through breeding techniques. We have fresh and pickling cucumber varieties of different shapes and sizes and an equal array of onion varieties. Resisto, a new, high-yielding sweet potato variety developed from the ARS Vegetable Laboratory at Charleston, SC, is resistant to 14 different insect, nematode, and disease pests. The germplasm used originally came from Central and South America. The Charleston Gray variety of watermelon introduced earlier from this laboratory has long been the standard of excellence, but breeding research continues to develop even better varieties.

Beans
Bean breeders at Beltsville, MD, have introduced many new snap bean varieties resistant to the bean rust fungus that causes unsightly blemishes and makes the beans unsalable. They also have recently introduced high-yielding, highly flavored, drought-tolerant lima bean varieties.

Other Vegetables
With ARS breeding programs on tomatoes, peppers, okra, asparagus, cabbage, broccoli, and sweet corn and many State and private industry programs on these and other vegetable crops, the U.S. farmer and consumer have reasonable assurances that new, improved high-quality vegetable varieties will continue to be marketed to satisfy the ever-changing needs of consumers.

New Fruit Varieties
Our fruit breeders have had an even more difficult assignment. All of the tree fruit crops originated outside the United States and had to be introduced and adapted to this country's diverse climate and soils. These crops include apples, pears, peaches, nectarines, plums, apricots, cherries, wine grapes, figs, oranges, grapefruit, bananas, mango, papaya, avocado, and dates. One parent species of our commercial strawberry came from Chile, but the other parent species was the small, highly flavored wild meadow strawberry still found growing in abandoned fields in Northeastern States. Blueberries, cranberries, and certain blackberry, raspberry, and grape species are native to the United States, and it is appropriate that ARS and many individual States have active breeding programs.

Blueberries, Blackberries, and Strawberries
ARS at Beltsville has had a long his-
tory of breeding small fruit crops—blueberries, blackberries, strawber-
ries, and raspberries. The Northern highbush blueberry program started
in 1910 using the largest of small ber-
ries from the wild. Through careful
selection of parents, and saving only
those hybrid seedlings with good fla-
vor, color, size, and shipping quality,
consumers now have improved varie-
ties that exceed 1 inch in diameter,
are highly flavored and attractive, and
have excellent shipping quality.
While wild blueberries are soft and
unsuited for shipment, these new var-
ieties ship well, and some fruit is now
being exported to Europe for the
fresh fruit market. This export market
is expected to increase as world
markets expand to include U.S. fruit
not previously exported.
Many State universities have been
involved in the ARS breeding pro-
gram on Northern blueberries and
now new cooperative programs are
improving the native rabbiteye
blueberry for the Southern States.
One might wonder if those big deli-
cious blueberries available in our
markets today need any improvement
at all and if the breeders have not
already reached the ultimate in flavor,
appearance, and shipping quality. But
the breeders see other opportunities
through continued breeding. They
are sure the size can be increased
further, if that is what the consumer
wants, but they also see the potential
for plant adaptation to different soil
types and increased tolerance to cold
and insect and disease pests. Such
improvements would further reduce
the cost of production and market
prices to consumers and would
encourage an expansion in home
gardening as well.
The ARS breeding programs for
blackberries and strawberries started
about 1920 and have been continu-
ous ever since. The blackberry is not
commonly found in the eastern mar-
ketplace as a fresh fruit, largely
because of the disease problems, so
this wonderful fruit is now used
primarily for jams, jellies, and juice.
However, after many years of
research, ARS breeders at Beltsville
have developed disease-tolerant,
high-quality, high-yielding varieties
without thorns on the canes. The
absence of thorns is especially good
news for growers and pickers. These
varieties are particularly well suited
for fresh market uses and juice and
have led to renewed interest in home
garden and commercial production.
Unlike many fruit crops, each
strawberry variety is adapted to a
rather restricted geographic area. For
this reason, ARS and State scientists
have worked closely together to
jointly develop and introduce varie-
ties for each production area. Empha-
sis has been on the maintenance of
flavor found in the wild strawberry;
good firmness and general appear-
ance needed for the marketplace;
resistance to disease, insects, and
nematode pests; tolerance to frost,
cold, and heat stress; and, of course,
yield and adaptability. The University
of California has had a particularly
successful breeding program, and
large, beautiful fresh strawberries are
now available from California for
about 11 months of the year. Contrast
this market availability to earlier
years—when fresh strawberries were
available for only 2-4 weeks in the
early summer.

Peaches
Much progress has been made in the
quality and availability of fresh
peaches (and nectarines which are
genetically the same as the peach but
without fuzz on the skin). The peach
is thought to have originated in China
and been introduced into the United
States from Europe. The wild peaches
in China ripen in late summer and
have small, hard, hairy, nearly ined-
ible fruit with white flesh. Plant
breeders have used this poor plant

New or Better Products To Meet Demand
material as parents and developed the many large, yellow-fleshed, high-quality, early-season peach varieties we now expect and find in our produce markets nationwide. It is a considerable achievement, yet additional improvements are expected. Current objectives of State and Federal breeding programs include breeding for increased tolerance to cold and resistance to many disease, insect, and nematode pests. Environmental stress and pests greatly reduce efficient production by the farmer and increase costs to consumers.

Grapes
Consumers have also benefited from ARS research on improved table grapes. Since most people prefer seedless grapes over seeded varieties, a long-term objective was to develop seedless varieties that could be shipped long distances. Though it is extremely difficult to develop seedless grape varieties, research at the USDA Horticultural Research Station at Fresno, CA, resulted in the Flame Seedless variety, introduced in 1973. This new red variety, sometimes sold as Red Flame in the market, has been extremely well received by both growers and consumers. It is well flavored, attractive, firm for shipping, and individual fruits stay on the bunch rather than shattering. The Fresno station has introduced 42 improved varieties of grapes, peaches, nectarines, plums, and apricots.

Citrus Fruit
The origin of citrus, particularly grapefruit, is not well established. It is known that Southeastern Asia is the center of origin and that citrus has been under cultivation for several thousand years. Oranges were introduced in Florida in the early 1830's but were killed by a freeze in 1835. The grapefruit was introduced in the 1880's, and the value of citrus as a new crop was soon recognized. California and Florida, as well as USDA, initiated citrus improvement programs about the turn of the century.

Primary objectives in citrus breeding are to develop varieties that are more tolerant to cold, diseases, and insects and have increased consumer acceptance. Important fruit characteristics are interior fruit color, juice color, the sugar-acid ratio, the absence or reduction of seeds, and of course flavor. Collectively, these characteristics equate to market quality. The ARS citrus breeding program at Orlando, FL, has cold hardiness as a primary objective. A citrus species known to survive as far north as Pennsylvania is one species used as a cold-tolerant parent even though the fruit is small, sour, and inedible. Some of these citrus hybrids have survived cold temperatures as low as 7°F. During the 1983 Florida freeze that killed or severely damaged 25 percent of commercial plantings, these hybrids survived and will continue to be used as parents in the breeding program.

It may be many years before more cold-hardy, high-quality citrus varieties can be commercially introduced. It should be reassuring to growers and consumers, however, to know that such a long-term Federal breeding program exists and that progress can be made. ARS has already developed 21 new improved citrus varieties, 3 during 1987, but these recently introduced varieties still do not have all of the cold tolerance desired.

Other Fruits and Nuts
Other ARS tree fruit and nut breeding programs are underway on pears, apricots, plums, avocados, mangos, carambola, passion fruit, pecans, and walnuts. This is long-term research to provide improved varieties that are needed for our expanding markets.