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Apple varieties grown in New York State

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No apple variety is perfect. Each has its own special problems in growing; each must be handled differently. The grower must learn the peculiarities of each and adjust his cultural practices accordingly.

Financial success in commercial apple growing is not a simple matter and is dependent on many factors such as the choice of orchard site, rootstocks, varieties, farm management, labor supply, marketing, and others. The choice of varieties is one of the most important decisions leading to success.

Because apple trees are long lived, shifts in the important commercially grown varieties are very slow. Since local markets may dictate the success of specific varieties, it is impossible to predict the profitability of any variety. The demand for fresh market varieties is largely determined by the decisions of the big chain store buyers. Because they deal in large volumes and demand a uniform product, these buyers show little interest in new or different varieties, even though the quality may be better. For processing varieties, the greatest demand is for those that are large fruited, firm fleshed, yellow fleshed, highly flavored, and heavy cropping. Only a few varieties meet these high standards. Dual-purpose varieties sometimes have an advantage because they are adapted for either the processing or fresh market, whichever happens to be better in a given year.

There is a trend toward fewer and fewer apple varieties so that there are now only 13 commercially important

varieties grown in New York State. The 1975 New York Orchard and Vineyard Survey showed 98 apple varieties grown on commercial scale in New York; i.e., 100 trees or more, but only 13 produce crops of more than 8.5 million pounds, annually. A commercial grower is most sure of success if he grows mainly the varieties that big buyers demand. Figure 1 lists these 13 important varieties, showing the average production of each in western and eastern New York State for the 5-year period, 1972-1976. In western New York, the varieties produced in largest volume are McIntosh, Rhode Island Greening, Rome, Cortland, and Delicious. In eastern New York, the most heavily produced varieties are McIntosh, Delicious, Cortland, and Rome.

New York State produces about 25 million bushels of apples annually, about one-fifth of the total United States production. Washington is the only state producing more than New York. New York's production is about equal to the total production in Canada and about three times that of all six New England states combined.

Figure 2 shows the 20 apple varieties planted most extensively in New York during the 5-year period, 1972-1976. These 20 varieties are discussed in this bulletin. In western New York, the most important newly planted varieties are Delicious, Idared, McIntosh, Empire, and Rome. Between 1968 and 1976, new plantings in western New York dramatically accelerated for Delicious and Empire, but

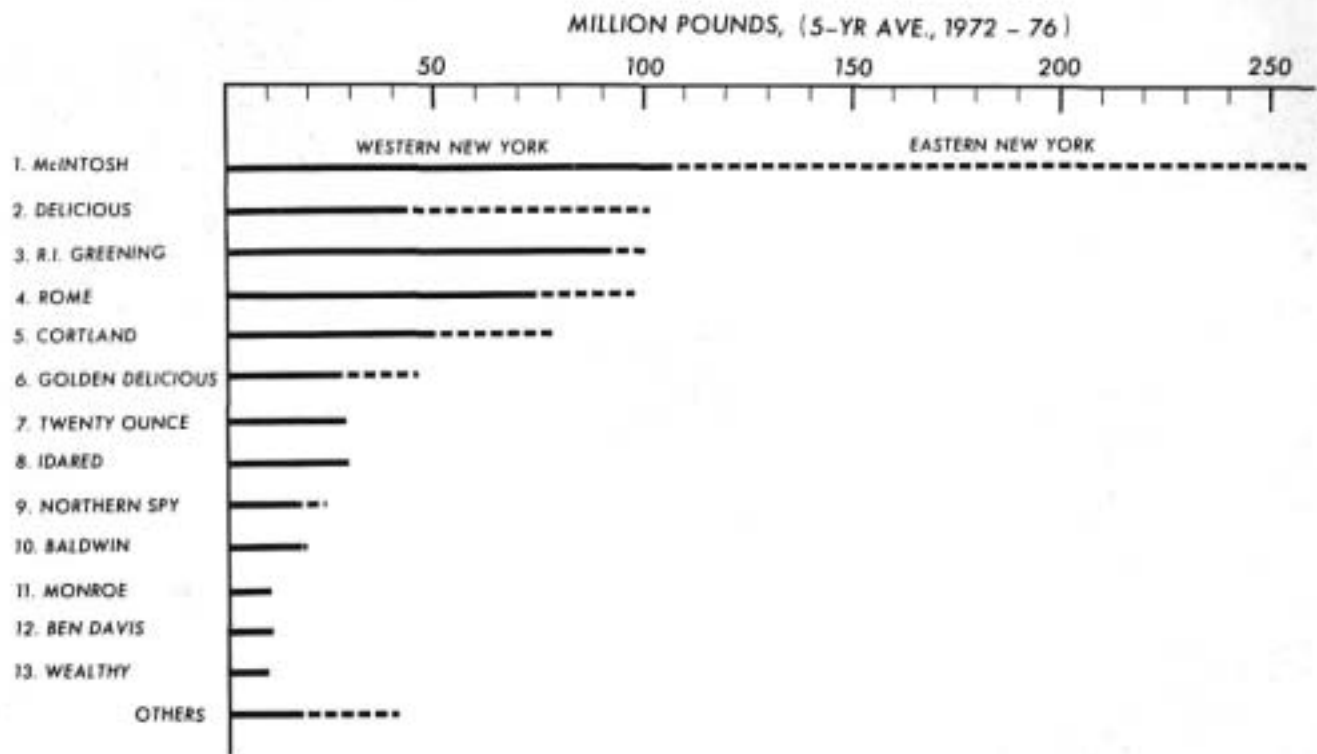


Figure 1.—New York apple production by varieties. (Sources: New York Crop Reporting Service, Western New York Apple Growers' Association.)

NO. TREES PLANTED ANNUALLY IN NEW YORK (5-YR AVE., 1972 - 76)

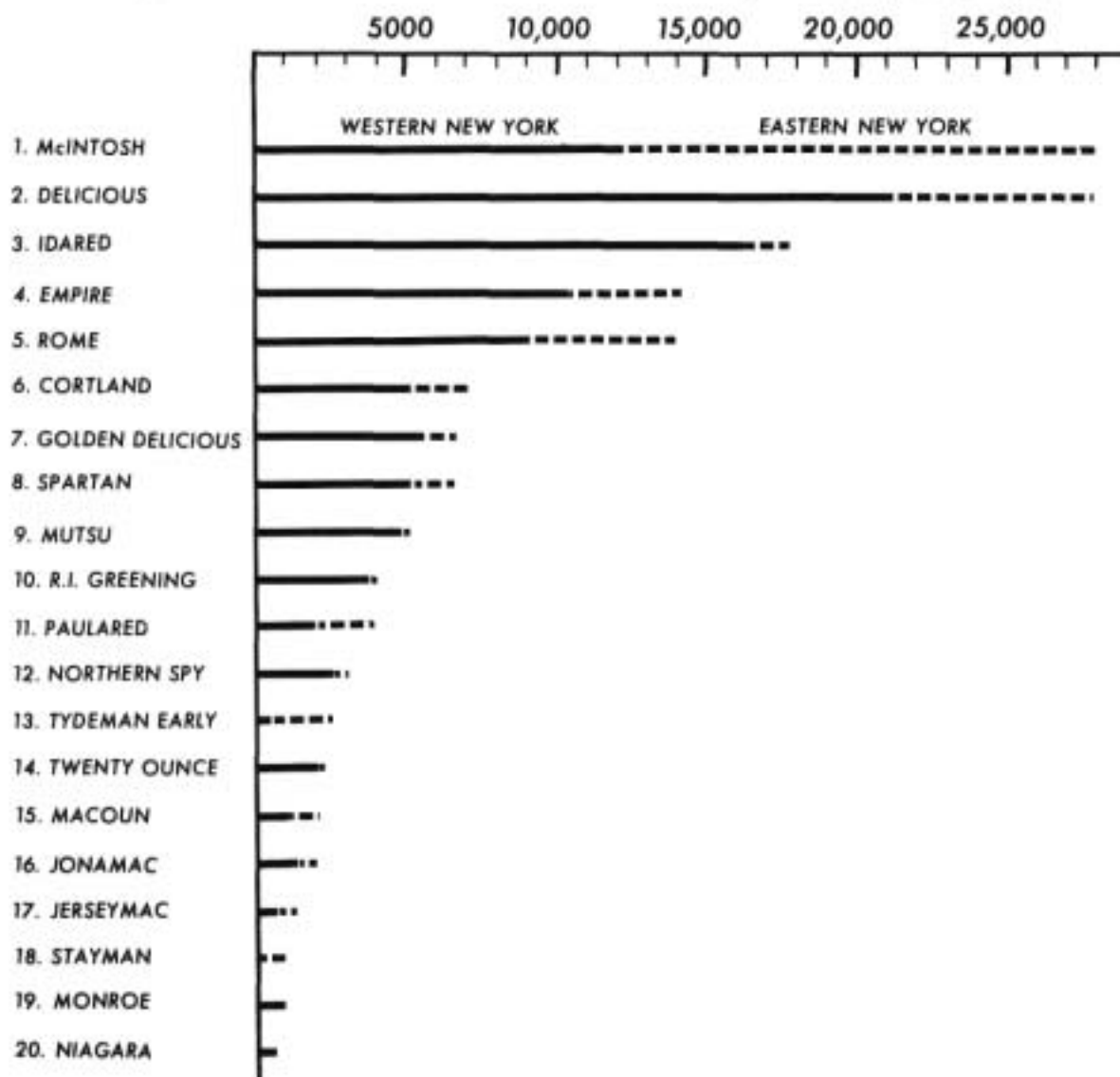


Figure 2. —New apple plantings by varieties made in New York; 5-year averages, 1972-76. (Source: New York Orchard and Vineyard Survey 1976, New York Crop Reporting Service Release 31.)

Idared, Golden Delicious, R. I. Greening, and Twenty Ounce were being planted less intensively than before.

Figure 2 shows that in eastern New York, in the mid-1970's, McIntosh was planted far more than any other variety. Delicious, Rome, and Empire were also important in new eastern orchards. Also of minor importance in new eastern plantings were Paulared, Tydeman Early, Cortland, Spartan, and Idared.

Many apple growers are inclined to plant those varieties which appear to be profitable for their neighbors and often fail to plan ahead. The varieties which a grower plants are determined all too often by the availability of trees at the nursery at the time he is ready to put them into the ground. Since the choice of varieties to plant is one of the most important decisions for a fruit grower to make and because he

must live with that decision for such a long time, he should give serious thought to the problem before planting.

Since every orchard business is different, recommendations cannot be made concerning the best ratio of the different varieties to grow. Some growers personally prefer to grow apples exclusively for the processor, and others have a better operational arrangement for the fresh market. Whatever varieties are grown, each should be in no greater quantity than can be harvested in a period of 10 to 14 days. Prompt harvest and storage are particularly necessary for those varieties ripening with McIntosh and Cortland in late September and early October, while the weather is still warm. During late October, when outside temperatures are lower, the prompt harvest of varieties is less critical, although early freezes after the beginning of November can

be a problem. Most commercial orchards are composed of about six varieties that are grown in large quantities. The grower may also have a small portion of his orchard where he experiments with a few trees of several new varieties.

In addition to the acceptability of a variety by the markets, variety selection will also be influenced by the availability of labor, the site, and the tree and fruit characteristics. The most profitable varieties are heavy, annual croppers and ones with a long storage life, although controlled atmosphere storage will compensate for normally short-term keepers such as McIntosh and Cortland.

In planning for a new orchard, provision must be made for pollination. No apple variety is sufficiently self-fruitful to be dependably productive when planted alone. Cross-pollination of apple varieties is discussed in another bulletin, *Pollination and Fruit Set of Fruit Trees*.

Excellent new apple varieties are introduced from time to time, some of which will eventually replace varieties that are currently important. Although many large-volume apple buyers are reluctant to accept new varieties, some of these new varieties are superior to the old standard varieties. Growers should plant large quantities of some new ones, not simply in small trial bits of rows, but rather in several full rows.

Figure 2 shows the extent to which some of the new varieties are being planted. Other new and noteworthy varieties are made available to growers through the New York State Fruit Testing Association, Geneva, New York 14456.

In the future, growers may thrill at seeing their beautiful crops of Holly with its conic shape, its holly-berry color, and its excellent eating quality. Mutsu could become a real money maker with its early bearing and heavy crops of large fruits of excellent eating quality and long storage life. Empire, despite its smaller size, could become so widely planted that every household would know it by name. Jonagold, with its luscious goodness and attractive color, may become the consumer's delight and the grower's reputation maker.

RED SPORTS AND SPUR TYPES

Mutations or sports sometimes occur in apple varieties and result in better fruit color or a spur habit of tree growth. Geneticists theorize that mutations may be caused by cosmic rays which pierce through the growing tip of a shoot and produce a gene or chromosome change. That portion of the shoot which grows after the change occurred contains the new type of tissue. Mutations can occur for many characteristics, including productivity, tree growth habit, fruit shape, flavor, time of ripening, redder fruit color, and so forth. Many changes are too subtle for the casual observer to discover after they have occurred in the orchard. Mutations have been found more frequently in Delicious, partly because it is the most widely grown variety in existence. Also, mutations frequently occur on heavily pruned or winter-injured trees.

With the exception of Northern Spy, the red sports generally produce more desirable fruits than the non-sported original variety. Delicious is now known to have more than 150 red sports. Other varieties having red sports are McIntosh, Rome, Twenty Ounce, Northern Spy, Stayman, Baldwin, Ben Davis, and Wealthy.

Trees of spur types are smaller than the parent variety from which they sported; they are usually about two-thirds normal size. This smaller tree size is a good feature because there is widespread interest in tree size control. Spur types require less pruning. Along with the spur growth habit, several other secondary changes may also occur at the same time, including narrower crotch angles, increased winter hardiness, fewer side branches, shorter internodes, thicker twigs, more frost resistant flowers, thicker and greener leaves, greater fruit production efficiency, and greener fruit flesh. For those varieties in which they are available, spur types are generally preferable to the standard growth habit. Spur types are available for Delicious, McIntosh, Rome, Golden Delicious, Tydeman Early, Arkansas Black, Earliblaze, Winesap, Winter Banana, Cortland, and others. Because spur types generally are preferred, it would be advantageous if spur types of even more varieties could be found.

The extent of control over tree size due to the spur growth habit differs greatly between the varieties. Spuriness is a relative thing. For example, trees of Starkspur Lodi are nearly as big as the normal nonspur Lodi trees, but trees of Starkspur Golden Delicious sometimes can have less than half the branch volume of nonspur Golden Delicious trees of the same age. Growth suppression in spur types of Delicious is intermediate between these two extremes.

Sometimes spur trees lose their spur character, and the growth habit reverts to the larger normal type. Thus, an orchard might be planted entirely with spur trees, but in a few years the odd tree sometimes will begin to grow as large as the normal, nonspurred parent variety. This has been a problem with spur types of Golden Delicious, but not with spur types of Delicious.

FEATURES AND FAULTS OF SOME LEADING VARIETIES

The apple varieties discussed in this bulletin are chiefly the 20 listed in Figure 2 in the descending order of their importance in new plantings made in New York during the 5-year period, 1972-1976. In addition, to those 20, other varieties listed include recommended early varieties, a few special varieties, and four promising new varieties. Tree and fruit characteristics of these varieties are tabulated at the end of the bulletin. Each variety is discussed briefly, some of its special features are listed, and a brief assessment of its commercial usefulness is given.

Varieties of apples are most easily characterized by describing their faults. Growers ask, "What's wrong with it?" The good features are always taken for granted. For this reason, unlike nursery catalogs, emphasis in the

descriptions here is placed on their special qualities and limitations. Descriptions are not intended to be complete, but rather they are intended to be used as aids to the grower in deciding what varieties to plant. Descriptions are based chiefly on performance observations in established New York orchards and in the variety test orchards at the Experiment Station at Geneva. **A word of caution:** Performance in other fruit growing areas could be significantly different from the descriptions given here.

1. **McIntosh** is more important in the mid-1970's than it was 30 years earlier. In the mid-1960's, it was the second most important variety in the United States, surpassed only by Delicious and accounting for about 11.5 per cent of the United States production. McIntosh is produced in greater volume than any other variety in New York (Fig. 1) and is still being planted far more than any other variety (Fig. 2).

The popularity of McIntosh is enhanced by its heavy annual crops, by the market's familiarity with the variety, by the increased use of stop-drop and Alar sprays, and by the extensive use of controlled atmosphere storage.

Although McIntosh is the most important variety being planted in New York, some growers will elect not to plant any new McIntosh trees because to do so is not always profitable. If accurate cost accounts could be made by varieties, many large orchardists would discover that their net returns for McIntosh might be negligible in some years. Because McIntosh is produced in such large volume in mediocre sizes and quality grades, it is not always the highest return variety. Furthermore, McIntosh has many horticultural weaknesses. It has tender flesh; drops before ripe in some seasons; has only medium storage life; is especially sensitive to above optimal nitrogen fertilization, resulting in poor skin color and soft flesh; is especially susceptible to apple scab; and so forth. For these reasons, some growers are changing their varietal structure by eliminating McIntosh. It may be possible to apply Alar to an earlier variety, such as Jonamac, to delay maturity.

Although the spur types of McIntosh are rather new, their advantages over nonspurred McIntosh are reliably documented, and growers will generally elect to plant spur McIntosh. Three spur types are MacSpur, SpurMac, and Starkspur McIntosh; others will be introduced.

A score or more color sports of nonspurred McIntosh are known. Many are indistinguishable from each other. Four of them that generally have produced color slightly superior to most of the others are Summerland, Kress, Imperial, and Rogers McIntosh.

2. **Delicious** is being planted in large quantities in both western and eastern New York (Fig. 2). In western New York, Delicious is being planted far more than any other variety. Delicious is the most important apple in the United States and in the world. It is increasing in importance in New York.

Delicious trees do not begin to bear at a young age, and even after they do begin to bear, they often set light crops. In the past, New York growers have had problems of poor fruit set but have gradually improved their ability to grow a

good Delicious. When poorly grown, it can produce small, low quality fruit. It performs better in Washington State where there is more sunlight. However, in recent years with the selection of good sites, new strains, and good tree care, the packout of eastern Delicious has improved. Delicious is more expensive to grow per bushel than many varieties, but prices and market demand are also greater, and consequently, net returns for Delicious are often higher than returns for most other varieties. Delicious requires a more fertile soil than some other varieties.

The desirably long conic shape and the protuberances near the calyx end of Delicious fruits are not strain characteristics but are induced by cool weather during 3 or 4 weeks following bloom. Fruits of this shape are more frequently borne on the older parts of the tree which bloom earlier. These blossoms which emerge early achieve their early fruit development during cooler temperature. The flowers of Delicious are more susceptible to damage by late spring frosts than those of McIntosh or Idared.

Because the markets prefer fully red apples, only those Delicious sports which develop 100 per cent red color should be planted. In the long list of color sports of Delicious, some have only a portion of the surface colored red; others are moderately covered; and still others, entirely covered with red. Some of the completely red sports are intermediate in the shade of red; others are very dark red all over. Growers will select dark red or light red strains, depending on their own individual preference. For poor coloring districts, a very dark strain should be selected. In addition to differences in intensity of red pigment, some strains have a striped color pattern; others, a solid blush (not striped). Some markets prefer striped; others, blushed. Among the nonspur, red sports of Delicious are Royal Red, Imperial, Vance, Starking, Earlired, Earlistripe, Gardner, Red Prince, Red Wenatchee, Topred, and Red Queen.

Spur Delicious varieties, being small trees, are suitable for closer spacing. Also, because of denser fruit set along the branches, they will often produce higher yields per acre than nonspur Delicious strains. Some spur strains will develop color earlier in the autumn than some nonspurs; but despite this early pigmentation, the spurs may actually become harvest ripe a week later than the nonspurs. To prevent greenish flesh and low eating quality due to undermaturity, spurs generally must be harvested well after they have become fully red and later than most nonspurs. At the same time, Delicious must be harvested before severe watercore begins to develop. Some spur Delicious strains are Starkrimson, Redspur, Wellspur, Miller Spur, Oregon Spur, Vermont Spur, Wayne Spur, Redchief, and Silver Spur. Other spur Delicious strains not mentioned here are also good, and their omission does not imply any inferiority. Young spur trees of Delicious often have bark blistering (measles). Young spur trees have very upright branches which must be trained outwardly by use of limb spreaders.

3. **Idared** is the second most important variety being planted in western New York (Fig. 2). Introduced in Idaho in 1942 from a Jonathan x Wagener cross, it is a relatively

new variety and is one of the few new varieties being planted extensively. Young Idared trees are especially susceptible to fire blight attack and were seriously damaged by the severe 1972 and 1974 fire blight attacks in western New York. Idared is susceptible to mildew which can be controlled by sulphur sprays up to the time of petal fall. It is also susceptible to flatlimb virus disease.

Idared trees are medium sized (see table for tree and fruit characteristics), a good feature for growers searching for smaller trees. Trees come into bearing at a young age and are annual, heavy croppers. Fruits ripen late with Rome and hang well after harvest maturity is attained. They are large, solid bright red, and handsome. The eating quality at harvest is only fair but improves after several months in storage. The storage life is considerably longer than that of most varieties, including Rome and Delicious. Idared often keeps in good condition until June in ordinary refrigerated storage. However, large Idared fruits picked overmature from young trees are subject to internal breakdown in storage. Jonathan spot can also be a problem.

Idared is popular on both the fresh and processing markets. Its processing qualities are only mediocre because the flesh is white and not yellow which is more desirable for processing. Despite this, large quantities of Idared are sold for processing in the hard class. Trees blossom early, even earlier than McIntosh, but the blossoms resist frost better than those of Delicious and most other varieties.

4. **Empire** is being planted in much greater numbers than Figure 2 indicates. It is a cross between New York's two most important fresh market varieties, McIntosh x Delicious, and was introduced from Geneva in 1966. It is harvested with Delicious, 2 weeks later than McIntosh. One of its major faults is that it develops full color by the time of McIntosh harvest, long before it has become harvest mature. Growers will be tempted to harvest Empire too early. The trees are annually productive. The tree shape, growth habit, and the even spacing of the fruits along the branches are particularly desirable. The fruits are almost fully dark red with a heavy waxy bloom on the surface. They are very attractive and hence especially useful for marketing in polyethylene bags. The eating quality is excellent. Empire is not a processing variety. The fruits keep longer in storage than those of McIntosh and are medium in size, similar to McIntosh. On old and heavily cropping trees, too small fruit size may become a problem. Empire resembles Spartan; but Empire is firmer, hangs better on the tree, and keeps longer in storage. Stop-drop sprays are not needed. If the fruits are frozen by early fall freezes while they are still hanging on the tree, they will lose quality more rapidly than most other varieties after freezing. Empire is very resistant, though not immune, to fire blight.

5. **Rome Beauty** is fourth in New York fruit production (Fig. 1) and fifth in the new tree planting (Fig. 2). Rome is sold on both the fresh and processing markets. This double market partially accounts for its popularity despite its

mediocre eating quality. New plantings in New York are greatest in the western part of the state where there is an important apple processing industry.

Rome trees are medium sized, bear at a young age, and are annual croppers. They are susceptible to scab and fire blight and require favorable soil and climate. Fruits usually hang well on the tree after they become harvest mature, although they do sometimes drop. Because the bloom is late, Rome usually escapes injury from spring frosts. It is a good pollenizer for Spy. However, Spy is not a good pollenizer for Rome because it does not begin to bear at a young age. Rome fruits are large and attractive. They have a long storage life but are susceptible to storage scald which can be controlled with scald inhibitors. Very dark colored sports are Law, Nured, and Lawspur Rome. Other spurs of Rome are Spuree Rome and Starkspur Rome. The very dark colored sports of Rome tend to have red pigment in the bundles in the flesh which causes red streaks. This is undesirable for fruits to be sold for processing. The very dark red sports should be planted for the fresh market and the less colored sports such as regular Rome or Gallia Beauty, for processing.

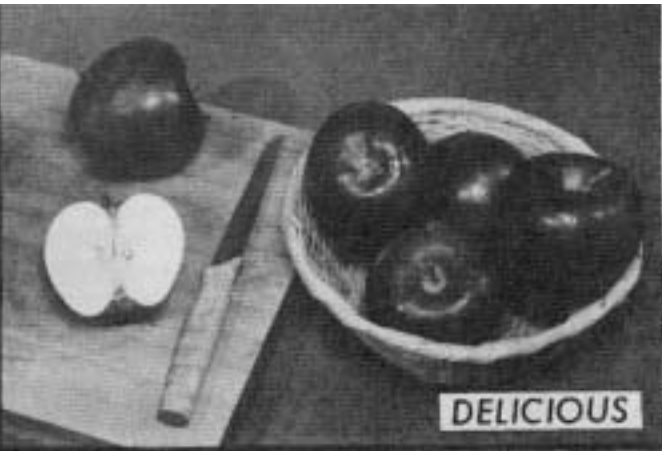
6. **Cortland** was fifth in New York apple production in 1972-1976 (Fig. 1); previously, in 1965, it had been third. Its importance has diminished to sixth in new plantings (Fig. 2). Because Cortland trees crop more heavily than most varieties, it will continue to have a high rank in production despite fewer new plantings. In comparison with McIntosh, Cortland is often more productive, larger fruited, better in eating quality, and easier to handle. Its major fault is that it ripens just after McIntosh. In orchards containing an excessive proportion of McIntosh trees, Cortland, which hangs well even after full harvest maturity is reached, may not be harvested in time to prevent overmaturity. Consequently, it is frequently picked overmature and is downgraded by big buyers. The skin has attractive dark stripes. The cut white flesh turns brown very slowly when exposed to air, and thus it is especially suited for salads. With scald control treatment, Cortland is well adapted to controlled atmosphere storage when harvested at optimum maturity. For best keeping quality, Cortland should be picked within 4 or 5 days after the optimum picking date for McIntosh.

7. **Golden Delicious** has recently surpassed McIntosh in the United States production and, in the late 1960's, became second in importance after Delicious. In 1965, more trees of Golden Delicious than those of any other variety were planted in New York, mostly in western counties. Although its production ranks sixth in New York (Fig. 1), new plantings in the early 1970's indicate that its importance will decrease.

For the fresh market, russet is one of the biggest problems with Golden Delicious. Russeted fruits, however, are acceptable for processing. Russet is often caused by damp, cool weather during the 30 days following bloom or by toxic sprays. Golden Delicious requires a captan spray



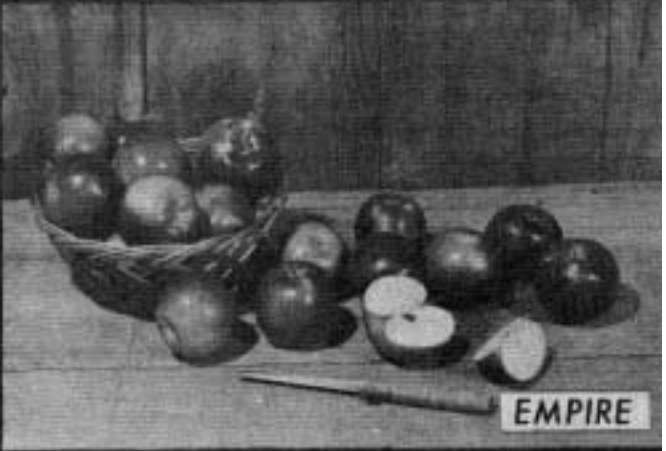
McINTOSH



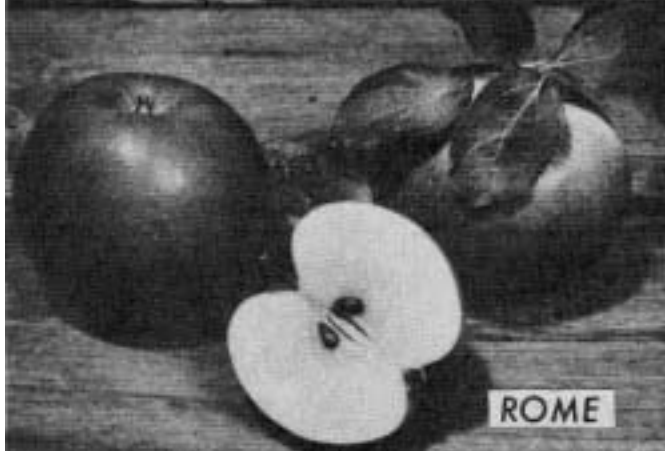
DELICIOUS



IDARED



EMPIRE



ROME



CORTLAND



GOLDEN DELICIOUS



SPARTAN

program which is mild and not russet inducing. Trees should not be planted near Monroe or Idared because sulphur sprays for mildew control on these two will cause russet on Golden Delicious. Avoid using water with high iron content for spraying and irrigating.

Golden Delicious trees begin to bear at a very young age, but after they come into production, they sometimes overcrop and become biennial. Biennial trees can be made annual croppers by applying blossom thinning sprays in years of oversetting. Fruit quality can vary widely from large, handsome, yellow fruits with excellent eating quality to small, poor quality, greenish fruits from overcropped trees. Large, fully yellow Golden Delicious fruits, because of their high quality, can command premium prices on the fresh market. Because it makes an excellent quality sauce, Golden Delicious is also in strong demand for processing. In storage, Golden Delicious requires high humidity to prevent skin shrivelling.

Yellow Delicious and Golden Delicious are synonymous. Smoothee, a sport of Golden Delicious, has some resistance to russet. Some spur sports of Golden Delicious are Starkspur Golden Delicious, Yellospur, Goldspur, and Nugget. Special problems with spur Golden Delicious are greater fruit russet and some tendency to revert to the normal growth habit.

Golden Delicious substitutes. Because of the russet problem in Golden Delicious, a search has been made to find yellow apples that do not russet so badly. These are not mutations of Golden Delicious but are distinct varieties. Some are seedlings of Golden Delicious, but others are seedlings of other varieties. They include Mutsu, Sungold, Ozark Gold, Prime Gold, Virginiagold, Magnolia Gold, Blushing Golden, Thewgold, Honeygold, Pacific Gold, Santa, Maigold, Chehalis, Toko, Hawaii, Ivette, Granny Smith, Firmgold, and Clear Gold. Some of these have lower eating quality than Golden Delicious. Granny Smith should not be planted in New York because it requires too long a season to ripen here.

8. **Spartan** is an attractive McIntosh type harvested about a week after McIntosh. In New York, Spartan is only medium sized and is especially suited for marketing in polyethylene bags. The fruits are well colored, firmer than McIntosh, and have excellent fresh eating quality, which should encourage repeat sales. The fruits drop badly; stop-drop sprays are required. Spartan's storage life is several weeks longer than that of McIntosh. Severe storage breakdown has been a problem in the west but less so in the east. However, after thinning to obtain good fruit size, Spartan sometimes breaks down badly here, too.

9. **Mutsu** has large yellow-green fruits. It was introduced in Japan in 1948 and resembles somewhat its Golden Delicious parent. It ripens somewhat later than Golden Delicious if the trees have a very high nitrogen status; fruits are often still green at the time of early fall freezes. Fruits harvested green will develop satisfactory yellowing after a few months in storage. Fruits from low nitrogen trees are

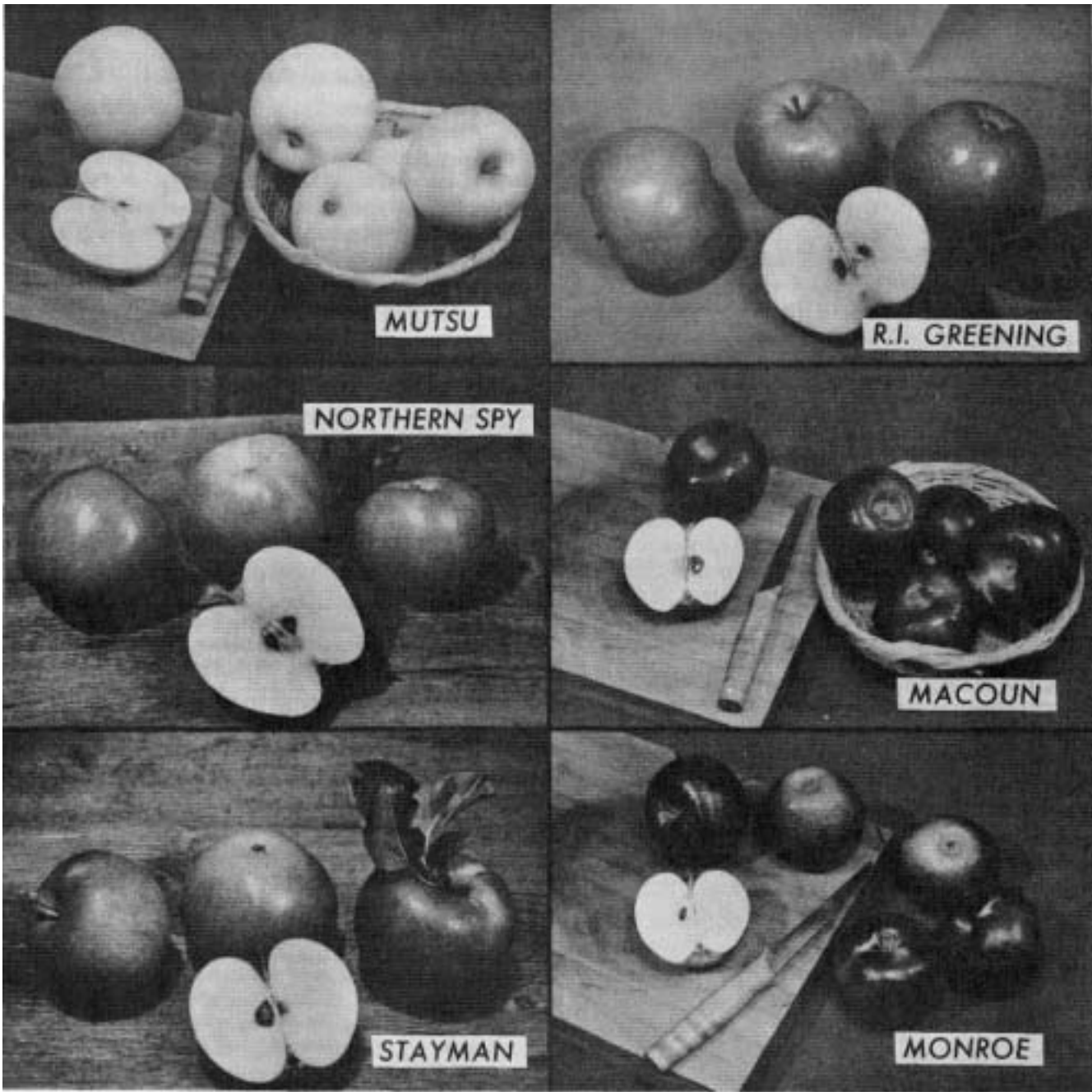
yellow at harvest. The eating quality is very good. Blindfolded taste testers could not distinguish Mutsu from Golden Delicious, their eating qualities being so very similar. However, the texture of Mutsu flesh is generally slightly coarser. Laboratory tests show that Mutsu is excellent, equal to Golden Delicious, for processing into sauce and slices. Trees bear young and heavily and more annually than Golden Delicious. Branch crotches are wide and strong. Mutsu is triploid; the pollen is not viable. It has less skin russet and storage shrivel than Golden Delicious and no scald or bitter pit. Storage life is longer than that of Rome or Delicious. Mutsu is recommended for planting in substantial quantities for processing. It may not successfully compete on the fresh market against large, deep yellow Golden Delicious.

10. **Rhode Island Greening** originated about 1750 and now, more than two centuries later, is still an important variety being planted in western New York (Fig. 2). It is a processing variety, good for sauce and slices, but is of minimal value on the fresh market. It is large and dark green. For best processing quality, it should be harvested 10 days after McIntosh. Trees tend to crop biennially. Immature fruits will scald in storage. Because Rhode Island Greening is a triploid, it does not produce viable pollen and will not serve as a pollen source for other varieties.

11. **Paulared** is a new, early ripening variety. In western New York it ripens the first week in September, about 3 weeks before McIntosh. It has good red color; its eating quality is fairly good. On young trees, the fruits tend to be borne in doubles on the tips of drooping branches, similar to Cortland. Paulared fruits are firmer than those of most early ripening varieties and therefore are easier to handle and have longer storage life. However, most growers will not store early varieties very long. Early varieties are generally marketed just after harvest.

12. **Northern Spy** trees are very slow to come into bearing. Sometimes 14 years elapse before they bear their first bushel. Dwarfing rootstocks, limb spreading, and minimal pruning will encourage earlier bearing. The trees tend to be biennial after they come into bearing. Despite this extreme nonprecocity, growers continue to plant Spy because it is one of the best processing sorts. Premium prices are paid for frozen slices of Spy. Spy also has excellent eating quality. Bitter pit is a problem, as well as limb-rub blemishes and bruise marks caused by handling. The storage life of Spy is long. Red sports are subject to storage breakdown and are less popular with growers than the original striped, partially red Northern Spy. The trees are late blooming. Spy is the most extensively grown variety in nearby Ontario.

13. **Tydeman Early** ripens in late August at a time when few other varieties are being harvested (see section on summer apples). It is one of the few early varieties planted on a commercial scale (Fig. 2). It is a McIntosh type, ripening 4 weeks earlier than McIntosh. Two pickings are usually required, because early varieties tend to ripen unevenly.



The fruits are almost entirely red, slightly dull; McIntosh shaped; and fair to good in eating quality. The branches are undesirably long and lanky but can be controlled with proper pruning. The trees bear only medium crops. The fruits hang fairly well as they ripen and keep in storage much longer than most early varieties. Tydeman Early, Tydeman Early Worcester, Tydeman, and Tydeman Red are all synonyms.

14. **Twenty Ounce** is planted in western New York in large quantities for the processing market. Fruits are very large and make good applesauce. Trees are very susceptible to both fire blight and collar rot. To avoid collar rot, resistant trunk stocks of McIntosh or Northern Spy can be used.

Twenty Ounce fruits have a short storage life and will keep only 1 or 2 months in cold storage.

15. **Macoun** received a new burst of interest in the early 1970's. Because of its very excellent fresh eating quality, it is useful in connoisseur markets which are willing to pay premium prices for high quality. The tree is difficult to grow because of its long, lanky branches, upright habit of growth, and biennial bearing. Macoun does especially well on M.9 rootstocks. Chemical thinning aids in attaining good fruit size and annual cropping. The fruits have short stems, are borne in clusters, and tend to push each other off as they ripen. Stop-drop sprays are required. Macoun is a McIntosh type with a very dark red color and often prominent

grayish scarfskin, which cannot be rubbed off. Sometimes the red is a less-than-fully attractive brownish red. Despite these shortcomings, Macoun is a good variety to grow for the fresh market.

16. **Jonamac** is a new McIntosh type, introduced by the Geneva Station in 1972. It ripens a week before McIntosh and has better color and better eating quality than McIntosh. It is ideal for growers who wish to sell in the early McIntosh market, before McIntosh is ripe enough to harvest. Trees are heavy, annual croppers and medium in vigor, which is a good feature. Although fruit color is very good, fruit size is somewhat smaller than ideal.

17. **Jerseymac** is a new summer variety, introduced from Rutgers University in 1971. In western New York, it ripens in the third week of August, about the same time as Duchess, Wellington, and Puritan, or about 5 weeks before McIntosh. Fruits are a McIntosh type, medium sized, about half red, somewhat soft, and of good eating quality. Similar to McIntosh, fruits of Jerseymac drop as they ripen and require a stop-drop spray. Like most summer apples, Jerseymac ripens unevenly, making it necessary to harvest in two pickings. Trees are strong growing and annually productive. Fruits will keep in marketable condition in cold storage for about a month.

18. **Stayman** ripens very late in New York and, in some seasons, fails to ripen. Immature fruits have greenish flesh. Most of the plantings are in the lower Hudson Valley (Fig. 2). Stayman is triploid, has large fruits with good red color, and, at its best, is rather good in quality. Skin cracks and checking sometimes cause problems. There are several red sports of Stayman. Although some growers are pleased with Stayman, it is not recommended for general planting in New York.

19. **Monroe** is a Jonathan type with 100 per cent attractive red color and is excellent for processing into sauce. It is generally annually productive, although some problems of fruit set have been encountered in commercial orchards having solid blocks of Monroe without pollenizers. The few cases of poor Monroe yields may also have been partially due to the excessive susceptibility of the blossoms to fire blight. Monroe trees are more susceptible than most varieties to both fire blight and mildew. Mildew is readily controlled by including sulphur in the spray schedule up to the time of terminal growth cessation. Tests have shown Monroe to be especially suited for mechanical harvesting because its fruits bruise considerably less than those of most varieties which are mechanically harvested. In some years, Monroe fruits are subject to soft scald in storage.

20. **Niagara** is an early fall apple, introduced by the Geneva Station in 1962. It is a McIntosh type. In western New York, it ripens at the end of August, about 3 weeks before McIntosh. The fruits are medium-large and almost fully red. In areas of high humidity near large bodies of water, the skin lenticels grow abnormally large, causing unattractive russet dots. The flesh is greenish until fruits are fully ripe; after ripening, the flesh is more yellowish than

McIntosh. Trees are strong growing and tend to be alternate in cropping.

IMPORTANT VARIETIES NOT BEING REPLANTED

Three varieties among the top 13 producers in New York State (Fig. 1) are not being planted much (Fig. 2); Baldwin, Ben Davis, and Wealthy. Similarly, Jonathan which originated in New York and is a very important variety grown in Michigan, is being planted very little in New York. Its fruits tend to be small.

SUMMER AND EARLY FALL VARIETIES

These varieties are described in *Early Apple Varieties*, New York State Agricultural Experiment Station, Geneva, Special Report 7, 1972. To promote better skin color, firmer flesh, and less fruit drop, early varieties generally should receive lower nitrogen applications than other varieties. Ethephon sprays can also enhance the fruit color of some early varieties.

The table below summarizes summer and early fall apple varieties.

Harvest season at Geneva, NY	Recommended summer and early fall varieties	Sometimes profitable summer and early fall varieties
Aug. 1st week (7 wk before McIntosh)	Quinte Vista Bella	Lodi
2nd week	Julyred	Caravel, Rantan
3rd week	Jerseymac, Viking	Scotia, Puritan Wellington, Williams, Melba, Carrol
4th week	Tydemar Early	Beacon, Early McIntosh
Sept. 1st week	Paulared	Summerred, Gravenstein, Earliblaze
2nd week	Burgundy, Akane, Niagara	Milton
3rd week (1 wk before McIntosh)	Jonamac, Wealthy	Prima, Lobo, Mollie's Delicious

NEW VARIETIES

There are hundreds of new apple varieties available from all over the world, many of which are being tested at the Geneva Station to evaluate their potential usefulness for commercial or home garden growing in New York State. Many years of testing are required. But even after adequate testing, it is difficult for a new variety to break into the markets. Idared and Empire are two new varieties which did successfully enter the market. However, 40 years after its introduction, some big apple buyers still are not acquainted with Idared, and they do not want to become acquainted with it unless they are forced into it.

Jonagold is large and attractively colored with light scarlet somewhat striped over a yellow ground color. It is a bright, light scarlet, not a deep dark purplish red. The flesh is crisp, and when Jonagold is grown under good orchard Conditions, its eating quality is one of the very best. It ripens a week after Delicious. It is dual-purpose, good for both fresh and processing markets. Laboratory tests show that it has excellent processing characteristics for both sauce and slices. It will keep until spring in 31 F storage. The trees are vigorous, annually productive, and spreading ingrowth habit. The best fruit color is obtained from trees on dwarf and semidwarf rootstocks. Jonagold is triploid and does not produce viable pollen. Jonagold is being extensively planted in England, France, and Belgium.

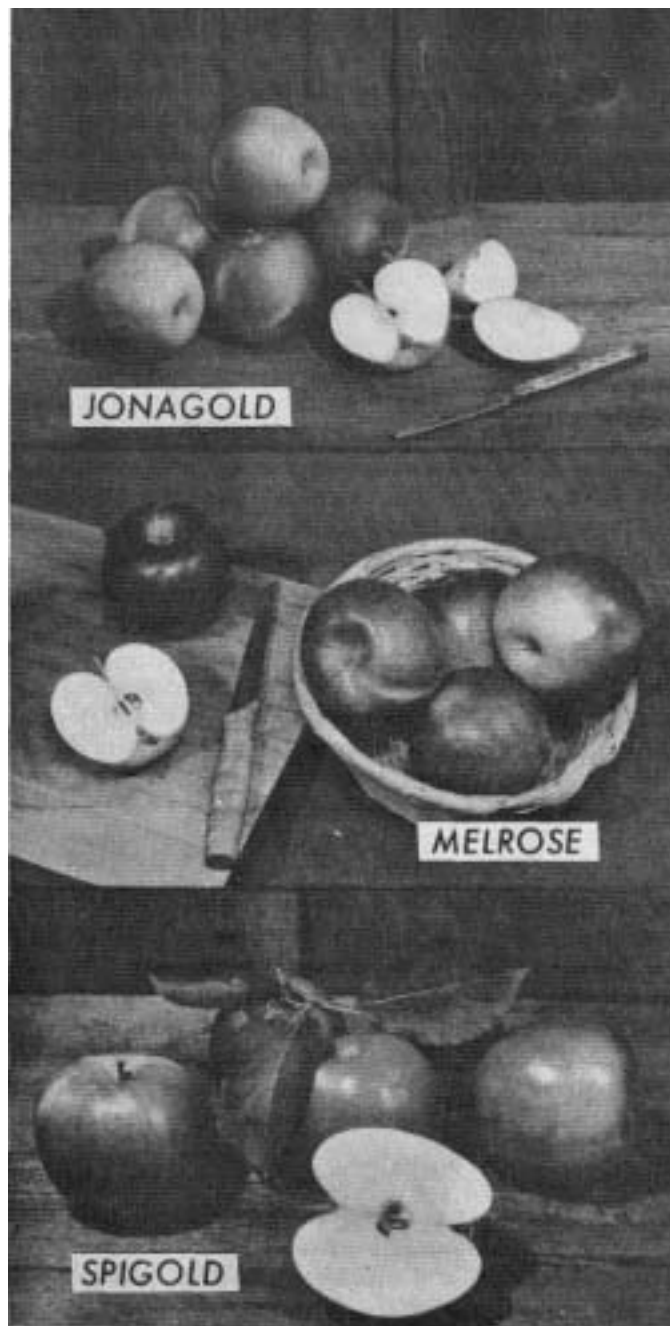
Holly is one of the most outstanding new introductions, a Jonathan x Delicious cross from the Ohio Agricultural Research and Development Center. It is a fresh market apple similar to Delicious, conic in shape but with less prominent protuberances at the base. The fruits are fully red; the color is the deep solid red of the American holly berry. Holly ripens 8 days after Delicious. The crisp flesh is juicy and the flavor is sweet, but slightly more tart than and superior to Delicious. Holly retains its flavor in storage longer than Delicious and has less tendency to become mealy. The trees begin to bear earlier and are more productive than Delicious.

Melrose, also from the Ohio Station, has one of the best eating qualities of all varieties when it is grown well; its flavor is less tart than that of Jonathan. The fruits are somewhat dull in color, resembling a well-colored Baldwin. They are large and flattish in shape. Melrose ripens late with Rome and has a long storage life. It is good for both processing and fresh markets. In an Ohio yield comparison of 31 varieties, Melrose outyielded all others. In 1970, the Ohio State Horticultural Society named Melrose the official Ohio State apple.

Spigold is a very large fruited Spy type, which some people say has the best eating quality of any apple variety. It is a cross between Spy and Golden Delicious and it combines the best of the flavors of its two parents. Spigold has some faults: fruits may be too large, trees can grow too big (too vigorous on seedling roots, they are unproductive), biennial bearing, bitter pit, fruit color not fully red. However, if Spigold is grown on M.7 roots and trees are kept annually cropping through the use of branch spreaders and chemical thinning, they bear heavy crops of beautiful fruit. Being triploid, its pollen is not useful to set fruit on other varieties or on itself.

SCAB-RESISTANT VARIETIES

The commercial usefulness of any apple variety often is related directly to the grower's ability to control insects and diseases. Varieties differ widely in their susceptibility to attack by various insects and diseases. For example, McIntosh is known to be more susceptible to apple scab than Jonathan; however, the susceptibility of different varieties to the many diseases will not be discussed in this evalua-



tion.

Some new scab-resistant introductions are Prima, Priscilla, Sir Prize, Macfree, and Nova Easygro. Scab-resistant varieties do not need to be sprayed for scab control, but some fungicide may still be needed for control of mildew and cedar rust. A full insecticide schedule of sprays is necessary. This feature of fewer applications of fungicide sprays is appealing to persons interested in reducing environmental pollution and to home gardeners who do not have adequate equipment or expertise to apply sprays properly to their apple trees. Prima is harvested a week before McIntosh; Priscilla, a week after Delicious. Both are medium sized. Prima has a rather short storage life of about 2 months.

TREE

Variety	Harvest date, avg. at Geneva, NY	Size of tree	Tree shape and limb structure	Winter hardiness of tree	Bearing age on seedling roots (yrs)	Productivity	Terminal or spur bearing habit	Annual or biennial bearing	Bloom season	Pollen viability
1. McIntosh	Sept. 25	Large	Spreading	Hardy	5 to 6	Heavy	Spur	Annual	Early	Good
2. Delicious	Oct. 12	Large	Upright spreading	Medium	5 to 8	Medium	Spur	Medium	Mid-season	Very good
3. Idared	Oct. 28	Medium	Wide angles, upr. spr.		Very early, 3 to 5	Heavy	T. & S.	Annual	Very early	Good
4. Empire	Oct. 9	Large	Upr. spr.		5	Heavy	Spur	Annual	Early	Good
5. Rome	Oct. 25	Medium	Spreading, drooping		Early, 4 to 6	Heavy	T. & S.	Annual	Late	Good
6. Cortland	Oct. 3	Large	Spreading, drooping	Hardy	Early, 4 to 6	Heavy	T. & S.	Annual	Late mid-season	Good
7. Golden Delicious	Oct. 22	Medium	Upright spreading	Medium	Early 3 to 6	Heavy, oversets	Spur	Somewhat biennial	Late	Very good
8. Spartan	Oct. 5	Large	Upr. Spr.	Hardy	4 to 6	Heavy	Spur	Somewhat biennial	Mid-season	Good
9. Mutsu	Oct. 25	Large	Upright spreading		4 to 7	Heavy	Spur	Annual	Mid-season	Not viable
10. R.I. Greening	Oct. 10	Large	Very spreading		6 to 8	Heavy	T. & S.	Sometimes biennial	Mid-season	Not viable

FRUIT

Variety	Tendency to drop fruit	Size of fruit	% red, color pattern	Attractiveness	Firmness of flesh texture	Bruise marks	Bitter pit	Eating quality	Approximate storage life at 31 F	Market
1. McIntosh	Drops	Medium	90 % blush & stripe	Medium	Tender	Stem punctures	Slight	Very good	Feb.*	Fresh & sauce
2. Delicious	Only slight	Med. to large	Sports 100 %	Very attr.	Firm, crisp	Little	Slight	Bland, good	March,* water-core	Fresh
3. Idared	Hangs well	Med. to large	90 % blush	Attr.	Firm	Little	Slight Jon. spot	Fair after storage	May	Fresh & process
4. Empire	Hangs well	Below medium	90% dark stripe	Very attr.	Firm	Little	None	Excellent	March	Fresh
5. Rome	Sometimes drops	Large	50 to 100% blush or stripe	Attr.	Very firm	Very little	Slight	Less than fair	April*	Fresh & process
6. Cortland	Hangs very well	Large	80% stripe	Attr.	Tender	Medium	Slight	Very good	Feb.*	Fresh
7. Golden Delicious	Little	Small to large	Light yellow, sometimes russet	Green to very attr. yellow	Firm	Very suscep.	None	Fair to excellent	March,* shrivels	Fresh & process
8. Spartan	Severe drop	Below medium	90% dark blush	Very attr.	Semi-firm	Stem punctures	None	Excellent	March*	Fresh
9. Mutsu	Hangs well	Large	Greenish to golden	Medium	Firm	Suscep.	None	Very good	March	Fresh & process
10. R.I. Greening	Sometimes drops	Med. to large	Green	Unattr.	Firm	Medium	Sometimes severe	Less than fair	March	Sauce, slices

*Stores until May or June in controlled atmosphere storage.

TREE

Variety	Harvest date, avg. at Geneva, NY	Size of tree	Tree shape and limb structure	Winter hardiness of tree	Bearing age on seedling roots (yrs)	Productivity	Terminal or spur bearing habit	Annual or biennial bearing	Bloom season	Pollen viability
11. Paulared	Sept. 6	Medium	Upr. spr., drooping	Hardy	4	Heavy	T. & S.	Annual	Mid-season	Good
12. Northern Spy	Oct. 22	Large	Very upright	Hardy	Very late, 10 to 14	Sometimes light	Spur	Often biennial	Late	Good
13. Tydeman Early	Aug. 28	Large	Lanky branches		5	Medium	T. & S.	Annual	Late mid-season	Good
14. Twenty Ounce	Oct. 10	Large	Upright	Collar rot	6	Medium	T. & S.	Mostly annual	Early	Good
15. Macoun	Oct. 5	Medium	Upright	Hardy	5	Medium	Spur	Biennial	Late	Good
16. Jonamac	Sept. 22	Medium	Upr. spr.		5	Heavy	Spur	Annual	Early	Good
17. Jersey mac	Aug. 20	Large	Upr. spr.		5	Medium	T. & S.	Annual	Early	Good
18. Stayman	Nov. 1	Large	Spreading	Tender	4 to 6	Heavy	Spur	Annual	Mid-season	Not viable
19. Monroe	Oct. 10	Medium	Upr. spr., drooping	Somewhat tender	Early, 3 to 6	Usually heavy	T. & S.	Annual	Mid-season	Good
20. Niagara	Sept. 12	Large	Upr. spr.	Medium hardy	6	Medium	T. & S.	Somewhat biennial	Early	Good

FRUIT

Variety	Tendency to drop fruit	Size of fruit	% red, color pattern	Attractiveness	Firmness of flesh texture	Bruise marks	Bitter pit	Eating quality	Approximate storage life at 31 F	Market
11. Paulared	Hangs	Medium to large	90% blush	Attr.	Firm	Little	None	Good	6 weeks	Fresh, roadside
12. Northern Spy	Sometimes drops	Small to large	40 to 90% stripe	Fairly attr.	Firm	Suscep.	Severe	Poor to excellent	April*	Fresh & Process
13. Tydeman Early	Hangs fairly well	Large	90% stripe	Attr.	Semi-firm	Little	Slight	Good	8 weeks	Fresh
14. Twenty Ounce	Medium	Very large	60% stripe	Not attr.	Semi-firm	Some	Little	Fair	Dec.	Process
15. Macoun	Drops	Medium	90% dark stripe	Attr.	Tender	Stem punctures	Slight	Excellent	Feb.*	Fresh
16. Jonamac	Not severe	Medium	90% dark stripe	Attr.	Semi-firm	Some	None	Excellent	Dec.	Fresh
17. Jersey mac	Medium	Above medium	80% blush	Attr.	Soft	Suscep.	None	Good	6 weeks	Fresh
18. Stayman	Hangs	Medium to large	100% blush	Attr.	Firm	Skin cracks	Medium	Good	April*	Fresh & process
19. Monroe	Hangs very well	Medium	100% blush	Medium	Firm	Little	Slight	Good	March	Fresh & process
20. Niagara	Slight drop	Medium large	90% blush	Medium, dots	Semi-firm	Little	Slight	Good	6 weeks	Fresh, roadside

*Stores until May or June in controlled atmosphere storage.

TREE

Variety	Harvest date, avg. at Geneva, NY	Size of tree	Tree shape and limb structure	Winter hardiness of tree	Bearing age on seedling roots (yrs)	Productivity	Terminal or spur bearing habit	Annual or biennial bearing	Bloom season	Pollen viability
Jonagold	Oct. 12	Medium	Upr. spr.		4	Heavy	Spur	Somewhat biennial	Late	Not viable
Holly	Oct. 20	Medium	Upr. spr.		4 to 6	Good	T. & S.	Annual	Mid-season	Good
Melrose	Oct. 20	Large	Upr. spr.		5	Heavy	T. & S.	Somewhat biennial	Late	Good
Spigold	Oct. 15	Very large	Upright	Medium	Late, 7 to 9	Often light	Spur	Biennial	Late	Not viable

FRUIT

Variety	Tendency to drop fruit	Size of fruit	% red, color pattern	Attractiveness	Firmness of flesh texture	Bruise marks	Bitter pit	Eating quality	Approximate storage life at 31 F	Market
Jonagold	Hangs fairly well	Large	80% light stripe	Very attr.	Firm, crisp	Little	None	Excellent	March	Fresh & process
Holly	Hangs	Med. to large	100% red of holly berries	Very attr.	Firm	Little	None	Excellent	March	Fresh
Melrose	Hangs well	Large	80% dull stripe	Medium	Firm	Little	Slight	Excellent	April	Fresh & process
Spigold	Medium	Very large	50% stripe	Good to poor	Firm	Very suscep.	Sometimes severe	Excellent	March	Fresh & process