syringae pv *syringae* van Hall) damage observed. Trees show moderate resistance to plum leaf scald (*Xylella fastidiosa* Wells et al.) based on visual foliage ratings in comparison to other plum cultivars in the same block.

Cropping records are incomplete but some years it has had a heavy fruit set. Fruit are round, 2-3 cm in diameter, red with yellow to yellow-red flesh. Quality is insipid and rated only fair which is typical of most red-leafed stone fruits. Bloom at Byron is in mid-March, later than most of the Japanese plums but similar to 750-850 chill hour peaches such as 'Redglobe.' The flowers, borne in clusters of 2 or 3, are light pink consistent with the red leaf character, rather than white as most plums are. Blooms are about 15 mm diameter, on a 5 mm pedicel, with orange anthers containing moderate amounts of pollen. Leaves are ovate, about 6 cm x 3 cm with a glandular serrate margin (Fig. 1). The deep red leaf color fades to purple-green on mature leaves during the summer as do other redleaf trees. Small quantities of non-virus-indexed budwood are available from W. R. Okie.

### Literature Cited


1. Edwards, J. H., D. W. Reeves, B. D. Horton, and J. M. Thompson. 1985. Influence of Ca concentration on growth, tissue concentration, and nutrient uptake of *in vitro* propagated plums and Lovell seedlings. J. Plant Nutrition 8:327-344.
2. Reeves, D. W., J. H. Edwards, J. M. Thompson, and B. D. Horton. 1985. Influence of Ca concentration on micronutrient imbalances in *in vitro* propagated *Prunus* rootstock. J. Plant Nutrition 8:289-302.


**Fruit Varieties Journal 43(2)59-66 1989**

# Peach Cultivar and Advanced Selection Evaluation in the Medium-Chill Region of Texas

DAVID H. BYRNE AND TERRY A. BACON[1]


## Abstract

In the last century, peach production in Texas has fluctuated with erratic weather and economic conditions, and has expanded from a 6-8 week harvest season in northern Texas to a 20 week harvest period beginning in the Lower Rio Grande Valley and ending in northern Texas. Thirty-one peach cultivars and seven advanced selections were evaluated in a medium chill zone of Texas. Most peach cultivars with a chilling requirement of 700 or more hours below 7.2°C cropped inconsistently and although the fruit is round or oblong in more northern regions, when grown in a medium-chill zone, the fruits have prominent sutures or tips. As compared to more northern zones very few cultivar choices are available for mild-winter regions.


Since the beginning of the century until the 1940's Texas peach production shifted from one major production center in the northeast corner of the state to two major centers of production: one in the northeast and the other center starting near Dallas-Fort Worth and continuing about 100 miles west with the production centered around the Parker-Erath county area (2, 4, 6, 7). During this time peach production was based mainly on the 'Elberta' cultivar and harvest began mid-June and lasted until mid-August.

By the 1950's, a third major production center began to appear: the Hill Country region—an area about about 70 miles northwest of San Antonio. This trend to develop peach orchards further south has continued to the present, with significant production coming from areas south of San Antonio that need peach cultivars that require 650 hours or less of chilling temperatures (2, 4, 6, 7, 8, 9, 10). In the past five years, with the availability of peach cultivars adapted to subtropical conditions (chill requirements <200 chill units, the production of peaches

[1]Assistant professor and research associate, respectively. Department of Horticultural Science, Texas A and M University, College Station, TX 77843-2133.

is being tried in the southern tip of Texas in the Lower Rio Grande Valley. With the development of new cultivars, and the push to produce peaches further south, the peach production has been extended from mid-April to September.

Today, peach production in Texas is based primarily on local retail (pick-your-own, roadside sales) and wholesale (local supermarkets) markets. A small portion is shipped out-of-state; primarily early-season peaches, produced in the Lower Rio Grande Valley. Locally produced peaches are picked closer to maturity and are marketed based on high quality. Texas peach production supplies 20-30% of the peaches consumed in the state. Most of these are produced in orchards of 30 acres or less. As production moves further south, there will be a trend towards the marketing of early-ripening peaches on the wholesale market.

There has been significant activity in Texas with respect to peach cultivar development and evaluation. J. W. Stubenrauch of Mexia was the most prominent private fruit breeder in Texas at the turn of the century—releasing cultivars such as 'Carman' (leading early cultivar in 1920's) and 'Frank' (a parent of 'Loring' and still grown as a late ripening cultivar in Texas) (1). Considerable breeding and selection activity occurred during this period as evidenced by the over one-hundred peach cultivars with origins in Texas listed in Hedrick's (3) *Peaches of New York*.

The first peach varietal trial in Texas was planted in 1899 and the stonefruit breeding program was initiated in 1935 by S. H. Yarnell with the objective of developing commercial yellow-fleshed freestone peaches adapted under mild winter conditions. Since that beginning over 50 years ago, the fruit breeding and evaluation program has expanded considerably. Production of hybrid peach seedlings by fruit breeding program has increased over the past few years and we are now planting 5,000 seedlings each year at College Station. There have been ten peach varietal releases over the years and hundreds of fruit materials evaluated at many different sites. Most of this work is done at five experiment stations (Stephenville, Overton, College Station, Yoakum, and Weslaco) although substantial information is acquired from cooperating commercial orchardists.

The objective of this publication is to summarize peach cultivar and advanced selection evaluation data from College Station and Yoakum for the past 20 years with emphasis on data from 1984-1986.

## Materials and Methods

All trees were spaced 10 feet by 20 feet or wider. Trees were trained to the open center system and pruned annually. The sod strip method of culture was maintained using herbicides under tree rows and mowed grass middles. Nitrogen was applied yearly in early spring before bloom. Insects and diseases were controlled by a spray schedule patterned after recommendations by the Texas Agricultural Extension Service. Fruits were thinned to achieve an approximate four to six inch spacing on a limb.

Bloom data was recorded twice a week, and fruit evaluations were made weekly. Fruit characteristics for each cultivar or advanced selection were assessed in the field when approximately 20 percent of the fruit were mature for harvesting as indicated by a change in ground color and firmness.

All average dates and evaluation parameters are based on data taken at College Station from 1984-1986. Previous data and data from Yoakum Experiment Station agree with these mean scores. Data from previous years were used to determine cropping consistency. Fruit characteristics evaluated include size, firmness, shape, blush, fuzz, appearance, and stone freeness.

All characteristics except stone freeness were rated on a 0-9 scale. This information is summarized in the comments.

### Climate and Cropping

College Station and Yoakum are in zones 4 and 5 respectively (Figure 1). Commercially, in this medium chill region, cultivars ranging from 850 chilling units ('Sentinel') to 450 chilling units ('Flordaking') are grown.

Table 1 summarizes the weather conditions and cropping history from 8 years at the College Station research orchard. Cultivars representative of early ('EarliGrande'), medium-early ('Texstar'), medium-late ('June Gold') and late ('Springold') blooming types are listed with corresponding full bloom (60-80% open flowers) and ripe dates (first ripe) for each year. "Mean Crop Ratings" represents mean crop ratings for all clones in the test for each bloom period. A rating of 5 is considered to be a full crop. A rating greater than 5 is excessive while a rating less than 5 is deficient. Late freezes in 1980 and 1982 affected crop ratings for materials in all bloom period categories. Insufficient chilling in 1986 reduced crop ratings for medium-late and late bloom period materials only. Crop ratings for early bloom period materials were down in 1984 and 1985. Late frosts affected those materials. The medium-early blooming clones had the most consistent production followed by the medium-late and late blooming materials.

Table 2 presents evaluation data from College Station (latitude 30° 40′) on 31 peach cultivars and 7 advanced peach selections by ripe date. Cultivars that bloomed with or before 'Flordaking' had inconsistent production ('EarliGrande,' 'Early Amber,' 'Flordagold,' 'Flordabelle') at College Station and are better adapted further south. Many of the cultivars developed further north with a chilling requirement of 700 or greater, although reported to be round or oblong, when grown in this zone have marginal shape due to prominent sutures or tips. This tendency is exemplified by 'Hamlet,' 'Harbinger,' 'Correll,' 'Candor,' 'Harken,' 'Ranger' and 'Ellerbe.' All of the higher chilling cultivars cropped poorly in 1986 after a mild winter, except for 'Canadian Harmony,' which had a full crop and 'Springold' which had 80% of a full crop. 'June Gold,' a popular 650 chill hour peach in this region, set poorly during this low chill year which indicates it is sensitive to insufficient chill accumulation.

Most of the higher-chilling cultivars are not suitable for this region due to shape, firmness or cropping consistency problems although several ('Sentinel,' 'Harvester') are still grown commercially due to the lack of better cultivars. 'Canadian Harmony,' given its tolerance to mild winters, may be suitable. Clones which require between 450 and 650 chilling units are generally well adapted in this region. The earliest maturing of these is 'Flordaking,' which is best adapted to Zone 5. Although fruit size is large, 'Flordaking' lacks in color and the shape is marginal. There is a two-week gap after 'Flordaking' until 'June Gold' and 'Texstar' begin to ripen. 'June Gold' is in the parentage of 'Flordaking' and shares the excellent sizing ability but also the poor shape and color. 'June Gold' has been losing favor in this area due to its tendency for split and shattered pits, low yields, and sensitivity to mild winters. 'Texstar' is a lower chilling cultivar which ripens with 'June Gold.' The 'Texstar' fruit is smaller than 'June Gold' but better shaped, and not known for split pits. 'Texstar' flowers are frost tolerant and trees are better adapted to this region. Two advanced selections, Y18-51 and Y18-48 have potential in this season due to their better adaptation, shape, and attractiveness when compared to 'June Gold.' 'Idlewild' and Y19-51 ripen between 'June

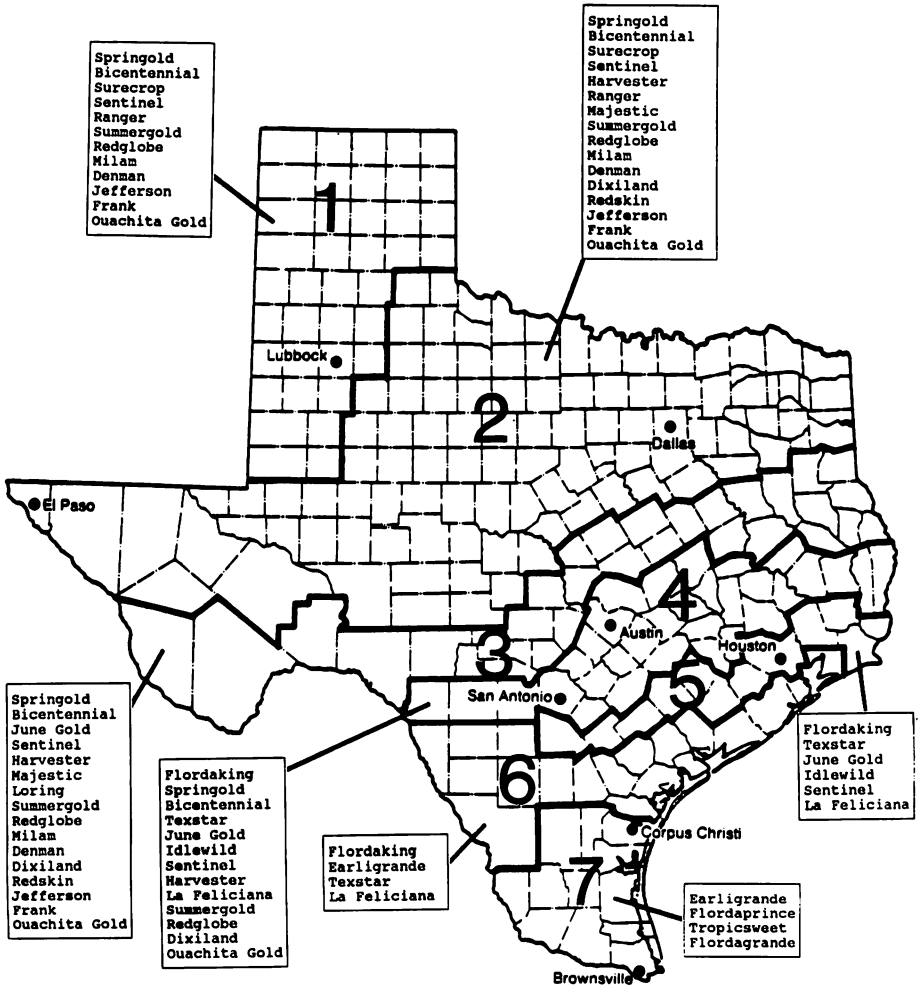


**Figure 1. Major commercial peach cultivars grown in Texas chilling zones 1-7.**

**Table 1. Weather summary and peach cropping history of College Station peach orchards (1979-1986).**

| Harvest year | Chilling hours[1] | Late frost[2] | Full bloom (B) and ripe dates (R) for selected varieties | | | | Average crop ratings all varieties/selections by bloom period[3, 4] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | EarliGrande | Texstar | June Gold | Springold | Early | Medium Early | Medium Late | Late |
| 1979 | 1144 | Frosts: 2/16-2/18 | B: 3/07<br>R: 5/15 | B: 3/11<br>R: 5/30 | B: 3/19<br>R: 5/30 | B: 3/19<br>R: 5/14 | 6 | 6 | 4 | 3 |
| 1980 | 683 | Hard Freeze: 2/16, 2/17 3/01, 3/02 | B: 1/23<br>R: No Crop | B: 2/27<br>R: No Crop | B: 3/08<br>R: No Crop | B: 3/09<br>R: No Crop | 0 | 0 | 0 | 0 |
| 1981 | 693 | Hard Freeze: 2/10-2/12 | B: No Data<br>R: 5/11 | B: 2/26<br>R:5/28 | B: No Data<br>R: 6/04 | B: No Data<br>R: 5/14 | 5 | 6 | 5 | 7 |
| 1982 | 713 | Light Freeze: 3/07 | B: No Data<br>R: 5/11 | B: 3/08<br>R: 5/25 | B: 3/17<br>R: 5/24 | B: 3/18<br>R: No Crop | 3 | 3 | 3 | 3 |
| 1983 | 815 | No Freezes | B: 2/16<br>R: 5/20 | B: 3/11<br>R: 6/13 | B: 3/19<br>R: 6/11 | B: 3/17<br>R: 5/25 | 8 | 5 | 6 | 5 |
| 1984 | 813 | Frosts: 2/29, 3/01 | B: 2/18<br>R: 5/15 | B: 2/28<br>R: 5/22 | B: 3/04<br>R: 5/26 | B: 3/07<br>R: 5/09 | 1 | 4 | 4 | 5 |
| 1985 | 950 | Frosts: 2/11, 1/12 | B: 1/27<br>R: 5/09 | B: 3/08<br>R: 5/22 | B: 3/13<br>R: 5/22 | B: 3/18<br>R: 5/12 | 2 | 4 | 4 | 4 |
| 1986 | 576 | Frosts: 3/01 | B: 2/02<br>R: 4/29 | B: 2/17<br>R: 5/07 | B: 2/24<br>R: 5/13 | B: 3/11<br>R: 5/06 | 4 | 4 | 2 | 3 |

[1]Below 45°F (7.2°C) (from min./max. temps: Costello, L. R., 1984. California Agriculture, Mar.-Apr.).
[2]Frosts, 32°F (0°C) to 27°F (-2.8°C); hard freeze, 26°F (-3.3°C) or less.
[3]0 = No crop, 5 = Full crop, 9 = Excessive crop.
[4]Based on average bloom period for 1984-86: Early = before 2/17; Medium early = 1/18-3/03; Medium late = 3/04-3/10; Late = 3/11-3/18.

**Table 2. Chilling requirement, bloom date, ripe date, fruit development period (FDP) and comments on the performance of peaches evaluated at College Station, Texas.**

| Name | Chilling requirement | Full bloom[2] | Ripe date[3] | FDP[4] (days) | Comments |
|---|---|---|---|---|---|
| Flordaking | 450 | 2/20 | 5/06 | 76 | Good size, marginal shape, low blush, inconsistent production. |
| Camden | 750 | 3/09 | 5/07 | 59 | High blush, small splits, soft tip and suture, red in flesh, cleft suture. |
| EarliGrande | 200 | 2/05 | 5/08 | 92 | Excellent size & shape, low color, inconsistent cropper. |
| Springold | 850 | 3/12 | 5/09 | 58 | Small, need to thin early, high blush, tends to have tip. |
| Early Amber | 350 | 2/17 | 5/11 | 83 | Good shape with suture, 50% blush, green ground color, soft, unattractive. |
| Hamlet | 900 | 3/14 | 5/13 | 60 | Small, poor shape, soft tip & suture, splits, high blush. |
| Harbinger | 850 | 3/11 | 5/13 | 63 | Small, poor shape, soft tip, high blush, splits. |
| Bicentennial | 700 | 3/05 | 5/14 | 70 | Good size, green ground color, softens quickly, marginal shape. |
| Y18-51 | 550 | 2/27 | 5/15 | 77 | Attractive blush, moderate size and shape. |
| Correll | 850 | 3/12 | 5/18 | 67 | Small, prominent shoulder, poor shape. |
| Y18-48 | 550 | 2/26 | 5/19 | 82 | Good size, 60% blush, some splits, moderately attractive. |
| Texstar | 550 | 2/27 | 5/19 | 81 | Moderate size, shape and color, no splits, frost tolerant, difficult to thin. |
| Candor | 850 | 3/16 | 5/19 | 64 | Poor shape, good blush, splits. |
| June Gold | 650 | 3/04 | 5/20 | 77 | Excellent size, low blush, marginal shape, splits if low crop. |
| Y19-51 | 500 | 2/25 | 5/25 | 86 | Good size, attractive, some red in flesh. |
| Idlewild | 600 | 3/02 | 5/28 | 87 | 70% blush, good size & shape, attractive, red in flesh. |
| Flordagold | 450 | 2/19 | 5/30 | 100 | Inconsistent cropper, 50% blush. |
| Sentinel | 850 | 3/10 | 6/03 | 85 | Marginal shape, 70% blush, large, softens quickly. |
| M3-112 | 800 | 3/15 | 6/05 | 84 | Large attractive peach, good shape, semi-freestone. |
| M6-5 | 750 | 3/06 | 6/06 | 92 | Good size, 70% blush, firm, clingstone. |
| RioGrande | 450 | 2/25 | 6/08 | 103 | Excellent size, poor shape, green ground color, 50% blush. |
| Y5-64 | 500 | 2/25 | 6/10 | 105 | Good size, freestone, 60% blush. |

**Table 2. Continued.**

| Name | Chilling requirement | Full bloom[2] | Ripe date[3] | FDP[4] (days) | Comments |
|---|---|---|---|---|---|
| Harvester | 750 | 3/13 | 6/11 | 90 | Moderate size & shape, cleft suture, 70% blush. |
| Coronet | 700 | 3/07 | 6/12 | 97 | Inconsistent cropper, marginal shape but good blush. |
| Harken | 850 | 3/08 | 6/12 | 96 | Poor shape, poor cropper, 70% blush. |
| Y7-97 | 650 | 3/04 | 6/13 | 106 | Large, 60% blush. |
| Ranger | 900 | 3/15 | 6/16 | 93 | Marginal shape, 60% blush, soft, good size. |
| Flordabelle | 150 | 2/01 | 6/17 | 136 | Inconsistent cropper, excellent shape, 60% blush. |
| Suwanee | 650 | 3/10 | 6/20 | 102 | 80% blush, good shape, excellent size, attractive. |
| Loring | 800 | 3/09 | 6/22 | 105 | Low crops, large, low blush, cleft suture. |
| Ellerbe | 850 | 3/13 | 6/24 | 103 | Good color, prominent suture, cleft suture, moderate size. |
| Harmony | 800 | 3/14 | 6/24 | 102 | Large, moderate shape, 70% blush, attractive, set well in low chill year. |
| La Festival | 450 | 3/03 | 6/25 | 114 | Large, round, 70% blush, freestone, heavy fuzz. |
| Winblo | 800 | 3/14 | 6/27 | 105 | Firm, semi-freestone, good shape. |
| La Feliciana | 550 | 3/07 | 6/29 | 114 | Prominent suture, large, green ground color, 60% blush. |
| Redglobe | 850 | 3/15 | 7/02 | 109 | Prominent suture, 70% blush, freestone, buttons in frost years. |
| Denman | 750 | 3/14 | 7/04 | 112 | Good sized freestone with moderate shape, 60% blush, frost tolerant. |
| Dixiland | 750 | 3/18 | 7/16 | 120 | Moderately attractive, large freestone. |

1. Chill hours below 45°F.
2. 60-80% of flowers open.
3. Date of first ripe, approximately 20% of peaches ripe.
4. "Fruit Development Period" from full bloom to ripe date.

Gold' and 'Sentinel.' They are comparable in size, shape, and attractiveness and Y19-51 requires about 100 less chilling units for good fruiting. Ripening along with 'Sentinel' (which fruits poorly due to insufficient chilling some years) are M3-112 and M6-5, which have lower chilling requirements. 'Harvester' is recommended for zone 4 but some years it will crop poorly due to insufficient chilling temperatures. Y5-64, Y7-97, and 'RioGrande' are better adapted and size well but their attractiveness is at best equal to 'Harvester.' 'RioGrande' and Y5-64 appear dull due to a green ground color. The last part of the season ('Loring' season or later) can be filled with 'Suwanee,' 'La Festival,' and 'La Feliciana.' All three size well and crop more consistently than 'Loring.' 'Suwanee' is an attractive freestone peach, but has been reported to

be susceptible to bacterial leaf spot (*Xanthomonas campetris* pv *pruni*) (5). 'La Festival' is round and freestone, but has high pubescence. 'La Feliciana,' the latest ripening commercial peach for these zones, tends to have a prominent suture and a slight green ground color.

### Literature Cited


1. Brison, F. R. 1976. Texas, p. 128-135. In: Upshall, W. H. (ed.). History of fruit growing and handling in United States of America and Canada. 1860-1972. American Pomological Society, Regatta City Press, Kelowna, B.C. Canada.
2. Gould, H. P. and F. Andrews. 1919. Peaches: Production estimates and important commercial districts and varieties. USDA Bul. No. 806.
3. Hedrick, U. P. 1911. The plums of New York. New York (Geneva) Agr. Expt. Sta. Rpt. 1910.
4. McMunn, R. L. and R. A. Kelley. 1943. An analysis of the peach industry, 1920 to 1940. Trans. Illinois State Hort. Soc. 77:99-200.
5. Ridley, J. D., D. W. Cain and W. C. Newall. 1986. Evaluation of selected peach cultivars for South Carolina. S. C. Coop. Serv. Cir. 574.
6. Sherman, W. A., H. F. Walker and L. H. Martin. 1915. Peach supply and distribution in 1914. USDA Bul. No. 298.
7. Sorenson, H. B. and G. R. Powell. 1965. Texas fruit and nut production statistics, 1949 and 1959. Texas A&M Univ. and Texas Agric. Ext. Serv. MP-736.
8. Texas Crop and Livestock Reporting Service. 1969. 1968 Texas fruit and pecan statistics. Texas Dept. Agric., USDA Bul. 51.
9. Texas Crop and Livestock Reporting Service. 1980. 1979 Texas fruit and pecan statistics. Texas Dept. Agric., USDA.
10. Texas Crop and Livestock Reporting Service. 1985. 1984 Texas fruit and pecan statistics. Texas Dept. Agric., USDA. Bul. 227.


## New Early-Fruiting Apple Variety, 'Empress'

Geneva, N.Y.—A new apple variety that has a pedigree dating back more than two and one-half centuries was named by the New York State Fruit Testing Cooperative Association Inc. at Cornell University's NYS Agricultural Experiment Station.

'Empress' is very similar in appearance and some characteristics to 'Empire.' The big difference is that 'Empress' ripens a month earlier than 'Empire,' an important facet of apple marketing in New York State.

Way and support specialist Kenneth Livermore have been working on 'Empress' for two decades. The original cross was made by Dr. Frederic Hough at Rutgers University in New Jersey in 1969. Seedlings were sent to the Geneva Experiment Station, and some were planted both in Geneva and in New Jersey.

The new seedling was designated "NY 651." Trees began Fruiting four years after propagation and for the past five years, both tree and fruit characteristics have been carefully scrutinized.

"Our observations lead us to believe that this variety will gain good acceptance," Way says. "It has an attractive red color and when left on the tree until maturity reaches about 90 percent redness. In some cases, the apple becomes completely red." He adds that its size (about 2 and 7/8 inches) and it shape resemble the 'Empire.'

"It has an excellent eating quality, with a good balance of sugars, acids and tannins that produce a highly flavorful aroma," Way says.

The parents of 'Empress' are the 'Jonamac,' introduced at the Station in 1972, and a New Jersey-bred apple, the 'Vista Bella.' 'Jonamac' is the result of a cross of 'MacIntosh' and 'Jonathan.'

Unlike many varieties that produce well every other year, the 'Empress' is an annual cropper with consistently good yield. And," Way adds, "the apple is the product of a relatively small tree, enabling growers to plant more trees per acre, thus increasing profits."