Caneberries

A Summary of Research Progress, 1980

North Willamette Agricultural Experiment Station

Special Report 594
July 1980
Agricultural Experiment Station
Oregon State University, Corvallis

ACKNOWLEDGMENTS

We thank those companies and their representatives who have donated materials, equipment, and plants to our research program. We extend special thanks to those growers who are providing field plots and assisting in special experimental treatments and observations.

Program Support and Cooperation

Bischof Farms, Inc.: 'Munger' black raspberry plants
Bob Conroy, Conroy Packing House, Woodburn: Plant storage
Ed Day, Grower, West Linn: Black raspberry plants
Dan Doty, Sandy Farms, Sandy: Red raspberry nutrition and fruit quality plot management
Ed Duyck, Grower, Cornelius: OR-US 1600 test site
Jim Evans, Grower, Beavercreek: Black raspberry nutrition and fruit quality test site
Jim Fujii, Fujii Farms: 'Evergreen' blackberry plants
Jim Griesenauer, Grower, Salem: OR-US 1600 test site
Phil Hawman, Grower, Dundee: Tissue culture 'Boysen' test site
Gordon Hedman, Wilbur-Ellis: Kocide 101
Bob Hoffman, Grower, Beavercreek: Black raspberry plants
Walt Kahle, J. M. Smucker Co., Woodburn: Selection of black raspberry clones
Dean Katterheinrich, J. M. Smucker Co., Woodburn: Red and black raspberry plants
Pete Konovalov, North Marion Fruit Company, Woodburn: OR-US 1600 test site
Ray Kuenzi, Grower, Silverton: Marion blackberry spray material test site; OR-US 1600 test site
Gene Littau, Littau Harvesters, Stayton: Use of caneberry harvester
Jim Love, Grower, Forest Grove: OR-US 1600 test site
Clyde Lowrie, Grower, Gervais: Marion blackberry spray timing and spray frequency test sites
Norbert May, Grower, Salem: OR-US 1600 test site; tissue cultured 'Boysen' test site
Norm McKinley, Dupont: Benlate
Rich Menconi, Grower, Oregon City: Black raspberry plants
Wes Moehnke, Grower, Beavercreek: Black raspberry plants
Northwest Regional Commission: Grant for planting stock improvement
Oregon Caneberry Growers: Salary support for research assistant
Sherman Reed, Chevron (Ortho) Chemical Co.: Orthocop
Ron Roberts, Grower, Boring: Red raspberry fruit quality observation site
John Rowell, Grower, Sandy: Red raspberry nutrition and fruit quality test site
Bob Sleight, Grower, Mulino: Black raspberry plants
Stefan Tipikin, Grower, Woodburn: Marion blackberry spray frequency test site

Glen Tuttle, Grower, Boring: Evergreen blackberry nutrition and fruit quality test site

Bill VanBuren, Grower, Portland: OR-US 1600 test site; 'Youngberry' donation

Bill Vollmer, Lilly-Miller: Microcop

Jack Warren and Carl Joplin, Mobay Chemical Corp: Dyrene

Leo Wiedeman, Webfoot Fertilizer: Custom fertilizer for potassium studies

Numerous growers who have identified and donated 'Boysenberry' clones

CANEBERRIES - A Summary of Research Progress, 1980

Foreword

Caneberry growers are in a continual struggle to maximize their production output and minimize their expenses. Our caneberry research program is mainly a reflection of these concerns - improved cultivars, more precise fertilizer recommendations, better pest control, in general a more efficient and productive cultural system.

Although research progress is often thought of in terms of major breakthroughs, it is more accurately an aggregate of many smaller advances - "nuts and bolts" that are needed to keep an industry viable.

This report has been prepared to acquaint you with our work and help you assess our efforts. The North Willamette Experiment Station with its many cooperators, and supporters in industry, is working hard not only to maintain the caneberry industry, but to improve it. When you read the summaries that follow, we hope you will agree.

Lloyd W. Martin, Superintendent
North Willamette Experiment Station

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I N D E X

ESTABLISHMENT AND MANAGEMENT OF 'BOYSENBERRY'

Lloyd W. Martin, Superintendent
North Willamette Experiment Station

Purpose: To compare the effect of 1) alternate year (AY) and every year (EY) cropping and 2) March and August training on 'Boysenberry' yield and berry size under drip and sprinkle irrigation; to compare production of virus-free and field-run plants, standard thorny clone and Thornfew clone (a select clone with few thorns), plants spaced 3 feet and 6 feet in the row, plants propagated in 6-inch and 2-inch pots

Treatments: Cropping and training: EY spring, EY summer, AY spring, and AY summer

Virus: Virus-free and field-run
Clones: Standard thorny and Thornfew
Spacing: 3-foot and 6-foot
Pot size: 6-inch and 2-inch

Progress: This project was completed in 1979. The published report, Establishment and Management of 'Boysenberries' in Western Oregon, Agricultural Experiment Station Circular of Information 677, is available to growers through county Extension agents and Agricultural Experiment Station, Oregon State University, Corvallis, OR 97331.

'BOYSENBERRY' CLONAL EVALUATION

Lloyd W. Martin, Superintendent
North Willamette Experiment Station

Purpose: To identify superior 'Boysenberry' clones for propagation and release to growers

Treatments: Fifty-seven virus-free 'Boysenberry' clones were supplied by R. H. Converse (USDA-SEA), OSU, and 47 'Boysenberry' clones were identified by Oregon growers. 'Boysenberries' from California and New Zealand were included, as well as the 'Tay' berry from Scotland.

Progress: In 1979, the first full crop year, differences among clones were apparent. Individual clones produced from 1.36 T/A to 4.63 T/A. The average production was 3.39 T/A, or twice the average Oregon yield of 1.70 T/A. Clones which produced well in 1978 generally produced well in 1979. Berry size from 1978 and 1979 also was correlated significantly.

There was a strong correlation between fruit size and seed weight and number. However, the proportion of seed varied in berries of similar weight. This suggests the possibility of identifying a clone with large berries with a relatively small proportion of seed.

The preliminary data suggest consistency of clonal performance. Past performance, number of canes, cane vigor, and regularity of fruit set have been the most reliable indicators of better clones. Data collection continues and will include clones from grower fields in 1980.

'BOYSENBERRY' PROPAGATION BY STEM CUTTING

Esther Nelson, Research Assistant
North Willamette Experiment Station

Purpose: To determine the best time for taking 'Boysenberry' cuttings; to compare performance of cuttings rooted at different times and grown in two container sizes before field setting

Treatments: Cuttings taken in June, July, August, September, and October and grown out in 2-inch or 6-inch pots

Progress: Clones were selected and cuttings taken June, July, August, September, October 1979. Each clone was tipped in September 1980. Rooted cuttings were potted in 2-inch or 6-inch pots and held for planting in 1980. Evaluation of field performance will indicate if differences persist and if these differences affect yield.

At the time of field planting, 'Boysens' propagated at different times and in different containers had markedly different root systems and top growth.

'BOYSENBERRY' TRAINING OBSERVATIONS

Esther Nelson, Research Assistant
North Willamette Experiment Station

Purpose: To compare performance of 'Boysenberries' completely trained in summer, trained to the first wire in summer and second wire in spring, trained completely in spring

Treatments: Summer training, spring training, and half summer - half spring training

Progress: Plants have been trained according to schedule. Summer training was completed August 1979. Spring training was completed February 1980.

Yield data will be taken in 1980.

GREENHOUSE MANAGEMENT OF TISSUE CULTURED 'BOYSENBERRY'

Esther Nelson and Peter Pelofske, Research Assistants
North Willamette Experiment Station

Purpose: To evaluate media and containers for producing field-ready stock from tissue cultured plantlets

Treatments: Five container types (plastic pots, peat pots, seedling tubes, styrofoam cubes, and peat pellets) and five media (peat-perlite, vermiculite, soil mix, peat pellet, and fine bark)

Progress: The most successful medium for establishment of tissue cultured 'Boysens' was a mix containing equal volumes of peat, perlite, and sterilized soil plus fertilizers. Plantlets rooted in soil mix in styrofoam cubes and peat pots were suitable for transplanting to gallon cans in less than 6 weeks; plantlets rooted in soil in plastic pots were ready one week later. Peat-perlite mix in peat pots or plastic pots was slightly less successful.

The most successful treatments produced plants suitable for field setting in approximately three months from time of transfer from culture jars.

Seedling tubes were unsuccessful with all media. Styrofoam cubes were unsuccessful with all media but soil. Vermiculite and bark were not satisfactory media.

NITROGEN AND BORON FERTILIZATION OF 'WILLAMETTE' RED RASPBERRY

Michael H. Chaplin, Associate Professor
Department of Horticulture, OSU

Purpose: To determine the most beneficial rates of N and B application, the relationship between fertilizer rate and levels of various elements in leaf tissue, and the value of leaf versus petiole analysis as an indicator of nutritional status

Treatments: Nitrogen at 0, 60, and 120 lb/A with Boron at 0 or 2 lb/A

Progress: This project was completed in 1979. Major findings included the following:

1. Leaf samples were better than petiole samples for nutrient analysis.

2. Applied N increased leaf N.

3. Applied B increased leaf B.

4. Applied N reduced leaf B.

5. Yields were statistically similar with 0, 60, and 120 lb N/A, but 60 lb N/A consistently produced numerically greater yields.

6. Leaf tissue from 0 lb N/A plots was not N-deficient and yields from those plots were not depressed. Standard values for leaf N and N fertilizer recommendations may need to be reduced.

7. Leaf tissue from 2 lb B/A plots was not above the normal range, but yields from those plots were depressed in two years. Standard values for leaf B and B fertilization recommendations may need to be reduced.

8. Increase in applied N was correlated with increase in fruit size and cane diameter, but not with yield or cane number.

Further information on this project is available:

"Raspberry Nitrogen and Boron Nutrition - Leaf Analysis and Yield Effects", Lloyd W. Martin and Esther Nelson, Proceedings 1980 Western WAshington Horticultural Association, pp. 143-146.

TRAINING AND FERTILITY IN 'MEEKER' RED RASPBERRY

Lloyd W. Martin, Superintendent
North Willamette Experiment Station

Purpose: To identify relationships among N rate, cane length, and productivity

Treatments: Canes pruned to 5 feet, 6 feet, and 7 feet and supplied 0 lb N/A or 60 lb N/A

Progress: Fertilized plots produced a greater yield than did unfertilized plots similarly pruned. Canes pruned to 6 feet and 7 feet produced greater yield than canes pruned to 5 feet. Shortest canes produced the largest berries. Number of canes was unaltered by either pruning or fertilizer treatment. Pruning height and N rate affected cane diameter and bud number, but the differences in cane characteristics had no significant relationship to yield.

RED RASPBERRY SEEDLING AND SELECTION EVALUATION

Francis J. Lawrence, Horticulturist
USDA-SEA, OSU

Purpose: To evaluate red raspberry seedlings from the OR-US breeding program; to evaluate advanced red raspberry selections from British Columbia, Washington State University, and OR-US breeding programs

Treatments: Fifteen hundred seedlings grown individually in the field and evaluated for two years; 150 selected plants propagated from root cuttings of seedlings, grown in blocks, and evaluated for three to six years.

Progress: Seedlings are bred under controlled conditions and grown in a greenhouse until field setting. The plants are evaluated primarily for vigor, fruit quality, and productivity. Those seedlings deemed superior are selected for planting in blocks where they are further evaluated and compared. Approximately 1,500 seedlings and 100 to 150 selections are under consideration.

Two selections are under special consideration for mechanical harvest.

In addition to summer-bearing selections, there are 10 to 12 primocane-fruiting (fall-bearing) selections. Several have good fruit qualities and ripen in August. Other promising primocane-fruiting selections will be added to the trial block.

CULTIVAR TESTING FOR MECHANICAL HARVEST OF RED RASPBERRY

Lloyd W. Martin, Superintendent
North Willamette Experiment Station

Purpose: To evaluate red raspberry cultivars and selections for mechanical harvest

Treatments: Red raspberry cultivars Nootka, Willamette, Meeker, OR-US 1950, OR-US 1780, Skeena, and Chilcotin are planted in replicated 30-meter plots

Progress: Raspberries have been trained to 5-foot trellises. Those with sufficient growth will be mechanically harvested in 1980. Cultivars will be evaluated for yield and fruit quality. Mechanically harvested fruit will be compared to hand harvested fruit as plant material permits.

'MEEKER' SPACING AND TRAINING FOR MECHANICAL HARVEST

Lloyd W. Martin, Superintendent
North Willamette Experiment Station

Purpose: To evaluate two in-row spacings, two between-row spacings, and three training systems for maximizing yield, fruit quality, and economics of production.

Treatments: In-row plant spacing 18 inches and 30 inches; between-row spacing 10 feet and combinations of 5 feet and 10 feet; training canes by tying to wire in upright bundles, by weaving to wire individually, and by looping bundles and tying bundles to wire

Progress: A 1.3 acre planting has been established at North Willamette Experiment Station. Baby crop yield will be evaluated summer 1981.

QUALITY OF MECHANICALLY HARVESTED RED RASPBERRY (OFF STATION)

Megan Hughes, Agent, Multnomah County Extension Service, and
Esther Nelson, Research Assistant
North Willamette Experiment Station

Purpose: To compare fruit quality in lots of red raspberry hand harvested and machine harvested

Treatments: Hand harvested plot; mechanically harvested plot, low pressure; mechanically harvested plot, medium pressure; mechanically harvested plot, high pressure

Evaluations early season (6/28), midseason (7/6), and late season (7/17)

Progress: The plot was not designed for statistical analysis. Numerical results indicate trends only.

1. Fruit injury increased with increasing harvester pressure.

2. Percent soluble solids was similar for all treatments on a single harvest date. Percent soluble solids varied from 12 to 9 on three dates.

3. Imperfections in fruit increased over the season with all harvest methods.

4. Imperfections increased with increasing harvester pressure.

5. Collapsed drupelets was the major imperfection in the high pressure plot; overripeness was the major imperfection in all other plots.

BLACK RASPBERRY CULTIVAR TRIAL

Esther Nelson, Research Assistant
North Willamette Experiment Station

Purpose: To evaluate the performance of eight black raspberry cultivars in terms of yield, berry size, suitability for mechanical harvest, and berry characteristics

Treatments: Black raspberry cultivars Allen, Alleghany, Logan, Huron, Black Hawk, Cumberland, Bristol, and Munger (standard)

Progress: Plants were set in spring 1979 and evaluated for vigor in September 1979. Vigor ratings (1-5) were based primarily on plant size--cane number, cane length, amount of foliage. 'Munger', the standard, distinguished itself as being superior; however, it was the only cv. dug and planted on the same day. Other cvs. were dug, shipped, and held in cold storage before planting. Of the remaining seven cvs., Bristol performed best. Meaningful harvest data will not be available until 1981.

BLACK RASPBERRY STOCK IMPROVEMENT

Esther Nelson, Research Assistant
North Willamette Experiment Station

Purpose: To identify superior stock; to compare various methods of vegetative propagation

Treatments: Identification of superior commercial fields and propagation of plants by stem cutting for field comparisons; identification of superior, medium, and inferior clones at North Willamette Experiment Station and propagation of each from tips and tissue cultured plantlets for later field comparisons

Progress: Plants from seven commercial fields have been propagated by stem cuttings. Superior, medium, and inferior clones have been identified and propagated by tipping in the field, rooting stem cuttings, and tissue culturing. The plants are being grown out to comparable physiological stage for field comparisons.

SPACING AND TRAINING FOR MECHANICAL HARVEST OF ALTERNATE YEAR 'MARION' BLACKBERRY

Lloyd W. Martin, Superintendent
North Willamette Experiment Station

Purpose: To identify plant spacing and training procedures to maximize yield of mechanically harvested AY plots

Treatments: Spacing at 0.5 meter, 1.0 meter, and 1.5 meter (approximately 1½ feet, 3 feet, and 4½ feet) and training during the season on wires at 1½ feet, 3 feet, 4½ feet, and 6 feet

Progress: Plots were trained in 1979 for 1980 harvest. Plants spaced 0.5 meter apart required 267 hours per acre training time; plants 1.0 meter apart, 217 hours per acre; plants 1.5 meter 189 hours per acre. Most training time was required in early August. Harvest data will be taken in 1980.

Plots for 1981 harvest will be trained in 1980.

'MARION' BLACKBERRY LEAF AND CANE SPOT FUNGICIDE SPRAY TRIAL

Iain C. MacSwan, Extension Plant Pathologist, and
Edward K. Vaughan, Professor Emeritus
Department of Botany and Plant Pathology, OSU

Purpose: To evaluate the effectiveness of several spray materials in controlling Septoria leaf and cane spot infection in 'Marion' blackberry

Treatments: Bordeaux, tribasic copper sulfate, Kocide 101, lime sulfur, polysulfide, Cyprex, Bravo at recommended rates, and an untreated check

Progress: Treatment plots were inoculated with Septoria rubi spores in 1978 and sprayed with appropriate fungicides in April and May 1978. Treatments were applied again October 1979 and April 1980. Fungicide treatments will be evaluated in 1980.

Samples from untreated check plots are taken weekly for evaluation.

LEAF AND CANE SPOT IN 'MARION' BLACKBERRY (OFF STATION)

Esther Nelson, Research Assistant
North Willamette Experiment Station

Preliminary evaluation of test plots (through October 1979) is published in 1980 Oregon Horticultural Society Proceedings.

1. Spray timing

Purpose: To evaluate three fungicide spray schedules for effectiveness in controlling leaf and cane spot infection of new cane growth where 'Marion' blackberries have been cut off

Treatments: Four copper sprays plus fall spray: 1) sprays concentrated in spring, 2) sprays spread throughout the growing season, or 3) sprays concentrated in late summer/fall

Progress: When canes were sprayed primarily in spring, the bases remained relatively clean and infection was concentrated in the terminal portions of the cane. When canes were sprayed in fall primarily, the unsprayed bases were most infected. The terminal is the least productive area of the cane, susceptible to cold injury and often pruned. Disease at the cane base is more serious since it can girdle and lead to loss of the entire cane. It appears that copper was effective in curbing disease, that spring sprays were most critical, and that spray throughout the growing season was beneficial.

2. Fungicide materials

Purpose: To gain experience with and to evaluate the usefulness of Dyrene and Benlate

Treatments: Application of materials May 1, June 1, July 1, September 1: Kocide 101, Benlate, Dyrene; untreated check area; dinitro treated area in each fungicide block

Progress: Dyrene, Benlate, and Kocide were applied in adjacent plots. An area was left untreated. All the fungicide materials provided some protection from leaf and cane spot. An untreated check area developed significantly more disease. Benlate appeared to provide best control. Because of resistance problems associated with Benlate, it is not recommended for use for leaf and cane spot until further testing is completed.

3. Frequency of fungicide application

Purpose: To compare the effectiveness of a standard spray program (three copper sprays) with an intensified spray program (five copper sprays) each with and without early season dinitro general burnback of new growth

Treatments: Three copper sprays, dinitro burnback before three copper sprays, five copper sprays, dinitro burnback before five copper sprays

Progress: Plots were sprayed either three (April, May, October) or five (April, May, June, July, October) times. Those sprayed three times had markedly more disease than those sprayed five times. Terminals in all plots were similar, but bases and mid-sections of canes with additional sprays were cleaner. Additional copper appears to have provided additional protection and time of application appears to correspond to area of the cane

protected. There is some indication that burning back the new canes ½ foot - 1 foot tall with dinitro general may provide some protection by delaying regrowth past a time of active spring infection without significantly reducing the number of bearing canes.

'MARION' BLACKBERRY DISEASE INOCULATION

Iain C. MacSwan, Tim Gottwald, Jeff Britt,
Extension Plant Pathology, OSU, and
Esther Nelson, Research Assistant
North Willamette Experiment Station

Purpose: To isolate disease organisms which commonly infect 'Marion' blackberry and to observe the response of plants inoculated with each organism

Treatments: 'Marion' blackberries in gallon cans inoculated with Septoria rubi (cane), Septoria rubi (leaf), Elsinoe veneta, Phoma (sp), Diplodia rubi, Leptosphaeria coniothyrium, and agar check

Progress: Spores from 'Marion' canes sampled May through December 1979 were identified and incubated at OSU Plant Clinic. Each organism was introduced into 10 actively grown 'Marions' at North Willamette Experiment Station greenhouses December 1979. Plant Clinic personnel are evaluating disease symptoms.

BLACKBERRY SELECTION EVALUATION: OR-US 1600, 1717, 1050

Francis J. Lawrence, Horticulturist
USDA-SEA, OSU

Purpose: To evaluate performance of three blackberry varieties on the basis of growth characteristics, disease resistance, hardiness, berry quality, and productivity

Treatments: OR-US 1717 (thornless), OR-US 1600 (thornless), OR-US 1050 in observational trials at the Station

Progress: OR-US 1050 has undergone considerable distribution and evaluation in grower fields. The berry is considered excellent; the canes, however, are objectionably thorny. In spring 1980, the plants exhibited a moderate amount of disease and little cold injury. The plants appear to be able to tolerate moderate disease and considerable cold.

OR-US 1600 is particularly attractive for its thornless cane. In spring 1980, the plants exhibited a moderate amount of disease and cold injury. In 1979, by comparison, the plants showed almost no disease or cold injury.

OR-US 1717 is also attractive for its thornlessness. It did not perform as well as OR-US 1600. In spring 1980, the plants showed some disease and considerable cold injury. Plants were less vigorous than 1600 and 1050.

OR-US 1600 BLACKBERRY EVALUATION (OFF STATION)

Francis J. Lawrence, Horticulturist
USDA-SEA, OSu

Purpose: To evaluate the performance of OR-US 1600 blackberry under a variety of conditions

Treatments: Placement of 10 plants with each of seven growers

Progress: The OR-US 1600 thornless blackberry, developed through the OSU breeding and selection program, has exhibited a number of desirable characteristics. In comparison with standard varieties and other test varieties, the OR-US 1600 has shown some tolerance to winter injury and disease problems. The experimental plants, tipped in 1978 and grown out in gallon cans in a screen house, were established throughout the 1979 season under different field conditions. In fall 1979, plants ranged from small (few canes of 3 to 3½ feet) to vigorous (several canes of 6 to 10 feet). Plants appeared disease-free and, according to growers, were easy to manage. In 1980, growers will evaluate fruit as well as vegetative growth.

'EVERGREEN' PRIMOCANE PRUNING

Esther Nelson, Research Assistant
North Willamette Experiment Station

Purpose: To evaluate the practice of pruning primocanes in the planting year to produce more canes and greater yield in the baby crop year

Treatments: 'Evergreens' unpruned, cut to 18 inches in May, cut to 18 inches in June, cut to 18 inches in July

Progress: Plants set in fall 1979 were completely cut back. Developing primocanes were pruned on appropriate dates. Canes will be summer trained. Canes will be counted fall 1980 and yield data taken in 1981.

EFFECTS OF POTASSIUM ON CANEBERRY FRUIT QUALITY

Lloyd W. Martin, Superintendent, North Willamette Experiment Station; Michael H. Chaplin, Department of Horticulture, OSU; Robert Smith, Extension Agent, Multnomah County

Purpose: To determine response of red raspberry to K (potassium) -- yield, tissue K content, fruit firmness; to evaluate correlation between K application and 1) subsequent K levels in soil and 2) K levels in plant tissue; to refine fertilizer recommendations

Treatments: K as K_2SO_4 at 0, 25, 50, and 100 lb/A

Progress: Plots were established at Sandy Farms and treated with K at all rates March 1980. Soil samples, leaf tissue samples, yield, and fruit firmness data will be taken 1980 through 1982.

Robert Smith, Extension Agent, Multnomah County; Esther Nelson, Research Assistant, North Willamette Experiment Station

Purpose: To observe response of black raspberry and 'Evergreen' blackberry to supplemental K -- yield, tissue content, fruit firmness

Treatments: Black raspberry, K at 80 and 160 lb/A; 'Evergreen' blackberry, K at 50 and 100 lb/A

Progress: Black raspberry plots were established at Evans Farms and treated with supplemental K as K_2SO_4 at 80 and 160 lb/A April 1980. 'Evergreen' plots were established at the Glen Tuttle Farm and treated with supplemental K as K_2SO_4 at 50 and 100 lb/A April 1980. Observations will be made in 1980.

'EVERGREEN' MECHANICAL HARVEST AND NUTRITION

Lloyd W. Martin, Superintendent and Esther Nelson, Research Assistant North Willamette Experiment Station

Purpose: To determine the effect of potassium (K) on fruit quality of mechanically harvested fruit

Treatments: K at 0, 60, and 120 lb/A

Progress: 'Evergreens' were planted in 1979. Fertilizer treatments were begun spring 1980 and will be applied annually. Fruit produced in 1981 will be mechanically harvested and evaluated for fruit size, firmness, soluble solids, and imperfections in addition to yield.