Avocado Variety Investigations

suitability of avocado varieties to climatic conditions of Riverside under long-term tests in experimental orchard

M. M. Winslow and Julius Enderud

Avocado varieties found unsatisfactory—for growing in the experimental orchard at Riverside—are changed by grafting or topworking the trees. Topworked trees have ranged in age from six to 10 years.

A large number of avocado varieties are under trial in the experimental variety orchard, and during the years of 1951, 1952, and 1953, records were made of the date of first and last bloom, amount of bloom, and a rating of the crop produced. No attempt was made to separate varieties into early and late flowering classes, but the average flowering period for most varieties was approximately 6–8 weeks. In 1954, some varieties were in bloom as long as 12 weeks.

In 1951 and in 1952, flowering dates for the same variety were quite similar. In 1953, they were generally much earlier than in the two previous years. There does not appear to be a consistent correlation in the amount of bloom with yield, except that a medium to heavy bloom is needed to produce a medium to heavy crop.

The accompanying table includes only three years of yield data, but records on many varieties have been kept for seven years. The most promising producers—included in the table—are Zutano, Duke, Emerald, Hass, and Ryan. The Hass and Ryan are the only two summer varieties that show some promise, based on behavior for a period of years. A few others show considerable promise based on short-time yield records.

The Zutano, Duke, and Emerald have had the best yield record of the fall and winter varieties under test.

The yield performance of all of the Fuerte strains has been disappointing. The yield data given in the table for the Fuerte is typical for the seven years that production ratings were made. No one strain has shown superiority over the others.

Unsuitable Varieties

A variety found to be not adapted to Riverside is eliminated from the experimental orchard—although it might do well under different climatic conditions—and another one is placed under test.

Avocado Varieties
Flowering Behavior and Yields*

Variety	Flowering dates: First open bloom	Flowering dates: Last open bloom	Amt. of bloom	Yield rating
		1951		
Duke	Feb. 3	Apr. 6	H	H
Zutano	Mar. 27	May 28	H	H
Irving	Apr. 8	May 7	F	F
Emerald	Apr. 8	May 25	M	M
Halsted	Apr. 18	May 23	L	L
Hass	Apr. 15	May 26	M	L
Ryan	Apr. 10	May 23	H	F
Clifton	Apr. 6	May 8	M	F
Regina	Apr. 17	May 30	M	L
Fuerte**	Mar. 27	May 25	M to H	M on 6 trees, others F to L
		1952		
Duke	Mar. 26	Apr. 26	H	L
Zutano	Apr. 4	May 20	M	L
Irving	Mar. 26	May 7	H	H
Emerald	Apr. 8	May 22	H	H
Halsted	Apr. 12	May 22	M	H
Hass	Apr. 4	May 24	M	M
Ryan	Apr. 3	May 16	H	H
Clifton	Mar. 26	May 14	H	H
Regina	Apr. 14	May 23	M	H
Fuerte	Apr. 2	May 16	M to H	H on 3 trees, others F to L
		1953		
Duke	Feb. 15	Apr. 1	H	M to H
Zutano	Mar. 9	May 18	H	H
Irving	Feb. 24	Apr. 20	H	F
Emerald	Mar. 25	May 26	M	M
Halsted	Mar. 24	May 20	L to M	L to H
Hass	Mar. 26	May 2	L to N	L to N
Ryan	Mar. 26	May 18	L	F
Clifton	Mar. 9	May 5	M	L
Regina	Mar. 24	May 24	L	N
Fuerte	Mar. 9	May 10	M to H	M on 2 trees, others F to L

* Both bloom and yield are arbitrarily rated: L—light; M—medium; H—heavy; F—few; N—none; and are approximate.

** Twenty-six bearing Fuerte trees represent 16 strains.

Of the 71 varieties tested, the following are some of those recently eliminated:

Regina—A heavy, alternate bearer of green, pear-shaped winter fruit which —when ready to harvest—is severely russeted and unattractive for the market.

Tomko—A green, pear-shaped summer fruit. Low production.

Sonora—A seedling with a low production record.

Hartman—A green, late summer fruit. Low production.

Campbell—A West Indian variety. No production.

Halsted—Produces medium to heavy, rather consistent crops of green, somewhat rounded fruit of fair quality. When mature, the light-green skin is severely russeted. Season: January to March.

Tantlinger—A Fuerte-like winter fruit. Production is low and erratic.

Nowels—A heavy producer in alternate years. Fruit runs to small sizes and is rather unattractive. Season: November to January.

Fuerte Fairbanks—Low production.

Silliman—A hybrid originating at La Habra. Season: April through June. Fruit medium green, pear shaped, and of good quality. At Riverside, the skin russets badly and fruit is unattractive. End spot with severe cracking was found on some fruits.

Varieties Added

In February 1954, the following varieties were added to the experimental orchard at Riverside for study:

Gae—A Fuerte mutation from Orange County. Season: July.

Susan—Mexican type. Bears green fruit ripening in October. To be patented. Originated at Baldwin Park.

Arturo — Originated at Fallbrook. Bears green fruit of good quality which ripens in October. Reported hardy. Patented.

Lodge—Originated at La Mesa. Fruit green, pear shaped, 6–10 ounces, with high oil content. Season: winter.

Frederico—Originated at Vista. The fruit is oval in shape and the skin is green. Season: late October and November. Quality reported good.

Bondoso—Originated at Vista. The green, pear-shaped fruit matures in late October and November. Good quality.

Unnamed hybrid — Mexicola Lyon cross made at University of California, Los Angeles. Fruit color is purple, ripens in early fall. No production data available.

Jalna—A Mexican variety originating at Encinitas. Reported a good bearer, and some trees have been planted inland. Fruit green and pear shaped. Season: November to January. It was tested in an earlier planting at Riverside, without conclusive results.

Not much information is available on the production of the above varieties since most of them are of recent origin.

Concluded on page 14

TOXICITY

Continued from preceding page

The smaller two column table on page 13 shows the chlorine content in the leaves, trunk, and roots. The upper—not fully mature—leaves from cultures No. 3 and No. 4 contain the least chloride, and these two cultures have made the best growth.

Preliminary tests were made as to whether there is a relation between the nature of the rootstock variety and its ability to absorb chloride. Three-gallon capacity soil cultures provided with drainage were used in the glasshouse with a nutrient solution consisting of distilled water containing in ppm: potassium, 276; magnesium, 81; calcium, 239; nitrate, 1078; phosphate, 158; together with the previously used minor elements. To this solution was added calcium chloride solution as to give 50, 100, 150, and 200 ppm chloride.

Avocado seedlings of several varieties of the Mexican and Guatemalan races were used, one seedling being planted in each culture. The seedlings all were planted on October 15, 1952—except Zutano—Mexican—planted January 27, 1953. The seedlings were grown until August 10, 1953. The largest table on page 13 gives the average percentages—closely agreeing duplicates—of chlorine in the dry matter of the leaves and rootlets, and the results indicate that when grown under similar conditions of chloride concentration, the dry matter of the leaves and rootlets of the Mexican avocado varieties of seedlings contain higher percentages of chlorine than is the case for the Guatemalan varieties.

A. R. C. Haas is Plant Physiologist, University of California, Riverside.

Joseph N. Brusca is Principal Laboratory Technician, University of California, Riverside.

GRAPES

Continued from page 2

a uniform schedule of wages—typical for plants that packed Emperor and summer grapes but about 20% lower than in the Tokay plants—was used throughout the calculations. The costs of direct packer labor, however, were computed from the packer wage plan used in the individual plant and at the average rate of output per packer when the plant was at its full-output rate. Packaging materials costs were made uniform.

Fixed costs for buildings and equipment were based on estimated replacement costs. Uniform methods of calculating fixed costs were used for all plants, although the costs were adjusted to reflect the basic types of building and equipment used in the individual plant. Unit fixed costs were based on the annual volume that would have resulted in each plant if the indicated rate of output were maintained for 250 hours per season. Physical data used in the analyses are based on accounting records for the 1951 season, but the costs of labor, materials, equipment, and other items were calculated at the 1953 price level.

There was a substantial variation between plants in the total cost per standard display lug. With Emperor grapes, total costs—based on the standardized conditions—ranged from 58¢ to 85¢ per lug and averaged 65¢; with Tokay grapes the range was 62¢ to 70¢ per lug and the average was 66¢; and with summer grapes the total costs ranged from 61¢ to 99¢ and averaged 75¢ per lug.

The major components of total cost are labor—which for all plants taken together averaged 31% of the total cost—and packaging materials, which averaged 56% of the total cost. Since packaging materials costs were taken as uniform for all plants, the principal source of variation in unit total costs between plants is in the costs of direct labor. The largest single labor item, and the principal source of variation between plants, is the direct packing labor. For Emperor grapes, packer labor costs ranged from 7¢ to 18¢ per lug and averaged 9¢; for Tokays, the range was 9¢ to 12¢ and the average was 10¢ per lug; and for summer grapes, the range was 7¢ to 23¢ and the average was 12¢ per lug.

The second largest item of labor cost was the category, handling incoming fruit and culls. For all plants, the range in costs for this item was 1.7¢ to 6.0¢ per packed display lug, and the average for all plants was 2.7¢ per lug. Regarding the remaining labor categories, costs per lug are relatively small, although the percentage variation between plants is high.

Fixed costs for buildings and equipment range from 2.9¢ to 17.2¢ per lug, and for all plants, averaged 6.0¢ per lug.

Season Average Unit Costs

With computation of costs on a standardized basis, relative costs with different methods of plant operation can be illustrated. For a particular plant, however, such a cost estimate may differ considerably from the actual season average cost, primarily because the costs represented in the graph are based on a full output rate of plant operation and a standardized wage schedule. If these costs were based on the season average rather than the full output rate, an increase ranging from 1% to 30% of the total unit cost would result in individual plants. Taking all plants together, adjustment to reflect a season average—rather than a full output rate—increases the level of labor costs about 15%. If total costs, including packaging materials are considered, the average increase for all plants is about 7%.

Similarly, adjustments which reflect the actual wage schedule used in the individual plant rather than the standardized schedule used in computations for the graph would vary with each plant. Both the direction and the amount of such adjustments would depend on the actual wage level in a given plant in relation to the standardized wage schedule.

Cost Reduction

Sizable cost reductions could be achieved in many grape packing plants. As a rule, such savings are effected through the introduction of numerous relatively small improvements in individual operations and by improved plant and industry organization. More sweeping changes—in the nature of innovations which would affect the level of costs in all plants—are desirable, especially if they could be easily adopted. The potential rewards for such developments are greatest in the major cost categories. In packing grapes for table use, these are direct packing labor and packing materials. Judging from recent changes in the packing of some other commodities—for example, citrus fruits and western head lettuce—the development of a more economical package seems a likely possibility.

Improvements in local packing and shipping operations which would yield significant savings in the annual marketing bill for California table grapes can apparently be achieved.

L. L. Sammet is Co-operative Agent of University of California Agricultural Experiment Station and of the Agricultural Marketing Service, U.S.D.A.

B. C. French was Co-operative Agent of University of California Agricultural Experiment Station and Agricultural Marketing Service, U.S.D.A., at the time the above study was made.

Improvements in fruit packing house operations will be reported in an article to be published in a future issue of California Agriculture.

VARIETIES

Continued from page 10

Where large trees are topworked, as at Riverside, only a few years are required to determine the important characteristics of a variety. Fruit quality, yield, and hardiness are the main characteristics used to determine a variety's value for commercial planting.

M. M. Winslow is Senior Administrative Assistant, University of California, Riverside.

Julius Enderud is Senior Laboratory Technician, Department of Horticulture, University of California, Riverside.