Behavior of short-chilling

Peach Varieties in Southern California

after warm winter of 1960–1961

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In southern California peaches frequently are not exposed to winter chilling sufficient to break the rest period. The dormant condition of the flower and leaf buds is prolonged and symptoms sometimes known as delayed foliation appear. Flower and leaf bud growth are late and irregular; the fruit ripens irregularly and, in extreme cases, there is little or no crop. The fall and winter temperatures of the buds and twigs are critical. Pruning has a localized growth-stimulating effect and spraying at the proper time with an oil-in-water emulsion containing DNO—dinitro-o-cyclohexyl phenol—or DNC—3-5-dinitro-o-cresol may be helpful.

The exact relation to temperature and timing of chilling peaches is unknown but probably exposure to 45°F, or below, is effective. Therefore, the sum of the hours at or below 45°F from the fall to the end of February is used as a rough measurement of winter chilling. Chilling after February is relatively ineffective. For the same locality, the temperature sum is a tolerable measure of winter chilling but symptoms of insufficient chilling were far more severe at Riverside in 1961, after 738 hours, than in 1960, after 636 hours. Presumably sunshine, fog, humidity and even air movement affect bud temperature.

Peach varieties vary in winter chilling requirement and a long term study was begun in 1927 with the object of developing improved short winter-chilling varieties adapted to southern California and other subtropical climates.

At Riverside such standard relatively long chilling varieties as Elberta, J. H. Hale and Rio Oso Gem have suffered partial or total crop loss from insufficient winter chilling in 10 of the past 30 years.

In general short-chilling varieties bloom earlier than long-chilling. Extremely short-chilling varieties may bloom in mid-January and suffer seriously from frost injury to the flowers when longer-chilling varieties, still in rest, will bloom later and often over a longer period. Flower buds require less chilling than leaf buds but may drop excessively after a mild winter.

The winter of 1960–1961 in southern California was extremely mild, sunny and dry. In peaches the symptoms of insufficient chilling were the most acute of the past 30 years and made it possible to determine accurately the usefulness

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IRRIGATION

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When an available water supply is less than 24″, a decision must be made regarding not only the most appropriate depth of water to apply and area to irrigate, but also the uniformity with which water is to be applied.

The lower graph on page 7 illustrates the effect of uniformity of water application on the total yield of a field of any given size. The letters in the graph describe the type of water distribution—the first letter referring to the depth of water applied at the upper end of the field and the second letter to the depth at the lower end. An application of C-C would be a perfectly uniform application of 12″ of water, whereas E-O would represent an application of 24″ at the upper end of the field and none at the lower end. The broken line represents the yield results for uniform water distributions, for any depth of application. The graph also shows that, for applications above 18″ of water, better yields may be obtained with more uniform application to the entire field. Below the application of 18″, apparently a non-uniform distribution of water results in better yields than a uniform distribution. For an average water application of 12″, for example, a grower would gain in production by applying 24″ of water at the upper end of the field and none at the lower end, compared to spreading 12″ uniformly over the entire area. However, a closer examination of the graph indicates that non-uniform water distribution is not the true reason for the better results, but rather it is due to the proper irrigation of only that portion of the area that results in economic returns. Instead of applying 12″ uniformly, or 24″ and zero inches at the upper and lower ends, the grower could irrigate only one half of the field uniformly with 24″ and not irrigate the lower half at all. The average total yield for the entire field, which would include 4.9 tons per acre for the upper irrigated half and 3.25 tons per acre for the unirrigated half, would then be 4.1 tons per acre; or an increase of one-half ton per acre over a uniform 12″ application.

In general, a good pre-irrigation or winter rain that supplies considerable water to a short-season crop may be more beneficial than other seasonal irrigations. During drouth years when water supplies for summer irrigation are extremely limited, growers should not try to stretch that water over an entire field, but should attempt to reduce the size of the irrigated area and to apply an economically feasible depth of water.

Generally, there are economic limits to the use of water, for either high or low applications of water, and growers must establish those upper and lower limits to make effective and efficient use of water.

Efficient irrigation with limited supplies of water involves considering the value of the crop, the cost of water, the crop returns for each inch of water applied, the critical growth stages of the crop, and the distribution of water to the crop in the field.

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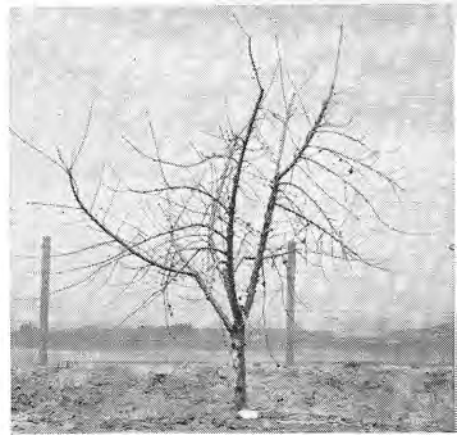
Clingstone peaches at Hemet, California, June 6, 1961. Halford II is severely injured by insufficient winter chilling; seedling 335-10 has normal crop.



Dormant leaf buds and sparse fruit set on relatively long-chilling peach variety 254-2 after 300 hours below 45°F. Photo May 31, 1961.

and limitations of the varieties released during the study. A variety which produced even a light crop in 1961 probably has a sufficiently short chilling requirement for that particular locality.

Tree behavior was noted in the following three localities and temperature sums are known in two of these. The South Coast Field Station is 10 miles from the Pacific, with some low hills between, and the coast climatic influence is strong with lower maximum temperatures and more humidity than the other test localities. In the winter of 1960–1961, the temperature sum—at or below 45°F—was only 300 hours. January was sunny with a mean black bulb temperature of 91.1°F compared with 81.6°F in 1960.

The Riverside–Ontario test locality is subject to some coastal climatic influence but maximum temperatures are high with much sunshine and low humidity. The temperature sum in 1960–1961 was 738 hours.

Beaumont and Yucaipa plots are on mesas at 2,500–2,900′ elevation. Maximum temperatures are a little lower than at Riverside but minimum temperatures significantly lower so that peaches receive much more winter chilling.

Since 1939, 11 peach varieties varying in chilling requirement, maturity, and other respects have been released. Among the released varieties, Golden State and Ramona have been discarded; Anza, which requires fairly long chilling, Sunglow and Hermosa are little grown. Rochon and Tejon, recent introductions, and four other varieties are grown in some southern California gardens and elsewhere. Their behavior in 1960–1961 is tabulated on page 10. No late frosts occurred in 1961 so the yield depended primarily on chilling requirement. The actual yield of the early varieties could be observed, but at the end of June the yield of the late varieties could only be estimated.

An unnamed variety, 254-2, is included in the tabulation because it was the only representative of the longer-chilling varieties available at South Coast Field Station. Actually, variety 254-2 requires considerably less chilling than Elberta. It has failed almost totally in 1960–1961 at South Coast Field Station but it produced well on the inland mesas at San Jacinto and Yucaipa. In 1960 245-2 produced heavily at South Coast Field Station after only 495 hours chilling but at Riverside in 1961, after 738 hours, it failed almost totally. However, where the tree was partially shaded, growth and production were almost normal.

At the South Coast Field Station on two to four trees of each variety, flower and leaf bud development were delayed and uneven in all eight varieties tested. Blooming began in mid-January. Growth

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Variety 254-2, a relatively long-chilling peach variety at Yucaipa June 6, 1961.

Fruit growth versus leaf growth in peaches at South Coast Field Station on May 9, 1961. *Left*—Rubidoux. *Right*—Seedling 338-4.

PEACHES

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was much less delayed in flower buds than in leaf buds. Severe flower bud drop occurred on 254-2 and perhaps to some extent on Rochon. The extremes in growth at South Coast Field Station on April 12 were impressive. From the condition of 254-2 on May 31, it appeared that nearly all the leaf buds would remain dormant throughout the 1961 season. Rochon produced fairly well and ripened in mid-May, two or three weeks earlier than in 1960. It was slightly less productive than Tejon, required much less thinning and was more attractive in appearance. Rochon and Tejon seem well adapted to a locality almost on the coastal plain. Ventura and Bonita—especially the Ventura—produced almost a full crop of uniform development. Prenda—formerly Rosy—and Rubidoux were severely affected and produced only a few fruits. Very few flower buds dropped on Prenda. The difference in development of fruits and leaves evident in Rubidoux and an unnamed variety is related to the difference in temperature response of flower and leaf buds.

In the Riverside–Ontario locality growth was irregular in all varieties except Rochon and Tejon; the crop on Rochon was rather light but better in size and appearance. Hermosa produced almost a full crop. Ventura and Bonita produced nearly a full crop and some trees a heavy one. Rubidoux and Prenda yielded only a very light crop so that in 1960–61 chilling was insufficient in this locality. At Riverside, Rubidoux yielded well in 15 of the 17 years in the record. Its longer chilling requirement associated with later blooming was an asset when late March frosts almost wiped out the crop of shorter-chilling varieties such as Bonita. Variety 254-2 had few leaves on April 14, 1961 and set a very light crop, as most of the flower buds dropped.

Behavior of Peach Varieties at the University of California South Coast Field Station
Flesh color: white = W, yellow = Y.
Stone adherence: F = freestone, SC = semi-cling.

Variety	Type	Locality	Bloom: amt. & time	Leaf growth	Fruit set	Actual or estimated crop
Tejon	Early Y SC (eglandular)	SCFS	heavy, early	slightly uneven	very heavy	heavy
		Riverside	medium bud drop, heavy	early, even	heavy	heavy
		Beaumont	.....	even	.....	.....
Rochon	Early Y SC (globose glands)	SCFS	light, early	uneven	medium to heavy	medium
		Riverside	light; bud drop	early, even	medium	medium
		Beaumont	.....	even	.....	.....
Ventura	Early mid-summer YF	SCFS	.....	uneven; late	medium	medium to heavy
		Riverside	heavy, little bud drop	even	medium	medium to heavy
Bonita	Midseason YF	SCFS	.....	very uneven	medium	medium
		Riverside	med. to heavy bud drop	uneven	medium to heavy	medium to heavy
Prenda	Midseason WF	SCFS	bud drop little; late	late	very light	very light
		Riverside	heavy, little bud drop	uneven	very light	.....
Hermosa	Midseason WF	Riverside (Ontario)	.....	uneven	medium	medium
Rubidoux	Late mid-season YF	SCFS	medium, irregular	very late	very light	.....
		Riverside	medium, little bud drop	uneven	very light	.....
		Beaumont	.....	even	heavy	heavy
254-2	Late WF	SCFS	extremely late; severe bud drop	extremely late	excessively light	.....
		Riverside	extremely light; severe bud drop	extremely late	almost none	.....
		Beaumont	.....	even	heavy	heavy

In Beaumont and Yucaipa 1960–61 chilling was insufficient for the standard varieties J. H. Hale, Rio Oso Gem and Fay Elberta. The 1961 set of fruit, especially on older trees, was fair to light. Variety 254-2, which failed at the South Coast Field Station, and Rubidoux set a heavy crop. Robin, Babcock, Rochon and Tejon were uninjured.

The amount of effective chilling at the Beaumont and Yucaipa elevation exceeded that at Riverside. Among the later ripening varieties which are in demand at roadside stands, Rubidoux and 254-2, a white-fleshed freestone, will very rarely lack sufficient winter-chilling in the Beaumont–Yucaipa region. Variety 335-10, another unnamed seedling, has yellow non-melting flesh and is suitable for processing. At Hemet, 335-10 produced a heavy crop while adjacent orchards of Halford II and Sullivan produced very little fruit.

Observations of peach varieties after an extremely mild sunny winter emphasize the necessity of carefully selecting varieties suitable in winter chilling requirement for a particular locality.

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***Left*—Rubidoux peach at Beaumont June 10, 1961 with heavy crop. *Right*—J. H. Hale peach at Beaumont, California June 6, 1961. About one half normal crop is expected.**