Clusters of on-vine dried Black Corinth raisins ready for machine harvest.

MECHANICAL HARVES

PETER CHRISTENSEN
CURTIS LYNN · H. P. OLMO
H. E. STUDER

THE BLACK CORINTH (Zante Currant) is a specialty raisin produced in the central San Joaquin Valley. Its main popularity is with the baking trade where the small, fruity, and tender raisin is ideal. Traditionally, the grapes have been hand picked and dried on trays in the vineyard. The variety has the advantage of being the earliest ripening and harvested raisin variety. However, hand harvest is difficult and costly because the clusters are small and the berries fragile. Pickers too often smash berries and cause juicing on the tray, and understandably complain about the numerous small clusters they must harvest.

Recent attempts to mechanically harvest this variety have been quite successful. This is possible because this variety will fully dry into raisins while still hanging on the vine. The on-the-vine drying is initiated by severing the fruiting canes from the vines. The canes and fruit are left on the trellis-wire-supports to complete the drying process. The dried raisins can then be machine harvested directly from the vines and are ready for packing house delivery. A bonus discovery is that the raisins dried on the vines have a more attractive appearance and flavor than those dried on trays.

Thompson Seedless

Unfortunately, this on-the-vine drying technique has not been practical to date with the predominate Thompson Seedless raisin variety. In earlier studies the larger Thompson Seedless berries were found to dry too slowly on the vine. The shaded berries on clusters especially did not darken or dry adequately. Fortunately, however, many of the cultural techniques developed in the earlier Thompson Seedless studies could be used on the Black Corinth variety.

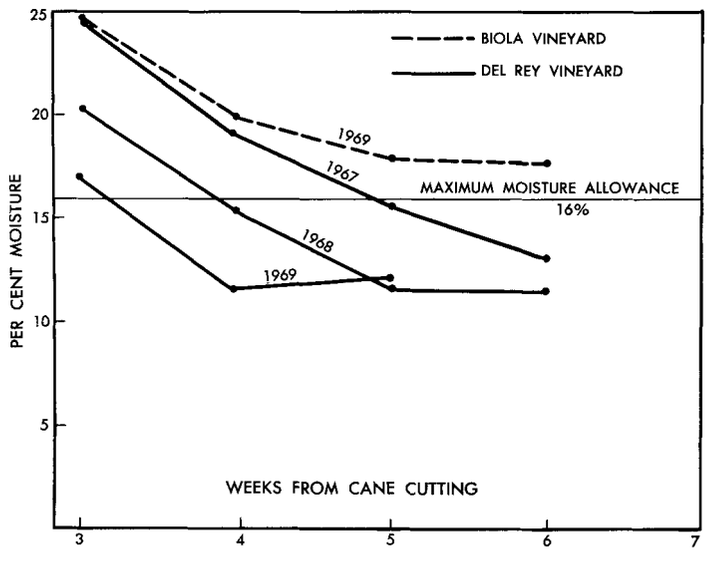
Studies were initiated in a Del Rey district vineyard in 1967 by first converting head trained, cane pruned vines to the "Duplex" vine training system. The Up-Right 2-wire flexible trellis was used to facilitate machine harvest with the U.C.-developed vertical impacter system.

Two-wire-system

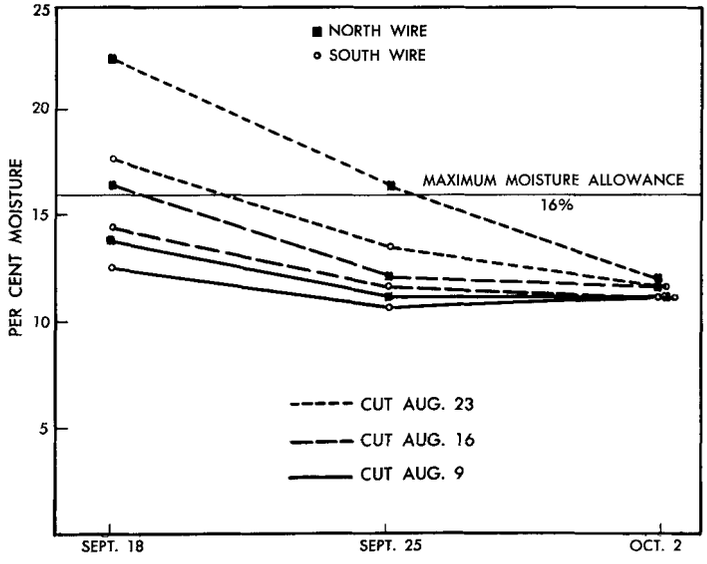
In the Duplex vine system the fruit bearing zone is restricted to shoots arising from canes wrapped on two horizontal trellis wires. The center or head of the vine is maintained as the replacement zone where shoots are left to provide the following year's fruiting canes. Fruit production is purposely eliminated from this zone by first removing some shoots in the spring (termed deshooting or suckering). Ample shoots are retained to provide a selection of fruiting canes during the following pruning season. All flower clusters on these shoots are pinched off to further eliminate all fruit from the vine head.

At normal harvest time (August 15 to 20) the fruiting canes are cut with hand pruning shears just below the trellis wire. This separates the fruit and the shoot growth on the wires from the moisture source of the vine. The leaves dry first, followed by the berry pedicles, cluster stems and shoots. The fruits then dry gradually to the desired moisture level.

Graph 1. On-vine drying rates of two Black Corinth vineyards at Del Rey and Biola (average of four replications).



Graph 2. On-vine drying rates of Black Corinth at three dates of cane cutting. Del Rey vineyard, 1968 (average of two replications).



TING OF BLACK CORINTH RAISINS

In the Del Rey vineyard, replicated trials were established to: (1) study the effects of cane cutting dates on fruit drying rates; (2) compare the quality of vine-dried fruit with tray-dried fruit; (3) study the effects of vine conversion on yields and fruit quality; and (4) determine the loss from fruit dropping to the ground during the prolonged vine drying process.

Drying rate

Beginning three weeks after cane cutting, fruit samples were taken weekly to follow the drying rate. The Del Rey vineyard fruit dried adequately within 3½ to 5 weeks during each year of study (see graph 1). In 1968 three different cane cutting dates were compared. Cluster samples were taken separately from the north and south trellis wires to compare drying rates. Graph 2 shows the more rapid drying of the south wire (sunny side) fruit, but the differences became smaller with continued drying. The earlier cane cutting dates also resulted in earlier drying and thus earlier possible harvest dates. The rate of fruit drying in all the treatments leveled off at 11 to 12 per cent moisture. Work is now underway to determine the effects of the earlier cane cutting dates on grape maturity and raisin quality.

All of the Del Rey vineyard plots with vine-dried raisins were successfully harvested using the experimental U.C. vertical impacter harvester. The harvest mechanism strikes the trellis wire from underneath with a vertical impacting rod at 250 rpm and 1.5 mph forward speed. The raisins fall into a belt conveyor which moves them into field boxes.

Many dried leaves were harvested with the raisins. However, most of these leaves could have been separated from the fruit and removed with a blower as they dropped from the end of the harvester conveyor.

Another concern at harvest was the possible raisin shatter ahead of the impacter, and before the catching frame moved underneath falling fruit. It was found that most of the raisins dislodged within 1 ft of the impact point, and only very negligible amounts shattered off more than 2 feet beyond the impacter.

Three-wire system

This Black Corinth mechanization work was expanded in 1969 to a Biola district vineyard. The vineyard uses a three-wire trellis system. The fruiting canes were wrapped onto a single wire 15 inches below a 24 inch wide "T" trellis with two wires. The upper trellis wires served as a support for the current season's shoot growth.

In a spring deshooting (suckering) and defloriating operation, excess shoots and all flower clusters were removed from the heads of the vines. This confined the fruit to the wire and left only desired renewal shoots for future canes, and spurs in the vine head. A 6-inch portion of the canes was rubbed completely free of shoots where they meet the wire. This established a separation zone between the fruiting and the renewal portion of the vines. The canes were cut at harvest time at this separation zone.

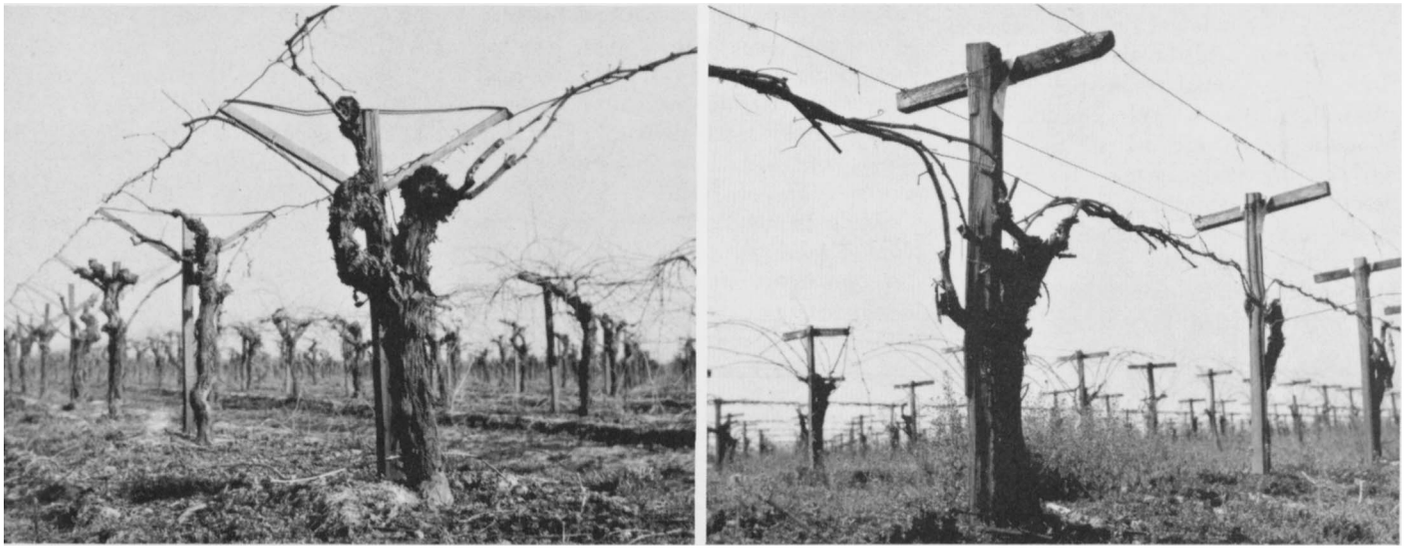
Shading

Replicated plots were established similarly to the Del Rey vineyard. Graph 2 shows the slower raisin drying rate at the Biola vineyard. This was attributed to: (1) most of the clusters being shaded by the trellis-supported leaf canopy at Biola, and (2) larger berries at Biola (2,754 raisins per lb vs. 4,532 per lb at Del Rey)—would result in a slower drying rate. Further studies are underway in this vineyard toward achieving earlier raisin drying.

The Biola vineyard raisins were successfully harvested with the Chisholm-Ryder Co. slapper-type harvester into 1,000-lb standard raisin bins. Dried leaf separation and removal during harvest was successful with this machine without any appreciable loss of fruit. The raisins were then run through a commercial dehydrator to complete drying.

Plastic sheets were placed under four replicated vines in each vineyard to catch fruit dropping to the ground during on-vine-drying. The loss was negligible—3.25 and 1.22 per cent of the total crop

Del Rey vineyard of Black Corinth raisin grape vines trained to "Duplex" system, left photo. Biola vineyard training system, right photo, showing two-wire foliage support trellis above a single wire for fruiting canes.



by weight at Del Rey and Biola, respectively.

Some yield reduction might be expected during the first one or two years of vine conversion for mechanical harvesting. At Del Rey the Duplex vines produced 16 per cent less raisin yield during the first year, as compared with standard vines. During the second year, this loss was narrowed to only 7 per cent less fruit in the Duplex vines. This was attributed to the necessary removal of poorly positioned arms and canes during the conversion period. Work is continuing to determine if yields return to normal or improve once conversion or retraining is completed in three to four years. Further possible effects of the Duplex system on grape maturity and raisin quality will also be evaluated.

The defloriating and deshooting operation in the Biola vineyard resulted in a 30 per cent lower raisin yield in the machine harvested plots. However, work is underway to determine if this loss of fruit can be offset by retaining more fruiting canes at pruning time.

Attractive appearance

One of the most striking results of on-the-vine drying of Black Corinth is the attractive appearance. The fruit retains a uniform, natural shape with its bloom left intact. The surface wrinkling is very fine and uniform. The color is a uniform dark blue.

In contrast, the tray-dried raisins are more often misshapen and have larger, less uniform wrinkling. The color is less uniform and has a more reddish cast. The vine-dried currants also have a more fruity flavor.

The 1969 machine-harvested raisins from both vineyards were successfully processed at the Sun-Maid Raisin Growers plant. It was found that the presence of some fresh fruit on the vines at machine harvest would result in juicy berries with embedded leaf fragments. These off-grade raisins are difficult to remove during processing. Thus, the spring flower cluster removal and cane cutting operations must be done very carefully and perhaps gone over a second time—to insure that all the fruit is on cut canes and will be dried at machine harvest time.

Peter Christensen and Curtis Lynn are Farm Advisors, Fresno County; H. P. Olmo is Viticulturist, Dept. of Viticulture & Enology, U. C. Davis; and H. E. Studer is Assistant Agricultural Engineer, Department of Agricultural Engineering.

D-1410 . .

J. D. RADEWALD • F. SHIBUYA
J. NELSON • J. BIVENS

This article reports results of trials with a systemic experimental nematocide, du Pont's 1410, chemically identified as S-methyl 1-(dimethylcarbamoyl)-N-[(methylcarbamoyl)oxy]thioformimidate (D-1410). When D-1410 was released for testing, evidence was presented that demonstrated its systemic activity. Trials reported here have shown that when D-1410 is sprayed on plant foliage, it—or one of its breakdown products—is translocated to the roots and controls plant-pathogenic nematodes.

SINGLE FOLIAR SPRAYS of D-1410 (at 4 lbs per 100 gallons of water), applied in greenhouse tests at Riverside, on the same day the soil in which the plants were growing was infested with nematodes, provided plants a high degree of protection from nematode attack for periods ranging from 21 to 28 days. This has been demonstrated with the root-knot nematode, *M. incognita*, on tobacco, sugar pumpkins, tomatoes, and sweet potatoes; and with a lesion nematode, *P. scribneri*, on pole beans.

Single or multiple foliar sprays applied a week or more after nematode infection either slowed down nematode development, or in some way interfered with nematode reproduction and sex ratios. In trial 1 on sweet potato plants (treatments 2, 3, and 6 in table 1), where sprays were delayed for 1, 2, or 3 weeks after nematode infection occurred, the root gall index was as severe as that in the unsprayed check. However, only a small number of larvae were recovered from the sprayed plants, compared with the check.

The best control was achieved when initial sprays were applied at the time of the nematode infestation of the soil and when additional sprays were applied 1 or 2 weeks later. This is shown in trial 1 (table 1) where roots from plants sprayed twice (treatments 4 and 5) yielded only a small number of nematodes compared with the results of the single spray treatment applied at the time of soil infestation (treatment 1). No apparent benefits were obtained when a D-1410 dip was used on the sweet potato slips. The results of trial 2 further substantiate this apparent increase in control of both root-knot and lesion nematodes (see table 2). However, additional sprays (treatments 8 and 9) applied on the third and fourth weeks did not further increase control. Foliar sprays of D-1410 did cause some degree of marginal leaf necrosis in all plants tested in the greenhouse.

Phytotoxicity

In trial 3 where rates of 1, 2, and 4 lbs of D-1410 per 100 gallons of water were used, the degree of phytotoxicity was proportional to the rate used. The 1-lb rate gave essentially the same degree of control as higher rates (see table 3). In trial 4, the soil drench test on roses, no phytotoxicity was observed at the rate of 20 lbs per acre (see table 4).

In trial 3 there was greater control of *M. incognita* on small sugar pumpkins than in trial 2. This difference in the results of the two trials can perhaps be explained by differences in the age of the plants at the time the spray was applied, or by differences in the initial nematode inoculum level. The effect of plant age on uptake of D-1410, and the efficiency of the compound against different inoculum levels, need further study.

Spot soil samples taken from the vari-