# Machine Harvesting of Olives

## average of 94.6% of the fruit removed from Mission olive trees in tests with boom-type shaker and catching frame

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**Tests conducted** during the 1954 season showed that 93% of green, pickling olive fruits can be mechanically removed from Mission trees early in November. A higher harvest percentage resulted with the more mature oil fruit during January and February.

To remove the fruit a double acting, rigid boom-type shaker was used. The shaker operates with a 4.5″ stroke at a frequency of 400 to 1,150 strokes per minute. A rubber-covered jaw with a 30° swivel significantly reduced limb injury as compared with the conventional fixed jaw. The vertical lift for the boom and the jaw action are hydraulically controlled by the tractor operator. The tractor belt pulley drives the shaker. This modified shaker was originally mounted on a wheel-type tractor, but tests with this equipment conducted in February 1954 removed only an average of 83% of the fruit. Since the rubber-tired, wheel tractor absorbed a considerable percentage of the energy output of the shaker, it was believed that the upper limit of fruit removal had been reached with the wheel-type mounting platform. Consequently, the shaker was mounted on a 35 HP crawler tractor, and the efficiency of fruit removal increased to 93%. The crawler platform also permitted positive maneuvering of the boom into the desired shaking position.

***Above:* Position of attachment of shaker arm to tree and placement of catching frame. *Below:* Type of mechanical shaker used in mechanical olive harvesting tests.**

Field trials—to determine the efficiency of fruit removal and magnitude of fruit injury—were conducted at Palermo on November 3 and 4, 1954. Six Mission trees were shaken and the fruit was caught with a McKillop prune catching frame. There was an average yield of 142.2 pounds of fruit per tree, with an average of 93.3% of this removed by shaking.

After the fruit was harvested, tests were made to compare the condition, following processing and canning, of machine-harvested fruit with the usual hand-picked fruit. In these tests the hand-picked fruit samples were taken from the trees just before they were shaken. In addition, a third lot was included consisting of machine-harvested fruit which was placed into containers of 4% brine immediately after shaking. It was thought that this latter treatment might reduce the amount of injury to appear subsequently. The fruit was processed by both the black ripe and Spanish green methods.

The containers of processed fruit were opened in May 1955; the olives were examined and classified as *1*, undam-

Concluded on page 13

## OLIVES

Continued from page 8

aged; 2, showing minor surface scars; 3, showing severe surface scars; or 4, showing severe surface cuts. Only fruit in the first two categories was considered marketable.

In the Spanish green process, where any fruit defects would be clearly visible, as much as 30% of the machine-harvested fruit showed sufficient scarring to make it unmarketable. Placing the fruit into brine immediately after harvesting apparently reduced the amount of visible scarring in half. By the black ripe method, however, in which any but severe scarring would be masked, the amount of visible defects was negligible. The quality of the machine-harvested fruit was equal to that of the hand-picked fruit. The quality of harvested fruit transported in brine was not appreciably different from that handled in lug boxes.

Mission fruit harvested with the type of mechanical aids now under test would show sufficient scarring so that it could not be marketed by the Spanish green process, but it apparently would be completely marketable if processed by the black ripe method.

Additional tests were made in shaking oil olives on January 25 and 26, 1955, to determine the efficiency of fruit removal and the time required for mechanical harvest. Thirteen Mission trees were shaken and the fruit collected on canvas under the trees. One man was required to operate the tractor and two were used in handling the canvas and fruit. The average amount of fruit per tree was 142.6 pounds. The shaker was able to remove an average of 94.6% of this fruit. It required 0.40 man-hour to remove a 35-pound lug box of fruit by the mechanical shaker while 0.75 man-hour was required to remove this amount of fruit by the conventional methods.

**The Effect of Different Harvesting Methods on the Surface Appearance of Olive Fruits Following Processing and Canning. Mission Variety. Palermo, 1954.**

| Processing method | Harvesting method | Condition of fruit | | | |
|---|---|---|---|---|---|
| | | Marketable | | Unmarketable | |
| | | Undamaged | Minor scars | Severe surface cuts | Severe surface scars |
| Spanish green | Machine | 17% | 50% | 2.6% | 30% |
| | Machine (in brine) | 0 | 85 | 0.4 | 14.6 |
| | Hand picked | 50 | 47 | 0.0 | 3.0 |
| Black ripe | Machine | 99.9 | 0 | 0.0 | 0.1 |
| | Machine (in brine) | 99.2 | 0 | 0.7 | 0.1 |
| | Hand picked | 99.9 | 0 | 0.1 | 0.0 |

The type of mechanical shaker presently under test can remove 93% to 95% of Mission olive fruits, but for the oil crop the present labor saving is insufficient to justify the equipment investment.

Further studies are needed on labor-saving techniques, such as the use of catching frames and pickup machines, as well as pruning systems which will adapt the shape of the tree to the action of the shaking machine.

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## AVOCADO

Continued from page 10

lem of how many scions—if more than one grows—to use to form the top. It has been found that best results are obtained if one vigorous growing scion is selected—and the others headed back and eventually removed—as it will eventually cover the cut surface.

With topworking, a careful and continuous follow-up is necessary to get a strong, well-formed tree. After the remaining scion is two to three years old, the stump is pruned, as shown in the illustrations on this page. By cutting off the shoulder proper healing of the cut surface is encouraged.

**Stump and two-year-old top before pruning.**

Occasionally, even though one or more scions grow, they make a weak, spindly type of growth the first summer. The leaves are small, crinkled, and light yellow, and the bark on the branches is also light yellow. Suckers sprouting from the trunk show the same type of growth. Minor element sprays have been tried with no apparent improvement in the type of foliage. Usually, however, in the late summer the new leaves become normal in size and color, and soon the top is in good growing condition. One reason for this may be that the shock to the roots of the trees from the severing of the original top is so severe that it is months before nutrients are adequately absorbed to feed the new top growth.

This weak type of growth was found in the Riverside experiments with the following combinations: Gardner on Nabal with a Ganter root; Elsie on Nowels with a Topa Topa root; and Gae on Regina with a Mexicola root. Topworked combinations which made an excellent growth were Topa Topa on Carr with a Mexicola root; an unnamed hybrid on Gerkin with a Mexicola root; and Susan on Emerald with a Ganter root. These examples are not given, however, as an explanation of variations in top growth but in order to show the range in rootstocks, the varieties topworked, and their growth behavior.

The three components usually found in a topworked tree at Riverside are the rootstock, a sandwich of the original variety, and the scion variety or new top. Little is now known about the effect of either the rootstock or sandwich on the behavior of the scion variety, and studies on these factors are under way.

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*Pictures by Kenneth Middleham.*

**Stump with two-year-old top pruned.**