Plum Packing Costs Reduced

bulk-filling of new container had the lowest unit cost in a study on methods of packing plums for interstate shipment

Dale G. Stallings and L. L. Sammet

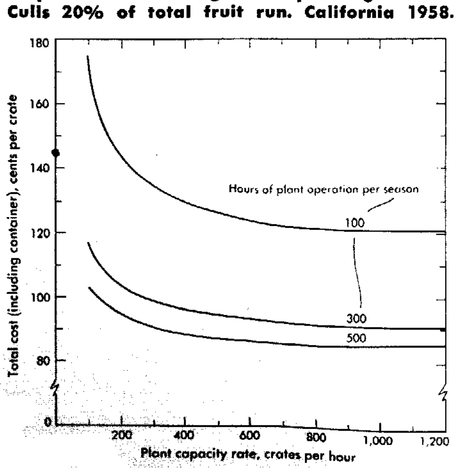
Left—conventional place-pack from moving belt; fruit sized visually by packer and placed individually in container. Left center—standard four-basket crate, 28 pounds net weight. Right center—test carton, 25 pounds net weight. Right—equipment for rope-sizing fruit into bins for place-packing, modified to permit bulk-fill of container.

Costs of packing and preparing California fresh plums for interstate shipment, based on an average annual volume of 4.5 million crates—4,500 cars—exceed four million dollars annually.

Two factors—container materials and the labor cost of filling the container—account for about three quarters of the total packing costs. The standard package is relatively complex—consisting of a wooden crate containing four split-wood baskets of fruit—and the individual plums are place-packed by hand.

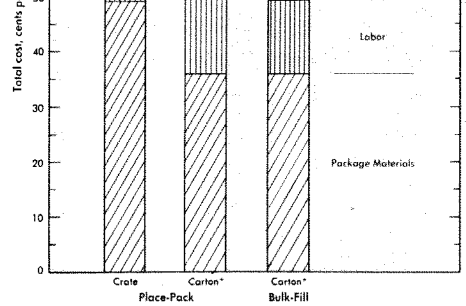
Recent attempts to reduce plum packing costs have involved industry development of a test container as well as trials by individual shippers and research in regard to bulk-fill packing methods. The standard four-basket crate of 28 pounds net weight and a test carton containing 25 pounds net weight are shown in the pictures. Also illustrated are two packing methods—place-packing from a conveyor belt and bulk-filling rope-sized fruit from bins.

Total unit cost of packing fresh plums in the standard four-basket crate in relation to plant output rate and length of operating season. Culls 20% of total fruit run. California 1958.



To obtain a basis for comparing costs, the packing operations in numerous California plants were studied. Many factors—plant size, length of operating season, fruit variety and size, proportion of culls, and wage rates—in addition to type of container and packaging methods and equipment influence unit costs. Consequently, cost comparisons in this study are not based on average cost actually realized in a sample of plants, but on estimates of materials and services used in efficiently organized plants to pack given quantities and grades of fruit.

The effect of type of container and method of fill on total unit cost of packing fresh plums in plants of capacity rate of 300 crate equivalents per hour, operating 300 hours per season, and with 20% of the total fruit run removed as culls. California 1958.



Since the standard crate and the test carton are of different net weights, the cost estimates—given in the chart in column 2—are expressed in terms of the cost of packing the weight equivalent of the standard crate. On this basis, costs per standard crate approximate $0.981 per crate, $0.789 per place-packed carton and $0.661 per bulk-filled carton. The savings with the place-packed carton over the standard crate include $0.132 per crate equivalent for container materials

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PACKING

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and $0.041 for labor. The unit savings with the bulk-filled carton over the standard crate are also $0.132 for container material, but $0.160 for labor.

Since operating conditions—such as plant size, proportion of culls, length of operating season, and wage rates—vary among plants, costs in particular plants may differ from those shown. How the costs given in the chart in the second column on page 2, for example, are affected by plant size is illustrated in the graph in the first column on page 2. This shows that with a given length of season, unit costs drop as plant output capacity goes up. In a 300-hour season—for example—the total unit cost, in a plant with a capacity rate of 100 crates per hour, is $1.162 per crate; in a plant with a capacity rate of 500 crates per hour, total unit cost is $0.945 per crate; and, in plants with 1,000 crates per hour capacity, total unit cost is $0.918 per crate.

Unit costs also decrease as length of season—with a given plant capacity—increases. In a plant of 300 crates per hour capacity, total unit cost with 100 hours operation is $1.344 per crate; with 300 hours operation, $0.981 per crate; and with 500 hours operation per season, $0.902 per crate. The reduction in unit cost results from the spreading of fixed costs—a function of plant capacity rate —over a larger season volume.

The costs illustrated in the chart assume that 20% of the fruit received will be sorted out as culls. Similar estimates based on only 10% culls indicate a level of costs about 1.5¢ lower per standard crate than shown; and with 40% culls these costs would be about 4.5¢ per crate higher.

The variations in unit costs—for the standard crate—as plant operating conditions change also were studied for the other two types of containers and filling methods. While estimated costs with both methods were lower than the standard crate, the range in costs attributable to plant capacity, length of operating season, and proportion of cull fruit would be roughly the same.

Effects on Quality and Price

The effect of new containers and filling methods on fruit quality and market prices is not easily measured. Meaningful comparisons of prices received with different containers require evaluation of many factors for which complete information was not available. These include information as to initial fruit quality, variation in transit and market conditions with respect to different test shipments and the price-effect of trade resistance to new containers available only in light and irregular shipments.

An alternative to evaluation on the basis of prices received on test shipments is to observe the effect of type of container on fruit quality. Test shipment experience and laboratory transit tests have suggested that place-packed or bulk-filled containers can deliver plums of quality equal to that obtained with the standard crate. Therefore, it appears that the industry could shift to the less costly types of package without adverse effect on market price. This would make the net advantage with the new-type containers equal to the reduction in packing cost. On this basis, the industry during the first year of the change would save—on a 4,500-car annual shipment—roughly $770,000 annually with the place-packed carton and $1,330,000 with the bulk-filled carton. Over a longer period of time—taking into account the wear-out of the present packaging and crate-making equipment and the costs of its replacement—slightly larger annual savings could be realized. The changes in equipment are relatively minor, however, and the estimated annual savings would be increased to approximately $865,000 with the place-packed carton and to $1,440,000 with the bulk-filled carton.

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The place-packed test carton was developed for test shipment by an industry committee in cooperation with the California Grape and Tree Fruit League.

This report is based on a more detailed study, copies of which may be obtained without cost from the Department of Agricultural Economics, Room 207 Giannini Hall, University of California, Berkeley 4.

LETTUCE

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substantiate the relationship of united wrapper leaves to the development of spiraled heads.

A special study of Great Lakes 6238 and Great Lakes 659 in comparison with Premier Great Lakes showed that the latter strain did not have any plants with united leaves nor any spiraled heads. The other two strains produced many plants with united leaves and spiraled heads.

A number of experiments were conducted to test the hypothesis that a united leaf or leaves bind the head and the resulting mechanical pressure forces the subsequent initiated leaves into a spiral-like fold. In the first series of experiments, plants in the early rosette stage—15–30 true leaves—were selected and a rubber band 2″ long and 1/8″ wide was placed around each plant and left on until the plants approached market maturity. It was found that, if the rubber band was kept around the upper half of the wrapper leaves—which is the general area where a united wrapper leaf or leaves exert a similar pressure—the plant would develop a spiraled head.

In a second series of experiments the leaf margins of the sixth or sixth and seventh leaves were stapled together to exert on the developing head a mechanical pressure similar to that obtained by natural union of wrapper leaves. Plastic friction tape was also used to help bind the leaf margins together. The leaf margins were left stapled for 7, 14, 21, and 29 days.

The stapling together of the leaf margins of a single wrapper leaf, or the leaf margin of one leaf to the successively initiated leaf, caused spiral-head formation. A single wrapper leaf with its leaf margins united was more effective in causing spiral-head development than when the leaf margin of a wrapper leaf was united to a successively initiated leaf. Pressure exerted on the developing head for as short a period as seven days was sufficient to cause spiraled heads, and the longer the pressure was applied the greater the chance for spiral-head formation.

Effect of United Leaf Margin on the Subsequent Development of Spiraled Heads.

Test No.	Treatment (25 plants per treatment)	Number of spiraled heads formed
1..	United leaf margin intact	25
	United leaf margin broken	1
	No united leaf margin	0
2..	United leaf margin intact	23
	United leaf margin broken	0
	No united leaf margin	0
3..	United leaf margin intact	21
	United leaf margin broken	2
	No united leaf margin	0

The differences observed between strains of Great Lakes in producing a united wrapper leaf or leaves under certain environmental conditions indicate that this is an inherited character. It appears that Great Lakes is segregating for this character, and that selections could be made within existing strains for freedom from united wrapper leaves, thus reducing the amount of spiral head development.

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