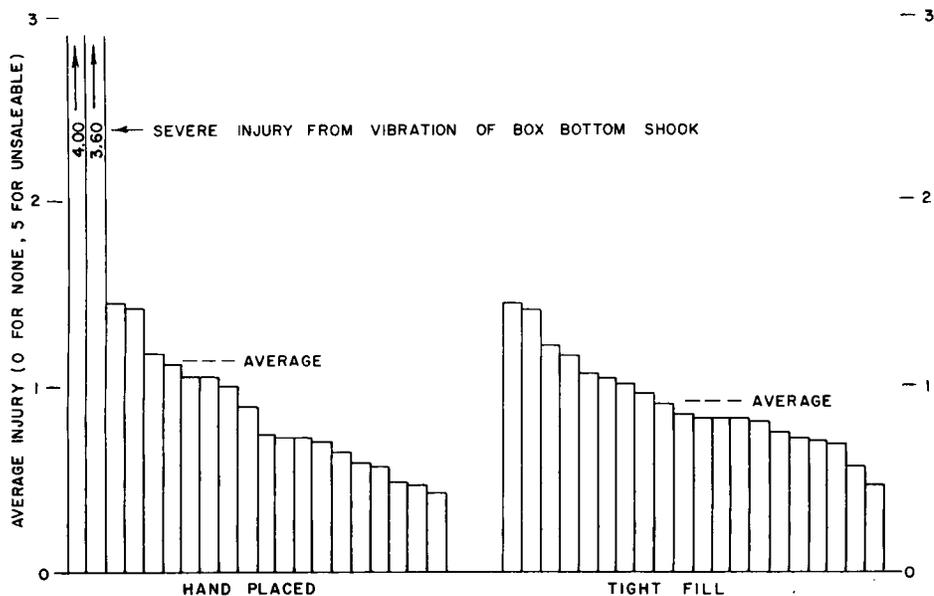


COMPARATIVE LEVEL OF FRUIT DAMAGE BETWEEN HAND-PLACED AND TIGHT-FILL PACKED PEACHES IN DAVIS TRANSIT TESTS.



LABORATORY AND TRANSIT TESTS

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A METHOD OF PACKING PEACHES that eliminates the need for hand placing, and reduces transit injury has been successfully tested in California. This "tightfill" packing procedure, developed earlier for pears and certain other fruits, involves sizing the fruit, volume-filling the container to a given weight, settling the fruit in the container by vibration, padding the top fruit, and fastening the lid under pressure. When this is properly done, the fruit is held in place within the container; and vibration bruising during transit is reduced.

California peaches for fresh shipment are usually hand packed (or "place packed") into 21-lb Los Angeles lugs. Fruit is placed in paper cups, plastic trays or paper wraps. Shippers find it increasingly difficult to obtain sufficient skilled labor to maintain their hand-packing operations. The ability of the hand-packed fruit to withstand injury during transit also varies with the skill of the packer. Thus, there has been a need for a packing method which will allow uniform good packing independent of worker skill.

Laboratory tests were conducted to determine the requirements and tolerances of peaches to various handling procedures and to evaluate alternative methods of packing. A simulated transit testing procedure was first developed to duplicate

in the laboratory the appearance of fruit, packing material and container after actual transit. Vibration settling, padding and depth of fill were evaluated, and from this screening procedure the most desirable combination was developed into a packing procedure. This was then compared with the standard peach-packing method in a series of laboratory tests. Finally this procedure was used in field trials to substantiate the method under actual transit conditions.

Commercial tests

Transit tests comparing peaches packed by the tight-fill method with standard hand-packed peaches were conducted in cooperation with commercial peach packers in California. Results indicated that peaches packed by the new method will carry as well or better than peaches packed by hand. Varieties included in these studies were Red Haven, Early Elberta, Suncrest, Rio Oso Gem, Fiesta and Halloween.

The requirements of tight-fill are exacting and must be followed carefully to be successful. Shippers trying the tight-fill method detailed in this article should proceed cautiously and only after becoming thoroughly familiar with the requirements of the pack. It should be remembered that the method has only been tried

on limited varieties and in tests of limited size during the last three years.

Containers

Containers must be strong enough to prevent compression of the fruit inside. Corrugated containers with wooden end frames used in some of these tests provided this protection. Wooden containers designed to resist bulge may be used if protection against fruit scuffing is provided by use of a chipboard liner or its equivalent. All-corrugated containers may also be designed which will provide the necessary protection. Moisture resistance to maintain container strength under high humidity conditions is also necessary. The ability of any proposed container to prevent compression and vibration bruising should be determined by tests with packed fruit.

The container size may vary, but the one used in many of these tests held 3/4 bushel by weight, after settling, and is similar in shape and appearance to the new container coming into wide use in the southeastern peach area of the nation.

A depth of at least three to four times the diameter of the fruit is necessary to allow adequate settling with minimum irregularities across the top. On the basis of laboratory results, a 10-in. depth appears reasonable for peaches.

Filling

Peaches can be volume-filled into containers with semi-mechanical or automatic gravity-fed bulk fillers, but care must be taken to avoid fruit bruising by excessive drops. Filling weight must be carefully determined by trial. Containers must be filled sufficiently to prevent fruit movement after settling and closing, but not so full as to allow compression bruising during or after closing. Once this fill weight is determined, however, it can be standardized for the variety. Mechanical fillers which prevent excessive drops may need further development to make them sufficiently automatic for large volume peach-packing operations.

Settling

Settling is a separate operation carried on after filling and weighing; it cannot be done properly during filling. If settling is not accomplished during packing, it will occur during transit—loosening the fruit and making it subject to vibration injury. Peaches settle most uniformly at a frequency of 800 to 1,100 cycles per minute with 1/8- to 1/4-inch stroke, and the vibration time should not exceed five seconds. A light top pressure—5 lbs or

more—is necessary during this procedure to assure settling of the fruit.

Vibration settling is one of the most critical parts of the tight-fill operation. An automatic vibrator, under development by the University of California, was used in the 1963 tests. This incorporates positive timing and positive seating of the cover. It appeared to improve fruit settling over anything which could be done by hand.

Padding

Both top and bottom pads are necessary. Half-inch envelope pads of either excelsior or redwood bark are suitable. The bottom pad reduced injury due to impact bruising; the top pad reduced injury due to vibration. Where the fruit was uneven across the top of the container, loose excelsior was better than excelsior or redwood bark pads. However, loose packing material was objectionable to both the packer and the receiver. Acceptable results in these tests were obtained with an envelope top pad.

Closing

The lid must be closed under pressure to assure tightness within the container during transit. Both depth of fill and closing pressures should be such that the fruit is held as firmly as possible without crushing. This requires careful attention to all steps in the packing operation.

Fruit firmness

Tests were made with fruit of normal commercial maturity for both local and eastern shipment, rather than with so-called "tree ripe" fruit, of which only a small volume is marketed. The very early soft tipped varieties were also not tested. Such varieties are often shipped in single-layer flats to protect the tips from compression bruising. Such soft fruit requires special handling. Thus, fruit for tight-fill packing should be of comparable firmness and maturity to that shipped commercially either to local or eastern markets.

For a complete detailed report of this program, the reader is referred to University of California Information Series in Agricultural Economics No. 64-1, "Technical and Economic Evaluation of New and Conventional Methods of Packing Fresh Peaches and Nectarines."

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ECONOMIC-ENGINEERING COST STUDIES PROVE VALUE OF TIGHT-FILL PEACH PACKING

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STUDIES WERE MADE of place-packing and tight-fill procedures with fresh peaches and nectarines in relation to the amounts of labor and equipment required at various rates of packout and lengths of season (for sizing and packing operations only). In commercial operations, as analyzed in this study, two types of equipment are most commonly used in place-packing operations: belt equipment and bin equipment. Belt packing requires the selection of unsized fruit from a conveyor. In bin-packing operations, the fruit is passed over a mechanical sizer and delivered, by size, to bins from which it is place-packed. For each type of equipment, one or both of two styles of pack are used: the cup-pack and the tray-pack. With the cup-pack, each fruit is placed in thin paper cups and then pattern-placed in the container. In tray packing, sized fruit is placed in the cells or depressions of preformed trays. Place-packing methods, representing specific combinations

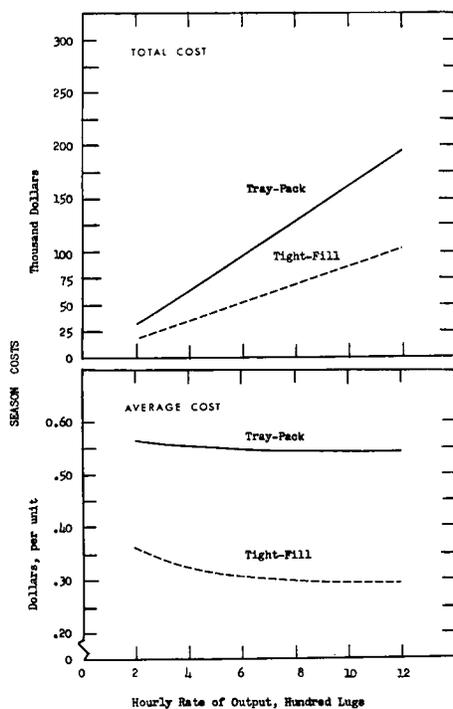
of type of equipment and style of pack, are given specific consideration.

Analyses of operations and costs with the tight-fill packing procedure are based on data obtained from three plants in the same general area, supplemented by a synthesis based on data obtained from pomologists, engineers, and equipment manufacturers. Data were also used from previous studies of operations in pear and plum packinghouses. The tight-fill pack, as described in the accompanying article, consists of filling a container with fruit, settling it by vibration, and closing the lid under pressure. Packing labor with the tight-fill method is partly or wholly replaced by semi-mechanical or automatic gravity-fed bulk fillers.

Automatic filling

With automatic filling, quality graded fruit flows to the packing area over a weight or dimension sizing assembly. When a weight sizer is used, the fruit fed to the sizer is received by a patented plastic belt system that aligns the fruit in single file from which it is deposited into parallel rows of individual plastic cups which pass over a series of scales preset to the desired weight. Sized fruit is then deposited on a foam plastic ramp that leads to a side-delivery belt, which conveys it to bulk fillers where the cartons are automatically filled to a predetermined weight, as governed by the scale on the filler. The full boxes are automatically ejected from the filler onto powered conveyors which lead to the main fruit conveyor. Empty boxes are supplied to the packing area by an overhead monorail conveyor. A scale is installed in the packed fruit line for checking fill weight. With dimension sizing, the sizing unit most commonly used is the diverging slat-sizer, whereby the fruit is conveyed by a series of metal flights that gradually widen to allow successively larger fruit to drop onto cross collection belts. Other operations are essentially the same as described above.

With semi-mechanical filling, the quality graded and sized fruit is delivered by size to a series of holding bins. The fruit may be sized either by weight or dimension sizing equipment. In the filling operation, a worker places an empty container



Peaches and Nectarines: Total and Unit Season Costs of Tray-Pack Operations with Bin Equipment and Automatic Tight-Fill Operations in Relation to Selected Rates of Output and 300 Hours of Operation per Season, California, 1964.