



Harvesting in bulk bins caused no more damage to shipping peaches, nectarines and plums than conventional handling and transporting with field boxes, according to limited field tests in Tulare County.

BULK HANDLING OF SHIP —trials encouraging in

J. H. LA RUE • F. G. MITCHELL

BULK BINS are adaptable to transporting a wide range of shipping fruits from the field to the packing house. Much of the citrus industry's fruit handling has changed from field boxes to bulk bins. Pears and apples are being handled by this method for both fresh shipment and processing. Some other processing fruits, such as prunes and cling peaches are also being frequently handled in bins. Picking directly into bins allows better field supervision and control of the pickers, easier and faster field handling of fruit, and reduced container replacement costs over a period of years. Factors to be balanced against these advantages include the initial cost of conversion, investment in new equipment, disposal of existing materials, and interim system complications.

Quality study

This study was initiated to show the effect of picking, handling and transporting in bulk bins on the quality and condition of shipping peaches, nectarines, and plums. The evaluation was based on the amount of damaged fruit found following handling in bins compared to field boxes. No attempt was made to evaluate other advantages or disadvantages of either system in the field and packing house, or the additional equipment necessary to change from field boxes to bins.

In the summer of 1963, a grower-shipper in Tulare County cooperated in a series of tests with several stone fruit varieties. The bins had a capacity of 34 field boxes and were similar in construction to those used by the cling peach industry. They were made of 3/4-inch plywood and measured 4 x 4 x 2 feet deep. A line around the inside of each bin at the 16- and 20-inch level served as a filling guide for pickers.

The varieties studied were Santa Rosa plum; Red Haven, Early Elberta and 49er peaches; and Early Sun Grand, Sun Grand and Late LeGrand nectarines. These varieties are shipped in large volume and were considered representative of the shipping fruit grown in that area.

The fruit was picked from the trees into buckets and then carefully dumped into field boxes and bins. Bins were filled to two levels—16 and 20 inches deep—for each variety tested. In each trial, the same crew picked into both field boxes and bins in the same drive or adjoining drives. The bins were positioned on a trailer pulled through the orchard by a tractor. The field boxes were first stacked on the ground, then loaded on a pallet on the same trailer next to the bins for transport to the packing house, a distance of about seven miles. Loading of the trailers was planned to give as near equal treatment as possible to all fruit during transportation.

The bins and boxes were removed from the trailer at the packing house by a fork lift. Samples were taken from the top third, middle third, and bottom third of each bin. A previously calculated percentage of each sample was taken adjacent to the bin side or bottom. These samples were drawn to show if any damage could be attributed to bin position or proximity to side or bottom of the bin. Samples were also drawn from each of the top, middle and bottom, field-box positions on the pallet to show if pallet position contributed to fruit bruising.

Evaluation

Each fruit in each sample was closely examined for damage and was scored on the basis of: 1. no damage—no visible external damage; 2. slight—external damage very slight; and 3. severe—external damage severe enough to be easily seen (and probably would be culled from a commercial pack).

Two types of bruises were scored: compression and abrasion. All external bruising was scored regardless of how it might have occurred. Thus the scores reflect damage occurring on the tree, during picking, filling, handling, transporting and unloading.

Results

Results of these tests, summarized in the accompanying tables, show there was no difference in the amount of bruising at the two bin depths of 16 and 20 inches (table 1). In no case was there evidence that fruit damage on the bottom of the bin was due to the weight of the fruit on top.

In one of two comparative tests with Santa Rosa plums, the sides of one bin

TABLE 1. COMPARATIVE DAMAGE IN 16- AND 20-INCH BINS
(Average all tests, per cent total fruit)

Damage	20" Bin	16" Bin
None	77	79
Slight	19	17
Severe	4	4

TABLE 2. COMPARATIVE DAMAGE IN SANDED AND UNSANDED BINS
(Santa Rosa Plums, 20-inch bins, per cent total fruit)

Damage	UnsanDED	Sanded
None	52	69
Slight	37	25
Severe	11	6

TABLE 3. COMPARATIVE COMPRESSION AND ABRASION BRUISING
(Average all fruit*, per cent total fruit)

Type of Bruises	20" Bins Sanded	Field Boxes
Compression, slight	5.8	6.0
Compression, severe	2.0	3.2
Abrasion, slight	6.8	5.5
Abrasion, severe	1.0	0.7

* UnsanDED Santa Rosa bin and 49er peach trial not included.

TABLE 4. COMPARATIVE DAMAGE: 20-INCH BIN VS. FIELD BOX
(By variety*, per cent damaged fruit)

	20-INCH BIN			FIELD BOXES		
	No damage	Slight	Severe	No damage	Slight	Severe
Santa Rosa	69	25	6	65	24	11
Red Haven	92	6	2	95	3	2
Early Sun Grand	90	8	2	86	10	4
Early Elberta	97	1	2	96	4	0
Sun Grand	83	16	1	86	14	0
Late LeGrand	75	20	5	80	14	6
Average	84	13	3	85	11	4

* Unsanded Santa Rosa bin and 49er peach trial not included.

PING FRUITS

Tulare

were sanded for comparison with another bin left unsanded. The unsanded bin had 17% more bruised fruit (table 2) from abrasion bruising of fruit along the sides of the bin.

Comparing the number of compression bruises to abrasions for all fruit tested (table 3), the 20-inch bins and field boxes had about the same amount and type of injury. There was considerable variation in level of injury between varieties (table 4)—showing that some are bruised much easier than others—but overall averages were about the same for bins and field boxes. (Results with the 49er peach variety are not shown because the bins and boxes were not transported on the same trailers in these tests and thus no comparison could be made.)

A summary of all fruit tested, compar-

ing the amount of damage done in the top third, middle third and bottom third in both the 20-inch bins and picking boxes, showed no differences in the number of compression bruises due to position (table 5). However, a slight increase in abrasion bruising appeared in the top of both the pallet and the bin.

Conclusions

In these tests, bin handling did not increase fruit damage as compared with the use of field boxes. While the amount of damage varied with variety, the two systems of handling and transporting the fruit gave the same amount of damage for any one variety. Compression bruising, which is a problem as fruit depth is increased, was similar for both 16- and 20-inch depth bins. Abrasion bruising was found to be slightly worse near the top of the bin. Thus there appears to be an advantage to the use of the 20-

TABLE 5. DAMAGE ASSOCIATED WITH POSITION OF FRUIT
(20-inch bins and field boxes—all varieties, per cent damaged fruit)

Position	20-inch Bins		Field Boxes	
	C	A	C	A
Top	8	9	11	8
Middle	7	8	9	6
Bottom	10	6	8	5

C = Compression bruising A = Abrasions

inch depth which affords a lower surface-volume ratio.

Close examination showed that much of the abrasion bruising occurred when the fruit was in contact with the side of the bin or box during transportation. It seems possible that special coatings or finishes for all containers would present a smoother surface to the fruit, resulting in further reductions of abrasion bruising.

Observations made during the course of these trials also indicate that the conditions during transportation from the field to the packing house are extremely important for either system of fruit handling. Shippers may gain considerably by reviewing transport methods to determine whether present levels of fruit injury can be reduced.

Any shipper trying bulk bins for handling fresh shipping stone fruits should do so with caution. While the trials reported here were of limited scope—one location, one handling procedure and generally, eastern shipping maturity—they do indicate a potential for the use of bulk bins for these fruits.

James H. LaRue is Farm Advisor, Tulare County; and F. Gordon Mitchell is Extension Pomologist, Marketing, University of California, Davis. Cooperation and advice in these tests were also obtained from the Giannini Packing Company, Dinuba, and Michael O'Brien, Department of Agricultural Engineering, U. C., Davis.

Bulk bins and field boxes are shown in position on a trailer ready for transporting to the packing house.

