THE CONTROVERSY OF BULGE PACKS

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Examines the question of what height packs are best suited for fresh fruit and vegetables bulge, flat or slack.

Despite the improvements made in packaging, handling, and distributing fresh fruits and vegetables, one controversy continues to plague many people in the fresh fruit and vegetable industry. Should shipping containers be packed with the product over the top edge of the container (bulge-packed), packed flat without a bulge (flat-packed), or packed with the product below the top edge of the container (slack-packed)?

Studies have shown that bulge- or high- "faced" packing (packing in which the top layer of product is specially arranged by hand) is one of the major causes of product losses. In addition, the labor cost is higher for this type of packing than for jumble- or volume- fill packing. Research published in 1960 showed that when fresh cherries were jumble-packed in 20-lb. capacity wooden boxes, they suffered less damage in transit than when they were bulge-packed in 15-lb. capacity wooden boxes, and the cost was less. (1) The research showed that the lower cost jumble-packing of cherries could save the industry about $200,000 a year. When they were bulge-packed, western-grown Italian prunes were bruised in 1/2-bushel wood-veneer baskets than when they were jumble-packed in 12-lb. capacity fiberboard boxes. (2) Only 7% of the prunes shipped in the fiberboard boxes were bruised as compared with 21% of those in the wood-veneer baskets. Adoption of these new, jumble-packed boxes would save the prune industry about $953,000 annually. Results of another study showed that when peaches were bulge-packed in peach boxes, the total bruise damage they suffered was 14.5% greater than when they were slack-packed. (3) This research also showed that if eastern-grown peaches were jumble-packed in newly developed peach boxes, instead of bulge-packed in crown-cover baskets, the peach industry could save several million dollars annually.

WHAT ABOUT GRAPEFRUIT?

In view of the successful use of the jumble method of packing cherries, prunes, and peaches, ARS researchers set out to determine the best method for packing grapefruit: bulge-, flat-, or slack-packed.

Three, 22-day, storage tests were conducted. In each test, (3) cartons of grapefruit received each of three packing treatments: bulge-, flat-, and slack. The grapefruit packed in all cartons were seedless (*Citrus paradisi* Macf.) about 4 in. in diameter. To attain flat- and slack-packed heights, experimental fiberboard cartons were manufactured 1-1/2 and 2 in. deeper, respectively, than the conventional size carton used by the citrus industry for the bulge packing of fresh fruit.

The grapefruit for each of the tests was hand-harvested by researchers from the same commercial grove located in the Indian River district of Florida and then transported to the U.S. Horticultural Research Laboratory, Orlando, Florida. The fruit was washed, treated with 1,000 ppm of thiabendazole (TBZ), waxed with a solvent wax, graded, sized, and place-packed by researchers in the test cartons. Weights totaling 225 lb. were placed on top of

cartons representing each treatment to simulate overhead carton stacking weights under commercial conditions.

The data in Table 1 show that the bulge-packs had significantly more top-to-bottom compression than occurred in the experimental flat- and slack-packed cartons, which indicates that the protrusion of the fruit over the top edge of the cartons did not materially improve the overall compression resistance of the cartons. The fact is that there was no appreciable bulge remaining in the conventional bulge-packed cartons at the end of the 22-day storage period. The data also show that overall appearance of grapefruit is related to the height at which fruit was packed. The higher the fruit was bulged, the more serious the adverse effects on the fruit's appearance. A better grapefruit appearance was maintained in flat-packed cartons than in those that were bulge-packed (with a conventional bulge of 1 in. and more). Additionally, appearance of the grapefruit was even better when space was left between the top layer of fruit and the carton cover than when the cartons were flat-packed.

In the three tests, 84.7% of the grapefruit packed in the bulge-packed cartons were seriously deformed, or about four times more than in the flat-packed cartons. Seriously deformed fruit is defined as fruit having a total (aggregate) flattened or indented surface area of 2 in. or more in diameter. Packing grapefruit in slack-packs, as compared with bulge-packing and flat-packing significantly reduced the amount of seriously deformed fruit to 5.3%.

Discussion

Data from this and many other studies indicated that bulge-packing in wood-veneer baskets, wirebound crates, and corrugated fiberboard cartons causes severe damage to the product's quality during its handling and transport to markets, and that this method of packing is more costly than other packing methods. However, shippers, buyers, merchandisers, receivers, and others in the marketing chain still hesitate to change their preference to flat- or slack-packs. Packing regulations such as Florida Regulation 105-1.03 limit the bulge for fresh citrus packs to certain heights, but most of the shipping containers are still over-packed. Controlling pack heights or bulge in shipping containers seems to be a difficult task.

In one attempt to control bulge, a California lettuce container was made large enough to accommodate the bulge or extra lettuce being packed; however, in a few years the container evolved into a larger "bulge-packed" container. A more recent survey to determine the needs of chainstore handlers and merchandisers regarding the packaging of fresh fruit and vegetables indicated decisively that the bulge in bushel baskets (especially green peppers) and in wirebound crates causes crushing and bruising of the product on its way to the stores. (4) Yet, many shipping containers of fresh commodities are still bulge-packed. Many shippers consider bulge-packing to be a marketing tool which allows them to give away a little more of their product (especially when prices are low) with the hope that the extra product will increase sales. Other shippers bulge-pack cartons so that their containers will look full upon arrival. Likewise, some buyers feel that bulge-packs give them a little extra product. Buyers for wholesale outlets that sell on package visibility state that bulge-packed cartons have a better appearance than flat- or slack-packed cartons. Although bulge-packing provides a better appearance, flat- or slack-packing provides greater advantages. Flat- and slack-packs cost less to pack, and the amount of product damage upon arrival is reduced. The elimination of bulge-packing would also be quite beneficial in maintaining the strength of the shipping containers and in encouraging the development of an automatic packing, closing, and palletizing system. It is strongly recommended that buyers who are concerned with the quality of the fruits and vegetables they purchase make known their preferences for slack- or flat-packs.

For specific fresh fruit or vegetable products for which there is no satisfactory container for flat- or slack-packing, the industry should conduct commercial shipping tests to find better ones. The results of these tests should then be carefully

Table 1. Carton Compression, Pack Heights, and Percentage of Seriously Deformed Fruit for Three Carton Treatments.[a]

Carton Treatment	Carton Compression[b]	Average Pack Height	Seriously Deformed[c]
	Inch	Inch	Percent
Conventional bulge-packed	1.2	1.2	84.7
Experimental flat-packed	.4	.1	20.3
Experimental slack-packed	.3	slack	5.3

[a]Total of nine cartons (360 fruit) examined for each treatment.

[b]Based on overall height of carton, including fruit protruding over top edge of carton body (referred to as "bulge" in report).

[c]Differences between treatments are significant at the 1% level.

monitored and presented to packers and shippers, along with recommendations for use of the improved containers to reduce losses and improve the general quality and appearance of the fresh fruits and veg etables for the consumer.

Literature Cited

(1) Fountain, J. B. and P. G. Chapogas. Evaluation of Shipping Containers for Washington Cherries. U.S. Dept. Agr. Market. Res. Rpt. No. 426, 26 pp. 1960.

(2) Fountain, J. B. and R. M. Hovey. Feasibility of Shipping Fresh Apricots and Prunes Jumble Packed in Fiberboard Boxes. U. S. Dept. Agr. Market. Res. Rpt. No. 839, 9 pp. 1969.

(3) Hale, P. W. and E. D. Mallison. Evaluation of Selected Shipping Containers for Eastern-Grown Peaches, U.S. Dept. Agr. Market. Res. Rpt. No. 737, 11 pp. 1966.

(4) Market Analysis Series MA 1-72 Florida Dept. of Agriculture and Consumer Services, 38 pp. 1972.