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# Marketing Potatoes

## *In Corrugated Fiberboard Boxes*

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Information contained in this report supplements the data for a similar study made in 1951.<sup>1/</sup> In the previous study the ability of fiberboard containers to carry washed potatoes and their ability to withstand the effects of common and cold storage was not determined. The purpose of this study, therefore, was to determine:

- ▶ The amount of protection furnished dry and washed potatoes by corrugated fiberboard boxes during transit and handling operations.
- ▶ The ability of the boxes to withstand the effects of common and cold storage conditions.

### Procedure <sup>2/</sup>

One test car of potatoes packed in 50-pound corrugated fiberboard boxes was shipped in April, 1952 from Redmond, Oregon to a chain store warehouse in Portland. The car was loaded with 880 boxes, of which 800 were commercially packed in a cellar-packing operation. The remaining 80 boxes contained the experimental potatoes used in the test. Forty of the test boxes contained washed potatoes. Potatoes in the other 40 boxes were unwashed.

### Transit and Handling Damage was Insignificant

Injuries received by the experimental potatoes averaged less than one-tenth of 1 pound per hundredweight between shipping point and the wholesale warehouse in Portland. Only two boxes out of the 80 test boxes shipped developed injury as a result of transit and handling operations. Damage in these two boxes resulted when they fell from the top of a loaded pallet while in the warehouse in Portland.

The appearance of the washed potatoes was affected by a surface mold which developed between the time of packing and the inspection at terminal market. Mold was found in about 85 per cent of the boxes containing washed potatoes. Less than 10 per cent of the boxes containing unwashed potatoes had potatoes with mold. The moldy condition of the potatoes was so superficial that its effect on appearance was not a major consideration. Additional air vents in the boxes might have prevented some of this mold.

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<sup>1/</sup> Teal, R. H., and Davis, G. B., "Trial Shipments of Potatoes in Corrugated Fiberboard Boxes," Oregon Agricultural Experiment Station, Circular of Information 500, 1951.

<sup>2/</sup> See page 5 for more details of the procedure used.

## Storage Caused Boxes to Bulge

Boxes held in common storage for a period of 3 days showed little tendency for their sidewalls to bulge (Figure 1). This was a common occurrence with some of the boxes tested the previous year.<sup>1/</sup>

Sidewalls of the containers held in cold storage for 10 days, however, tended to bulge (Figure 2). Even though the boxes were constructed of water-resistant material, the fiberboard absorbed moisture while in cold storage. While in cold storage sidewalls on boxes containing washed potatoes did not tend to bulge any more than did sidewalls on those containing unwashed potatoes.

The bulging of the boxes which resulted from weakened sidewalls affected the appearance of the containers and their ability to be stacked. The potatoes, however, were not affected.

## Packing in Farm Cellars Not Satisfactory

The commercially packed boxes were packed in a cellar packing operation and hauled to the car by a truck equipped with stockracks (Figure 3). So long as the crew was able to work outside the cellar, working space was adequate. Most farm cellars, however, are not constructed with enough interior working space to permit efficient box assembling, filling and closing. It is likely that these operations could have been performed more efficiently in warehouses.

During the packing operations considerable trouble was encountered in filling and closing the containers. This could be attributed, for the most part, to the unusually large sized potatoes packed. "Baker" size potatoes were not removed. Each box was vigorously jiggled to settle the potatoes into place so that the top of the box could be closed. Even when this was done most of the boxes had bulged tops when loaded into the car. The trip to terminal market, however, settled the potatoes and the bulge was not noticeable there.

The cost of loading potatoes in cars when packed in farm cellars probably would be greater for boxed potatoes than for potatoes in conventional 100-pound bags. In team track loading, car loaders would have to make twice as many trips carrying the boxes from the loaded truck into the car than would be required to load a car with 100-pound bags.

A tight load, whether boxes or bags, minimizes damage caused by shifting. Boxes can be loaded tighter than bags because of their fixed dimensions (Figure 4). All refrigerator cars do not have the same inside dimensions. A different loading arrangement, therefore, might be required for each car size.

## Boxes Well Adapted to Palletized Handling

At terminal market the boxes were moved out of the car by roller conveyor to pallets, (Figure 5). Fork-lift trucks then moved the pallets to storage. The unloading crew estimated that unloading time was about the same for the boxes as for 100-pound bags.

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<sup>1/</sup> Ibid.



Figure 1. These boxes were in good condition after being held in common storage for 3 days.



Figure 2. Notice bulged boxes after 10 days of cold storage and 3 days of common storage. An overlapped loading would prevent much of the bulging.



Figure 3. Stock racks were used to keep the load from slipping while enroute to the car from the cellar-packing operation.



Figure 4. Boxes made a tight load in the refrigerator car. Each box was hand placed in the load.



Figure 5. The use of a roller conveyor and pallets made unloading a quick job.



Figure 6. Boxes were still in good condition in this retail store display.



Pallets were not double decked. Boxes in the bottom pallet would not have withstood the weight of a second pallet load. This, however, is no disadvantage because pallets of 100-pound bags also are not double decked.

It was quite apparent that the mechanized handling of the boxed potatoes was more efficient than handling by means of two-wheeled hand trucks. The latter method had been used in a previous experiment.

## Retail Store Managers Liked the Containers

Forty retail store managers receiving 560 of the 800 commercially packed boxes returned questionnaires. At the time the questionnaires were returned 475 boxes of potatoes had been sold. Seventy-nine per cent were sold in the original boxes as 50-pound units, (Figure 6). Potatoes in the remaining 21 per cent were repacked in the stores in 10-pound consumer units and then sold. None of the boxed potatoes were emptied into bins and sold from bulk displays.

In general the store managers' comments were favorable toward the boxes over the conventional 100-pound bags. Their opinions, however, may have been influenced by the quality and size of the potatoes in the containers. The potatoes were unusually large and were of better quality and condition than most potatoes being received at the time this experiment was conducted.

One of the disadvantages cited in the report of the 1951 investigation was the lack of salvage value for the empty containers. Since empty fiberboard cartons are commonly used in retail stores as containers for customers' groceries, the store managers were questioned concerning the proportion of the boxes that were suitable for that purpose. They considered the boxes very satisfactory. Of the managers questioned, 23 said 100 per cent of the boxes were satisfactory; 1 manager said 95 per cent; 2 answered 90 per cent; and 2 said 75 per cent were usable.

The managers also rated the condition of the containers received. All but 3 reported the condition of the boxes to be "good" or better. One reported the boxes to be in "fair" condition and one reported "pretty bad." Findings were as follows:

### POINTS IN FAVOR OF BOXES

<u>Managers</u>	<u>Comment</u>
26.....	Easier to handle
20.....	Less damage to potatoes
16.....	Easier to stack
13.....	Easier to store
11.....	Easier to display
9.....	Neater sales display
5.....	Use of empty containers
3.....	Sturdy
3.....	Easier to truck
2.....	Good customer acceptance
1.....	Keep potatoes from direct light
1.....	Easy to repack - no dumping

### POINTS AGAINST BOXES

<u>Managers</u>	<u>Comment</u>
1.....	Mash if stacked too deep
1.....	Mashed boxes hard to display
1.....	Wet or damp cartons go to pieces
1.....	No value on empty containers
1.....	People used to buying in bags
1.....	Does not have customer acceptance
1.....	Needs customer education
1.....	Customer can't tell what's in them
1.....	Takes up too much space for display
1.....	Sharp staples
1.....	Takes more room

## Boxes Cost More Than Bags

Two weights of boxes were used in this experiment, as explained in the Appendix. Box cost varies according to the weight of the inner and the outer facing per thousand square feet. Boxes rated 47-47 cost 15¢ each. Boxes rated 69-42 cost 17.5¢ each. Prices include delivery to Redmond or Klamath Falls on a carlot basis and include normal printing (as of July 1, 1952). Staples for assembling and closing boxes would cost approximately 1¢ per box.

The cost of two 50-pound boxes is more than the cost of one 100-pound burlap potato bag. Potato bags have a salvage value. Empty potato boxes have only a minor resale value, but would have some value when used in retail stores for carryouts.

## Conclusions

Corrugated fiberboard shipping containers afforded excellent protection to the potatoes from the standpoint of transit and handling damage. This was true even though the boxes did not stand up well in cold storage. If the boxed potatoes moved rapidly from the producing area to the retail store then they should be satisfactory regardless of whether they contain washed or unwashed potatoes. Problems will arise, however, if the potatoes are held too long in cold storage.

Present methods and facilities for handling potatoes at shipping point are not well adapted to the boxed potatoes. Not enough work space is available in most farm cellars for cellar packing of boxes. The cost of loading boxes in cars at either team tracks or warehouse platforms will be more than for 100-pound bags. Warehouse packing in boxes could be improved by devising box jiggling and better car-loading equipment.

Retail store managers' reactions to the containers appeared to be very favorable. This, however, cannot be viewed as conclusive evidence that the boxed potatoes will be able to compete effectively with potatoes packed in other types of containers. Cost of boxes, handling costs and susceptibility to bulging are factors which also must be taken into account.

## APPENDIX

### Details of Procedure Followed

The potatoes in the 80 boxes were free from all mechanical injuries when they left shipping point. All grade and nongrade defects had been removed by a federal-state inspector.

Upon arrival of the car in Portland the 80 test boxes of potatoes were removed from the car and placed in the warehouse. One half the washed and one half the unwashed potatoes were placed in common storage. The other 40 boxes went into cold storage and were held at a temperature averaging about 40 degrees Fahrenheit. At the end of 3 days the potatoes held in common storage were examined by the same federal-state inspector who conducted the inspection at shipping point. The potatoes were inspected for grade and nongrade mechanical defects. Potatoes in cold storage were moved at the end of 10 days to common storage. After being held there for 3 days they were inspected by the same federal-state inspector.

The 800 commercially packed boxes of potatoes were distributed to several of the retail chain stores. Each of the store managers received a questionnaire asking for certain information concerning their reactions to the containers.

The boxes used in the experiment measured 16 inches long, 13 inches wide, and 10 inches deep. One half the boxes were constructed of corrugated fiberboard having a weight of 47 pounds per thousand square feet for both inner and outer facing. The outer facing of the other boxes weighed 69 pounds and inner facing 42 pounds per thousand square feet. Both grades of boxes had handholds and bore a 200-pound test freight certificate stamp and contained the same water-resistant corrugating medium and adhesive.

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