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## Evaluation of Shipping Containers for Tennessee Fresh Market Strawberries

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# EVALUATION OF SHIPPING CONTAINERS FOR TENNESSEE FRESH MARKET STRAWBERRIES

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by

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THE UNIVERSITY OF TENNESSEE  
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KNOXVILLE

## SUMMARY

### Comparative Cost of Containers and Labor

**M**ATERIAL cost computed for both the wirebound and corrugated crates (containers, quart cups, labels, and staples for labels) was 0.57 cents lower for the corrugated crate. The total labor cost of packing and loading was 4.66 cents for a wirebound crate compared to 4.69 cents for a corrugated crate.

- Total direct cost for materials, packing and loading the corrugated crate was 84.49 cents compared to 85.03 cents for the wirebound crate. The savings on a trailer load of 15,000 of the corrugated containers would be \$81.

### Field and Transit Temperatures

- The temperature of the strawberries increased from the time the temperature was first recorded at the field until the temperature of the last cup was recorded for each test, with one exception, which was an afternoon picking.

- During shipment from Portland, Tennessee, to Cincinnati, Ohio, temperatures within both wirebound and corrugated crates tended to descend at a slow, steady rate, with the lowest temperatures being recorded during the hours after midnight. The temperatures were not consistently lower in either the corrugated or wirebound containers. When a tier of corrugated and a tier of wirebound crates were stacked "solid," the temperature in the corrugated crates did not start falling until 5 hours after it had started to decline in the wirebound ones.

### Condition of Strawberries and Crates After Shipment

- Observations at the terminal market revealed no discernible bruising or damage to the strawberries in either of the crates.
- Although some methods of lateral bracing proved unsatisfactory and permitted tilting and shifting of the widely-spaced stacks, the corrugated crates were reported to be in excellent condition upon arrival at their destination.

### Wholesalers', Retailers', and Consumers' Preferences

- Fifty-four percent of the 26 wholesalers, 66% of the 100 retailers, but only about 25% of the 250 consumers in Cincinnati expressed a preference for the wirebound crates. The wholesalers and retailers indicated the primary reasons for preference of the

wirebound crates were less damage to fruit and less cost to handle. About three-fourths of the wholesalers indicated their preference for the corrugated container was equally divided between container attractiveness and less cost to handle. Seventy-five percent of the retailers said they preferred the corrugated crate because of container attractiveness, less cost to handle, and less damage to fruit.

- The merchants' preferences for the wirebound over the corrugated containers were significant at the 0.05 level. There was a significant difference in the consumers' preference for the corrugated container over the wirebound.

- Sixty-three percent of those who were interviewed in the three retail grocery stores in Cincinnati indicated that the display of crates attracted their attention. Sixty-four of the consumers interviewed purchased strawberries from the wirebound crates and 211 of them purchased from the corrugated crates. Of the latter, 87% considered the corrugated containers attractive.

- About 88% of the wholesalers and 72% of the retailers preferred the wood veneer over the plastic cups. There was an overwhelming preference by merchants and consumers for the wood veneer cup at the 0.01 level.



## ACKNOWLEDGMENTS

The authors express their appreciation to those who have assisted in furnishing the data for preparing this report, especially officials of the Dyer Box and Crate Company, Dyer, Tennessee; the West Virginia Pulp and Paper Company, Hinde and Dausch Division, Richmond, Virginia; Messrs. Irvin Fly, Manager, Madison County Strawberry Growers' Association; J. B. Donoho, Manager of the Portland Strawberry Growers' Association; and the cooperating members of the association who furnished strawberries for the test containers. Appreciation is also expressed to Ray Nardini and other personnel of the Wm. Enderlein Company; Floyd Bradley, Produce Merchandiser; and the three managers of the retail grocery stores of the Kroger Company, Cincinnati, Ohio, for their cooperation. The assistance of the three enumerators from the B and B Research Agency, Cincinnati, Ohio, is also appreciated. Special acknowledgement is made to T. J. Whatley, Department Head; to the Departmental Committee; and to the Technical Committee for the Southern Regional Project SM-8 for reviewing this report.

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# EVALUATION OF SHIPPING CONTAINERS FOR TENNESSEE FRESH MARKET STRAWBERRIES<sup>1</sup>

WILLIAM E. GOBLE, JOHN L. GINN, JOE W. WHITE\*

## INTRODUCTION

### Importance of Strawberries in Tennessee and the Southern Region

Strawberries are relatively important as a source of income for about 5,000 farmers in Tennessee. The average annual income from strawberries for the state during the 10-year period, 1950-1959, was \$3,688,000. Over \$1,000,000 was derived from fresh-market strawberries. Considering the economic importance of fresh-market strawberries, members of the Tennessee strawberry industry desired to determine whether producers would benefit by a change of the marketing containers currently in use. This research would apply to strawberry producers in six of the states contributing to the SM-8 Project: Arkansas, North Carolina, Florida, Louisiana, Tennessee, and Virginia. The income from strawberries for these states for the 10-year period, 1950-1959, was \$16,856,000 of which 71% was income from the fresh market.<sup>2</sup>

Since most states now using corrugated board containers for strawberries normally pack in pint cups, little information was available on the shipping performance of the 16-quart master corrugated-board container (two 8-quart boxes). Moreover, information was not available on the comparative shipping performance of the 16-quart corrugated, moisture-resistant container and the conventional 16-quart wirebound crate.

### Objectives of Study

The purpose of this study was to determine whether the moisture-resistant, corrugated, 16-quart containers were adapted to the growers' marketing program for strawberries and how they com-

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<sup>1</sup>One of Tennessee's contributions to Regional Project SM-8, "Evaluation of Alternative Vegetable Marketing Organizations and Handling Methods." Agricultural Experiment Stations in Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Texas, and Virginia are cooperating in this research.

<sup>2</sup>*Vegetables—Fresh Market*, 1961 Annual Summary, USDA, Washington, D. C.

pared as a shipping container with the 16-quart wirebound containers which have been in use for several years. Specific objectives of the study were:

- 1) To measure the cooling rates of strawberries in each type of container and to ascertain the amount of bruising in each during transportation.
- 2) To determine the comparative cost for 16-quart units of wirebound and corrugated crates and materials for shipping strawberries, and the direct labor and cost to pack and load strawberries by operations and type of containers.
- 3) To appraise the over-all shipping performance of the two types of containers.
- 4) To evaluate trade acceptance and buying patterns for both types of containers and cups by wholesalers, retailers, and consumers.

## Procedure

### 1959 Season

A pilot study was conducted in 1959 in the western section of the state with a prototype of the container used in the 1960 season. Five test shipments consisting of 98 of the 8-quart boxes filled with the Tennessee Beauty variety of Number 1 strawberries were made by truck.<sup>3</sup> An adjacent tier of 16-quart wirebound crates was used as a check. Wooden cups were used in both types of test containers. All shipments were made by the Irvin Fly Company, agent for the Madison County Strawberry Growers' Association, Jackson, Tennessee. Two went to Dayton, Ohio, one each to Cincinnati and Springfield, Ohio, and to Chicago, Illinois.

These corrugated boxes, stacked 7 rows across and 14 boxes high, formed one complete tier in the truck. The tier of experimental boxes was placed in different positions in each shipment to determine how much damage would be done to the test containers and the adjacent tiers of wirebound crates in the different positions. There were 6 additional tiers of 16-quart wirebound crates in each truckload, stacked 7 rows across and 7 containers high.

### 1960 Season

The test shipments originated at Portland, Tennessee, and terminated at Cincinnati, Ohio. The shipping tests began on May 21.

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<sup>3</sup>Preliminary work was conducted by W. E. Goble, Department of Agricultural Economics and Rural Sociology, and by Paul Colditz, formerly with the Department of Horticulture at the University of Tennessee, but now with the University of Georgia.



Eleven truck shipments were made, with each crate filled with U. S. No. 1 grade of Tennessee Beauty and Pocahontas varieties, all obtained from several cooperating growers.

Thirty-nine hundred questionnaires, marked with an appropriate shipment number, were randomly placed in half of the quart cups in each experimental container before packing. These cards requested specific information on preference for the containers in which the strawberries were packaged. Store interviews were used to supplement the mailed questionnaires.

Packing strawberries is a two-phase operation. All packing operations were performed in the field—usually in a small shed, or under a shade tree. Here the containers were assembled, the strawberries graded, sorted, and packed in the veneer cups, and the cups packed in either the wirebound or corrugated crates. After enough containers were packed to justify a trip, they were loaded on a covered truck and taken to the assembling or shipping point area. At the assembling area, the containers were unloaded and stacked on the open platform, five crates high. Since all the test containers were destined for Cincinnati, Ohio, and vicinity, the test shipments remained on the dock for several hours before being loaded on a truck going to Cincinnati. The strawberries were graded by a government inspector, the variety and grade stamped on the container, and then they were loaded and braced in a refrigerated truck.

Each test shipment was inspected to determine the condition of the experimental containers and the strawberries upon arrival at the terminal market. Experimental crates were placed in different locations within the transit vehicle and were stacked 4 to 8 crates high. Spacing between stacks within a tier was also varied and ranged from zero to approximately 6 inches.

Temperature of the strawberries and air temperature were recorded during each step in harvesting and transportation. Both temperatures were taken when the first and last cup of each shipment were filled and when the strawberries left the field and the shipping dock. The temperature inside the refrigerated truck and the outside air temperature were recorded at the terminal market.

The combined cost for materials and direct labor used for packing and loading strawberries in the wirebound and corrugated crates was determined in the Portland area.

To determine the preferences and trade acceptance for the wirebound and corrugated containers, all wholesalers of fresh produce



and every fifth retail grocery store listed in the Cincinnati telephone directory were contacted.

In addition three retail grocery supermarkets were selected in Cincinnati, Ohio, and a professional interviewer was assigned to each store to record the consumers' evaluations of the containers.

Experimental corrugated boxes were set up as a display beside wirebound crates in each of these stores, and the interviewers were instructed to complete a form for as many as possible of those buying strawberries (Fig. 1). The number of interviews by store and date can be found in Appendix Table 1.



Figure 1. Consumer interviewed at display of strawberries, retail grocery store, Cincinnati, Ohio, May, 1960.

### Description of Shipping Containers

The corrugated container used in 1959, which is shown in Figure 2, differed from the 1960 model in only two characteristics: the 1959 model was  $\frac{1}{2}$ -inch deeper and the exterior was made of plain Kraft instead of bleached Kraft with colorful designs. Specifications of both types of crates are given in the description for the 1960 containers.

The standard 1-quart veneer cup was used for the shipping tests in this study. However, the interviewers showed consumers

plastic cups before the consumer expressed his preference for the two types of cups.

### Experimental Corrugated Crate

The experimental container was constructed of moisture-resistant, corrugated boards. In this study, two 8-quart boxes will be referred to as one container or crate. Each die-cut corrugated box with open top was made of plain Kraft on the inside and on the outside, which was printed on four panels in two colors. It was triple walled at each end, single walled on bottom and sides with a crosswise double-walled partition in the center (Fig. 2). There were five die-cut ventilation holes in the bottom and two on each side.

Since there was some difference in the weight of individual containers, 50 crates—100 8-quart boxes—were weighed (including dividers, partitions, and quart cups); the weight of the crates averaged 3.5 pounds.

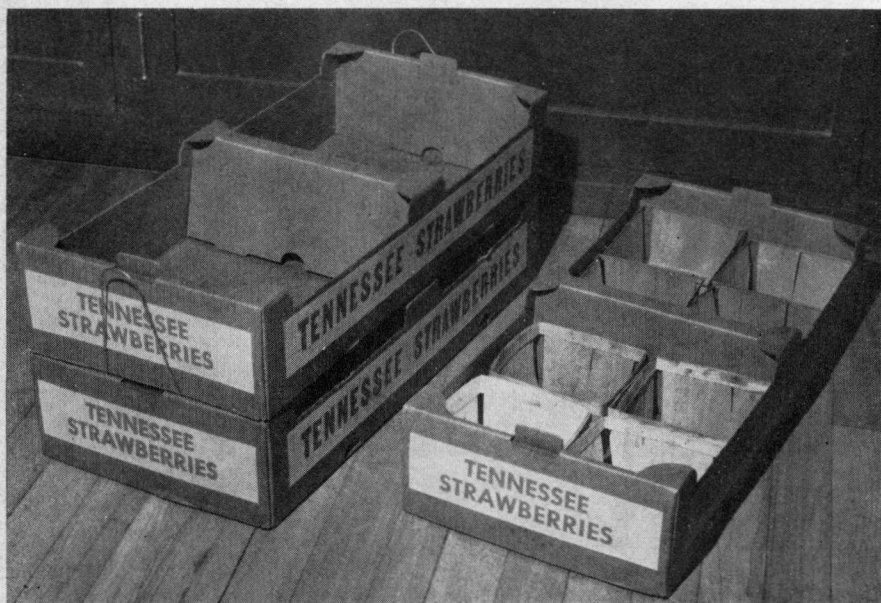


Figure 2. Early model of the corrugated container which was used in shipments from Jackson, Tennessee, May, 1959.

### Conventional Wirebound Crate

The conventional container was constructed of veneer strips bound together by wire. It was assembled manually by folding

and interlocking the wire tabs and it was designed to hold 16 one-quart cups of strawberries. Eight filled cups were packed in the bottom and then a wood strip was placed crosswise in the center as a partition and for support. A veneer strip partition was placed over the eight bottom cups and was supported by two wood strips running lengthwise along the inside of the crate. After the eight top cups were packed, another wood strip divider was placed crosswise. Three extended wire tabs and loops were used to fasten the lid on the wirebound crate (Fig. 3).

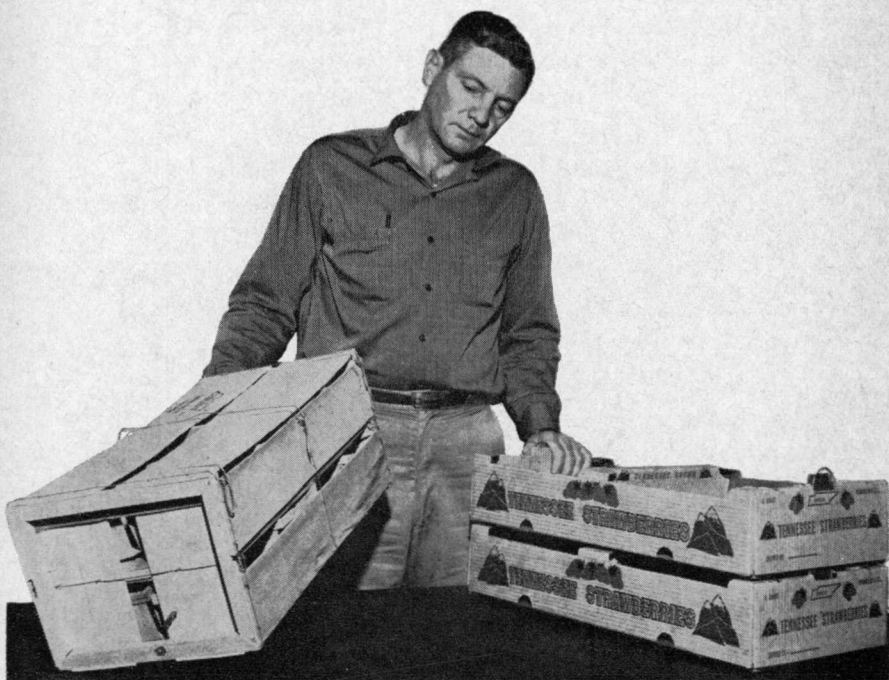


Figure 3. Wirebound and corrugated containers which were used in shipment tests from Portland, Tennessee, May 25-June 4, 1960.

Because the weights of individual crates varied, 50 crates—including dividers, partitions, and quart cups—were weighed and the weight of the crates averaged 4.7 pounds, or 1.2 pounds heavier than the corrugated crate.

## COST OF SHIPPING CONTAINERS

### Material Cost

Material cost was obtained on the basis of a purchase order for

15,000 containers—trailer load or over. The cost of each container is shown in Table 1. All charges were based upon the points of

Table 1. Cost of Containers and Materials for Shipping Strawberries in 16-quart Units, Tennessee, 1960.

Item	Wirebound crate	Cents	
		Wirebound crate	Corrugated crate
Container	50.00		49.80
Veneer quart cups (16)	30.00		30.00
Labels	0.25		—
Staples for labels	0.12		—
Total	80.37		79.80

distribution and production; however, these charges would vary by amounts purchased, distance transported to production areas, and whether or not containers were assembled at manufacturing plants, distribution centers, or the packinghouse. Material cost for both crates was practically the same, with the wirebound crate being 0.57 cents higher.

### Labor Cost for Packing and Loading

Since this was a comparative study, only plant operations directly connected with packing were studied. Labor for harvesting, panning or grading, sorting, and supervision was not included as it was the same for both containers from the same plant. Table 2 shows the cost and amount of direct labor for the two containers;

Table 2. Direct Labor Requirements and Cost to Pack and Load Strawberries by Operations and Type of Container, Tennessee, 1960.

Operations	Labor requirements		Labor cost	
	Wirebound	Corrugated	Wirebound	Corrugated
	Man/minutes per crate		Cents per crate <sup>1</sup>	
Assembling	0.4136	0.9338	0.68	1.56
Packing and closing	2.1286	1.5929	3.55	2.65
Labeling	0.1355	—	0.23	—
Stamping	0.0192	0.0328	0.03	0.06
Loading and bracing	0.1005	0.2468	0.17	0.42
Total	2.7974	2.8063	4.66	4.69

<sup>1</sup>Based on \$1.00 per hour.

labor time in this report has been adjusted by allowing enough to cover personal time and fatigue.



The most costly operation—the packing and closing of the container—was 2.65 cents for the corrugated crate compared with 3.55 cents for the wirebound crate. The total labor cost for a wirebound crate was 4.66 cents compared to 4.69 cents for a corrugated one.

### Cost of Materials and Labor

Transportation, refrigeration, and bracing material charges were not included in the cost of materials because these were borne by the broker. Total direct cost for materials, packing, and loading the wirebound crate was 85.03 cents compared to 84.49 cents for the corrugated crate (Table 3). The savings on a trailer load of 15,000 of the corrugated containers would be \$81.

Table 3. Costs of Materials and Direct Labor Used for Packing and Loading Strawberries in Containers, Tennessee, 1960.

Item	Wirebound crate	Corrugated crate
	Cents per crate	
Materials	80.37	79.80
Direct labor	4.66	4.69
Total	85.03	84.49

## RESULTS OF SHIPPING PERFORMANCE TESTS

### 1959 Season

Although shipping performance was generally satisfactory for both types of containers, the shippers and buyers suggested that certain changes in the corrugated container would be desirable. Suggested adjustments were 1) reduction of inside compartment dimensions to provide a better fit for 8 quart-size cups; 2) extension of the handles by 1½ inches so that two boxes could be fastened together; 3) provision of attractive color on outside of crates to increase sales appeal; and 4) development of a lid for the top container of each stack.

The fruit in some of the experimental containers appeared darker, possibly due to poor air circulation. It was suggested by the buyers that crosswise loading of the containers in the truck might increase air movement over the strawberries and eliminate this darkened condition. This preliminary work provided a basis for the study made in 1960.



## 1960 Season

### Field and Transit Temperatures

Temperatures of the strawberries and air temperatures at different steps in harvesting and transportation are shown in Table 4.

Difference between the fruit and air temperature may be illustrated by a comparison of the two when the first cup was harvested for each shipment. In 11 pickings the temperature of the strawberries was lower than the air temperature; having been reduced by the lower temperature at night, it had not increased as much as had the air temperature by the time of the first picking. In 4 pickings the temperature of the air was lower than the temperature of the strawberries and in 1 picking the temperatures were the same. Temperature of the strawberries increased from the time the temperature of the first cup was recorded at the field until the temperature of the last cup was recorded for each test; one exception was an afternoon picking. The increase in temperature would be expected because the strawberries in the first cup were usually picked early in the morning when it was relatively cool, and the strawberries were in the sun until the containers were filled.

Fruit temperatures recorded just before the berries were hauled from the field showed that the temperature of the fruit decreased for six pickings, increased for six, and remained the same for four. The reduced and constant temperatures were partly explained by the removal of the strawberries to shade shortly after harvest.

Regardless of the length of time the strawberries were left on the loading platform, fruit and air temperatures were recorded immediately before they were loaded on the refrigerated truck. Figure 4 shows, by shipment, the time between first picking and removal from the field and the time on the shipping platform.

A comparison of the temperatures of strawberries when they left the shipping dock in Portland with those recorded when they arrived at the terminal in Cincinnati showed a reduction in temperature for all five shipments for which complete data were compiled. This would be expected, as all shipments were made in refrigerated trucks.

Although two types of thermometers were used for recording temperatures, both recorded temperatures accurately on constantly revolving charts. Generally, ambient temperatures in the terminal market area were somewhat lower than those recorded in the transit trucks. Temperature decreases during the night within each of the crates and ambient temperature near both the produc-

Table 4. Temperature of Strawberries and Air Temperature at Different Steps in Harvesting and Transportation, May 25-June 4, 1960.

		Shipment											Picking <sup>1</sup>				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Temperature		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		Degrees F.															
15	Fruit:																
	First cup	68	68	77	68	70	72	80	73	67	70	85	71	72	65	70	74
	Last cup	82	78	88	70	73	78	85	83	68	82	80	83	79	76	74	78
	Leaving field	87	80	86	71	70	80	76	80	80	82	80	72	74	78	74	78
	Leaving shipping dock	74	—	—	65	—	74	—	75	78	—	—	—	—	—	—	—
	Air:																
	First cup	69	73	76	68	74	70	83	68	70	71	92	70	75	69	77	78
	Last cup	78	83	85	64	72	81	—	75	77	84	88	79	78	—	84	78
	Leaving field	80	83	—	64	72	81	—	75	77	84	88	79	78	77	84	78
	Leaving shipping dock	85	—	—	70	—	82	—	78	75	—	—	—	—	—	—	—
	Inside truck <sup>2</sup>																
	Wirebound crate	67	—	—	62	62	—	—	72	68	62	62	62	—	—	—	—
	Corrugated crate	70	—	—	57	57	—	—	72	68	64	64	64	71	71	71	71
	Outside air <sup>3</sup>	60	60	60	56	56	63	63	58	57	59	59	59	62	62	62	62

<sup>1</sup>The number of pickings exceed the shipments because it was necessary to obtain more berries at another farm to complete the shipment.

<sup>2</sup>Reading taken from recording thermometer placed inside the crates in refrigerated transit truck at terminal market.

<sup>3</sup>As reported by United States Weather Bureau at Cincinnati, Ohio, at unloading time.

HOURS

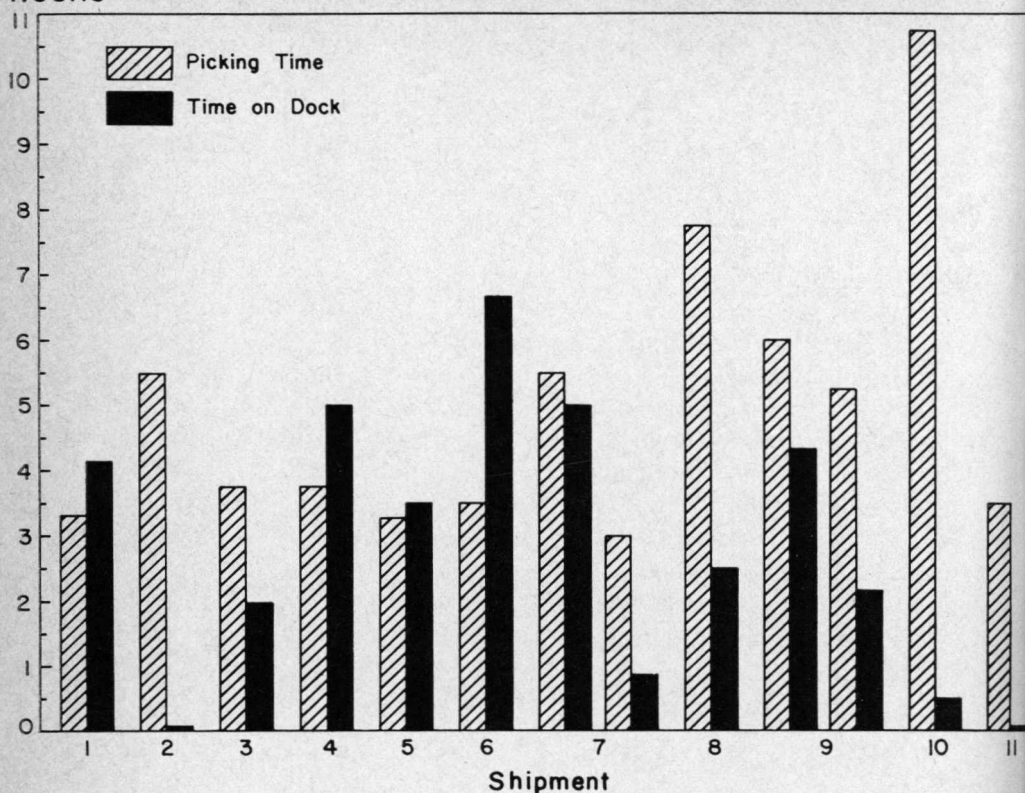


Figure 4. Length of time strawberries were in the field during harvest and on the shipping platform before loading on transit truck, Portland, Tennessee, May 25-June 4, 1960.

tion and marketing areas are shown in Figure 5. Temperatures within both wirebound and corrugated crates tended to descend at a slow, steady rate. Lowest temperatures were recorded during the hours after midnight.

Temperatures were not consistently lower in either the corrugated or wirebound containers. A tier of corrugated and a tier of wirebound crates were stacked "solid" in shipment 3. Temperature reduction was delayed appreciably in both types of containers; however, the temperature in the corrugated crates did not start dropping until 5 hours after it had started to decline in the wirebound ones. Containers should not be stacked solid unless the transit truck has been precooled, especially when using corrugated containers.

# TEMPERATURES — F

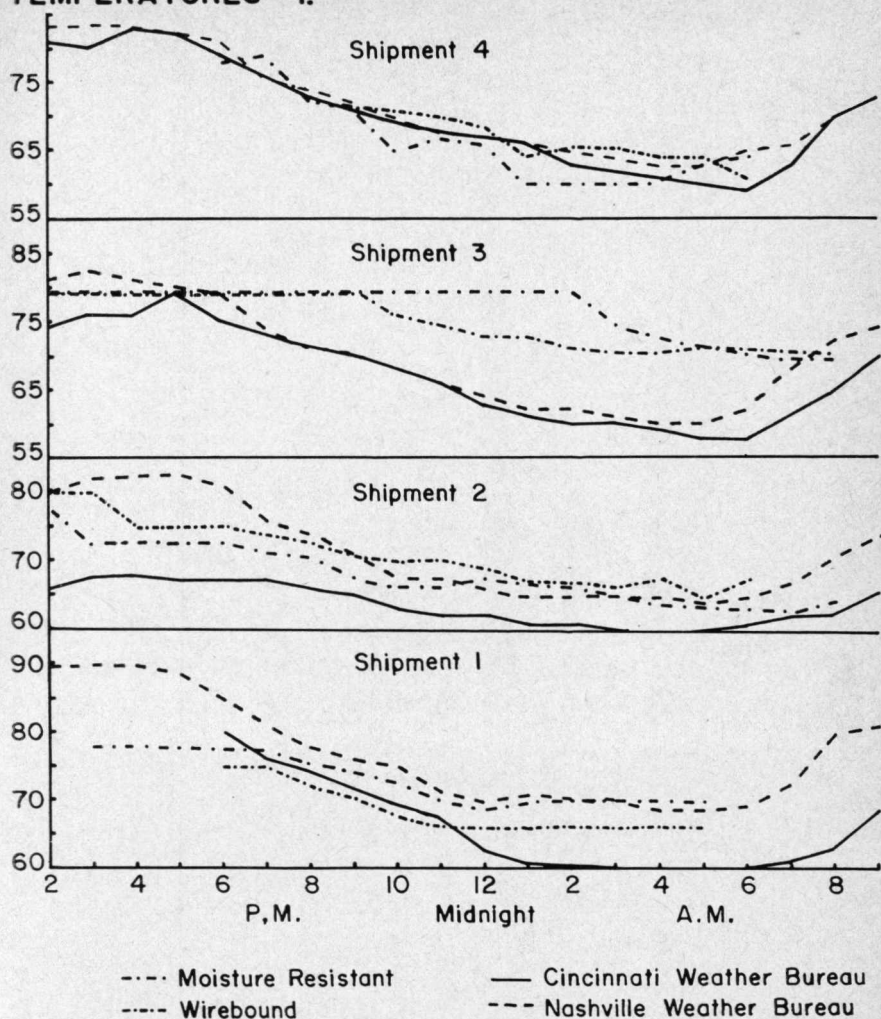


Figure 5. Temperatures registered by Weather Bureaus at Nashville, Tennessee, and Cincinnati, Ohio, and by recording thermometers in transit trucks, May 25-June 4, 1960.

## Appearance of Strawberries After Shipment

After a trip of about 8 hours from Portland to Cincinnati, the observations at the terminal market revealed no discernible bruising or damage to the strawberries in the experimental crates. This shows that the test containers protect the berries in shipment as well as the wirebound crates. The fruit shipped in cor-



rugated crates was usually rated of a superior quality by observers at the terminal market.

### Condition of Container After Shipment

Of the methods employed in an attempt to determine the best system of hauling these test crates as a partial shipment (98 eight-quart corrugated boxes and 49 sixteen-quart wirebound), cross-stripping of thin cardboard and of wood slats was used with varying degrees of success. A lattice-work of wood slats through the handles of crates at the top of the stacks proved to be the most successful of the methods tried.

When the experimental crates were placed in different locations within the transit vehicle to determine any structural weaknesses, and spacing between stacks within a tier was also varied, some methods of lateral bracing proved unsatisfactory and permitted tilting and shifting of the widely-spaced stacks. The test crates were, without exception, reported to be in excellent condition upon arrival at their destination. In only one instance involving two crates in the third shipment were strawberries reported to have been spilled.

Each test shipment was inspected for the condition of the containers and of the strawberries upon arrival at the terminal market. Figure 6 shows one shipment immediately before unloading,



Figure 6. Test shipment immediately before unloading at the terminal market in Cincinnati, Ohio, May 25-June 4, 1960.



and Figure 7 shows the experimental crates in a wholesale warehouse in Cincinnati.



Figure 7. Experimental crates in a wholesale warehouse, Cincinnati, Ohio, May 25-June 4, 1960.

## WHOLESALE'S, RETAILERS', AND CONSUMERS' PREFERENCES

### Type of Container—Wirebound Vs. Corrugated

Data presented in Table 5 show that almost 54% of the wholesalers said they preferred wirebound containers and about 46% preferred the corrugated containers. The wirebound containers were preferred by 66% of the retailers, whereas only 34% of them preferred the corrugated containers. There was no significant difference in opinion between wholesale and retail merchants about the type of container used. However, the wholesale and retail merchants' preferences for the wirebound over the corrugated containers were significant at the 0.05 level. About three-fourths of the consumers expressed a preference for the corrugated containers because of their attractiveness. The chi-square test showed there was a significant difference at the 0.05 level in the

Table 5. A Comparison of Types of Strawberry Containers Preferred by 26 Wholesale Merchants, 100 Retail Merchants and 250 Consumers, Cincinnati, Ohio, 1960.

Type of Container	Merchants				Consumers	
	Wholesale		Retail			
	No.	Pct.	No.	Pct.	No.	Pct.
Wirebound	14	53.8	66	66	66	26.4
Corrugated (moisture resistant)	12	46.2	34	34	184	73.6
Total	26	100.0	100	100.0	250	100.0

consumers' preferences for the wirebound and corrugated containers since most consumers preferred the corrugated container (Appendix Table 2).

The seven different reasons given by the wholesalers for preference of type of container are shown in Table 6. Reasons given most frequently for preferring the wirebound container were "less damage to fruit" and "container costs less to handle." The most frequent reasons for preferring the corrugated container were "attractiveness" and "container costs less to handle." Information was not compiled on the comparative cost of handling the wirebound and corrugated containers.

Table 6. Reasons Given for Preference of a Specified Type of Container by 26 Wholesale Merchants, Cincinnati, Ohio, 1960.<sup>1</sup>

Reasons	Type of Container			
	Wirebound		Corrugated	
	Number	Percent	Number	Percent
Less damage to fruit	10	45.5	2	10.5
Container more attractive	—	—	7	36.8
Container costs less to handle	9	40.9	7	36.8
Moisture Resistant	—	—	2	10.5
More profit	1	4.5	1	5.4
Better ventilation	2	9.1	—	—
Total	22	100.0	19	100.0

<sup>1</sup>The number of reasons add to more than 26 because some respondents gave more than one reason.

Table 7 shows that half of the reasons given by the 100 retail merchants for preferring the wirebound container was "less damage to fruit." The principal reasons given for preference of the

corrugated container included "less damage to fruit," "container attractiveness," and "less cost to handle."

Table 7. Reasons Given for Preference of the Wirebound or Corrugated Container by 100 Retail Merchants, Cincinnati, Ohio, 1960.<sup>1</sup>

Reasons	Type of Container			
	Wirebound		Corrugated	
	Number	Percent	Number	Percent
Less damage to fruit	44	49.4	21	25.0
Strawberries brighter in color	—	—	2	2.4
Container more attractive	—	—	21	25.0
Container costs less to handle	20	22.5	21	25.0
Moisture Resistant	—	—	15	17.8
More profit	4	4.5	1	1.2
Better ventilation	1	1.1	1	1.2
Containers easier to handle	—	—	2	2.4
Better visibility of strawberries	2	2.3	—	—
Containers stack better	4	4.5	—	—
No experience with other containers	14	15.7	—	—
Total	89	100.0	84	100.0

<sup>1</sup>The number of reasons add to more than 100 because some respondents gave more than one reason.

### Type of Cup—Wood Veneer Vs. Plastic

The survey revealed that all the wholesalers and almost all of the retailers had purchased most of their strawberries in wooden veneer cups. About 85% of the wholesalers and 74% of the retailers preferred wood to the plastic cups at the same price (Table 8). However, 3% of the wholesalers and 11% of the retailers had not tried the plastic cups.

The consumers were asked their preference for wood veneer or plastic cups at the same price (Table 8). Slightly over 68% of the consumers preferred the wood cup and slightly over 31% preferred the plastic cup.

Table 8. A Comparison of Preference for Veneer or Plastic Strawberry Cups by 26 Wholesalers, 100 Retailers, and 598 Consumers, Cincinnati, Ohio, 1960.

Type of cup	Merchants					
	Wholesale				Retail	
	No.	Pct.	No.	Pct.	Consumers	
Wood veneer	22	84.6	74	74.0	411	68.7
Plastic	4	15.4	26	26.0	187	31.3
Total	26	100.0	100	100.0	598	100.0

The preferences between the wholesale and retail merchants were not significantly different for veneer or plastic cups. There was no difference in preference between consumers and merchants. There was an overwhelming preference by merchants and consumers for the wood veneer cups at the 0.01 level (Appendix Table 3).

When asked how cups might be improved, some merchants suggested that plastic cups would be more in demand if there were a variety of colors, if structural strength were increased, and if the mesh were smaller. It was suggested that colored top bands on the wood cups, more porous wood, better ventilation, and cleaner cups would be desirable changes. Most respondents, however, failed to suggest improvements.

### Strawberries—Point of Origin

The ratings given to the Tennessee strawberries by both the wholesale and retail merchants in Cincinnati—when asked to rate the berries “excellent,” “good,” “fair,” or “poor”—are shown in Table 9. Of the 126 merchants reporting, 93 of them rated the strawberries as “excellent” or “good.”

Table 9. The Rating of Tennessee Strawberries by 26 Wholesale and 100 Retail Merchants, Cincinnati, Ohio, 1960.

Ratings	Merchants					
	Wholesale		Retail		Total	
	No.	Pct.	No.	Pct.	No.	Pct.
Excellent	3	11.5	27	27.0	30	23.8
Good	15	57.7	48	48.0	63	50.0
Fair	8	30.8	23	23.0	31	24.6
Poor	—	—	2	2.0	2	1.6
Total	26	100.0	100	100.0	126	100.0

The wholesale and retail merchants were asked from which states they had purchased strawberries during the year. Figure 8 depicts the proportion of merchants who bought from each state. Eighty-seven percent of the merchants had purchased Tennessee strawberries.

### Rate of Sale by Type of Container

During the study, 275 personal interviews were made. The display attracted the attention of 63% of those interviewed in the store.

STATE

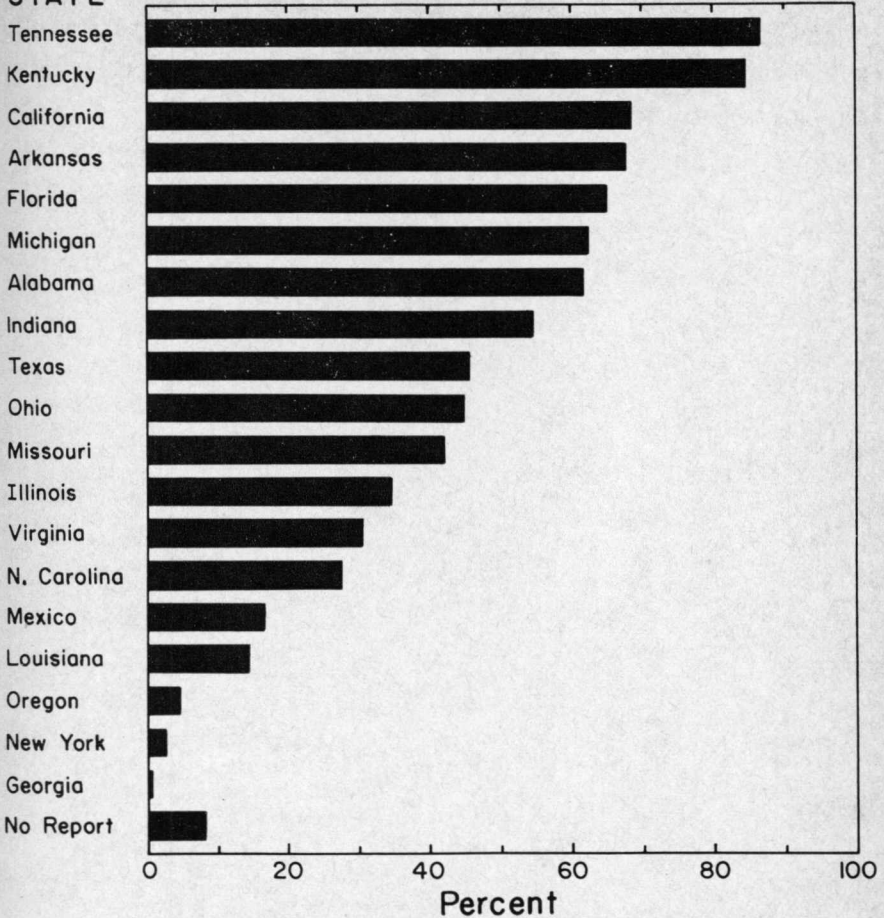


Figure 8. Proportion of wholesale and retail merchants who purchased fresh strawberries during the year by each state named by them, May 26-June 4, 1960.

A comparison of the rapidity with which individual quarts were purchased from the wirebound and corrugated displays is given in Table 10. Morning purchases were generally fewer than afternoon purchases. During days when large volumes were moved, the shoppers tended to select relatively more strawberries from the corrugated display. On the whole, 127 more quarts were selected from the corrugated display than from the wirebound one.



Table 10. Number of Quarts of Strawberries Sold from Two Types of Crates, Three Selected Retail Grocery Stores, Cincinnati, Ohio, May 26-June 1, 1960.

Date	Wirebound crate		Corrugated crate	
	Quarts	Percent	Quarts	Percent
May 26 a.m.	12	5.5	15	4.4
p.m.	22	10.1	48	14.0
May 27 a.m.	30	13.8	42	12.0
p.m.	39	18.0	65	18.9
May 28 a.m.	25	11.5	29	8.4
p.m.	31	14.3	51	14.9
May 31 a.m.	10	4.6	8	2.3
p.m.	14	6.5	11	3.2
June 1 a.m.	16	7.4	14	4.1
p.m.	18	8.3	61	17.8
Total	217	100.0	344	100.0

# APPENDIX

## Appendix Table 1

Number of Store Interviews in Three Selected Retail Stores,  
Cincinnati, Ohio, May 26-June 1, 1960.

Date	Store			Total
	Mariemont	Kenwood	Norwood	
			Number	
May 26	17	39	8	64
May 27	20	55	25	100
May 28	—	40	15	55
May 31	—	21	—	21
June 1	—	35	—	35
Total	37	190	48	275

## Appendix Table 2

Summary of Chi-Square Tests

Hypotheses tested	Significance
No difference in opinion between wholesale and retail merchants about type of container used	Reject at 0.05 level
No difference in wholesale and retail merchants' preferences for wirebound and corrugated containers	Accept at 0.05 level for 1 degree of freedom
No difference in consumer and merchants' preferences for containers	Accept at 0.05 level for 1 degree of freedom

## Appendix Table 3

Summary of Chi-Square Tests

Hypotheses tested	Significance
No difference in preference between wholesale and retail merchants for veneer or plastic cups	Reject at 0.05 or 0.10 percent level
No difference in preference for wood veneer or plastic cups between consumers and merchants	Reject at the 0.05 or 0.10 percent level
No difference in preference for wood veneer or plastic cups	Accept at the 0.01 level for 1 degree of freedom

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