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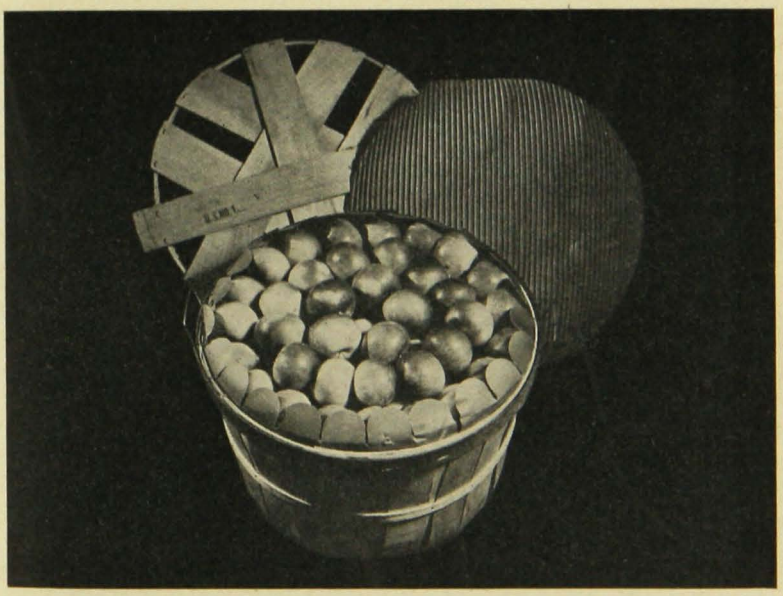

UNIVERSITY OF MINNESOTA
AGRICULTURAL EXTENSION DIVISION

PACKING MINNESOTA FRUITS FOR MARKET

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This publication comprises a study of the different types of fruit packages on the market, with particular reference to their adaptability for marketing Minnesota-grown fruits. The actual marketing of fruit in different types of containers was included as a part of the project, to determine the market value of the various types of packages used. This was supplemented by a questionnaire sent to representative shipping associations in all parts of the United States. A survey also was conducted among 230 Minneapolis retailers during June 1934 to determine consumer likes and dislikes with respect to strawberry marketing.

The total quantity of deciduous fruits sold annually in Minnesota far exceeds the volume produced within the state.[2]

In the case of strawberries this is largely because the southern districts are able to enter the market far in advance of the Minnesota crop season. This seasonal difference will also permit the development of a market for Minnesota-grown strawberries in districts to the south. In tree fruits, especially apples, a much larger part of the volume required to supply the Minnesota market can be supplied from local sources, particularly if new varieties are developed to extend the marketing period. A few apple growers in the southeastern part of the state now market well-graded, high-quality fruit that is equal to the best produced anywhere in the United States. The raspberry is the only fruit grown in Minnesota in quantities sufficient to equal or to exceed the total volume sold within the state.

Continued expansion of the fruit industry in Minnesota will require closer attention to uniform standards of grading and packaging on the part of the growers than has been necessary heretofore.

CONTAINERS FOR APPLES

Baskets

The basket is used almost universally in Minnesota for marketing apples. All basket manufacturers doing an interstate business are required to conform to the United States Standard Container Act, which establishes the standard bushel as 2,150.42 cubic inches. The solicitor of the United States Department of Agriculture has expressed the opinion that the federal act, in fixing the capacity of the standard

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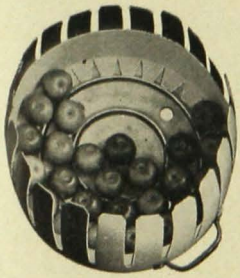
[2] The total number of cars of apples unloaded in Minneapolis, St. Paul, and Duluth was 1,658 in 1932, 1,447 in 1933, 1,701 in 1934, and of strawberries 485 in 1932, 444 in 1935, 434 in 1934.

bushel, makes inoperative all state laws establishing weights per bushel so far as they affect fruits and vegetables packed in the containers standardized by that law. This refers to hampers, round stave baskets, and splint baskets. The Minnesota state law formerly required that a bushel of apples shall weigh 50 pounds. This law was amended by Chapter 270, Session Laws 1935, so that the legal bushel of apples in Minnesota now is 2,150.42 cubic inches, conforming with federal law.

Apple baskets are made in many styles, the principal ones in use in this region being the two-hoop and the three-hoop round-bottom baskets. Tub baskets, with straight sides and flat bottoms, are made in two-hoop, three-hoop, and four-hoop styles. Basket covers are made in both the flat and the crown style.

The introduction of ring packing forms (Fig. 1) has increased the popularity of the basket pack, because growers are able to put up attractively faced baskets of apples with a minimum amount of labor and expense. One Minnesota grower reported he was able to sort, grade, face, and pack 700 to 800 bushel baskets in 10 hours with an 11-man crew.



A Typical Ring Packing Form with Facing Disc in Position

Bushel Basket Placed over Packing Form. Ready to Invert

Basket of Apples Packed with Ring Form

FIGURE 1

One man poured the apples upon the sorting table, two men picked out the No. 1 facers, one man picked out the No. 2 facers, two men picked out the No. 2 grade and culls, two men faced the No. 1 apples on ring forms, one man faced the No. 2 grade on ring forms, one man filled the basket and took out the ring form, and one man put the covers on and stacked the baskets. The man facing the No. 2 grade often assisted in stacking the baskets. Eight ring packing forms were used. Another grower reports an output of 400 to 450 bushels per day with a 7-man crew. Expert packers are not required for these ring packing forms, but care must be taken to see that they are properly used. A corrugated paper pad should be placed between the face apples and the basket cover.

Minnesota growers who are using a ring packing form prefer a round-bottom basket because they find it holds the face of the pack in position better than a basket with a flat bottom. Poorly constructed round-bottom baskets with only two hoops are likely to bulge when filled with fruit and thus allow the face to sag. The three-hoop style is more likely to hold the face in position for a longer storage period than the two-hoop style, but the latter is in more general use because of its slightly lower cost. Crown covers are superseding the old-style flat cover. Baskets with crown covers stack very satisfactorily.

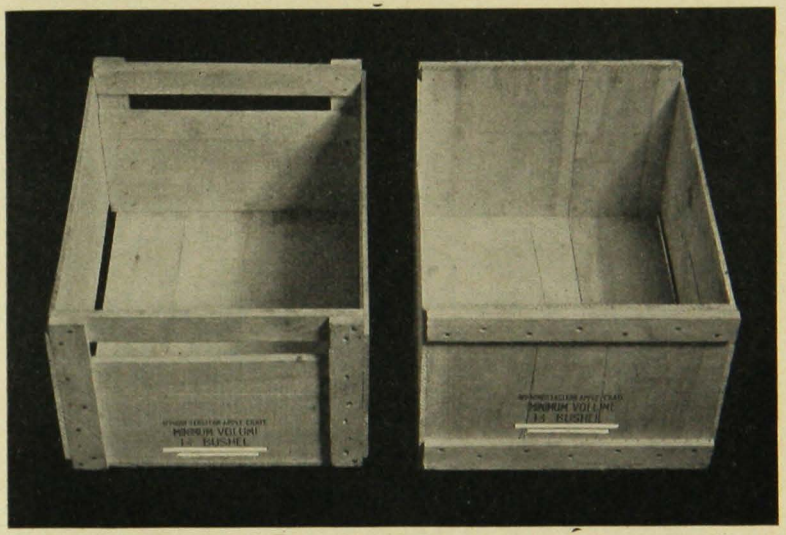
The tub basket has been shown to protect the fruit from bruising better than the round-bottom type, but it is not used extensively in Minnesota. It is more expensive than the round-bottom style and growers prefer the round-bottom baskets for the ring pack.

Oiled shredded paper is being used extensively with the faced pack. This paper comes in several colors. Minnesota growers who are using these oiled shreds generally prefer the purple color for apples. It adds to the attractiveness of the pack and aids in preventing storage scald of some varieties. Paper fringes are used around the top of the basket, on the inside of the rim, to protect the fruit from injury.

A good basket must be strong enough to hold the face intact when filled. Baskets sometimes are damaged by improper handling. Nests of baskets never should be tossed, thrown, or dropped on end to the floor. Unused baskets that are held over to the next crop season should be stored in tiers on their sides.

Eastern Apple Crate

A new type of box was introduced about five years ago in the Hudson Valley of New York and has become widely used in New York and the New England States. This container has become known as the Eastern apple crate. For the first two or three years, more than 25 different sizes and types were used. In 1933 representatives of the apple-growing industry in this area met and recommended that the size of this crate be standardized at 17½″×14″×11″ inside dimensions. The following year this recommendation was amended to include a slight variation in size, namely 17″ or 17½″×14″×11″, the longer box having inside corner posts and the shorter one having none. Both styles are made with the end pieces projecting ¾ inch above the side pieces to permit the boxes to be stacked. According to the United States Standard Container Act, this allows a minimum volume of 1⅛ bushels when filled to the top of the side pieces, or 1⅕ bushels when filled to the top of the end pieces. Actually the crate holds the same quantity of apples as is contained in a ring faced standard bushel basket of apples packed with the usual crown. Four different styles of construction were approved. Two of these approved styles are shown in Figure 2. In Massachusetts it was estimated that in 1933 about 73 per cent of the total commercial crop was marketed in this type of crate.



Open-End Style Closed-End Style

FIG. 2. THE EASTERN APPLE CRATE

In common with other types of box packs, fruit marketed in the Eastern apple crate is less subject to bruising than when packed in baskets. Liners are generally used with this crate to protect the fruit. Covers, consisting only of a couple of slats, are sometimes used, but the majority of crates are sold without covers. A jumble type of pack is used for practically all the apples sold in containers of this type. Fruit packed in these crates takes up very much less space in storage than when packed in bushel baskets, an important item in warehousing and transportation. The cost of this crate is about five cents higher than the cost of a bushel basket with cover.

Cell-Type Cartons

Another type of package being used in some eastern districts for fancy apples is a corrugated box provided with dividers so that each apple is surrounded entirely by paperboard (Fig. 3). These boxes are designed to hold 40 pounds net and are made for all sizes of apples from the 2¼-inch to the 3½-inch. The fruit is sold by net weight, count, grade, and variety. These containers cost about 75 per cent more than the bushel basket, with cover. This increased cost may be offset to some extent by the smaller quantity of fruit contained. The fruit is well protected for satisfactory parcel post shipment.

Similar cartons are made to hold smaller quantities of fruit. Hauck[3] reports that apples packed in these cell-type cartons require less stor-

[3] Hauck, Chas. W. An experiment in packing Ohio apples. Ohio State Univ. Dept. Rural Econ. (Mimeo. Bull.) 68. 1933.

age space than when packed in tub baskets. He found also that apples in the larger cell-type cartons sold satisfactorily in the Columbus, Ohio, market toward the end of the season after the trade had become familiar with this package. A small gift size holding 12 apples was difficult to sell, and the fruit was transferred to tub baskets in which it could be sold at less cost and with less effort.

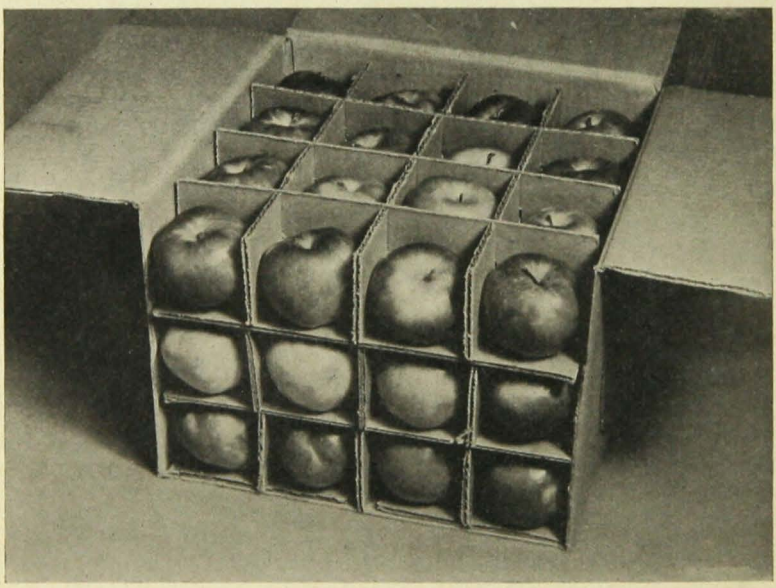


FIG. 3. DIVIDERS AND FRUIT IN CELL-TYPE CARTON WITH ONE SIDE REMOVED TO SHOW THE DIVIDERS

Other Apple Containers

Certain sections of the United States use other types of containers. The barrel still is used extensively for apples in the eastern United States but is being replaced by other containers, especially the basket and the Eastern apple crate. The Northwest type of wooden box is used almost exclusively in the apple districts of the west, except in Colorado, Idaho, and Utah, where many baskets are used. This box contains 2,173.5 cubic inches, which is slightly higher than the United States standard bushel. This box, however, usually holds two or three pounds less fruit than a properly filled bushel basket. Recently, boxes and cartons holding 20 pounds of apples have been used by western shippers. For local sales 12-quart and 16-quart splint baskets sometimes are used, also strong paper sacks.

Recommendations for Minnesota Apple Growers

The basket makes a desirable package for Minnesota apple growers, and for the bulk of the crop no change seems justified under pres-

ent market conditions. The more general use of ring packing forms by Minnesota growers for the better grades of apples is recommended.

CONTAINERS FOR PLUMS

Improved varieties of Minnesota-grown plums are reaching the local markets. Most of these plums are sold in half-bushel baskets. Some plums are sold locally in used peach crates, which hold about one-third of a bushel. Plums from the Pacific Coast are sold commonly in 4-basket crates, each holding four 3-quart square baskets. Eastern plums are sold in 4-quart and 12-quart Climax baskets.

The half-bushel basket is not an ideal package for the larger types of plums. Fruit at the bottom of the basket is likely to become crushed in handling, and the quantity is too large for the average retail demand. On the Twin City markets plums packed in half-bushel baskets were found to sell more readily than when packed in smaller containers, because most sales are made to retail merchants who sell the plums by the pound or re-pack them into small till baskets. Several lots of plums taken to the Minneapolis city market were packed in wooden crates, each containing four 3-quart oblong till baskets made of paperboard. These plums were difficult to sell at 25 cents per basket, altho similar plums sold readily at one dollar per half-bushel, not including the basket.

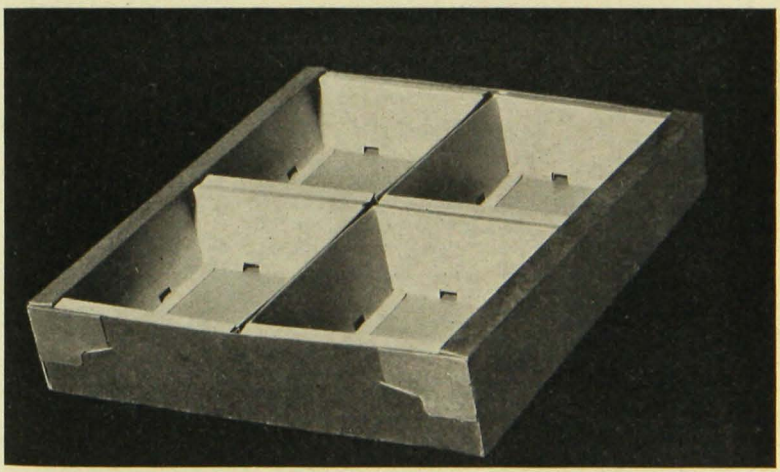


FIG. 4. A CARTON OF FOUR 3-QUART PLUM BASKETS

Several growers who cooperated in testing the sale of plums in 3-quart baskets during the 1934 season reported satisfactory results in sales made direct to consumers. A bushel basket of plums contains the equivalent of about eleven 3-quart till baskets. The 3-quart baskets usually sold at 25 cents, leaving a net return of $2.55 per bushel after deducting the cost of the baskets. One grower suggested that a price

of 21 cents per 3-quart basket would increase sales and bring a satisfactory net return per bushel. Plums packed in 4-quart baskets are difficult to sell at any appreciable advance in price over the 3-quart size.

The fact that plums in several localities are being sold in used peach crates with satisfactory results indicates that a comparatively shallow container of about one-third bushel capacity may be a very desirable size for Minnesota plums. There is much less crushing of the fruit in such a container, and the comparatively low price at which a one-third bushel pack can be sold might stimulate sales.

In smaller quantities, the 3-quart basket is an economical size. The oblong till basket is too deep to be entirely satisfactory. A square basket of the California type, but wider and with less depth, should be far more desirable. A carton containing four 3-quart baskets of this type, made of paperboard, is shown in Figure 4.

CONTAINERS FOR RASPBERRIES AND STRAWBERRIES

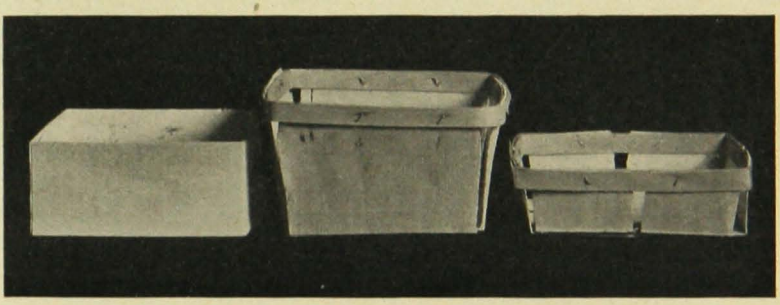
Types of Berry Boxes

Berries are commonly packed in pint and in quart boxes made principally of wood veneer, except in the Pacific Coast States where pints are almost always used. In some instances berries are marketed in half-pint boxes. These sizes are based on dry measure as established by the United States Standard Container Act. A number of different types of boxes are in use in the various fruit-producing regions. The American type undoubtedly is the most popular for strawberries east of the Rocky Mountains. This box is manufactured with and without a metal rim. The Hallock type is commonly used for both raspberries and strawberries in Minnesota, Michigan, Oregon, Washington, and in parts of Illinois and Indiana. The Leslie type, which is an octagonal box with a raised bottom, is used to some extent in a few of the Mississippi Valley States. These are the principal types of berry boxes in use throughout the United States. A new type of pint box recently has made its appearance in Tennessee. This is essentially a shallow form of the American box, with a top of the same dimensions as the American quart and sufficiently shallow to hold no more than one pint. Various shipping crates have been developed for these types.

Survey of Consumer Preferences

An important feature of the research project was a survey made among 230 retail merchants in Minneapolis to determine the attitude of consumers with respect to the marketing of Minnesota-grown strawberries. Opinion was practically unanimous that the home-grown strawberries are much superior in quality and flavor to those shipped in. According to these merchants, the Hallock-type box used in Minnesota has come to be so uniformly identified with home-grown strawberries as to approach "trade-mark" recognition. Many merchants

said that a prejudice formerly existed against the Hallock type because of the opinion that the raised bottom gave short measure, but this they believe has been overcome. Only 11 per cent of the merchants reported that their customers seemed to prefer the American-type box.



Hallock Pint American Quart Shallow American Pint

FIG. 5. TYPES OF BERRY BOXES

During this survey, several of the merchants called attention to the need for crates of improved design to provide better ventilation and to protect berries in the bottom decks from being crushed by boxes in the top layer. A comment of particular interest made by many of the merchants was that consumers are getting away from the custom of waiting for Minnesota berries to use for canning because of the short supply of home-grown berries on the market in recent years.

Tests of Paperboard Boxes

In the spring of 1934 approximately 4,500 paperboard pint and quart boxes were distributed for trial to 18 different commercial berry growers in various parts of the state. These boxes consisted of five different styles, four of the American type and one of the Hallock. Two were folding boxes. These growers were asked to market berries in the paperboard containers, along with similar berries in wood-veneer boxes. In most instances wood-veneer boxes of the American type were supplied, as growers in this state seldom have these on hand. Wooden crates of the correct sizes were furnished also. At the close of the season, reports were obtained from each one of these growers.

Due to unprecedented drouth, which caused almost a complete crop failure in strawberries, only a comparatively few of the quart boxes were used. For this reason, no conclusions as to the value of paperboard boxes for strawberries would be justified. The few reports received were conflicting, some finding that berries sold as readily in the paperboard boxes as in the wood-veneer boxes. Others found it more difficult to sell berries in these containers.

Every raspberry grower who used the American type of paperboard box found it less satisfactory than the ordinary wood-veneer, Hallock-

type box. The reason given by most of the growers was that the berries were difficult to sell. One grower had to take back from a retail merchant at Brainerd two crates of raspberries in paperboard boxes, while similar berries in wood-veneer boxes sold readily. On the other hand, one lot consisting of one crate in paperboard boxes and one crate in wood-veneer, Hallock-type boxes was sold to a retail merchant in St. Paul, who reported that most of the paperboard boxes sold first. Raspberries taken to the Minneapolis city market in paperboard boxes had to be sold at a discount of 25 cents per crate.

Reports on the folding, Hallock-type box were more conflicting. Some growers found them satisfactory as far as sales were concerned; others said that berries in these boxes were difficult to sell. The boxes were found hard to put into the crate because of the extra thickness of paperboard, and the waxy coating made them slippery to handle. Nearly all growers agreed that this particular type of folding box took too much time to put together. The latter observation is supported by a study made of the time required to put together three styles of folding boxes in comparison to the time required for making up ordinary wood-veneer boxes with a hand-operated stapling machine. The time required, as shown in Table 1, is that taken by average workers. It is possible for experienced growers to staple a larger number of wood-veneer boxes per hour than the quantity shown.

Table 1.—Time Required to Fasten or Staple Different Types of Pint Berry Boxes

Kind of box	Type	Average number made up per hour
Paperboard, folding	Hallock	180
Paperboard, folding	American	480
Wood-veneer, folding	Hallock	750
Wood-veneer, in flat	Hallock	420

A questionnaire sent to representative shipping associations in all parts of the country revealed that only 6 out of 31 associations that replied had tried paperboard containers. Four replied that no advantage in their use could be seen, and one replied that their use had been too limited to justify any statement. These reports came from Alabama, New York, Oregon, Washington, and Wisconsin. One reason given for their being unsatisfactory was that they hold heat longer than wood-veneer boxes and consequently the fruit cools too slowly.

A study was made of the shipping costs of the various types of berry boxes, using the freight rate from St. Paul to Duluth in less than carlot quantity as a basis for comparison. These costs are shown in Tables 2 and 3. The Hallock-type paperboard boxes showed no appreciable advantage or disadvantage in shipping costs. The paperboard American-type boxes showed some saving over the wood-veneer boxes of the same type.

Table 2.—Shipping Cost of Different Types of Quart Berry Boxes

Kind of box	Type	Quantity	Shipping weight	Freight cost L.C.L. St. Paul to Duluth
Wood-veneer, in flat	Hallock	1,000	150 lb.	$0.68
Wood-veneer, folding	Hallock	1,000	125 lb.	.56
Wood-veneer, nested	American	1,000	125 lb.	.80
Paperboard, Style A	American	1,000	95 lb.	.60
Paperboard, Style B	American	1,000	100 lb.	.64
Paperboard, folding	American	1,000	93 lb.	.45
Paperboard, folding	Hallock	1,000	170 lb.	.77

The foregoing data indicate that the present types of paperboard boxes do not have any advantages over wood-veneer boxes and in many instances are much less satisfactory. The cost of paperboard boxes is approximately the same as of the wood-veneer boxes. Furthermore, it has been shown[4] that raspberries cool more slowly in the paperboard boxes than in the wood-veneer boxes. Under present conditions it seems unlikely that paperboard containers will come into general use.

Table 3.—Shipping Cost of Different Types of Pint Berry Boxes

Kind of box	Type	Quantity	Shipping weight	Freight cost L.C.L. St. Paul to Duluth
Wood-veneer, in flat	Hallock	1,000	100 lb.	$0.45
Wood-veneer, folding	Hallock	1,000	100 lb.	.45
Paperboard, Style A	American	1,000	60 lb.	.39
Paperboard, Style B	American	1,000	65 lb.	.42
Paperboard, folding	American	1,000	53 lb.	.23
Paperboard, folding	Hallock	1,000	92 lb.	.40

SHIPPING CRATES FOR BERRIES

Crates for Raspberries

About 50 western-type ventilated Hallock crates were distributed to Minnesota raspberry growers in 1934 in an attempt to learn whether this type offered any advantages to growers in this state over the deeper type in general use here. This western type is used extensively in the Pacific Northwest and contains the shallow-style Hallock pint box. In some instances it was found that after these crates had been trucked some distance the berries had settled enough in the shallow boxes so that the bottom of the box could be seen between the fruit. Consequently, buyers thought the boxes were not properly filled, altho full weight was there. A disadvantage noted by all growers was that the shallow boxes do not fit any of the berry carriers in use.

Judging from this rather limited experience, it seems that the western type of raspberry container is not particularly well suited to the requirements of this region under present marketing conditions.

[4] Winter, J. D., Alderman, W. H., and Waite, W. C. Picking, Handling, and Refrigeration of Raspberries and Strawberries. Minn. Agr. Expt. Sta. Bull. 318. 1935.

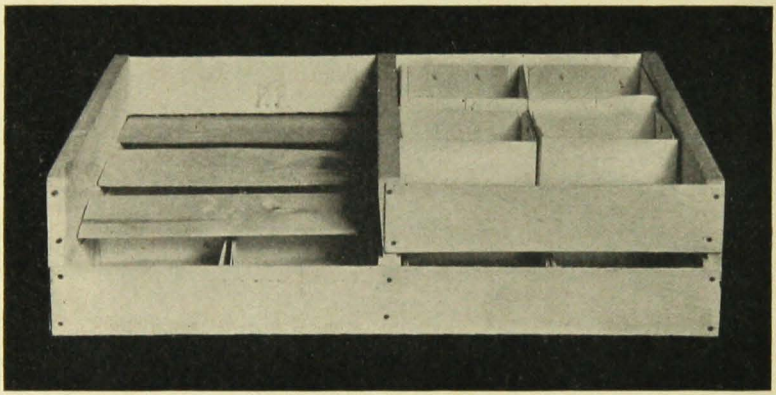


FIG. 6. A 24-PINT VENTILATED RASPBERRY CRATE WITH A PORTION OF ONE SIDE REMOVED TO SHOW CONSTRUCTION

The 24-pint ventilated crate, using the deep-style Hallock containers, undoubtedly is the most desirable crate for general use by Minnesota raspberry growers. It is used exclusively by the principal berry shipping associations in the state, as well as by some of the largest individual growers. This ventilated crate (Fig. 6) has a divider between the top and the bottom deck which rests on grooves cut into the headers and the middle partition. In this way the berries on the top of the bottom deck are protected and do not become crushed by the boxes in the top deck. Another advantage of the ventilated crate is that it permits berries to cool much more rapidly than does the old-style crate.[5]

The old-style, non-ventilated crate without a divider between the top and the bottom deck of boxes is rapidly being replaced by the ventilated crate which reduces loss from spoilage. The old-style crate is about three cents cheaper and therefore may be more economical where the berries move quickly from grower to consumer.

Crates for Strawberries

In Minnesota the June crop of strawberries is sold in 16-quart and 24-quart Hallock crates. The 24-quart crate is used mostly in the vicinity of St. Paul and Minneapolis, but in other sections of the state the 16-quart crate is used extensively. Shipping associations use a crate having a divider between the top and bottom decks, but most of the crates used elsewhere in Minnesota are without this divider, the top box being placed directly on the bottom box. This often results in some crushing of the fruit and staining of the boxes.

The majority of strawberries sold in American-type boxes are shipped in 24- and 32-quart crates. The 16-quart American type is

[5] Winter, J. D., Alderman, W. H., and Waite, W. C. Picking, Handling, and Refrigeration of Raspberries and Strawberries. Minn. Agr. Expt. Sta. Bull. 318. 1935.

used considerably in Wisconsin. In Oregon and Washington the 24-pint crate, with the deep-type Hallock boxes, is in general use. Elsewhere in the United States pints are used mostly for the earliest southern berries and for berries produced in the fall of the year.

Crates for the Leslie type usually contain 24 half-pints, 24 pints, or 24 quarts. A special crate known as the "pony refrigerator" is used to some extent for early shipments. This crate holds from 64 to 80 one-quart American-type boxes with provision for icing.

The fall crop in Minnesota is sold in both pint and quart containers, with a more general use of the pint size. A crate holding one layer of boxes is commonly referred to as a "flat" (Fig. 7). A large quantity of fall-bearing strawberries have been sold in 12-pint flats, and it is likely that these flats will come into more general use during the fall season. Recently a quantity of the early southern strawberries have arrived in the Twin Cities in 24-pint flats, using American-type boxes.

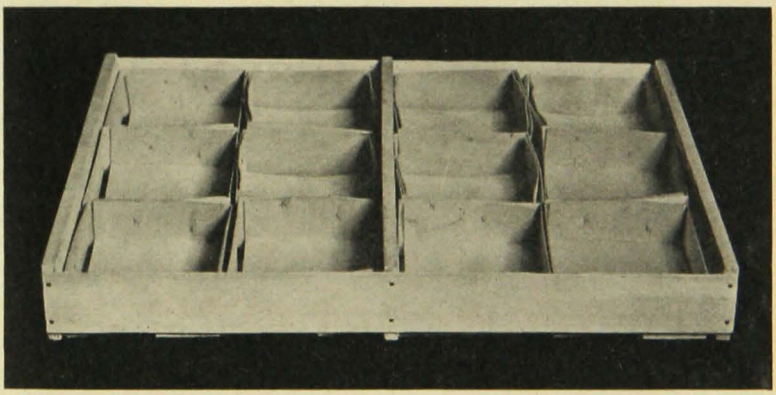


FIG. 7. A 12-PINT "FLAT" FOR FALL-BEARING STRAWBERRIES

A ventilated strawberry crate similar to the ventilated raspberry crate recently has made its appearance on the market. This crate is designed to hold the American style of quart box and has a divider between the top and the bottom deck which rests on grooves cut into the headers and the middle partition. This type of crate can be made for either the American or the Hallock-type boxes and it affords excellent protection to the berries during shipment.

Another strawberry crate of improved design that appeared on the market recently has received very favorable comment from shipping associations and from large individual growers in Minnesota. This crate contains American-style boxes of unique design, each box having four "ears" protruding above the rim (Fig. 8). These "ears" provide support for a divider that is placed between each deck.

The crate is wire-bound, having either two or three decks of eight quart boxes each. The ventilation of the individual boxes and of the

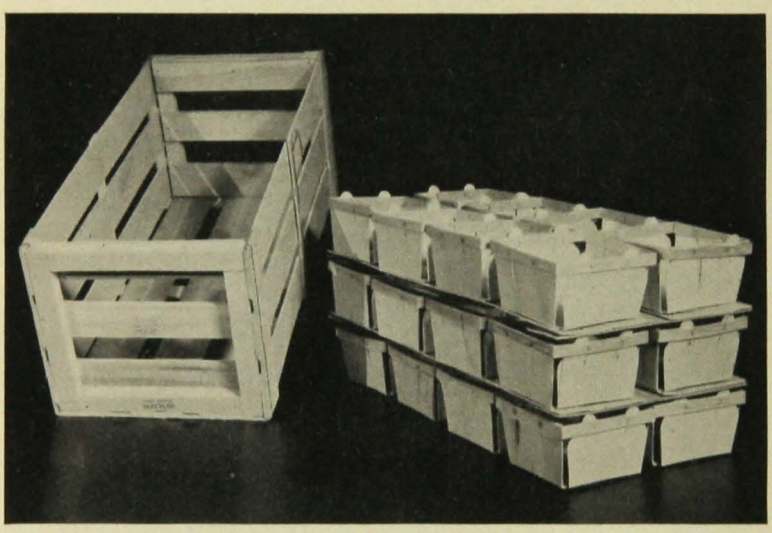


FIG. 8. IMPROVED TYPE OF VENTILATED STRAWBERRY CRATE, SHOWING FILLERS OF NEW DESIGN TO THE RIGHT

filled crate is unusually good. The boxes are held very firmly in place when the crate is filled and the cover fastened. The 24-quart crate of this type with boxes weighs about 8 pounds when not filled with berries, or about the same as the 24-quart Hallock crate with divider.

Test of Transparent Wraps for Berry Boxes

The wide use of transparent wrapping material for many kinds of merchandise suggests the possibility of its use in marketing berries. Several types of this material are on the market, including Cellophane, Kodapak, and Sylphrap. Most manufacturers prepare it in both moistureproof and non-moistureproof form. The latter is better for raspberries and strawberries, which respire heavily.

Table 4.—Development of Decay in Raspberries With and Without Transparent Covers

Date	Variety	Temperature maintained	Covering	One day after picking	Two days after picking	Three days after picking
July 11	Latham	75° F.	Cellophane	0	40 per cent	90 per cent
"	"	"	Kodapak	0	trace	50 per cent
"	"	"	None	0	90 per cent	100 per cent
July 13	"	70°–76°	Cellophane	0	trace	2 per cent
"	"	"	Kodapak	0	"	5 per cent
"	"	"	None	0	"	5 per cent

Twice during the 1934 season, several pint boxes of raspberries were covered with the non-moistureproof type of Cellophane and Kodapak, and the berries were held at temperatures between 70° and 76° F. Two pints of berries were used in each lot. Rubber binders were used to hold the material in place over the top of the berry box.

Table 4 shows the development of mold in raspberries covered in this manner. While this experiment was not sufficiently extensive to justify any conclusions, it indicates that berries keep equally well at these temperatures with or without such a covering. Similar results were obtained with raspberries and strawberries held in a refrigerator at 40° to 44° F., as shown in Table 5. The development of mold under the different transparent coverings was not consistent in the various lots, and no conclusions can be drawn as to the relative value of the two types of transparent coverings used. When brown paper was used in the refrigerator, the greater development of mold after eight days appears to be significant. Ordinary brown wrapping paper was placed over the berry box, but was not held in place with rubber binders.

Table 5.—Development of Decay in Raspberries and Strawberries With and Without Covering of Different Types When Held in Refrigerator at 41° to 44° F.

Date	Variety	Days in refrigerator	Covering	Per cent of moldy berries			
				Five days after picking	Six days after picking	Seven days after picking	Eight days after picking
July 11	Latham	5	Cellophane	0	2 per cent	10 per cent	.....
"	"	5	Kodapak	0	2 per cent	10 per cent	.....
"	"	5	None	0	2 per cent	10 per cent	.....
July 13	"	3	Cellophane	5 per cent	.....	.....	.....
"	"	3	Kodapak	15 per cent	.....	.....	.....
Sept. 28	Progressive	8	Cellophane	.....	trace	.....	trace
"	"	8	Kodapak	.....	5 per cent	.....	8 per cent
"	"	8	Brown paper	.....	5 per cent	.....	20 per cent
"	"	8	Brown paper	.....	5 per cent	.....	15 per cent
"	"	8	None	.....	trace	.....	trace

Experimental shipments of strawberries covered with Cellophane were made on several occasions during the fall, through the cooperation of a commercial berry grower in Hennepin County. Each pint box was individually covered, using a sheet of Cellophane 9½×9½ inches in size and held in place with a rubber binder. The shipments were made by express to various places. The longest shipment (to Leetsville, Michigan) was in transit 64 hours and was kept for two days after arrival by the consignee. All shipments held in excellent condition. The transparent covering held the berries in place and discouraged pilfering in transit. The wrappings made it difficult to get the boxes into the standard size of crate—about five minutes were required to wrap 24 pint boxes and place them in a crate. The cost of materials is approximately 12 cents per 24-pint or quart crate.

Reports from 31 berry shipping associations show that only three have made any attempt to use material of this kind. Two replied that the extra expense is not justified under present conditions. One replied that no practical way of handling this material in quantity had been found, and another said that the covers held too much heat. These

replies came from New York and Washington. Darrow and Dearing[6] report that Cellophane has been used experimentally for two seasons at the Coastal Plain Station in North Carolina and that its use is desirable for strawberries "where and when practicable." They point out that Cellophane-capped boxes or crates are preferable to those completely wrapped and that during the cooler weather boxes carry better when capped with Cellophane.

It is evident that, under certain conditions, transparent wraps can be used successfully on berries. Whether the use of this material is economically practicable under present conditions is open to question.

SUMMARY

The use of various types of baskets, crates, and cartons for packing apples and plums is discussed. The basket makes a desirable package for Minnesota-grown apples, and no change seems justified under present market conditions. The use of ring packing forms for the better grades of apples is recommended. Minnesota-grown plums are being marketed in various types of containers with no apparent trend toward standardization.

The Hallock type of berry box for marketing Minnesota-grown strawberries has come to be so uniformly identified with home-grown berries as to approach "trade-mark" recognition. The recent development of new types of containers for shipping strawberries may lead to a change in present usage should any of these new containers prove to be more profitable for growers in this region by reducing spoilage or otherwise facilitating the marketing of the crop. A test of five different styles of paperboard berry boxes indicated that none had any advantage over wood-veneer boxes. In some respects they were much inferior.

The ventilated type of crate for shipping raspberries reduces spoilage and is rapidly replacing the old-style nonventilated crate.

The 24-quart crate is used mostly by growers in the vicinity of St. Paul and Minneapolis for the spring strawberry crop, but in other parts of Minnesota the 16-quart crate is used extensively. The fall crop is sold in both pint and quart containers, with the trend toward a more general use of the pint size. A crate holding one layer of pint boxes has been found very satisfactory for the fall crop.

Preliminary experiments with transparent wraps for berries indicated that, under certain conditions, these wraps can be used successfully for covering berries. But whether their use is economically practicable at present is open to question.

[6] Darrow, G. M., and Dearing, Charles. The Culture and Handling of the Blakemore Strawberry. North Carolina Dept. of Agr. The Bulletin, November, 1934.

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