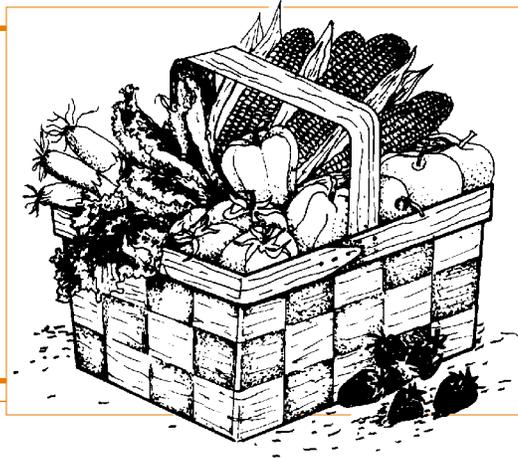


CONTAINERS AND PACKAGING FRUITS & VEGETABLES

By
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There is an old adage that “If you package it right, you can sell just about anything.” It’s no different for packaging fruits and vegetables—they must be packaged so customers will buy them.

Proper packaging is especially important when a grower is selling to a wholesale buyer. There is no uniformity in container size or weight standards for all fruits and vegetables, but individual crops have specific industry packaging standards. If the crops are not packaged accordingly, wholesale customers probably will not buy them. Reasons for specific industry standards are twofold:

- So everyone in the industry speaks the same “packaging” language. In other words, everyone knows what they are buying and selling.
- Crops have different requirements for handling, so different types of containers are made to fit them.

The generic term, “container,” will be used in this publication to refer to boxes, cartons, lugs, flats, crates, bags, sacks and bulk bins. When a specific container is discussed, that term will be used.

Different container sizes and types have the disadvantage of making handling and transporting crops to markets difficult. Often, they do not fit well together on pallets in storage, or in trucks. Where the crop is grown also will influence the container size and shape. In the past, when fruit and vegetable production and distribution was regional,

different regions developed specific container sizes for their own markets. That is why there are Long Island, Florida, Catskill and California wirebound crates. L.A., Sanger and Brentwood lugs are examples of cities developing containers to differentiate their produce.

The main functions of a produce container are:

- To prevent and reduce injury to the crop during transit and handling.
- To provide ventilation to hasten cooling and escape of heat caused by respiration.
- To reduce water loss from the crop.

Container Materials

Containers may be made of wood, styrofoam, and plastic, but corrugated fiberboard is the most popular rigid container. Each material has advantages and disadvantages. Stacking strength, length of storage, storage treatment, precooling method and cost influence the choice of material.

If the container has contact with water or ice, it should be made of water-resistant material. Nailed wooden boxes and wirebound wooden crates provide rigidity under moist conditions and have excellent stacking strength. Due to costs, though, they are being replaced by cheaper fiberboard or plastic containers.

Fiberboard containers are often waxed to give them water resistance; otherwise they weaken if they become wet or moist. Thus, their use is limited to long-term storage in high humidity conditions, or when hydrocooling and top-icing are used in precooling. Telescoping construction, dividers and corner reinforcement are ways that fiberboard boxes have been made stronger.

Plastic containers, a relatively new type of container, have good stacking strength and are water resistant. They tend to be brittle, especially foam plastic, which shatters quite easily when dropped or handled roughly.

Nonrigid containers such as bags and sacks are made of burlap, cotton or plastic mesh or ventilated plastic film. They contain the produce, but offer no structural support. They allow good contact between the produce and ice for cooling and storage.

Bulk Bins

Bulk bins, originally used in harvesting, are now used for shipping and storage of some produce. Bin sizes vary, but there is a move to a standard 40 × 48-inch size with a palletized bottom for easy handling. Placement and type of bin vents varies. Most bulk bins are wood and stackable. Corrugated fiberboard bins that are attached to wooden pallets are mostly used for watermelons and other vine crops.

Bulk bins are replacing loose bulk loading and handling for commodities such as potatoes, onions, melons and squash. Bins reduce the amount of handling labor needed, and may reduce bruising of the fruits and vegetables.

Container Ventilation

Containers need to be vented to effectively lower and maintain produce temperature for storage. If the produce is pre-cooled by room cooling or forced-air cooling, the cold room air must be forced through the containers to remove field heat. To ensure the longest shelf life, the produce must be pre-cooled as quickly as possible. Vents allow cold air to be forced more quickly through the containers and produce.

Vents also allow the heat built up by respiration to escape. Produce exposed to high temperatures in unvented containers will usually have a shorter shelf life.

A well-made container has uniform venting, so when it is stacked the vents will match other containers. Matching is important so cold air can be pulled through a whole stack or pallet of containers.

Too much venting weakens a container, while too little venting restricts the air flow through it. A good rule of thumb is to have 5 percent of the container sides and/or ends vented. A few large vertical vents are better than many small round ones. A container with bags, liners and vertical dividers will eliminate the beneficial effects of vents. Most commercial box and carton companies have standard containers with effective venting spacings.

Wrapping

Wrapping pears and apples individually in tissue-type paper has been a common practice to reduce vibrational and impact bruising from other fruit in the container. Wrapping has become less common in recent years because skilled labor is required to wrap fruit properly and efficiently.

Palletization of Containers

Palletization or unitized handling (stacking containers on standard size pallets) is used to reduce the number of times an individual container is handled, and to reduce damage to the contents. Palletization is becoming an industry standard for handling large quantities of produce.

A standard pallet is 40 × 48 inches, and most containers are designed to stack on them (straight or crossed). To hold the stack on the pallet, some containers have interlocking tabs between the layers. "Break-away" glue is sometimes used between the layers, or the unitized pallet is wrapped with plastic film or mesh. When stacking and loading the pallet, care needs to be taken to match vents between containers. Standard container sizes are now being developed that fit interchangeably on the 40 × 48-inch pallet.

Labeling

Produce containers should be labeled *at each end* and *on the top* with the following information:

1. Commodity (potatoes, apples, etc.)
2. Size, count and/or net weight (50 count, 32 pounds, etc.)
3. Grade (U.S. Fancy, U.S. #1, etc.)
4. Packer/grower/shipper (name and address)
5. Packing date (1-23-91, etc.)
6. Quality assurance or control code (harvest date information, bin number, packing time, packer number, inspector number, gassing room number for tomatoes or honeydew melons, etc.)

It is most important to label the end of the container; this part of the box will be most visible when containers are stacked. The first four items let the buyer know who, what and how much. The last two items help with quality assurance or control of the produce. If there are problems, a quality assurance code system will help find the source of the problem.

Grades and Sizes

Besides having a specific size container, each crop is packed to a uniform grade and size. The grades are set by the U.S. Department of Agriculture or by states. Individual states are often more strict than USDA standards. Most buyers want at least U.S. Grade No. 1 or better. The difference between No. 1 and lower grades is the percentage of fruits or vegetables that do not pass the grade standards. The USDA publishes leaflets with grade standards for most crops. Single copies are free from:

Fresh Products Branch
Agricultural Marketing Service
Fruits and Vegetable Division
U.S. Department of Agriculture
P.O. Box 96456, Room 2056-South Bldg.
Washington, D.C. 20090-6456

Sizing is an important part of packing a crop “right.” The buyer wants a container with uniformly sized fruits and vegetables, and also wants them labeled appropriately. Size may be designated

as the number or count in the containers; but some crops use actual produce size in length or diameter.

Number or count is the number of fruits or vegetables that will fit into the container. This is customarily called a “count pack.” The “designated number” usually corresponds to a standard size range of the fruit or vegetables. For example, if you are packing melons as “18s,” you cannot put six extra-large melons into a container with 12 extra-small melons and label it as a carton of “18s.”

A different type of count is used most commonly with tomatoes packed in two-layer boxes (lugs). They are labeled as 4×4, 4×5, 5×5, 6×6, etc. A 6×6 lug indicates that the box has six rows of six tomatoes in each layer—36 tomatoes in each layer—with a total of 72 tomatoes per lug, which should weigh about 20 to 25 pounds.

Other crops are labeled by size, usually diameter. For example, a container may be labeled 2¼-inch peaches.

Containers may also have minimum weight ranges. Bulk or loose packaging may have a minimum weight range to compensate for slight differences in the produce. Containers are often over-filled to offset weight losses during handling, storage and transit. Precise container weights are usually found in wholesale produce containers that are packaged with individual 1- to 5-pound bags for retail sales, called “consumer packs.” Individual consumer packs within a wholesale container also are used with volume units. Berry fruits are the most common example where 12 to 24 half-pint, pint or quart boxes are packed in a flat or carton. The wholesale box containing consumer packs is called a “master.”

Conclusions

Washing, drying, sorting, grading and packing crops into the right container is a good start, but it will not be good enough for most wholesale buyers and brokers. The packed produce must be at a proper storage temperature when it is delivered before most buyers will accept it. Ideally, the produce should be precooled rapidly to storage temperature before or after packing. Precooling will ensure the longest produce shelf life. Packed and precooled produce must be stored at optimum storage temperatures until it is delivered to the buyer.

For more information on optimum storage conditions (temperature and relative humidity) for specific crops, read K-State Research and Extension Bulletin MF-978, *Postharvest Management of Commercial Horticultural Crops: Storage Conditions—Fruits and Vegetables*.

VEGETABLES

Asparagus—Asparagus is sold by weight in the standard containers listed in Table 1. Spears may be loose-packed, or bundled vertically in pyramid crates. Vertical packing keeps the spears straight. Spears are sized by diameter and must be at least $\frac{5}{16}$ inch in diameter to be sold. USDA size grades are:

- Small = $\frac{5}{16}$ inch to less than $\frac{8}{16}$ inch diameter
- Medium = $\frac{8}{16}$ inch to less than $\frac{11}{16}$ inch diameter
- Large = $\frac{11}{16}$ inch to less than $\frac{14}{16}$ inch diameter
- Very Large = $\frac{14}{16}$ inch and up diameter

Beans, snap—Snap beans are sold by weight and bulk-packed in bushel hampers and cartons. They are sized by diameter.

Sieve size	Diameter (to but not including)
No.1 =	$\frac{12}{64}$ – $\frac{14.5}{64}$ inch
No.2 =	$\frac{14.5}{64}$ – $\frac{18.5}{64}$ inch
No.3 =	$\frac{18.5}{64}$ – $\frac{21}{64}$ inch
No.4 =	$\frac{21}{64}$ – $\frac{24}{64}$ inch
No.5 =	$\frac{24}{64}$ – $\frac{27}{64}$ inch
No.6 and larger =	$\frac{27}{64}$ inch and larger

U.S. No.1 grade snap beans must have a maximum sieve size of 4; U.S. No.2 has no upper limit. Both have a minimum diameter of $\frac{12}{64}$ inch.

Beets, bunched or topped—Beets are sold by weight and packed in the containers given in Table 1. They are usually sold bunched with 12 beets per bundle with tops attached, or loose with tops trimmed short or removed. Short-trimmed tops cannot be more than 4 inches long; topped beets cannot be more than $\frac{1}{2}$ inch in length.

Broccoli—Broccoli is usually sold in cartons holding 14 and sometimes 18 individual heads, or bunches of stems of uniform size. Cartons weigh 20 to 24 pounds.

Brussels Sprouts—Brussels sprouts are packaged in 25-pound bulk-pack cartons, or in flats holding 12 10-ounce consumer-ready cups. They should be greater than 1 inch and no more than $2\frac{3}{4}$ inches in diameter.

Cabbage—Cabbage is sold by weight, in bulk or 50-pound sacks or cartons. Packages are labeled with head size: Small=less than 2 pounds, Medium=2 to 5 pounds, and Large=greater than 5 pounds. Sometimes head size is given as the number of heads in a 50-pound container.

Carrots, bunched or topped—When carrots are bunched with the tops left on, the bunches must weigh more than 1 pound and contain at least 4 carrots. They are packed 24 bunches to a crate. Topped carrots are packed in consumer-ready 1- or 2-pound poly bags that are packed in 48-pound units. Carrots also are packed loose in bulk containers.

Cauliflower—Cauliflower is usually packed in a flat or 2-layer carton of 9 to 16 trimmed and film-wrapped heads. A size designation is usually given that corresponds to the number of heads in the carton. The number 9 heads are larger than number 16s.

Corn, sweet—Sweet corn is packed with 5-dozen ears in cartons or wirebound crates. It is also packed in bags.

Cucumbers—Cucumbers are most often packed in $1\frac{1}{2}$ bushel cartons. Size is based on diameter and length. Small cucumbers have diameters between $\frac{1}{2}$ and 2 inches. Large cucumbers have diameters greater than $2\frac{1}{4}$ inches and lengths longer than 6 inches. If cucumbers are packed in smaller cartons, they are sold by count packs.

Cucumbers, greenhouse—Greenhouse cucumbers are packed in smaller cartons than field-grown cucumbers. They have a carton weight of 12 or 16 pounds, and often are plastic-wrapped (shrink-wrapped) to prevent water loss.

Eggplant—Eggplants packed in 20- to 23-pound cartons are packed 18 to 24 per carton. Size is designated by number per container.

Garlic—Garlic is packed in bulk or in a carton containing consumer-ready packages of 2 bulbs each. Bulk-packed garlic is sized.

<u>Garlic size designations</u>	<u>Diameter in inches</u>
#11 Super-Colossal	2 ¹⁵ / ₁₆ and up
#10 Colossal	2 ¹¹ / ₁₆ – 2 ¹⁵ / ₁₆
#9 Super-Jumbo	2 ⁷ / ₁₆ – 2 ¹¹ / ₁₆
#8 Extra-Jumbo	2 ³ / ₁₆ – 2 ⁷ / ₁₆
#7 Jumbo	1 ¹⁵ / ₁₆ – 2 ³ / ₁₆
#6 Giant	1 ¹³ / ₁₆ – 1 ¹⁵ / ₁₆
#5 Tube	1 ¹¹ / ₁₆ – 1 ¹¹ / ₁₆
#4 Medium Tube	1 ⁹ / ₁₆ – 1 ¹¹ / ₁₆

Greens—Greens include collards, dandelion greens, kale, mustard greens and Swiss chard. They are packed either loose or in bunches, 12 to 24 per carton.

Herbs—There are no USDA standards for most herbs, and few industry standards for packing containers. Most herbs are packed in airtight bags to prevent wilting. They are packed in bulk, or in bunches of 6, 12 or 30 per container. It is best to work closely with the buyer when packing herbs.

Lettuce: romaine, big Boston, bibb, leaf—These leafy types of lettuce are most commonly packed in cartons of 24 heads.

Melons: casaba, crenshaw, honeydew, muskmelon—Melons of uniform size are packed in various size boxes. Muskmelons are packed in containers that can range from 38- to 41-pound half-cartons to 80- to 85-pound jumbo crates. Honeydews are usually packed in 30- to 40-pound cartons. The other specialty melons are packed in 25- to 35-pound cartons.

Okra—Okra is packed in various size containers which have a standard packed weight. Okra is usually sold by weight.

Onions—Dry onions are sold by weight, but are packed in standard weight containers and packed to a uniform size. Size is determined by diameter.

<u>Onion bulb size designation</u>	<u>Diameter in inches</u>
Small	1 to 2 ¹ / ₄
Repackers or Prepackers	1 ³ / ₄ to 3 (60% or more 2 inches)
Medium	2 to 3 ¹ / ₂
Large or Jumbo	3 or greater

Green onions are bunched and packed 24 or 48 bunches per container, depending on size. Green onions can be sized by diameter: Small=less than 1/2 inch, Medium=1/2 to 1 inch, and Large=over 1 inch.

Oriental Vegetables—Leafy and head-type oriental vegetables are often bunched and packed into standard containers.

Ornamental Gourds—There are no USDA grade standards; handling will depend on the buyer. Gourds are often sold by weight and packed in bulk bins, or sold like miniature pumpkins, 40 pounds in 1/2- to 5/8-bushel crates.

Peas, green and snow—Peas are packed in standard size containers as outlined in Table 1. They are sold by standard weight of the filled container.

Pepper—Bell peppers are packed by size into standard containers that have a specific filled weight. Sizes are small, medium, large and extra large.

Chili peppers have no official standards for size and count. Standard packing containers are covered in Table 1.

Potatoes—Potatoes are packaged by size and by count per 50 pounds.

<u>Potato size designation</u>	<u>Diameter (inches)</u>
Size A	1 ⁷ / ₈ and up
Size B	1/2 to 2 ¹ / ₄
Small	1 ³ / ₄ to 2 ¹ / ₂
Medium	2 ¹ / ₄ to 3 ¹ / ₄
Large	3 to 4 ¹ / ₄
<u>Potato count</u>	<u>Approximate tuber weight (ounces)</u>
Under 50	15
50	12–19
60	10–16
70	9–15
80	8–13
90	7–12
100	6–10
110	5–9
120	4–8
130	4–8
140	4–8
over 140	4–8

Pumpkins—Jack o’lantern and processing pumpkins are shipped in bulk or in bulk bins. Eating pumpkins (small pie types) may be packed in crates, cabbage cartons or sacks. Standard weight for these smaller packs is 40 or 50 pounds. Miniature pumpkins are packed in 1/2- to 5/8-bushel crates with a standard weight of 40 pounds.

Radishes—Radishes are packed topped or bunched with tops. Bunched radishes must be uniformly sized within the bunch. Sizes are: Small = ½ to ¾ inch diameter, Medium = ¾ to 1 inch diameter, Large = 1 to ¼ inch diameter, and Very Large over ¼ inch diameter.

Rhubarb—Rhubarb is often packed in cartons or lugs of 20 pounds. U.S. grade standards have guidelines on length and diameter.

<u>Rhubarb Grades</u>	<u>Diameter</u>	<u>Length</u>
U.S. Fancy	> 1 inch	> 10 inches
U.S. No.1	> ¾ inch	> 10 inches
U.S. No.2	> ½ inch	> 10 inches

Rutabaga—Rutabagas are packed in 25- or 50-pound sacks or cartons, packed topped and usually waxed. They must be greater than 1¾ inches in diameter.

Spinach—Spinach can be packaged loose in bulk, loose in consumer-ready packages, or bunched. Bunched spinach is usually packed 24 bunches to a 20- to 22-pound carton. Cartons holding 10-ounce consumer-ready plastic bags are packed 12 to a carton.

Squash

Winter squash includes green and gold Table Queen (acorn), turban, delicata, butternut, sweet dumpling, kabocha, golden nugget, buttercup, delicious, orange marrow, hubbard, banana, sweet meat, Mediterranean and calabaza. Winter squash is usually packed in bulk bins or smaller 40- to 50-pound crates, and sold by weight.

Summer squash includes zucchini, cocozelle, chayote, scallopini, yellow crookneck, yellow straightneck and sunburst. Summer squash is packed in a variety of containers with standard minimum weight requirements. It is also sized by small and medium categories.

Sweet Potatoes—Sweet potatoes are packed in containers that hold 40 or 50 pounds. U.S. grade standards cover the requirements for different sizes.

Sweet potato U.S. Grade	Diameter (inches)	Length (inches)	Weight (ounces)
U.S. Extra No.1	1¾ - 3¼	3-9	< 18
U.S. No.1	1¾ - 3½	3-9	< 20
U.S. No.2	< 1½	—	< 36

Tomatoes—Cherry tomatoes are sold in flats holding 12, 1-pint boxes or baskets. They are usually picked vine-ripe.

Plum tomatoes are usually packed in quart boxes or baskets, eight to a carton. They are also picked vine-ripe.

Mature green tomatoes are sold in bulk-packed cartons, holding approximately 25 pounds. They are sorted by size. Size designation is based on the number of tomatoes (in rows and columns) in a layer on a standard two-layer tomato lug.

Pink and vine-ripe tomatoes are usually packed by uniform size in a two-layer lug or tray pack. They have softened enough that bulk packing causes too much bruising.

Size designation of tomatoes

Name	Size	Inches (min.) (max.)	
Maximum			
Large	4 × 5 and up	3 ¹⁵ / ₃₂	and up
Extra Large	5 × 5 and 5 × 6	2 ²⁸ / ₃₂	3 ¹⁵ / ₃₂
Large	6 × 6	2 ¹⁷ / ₃₂	2 ²⁸ / ₃₂
Medium	6 × 7	2 ⁹ / ₃₂	2 ¹⁷ / ₃₂
Small	7 × 7	2 ⁷ / ₃₂	2 ⁹ / ₃₂
Extra Small	7 × 8	1 ²⁸ / ₃₂	2 ⁴ / ₃₂

Turnips—Turnips are packed bunched with tops, with tops short-trimmed, or topped. Packing containers and weight requirements differ for each type of pack. Topped turnips are bulk-packed in mesh or poly film bags or bushel baskets, or packed in consumer-ready 1-pound plastic bags, 24 bags to a carton. Turnips with tops are usually bunched and packed in wirebound crates or bushel baskets, and have a required minimum weight of 25 pounds.

Watermelon—Watermelons are sold by weight and usually in bulk bins. Prices are quoted per hundred-weight.

FRUITS

Apples — Apples are packed by count and weight. Apples sold by weight are usually packaged in consumer-ready 3-pound poly bags, 12 bags per carton. The apples are uniformly sized.

Apples are also sold by count, which is the number of apples of a certain diameter/size that will fit into a standard bushel carton. The larger the apple, the fewer per carton, so the lower the number designation. Apples can be bulk- or volume-filled into a carton, or place-packed into tray or cell packs in a carton. Tray or cell packs reduce the amount of injury to the fruit, but cost more because the tray and cell inserts must be purchased. Following is a summary of the fruit count and size, and packing arrangement for apples.

1. Count	2. Pack	3. No. row	4. Pieces per layer	5. Layers	6. Size inches	7. Paper size
216	3×3	6×6	36	6	2 ¹ / ₈	9"
198	3×3	6×5	33	6	2 ¹ / ₄	9"
175	3×3	6×7	35	5	2 ³ / ₈	9"
163	3×2	6×7	33–32	5	2 ¹ / ₂	9"
150	3×2	6×6	30	5	2 ⁵ / ₈	10"
138	3×2	6×5	28–27	5	2 ³ / ₄	10"
125	3×2	5×5	25	5	2 ⁷ / ₈	10"
113	3×2	5×4	23–22	5	3	10"
100	3×2	4×4	20	5	3 ¹ / ₈	11"
88	3×2	4×5	22	4	3 ¹ / ₄	11"
80	2×2	5×5	20	4	3 ³ / ₈	11"
72	2×2	5×4	18	4	3 ¹ / ₂	12"
64	2×2	4×4	16	4	3 ⁵ / ₈	12"
56	2×2	3×4	14	4	3 ³ / ₄	12"
48	2×2	3×3	12	4	3 ⁷ / ₈	12"

- Count = Number of apples per carton or box.
- Pack = Add the two numbers to get the number of rows per tray or layer.
- Number per rows = 1st number is the number of fruit in 1st, 3rd and 5th rows in the layer/tray. 2nd number is the number of fruit in the 2nd, 4th and 6th rows in the layer/tray.

- Pieces per layer or tray = Number of fruit per layer or tray.
- Layers = Number of layers or trays per carton or box.
- Size = Minimum fruit diameter for given count.
- Paper = Size of wrapping papers if fruit is to be individually wrapped.

Apricots—Apricots are sold by count and weight. When bulk- or volume-filled into 24-pound lugs, apricots are sold by weight. The size is designated by diameter in inches, or by jumbo, large, extra large, etc. When the fruit is tray-packed, it is given a count number, and price is based on that number.

Berries—Blackberries, blueberries, raspberries and strawberries are sold by volume in half-pints, pints and quarts. They are usually packed 12 (or sometimes 24) to a single layer crate, flat or box. Blueberries can be labeled by size. The standard used is the number of fruit per pint.

Extra large = Fewer than 90 berries per standard pint

Large = 90–129 berries per standard pint

Medium = 130–189 berries per standard pint

Small = 190–250 berries per standard pint

Cherries—Sweet cherries are bulk- or volume-filled into lugs that hold 18 to 20 pounds. The lugs are often lined with polyethylene (plastic) bags to preserve quality. Sweet cherries can be sorted by size. Fresh sour cherries are rarely seen in retail markets, except near production areas. They are very perishable, and most go to processors close to the production areas. There are no standard packs for sour cherries.

Grapes—Grapes are typically sold by weight in 23-pound lugs. Eastern or American type grapes are often sold by volume, in cartons filled with 12, 1-quart containers packed similar to berries.

Nectarines—Nectarines are sold by count of uniformly sized fruit in a bulk- or volume-filled lug, or a two-layer tray pack. The volume-filled lug must be at least 25 pounds, and the tray-pack averages 22¹/₂ pounds. Size designations range from the larger 50 size (number per lug) to the smaller 84 size.

Peaches—Peaches are usually sold by weight and sometimes by count. Shipping containers are packed with uniformly sized fruit, usually designated by diameter in inches. They are packed bulk- or volume-filled, or in tray-packs. If fruit is ranch-packed, then tray-packing is used to protect the softer fruit from bruising.

Pears—Pears are usually sold by count in bulk- or volume-filled cartons, wrapped in bulk- or volume-filled cartons, or tray-packed in lugs. The greater the count number, the smaller the fruit size. Each carton must contain uniformly sized fruit.

Plums and Fresh Prunes—Plums and fresh prunes are usually sold by weight of bulk- or volume-filled half-bushel lugs, with a minimum weight of 28 pounds. Fruit size is designated as 3×4, 6×6, 5×5, etc. These designations originated with an old 4-basket crate pack. The numbers designate the number of rows and columns in the top layer of the baskets. A 3×4 lug would have larger fruit than a 6×6 lug.

Definitions

Box or carton—Usually refers to a corrugated fiberboard container. It may be a two-piece telescoping box, or a carton that closes with top flaps. The contents can be place-packed with liners and layer dividers, or bulk-filled.

Crate—Usually refers to a wooden, wirebound container. These are usually bulk-filled to a desired weight or, in the case of sweet corn, filled with 5-dozen ears.

Flat—Usually refers to a container that is place-packed in one or two layers, depending on the crop. Flats are also used to package produce that are packed in half-pint, pint and quart consumer-ready containers.

Lug—Usually refers to a container that is place-packed in two or three layers, depending on the crop. Lugs can also be bulk-filled. They are made of wood, corrugated fiberboard, or a combination of both. Standard dimensions are 16½ × 13¼ inches with varying depths.

References

Hardenburg, R.E., A.E. Watada and C.Y. Wang. 1986. *The Commercial Storage of Fruits, Vegetables and Florist and Nursery Stocks*. USDA-ARS Agriculture Handbook #66 (revised) 136p.

Kadar, A.A., R.F. Kasmire, F.G. Mitchell, M.S. Reid, N.F. Sommer, and J.F. Thompson. 1985. *Postharvest Technology of Horticultural Crops*. Cooperative Extension University of California, Division of Agriculture and Natural Resources Special Publication #3311. Oakland, CA.

Lorenz, O.A. and D.N. Maynard. 1988. *Knott's Handbook for Vegetable Growers*, 3rd ed. Wiley Interscience, New York.

1990 Produce Availability and Merchandising Guide. *The Packer*. Vance Publishing Corp. Overland Park, KS.

Ryall, A.L. and W.J. Lipton. 1979. *Handling, Transportation and Storage of Fruits and Vegetables*, Volume 1, 2nd ed. Vegetables and Melons. AVI Publishing Co., Westport, CN.

Ryall, A.L. and W.T. Pentzer. 1974. *Handling, Transportation and Storage of Fruits and Vegetables*, Volume 2. Fruits and Tree Nuts. AVI Publishing Co., Westport, CN.

Containers and Packaging

Adelman-Fisher Packaging
207 Walnut Street
Kansas City, MO 64106

Aargus Poly Bag Co.
1415 Redeker Rd.
Des Plaines, IL 60016
(312) 356-3341

Liberty Carton Co.
Agri-Pack Div.
870 Louisiana Ave.
Minneapolis, MN 55425
(612) 540-9615

Allied Fastener Corp.
133 N. 25th Ave.
Melrose Park, IL 60521
(312) 345-0063

Alton Packaging Corp.
401 Alton St.
Alton, IL 62002
(618) 466-6552

Anderson Box Co.
Park Fletcher Station
Box 41264
Indianapolis, IN 46241
(317) 248-8086

Chesmore Seed Company
1302 S. 4th Street
St. Joseph, MO 64501
(816) 279-0865

Cordage Packaging
8112 W. Thomas St., Apt. 3
Justice, IL 60458
(312) 496-3152

Fresh-PAK
P.O. Box 256
Stevensville, MI 49127
(616) 429-3295

International Paper Co.
635 Northwest Ave.
Northlake, IL 60164
(312) 562-6900

Jacksonville Box & Woodwork Co., Inc.
(tomato lugs)
P.O. Box 3447
Jacksonville, FL 32206
(904) 354-1442

Love Box Company, Inc.
3380 Centennial Road
Salina, KS 67401
(785) 823-7354

Pacific States Box and Basket Co.
(berry boxes; baskets)
1295 S. Los Angeles St.
Glendale, CA 91209
(213) 245-5711

Package Research Laboratory
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Packaging Corp. of America
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Ridge Pallets, Inc.
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Rockford Package Supply, Inc.
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Rockford, MI 49341
800-444-7225 or (616) 866-0143

Smalley Package Company, Inc.
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Berryville, VA 22611
(703) 955-2550

Table 1. Standard size and net weights of common containers used for fresh vegetables.

Vegetable	Container	Approximate net weight (lb.)	Vegetable	Container	Approximate net weight (lb.)			
Asparagus	Pyramid crate	30–36	Eggplant	Carton packed 18s and 24s	20–23			
	Half pyramid crate or carton	15–17		Bushel carton, 1 $\frac{1}{9}$ -bushel carton or wirebound crate	30–35			
	Carton holding 16, 1 $\frac{1}{2}$ -lb. pkgs.	24–25	Garlic	Carton or crate, bulk	20			
Bean, snap	Bushel crate hamper, or basket	28–32		Carton or crate, bulk	30			
	Carton	20–22		Carton of 12 pkgs. of 2 bulbs ea.	10			
Beet	Bunched	1 $\frac{1}{9}$ -bushel crate, 24s	36–40	Greens	Bushel basket, crate, carton	20–25		
		$\frac{1}{9}$ -bushel crate, 12s	15–20		1 $\frac{1}{9}$ or 1 $\frac{1}{2}$ bushel, crate or carton	30–35		
		Topped	Sacked, as marked		25–50	Herbs, Fresh	Bulk, bunched-packed 6, 12, or 30 per carton.	Varies
Broccoli	Carton holding 14–18 bunches		20–24	Lettuce	Romaine		1 $\frac{1}{9}$ bushel wirebound crate	20–25
	Brussels Sprouts	Carton	25		Big Boston		Carton & eastern carton holding 24 heads	20–24
Cabbage		Sack, crate or carton			50–55	Bibb	Carton	5–8
	Carrot	Bunched	Carton holding 2 dz. bunches	23–27	Leaf	Carton	10–13	
48, 1-lb. or 24, 2-lb. bags in master container			48	Melon	Casaba	Carton, bliss style, packed 4, 5, 6 or 8	32–34	
Mesh bag, loose or as marked			25–55			Crenshaw	Carton, bliss style, packed 4, 5, 6 or 8	30–33
Cauliflower	Flat or 2-layer carton holding 9–16 trimmed heads	18–24	Honeydew			Flat crate standard	40	
	Long Island type crate	45–55	Muskmelon	$\frac{1}{2}$ -carton or crate packed 12, 15, 18, 23	35–40			
	Chinese Cabbage	15 $\frac{1}{2}$ -in. wirebound crate		50–53	Jumbo crate packed 18 to 45	70–80		
1 $\frac{1}{9}$ -bushel wirebound crate		40–45		$\frac{2}{3}$ -carton packed 15, 18, 24, 30	53–55			
Corn, sweet	Wirebound crate 4 $\frac{1}{2}$ –5 dz.	42–50	Watermelon	Bulk bin, medium size	1,400–1,800			
	Sacks	35–40		Carton holding 3–5 melons	65–80			
Cucumber	Bushel carton or wirebound crate	50–55	Okra	Bushel hamper or crate	30			
		1 $\frac{1}{9}$ -bushel carton or wirebound		50–55	$\frac{1}{9}$ -bushel crate	18		
	Los Angeles lug	28–32		Carton	18			
	12-qt. basket	15–18		Onion Dry	Sack	50		
Cucumber, Greenhouse	Carton holding 1-layer pack	8–10	Sack		25			
	Carton	16	Carton holding 15, 3-lb. bags		45			
			Carton holding 20, 2-lb. bags		40			

Vegetable	Container	Approximate net weight (lb.)	Vegetable	Container	Approximate net weight (lb.)
Green	Carton/crate holding 4 dz. bunches	15-25	Spinach	Carton or wirebound crate holding 2 dozen bunches	20-22
	Carton/crate holding 2 dz. bunches	20		Carton holding 12, 10-oz. film bags	7½-8
	Carton	13		Bushel basket or crate	20-25
Pearl	Carton holding 12, 10-oz. containers	8	Squash		
Oriental Vegetable	Lug	25-28	Winter	1½-bushel crate	40-50
	Crate	75-80	Bulk bin carton, collapsible and reusable		800-900
	Carton	20-22	Various bulk bins		900-2,000
	Wirebound crate	45	Summer	⅝-bushel crate or carton	21
Ornamental Gourds			½-bushel basket or carton	21	
	½- to ⅝-bushel crate	40	Carton or Los Angeles lug	24-28	
	Bulk or Bulk bins	900-1200	¾-lug	18-22	
			1½-bushel crate	42-45	
Pea			Sweet Potato	Carton, crate or bushel basket	50
Green	Bushel basket or wirebound crate	28-32	Carton, California		40
Snow pea	Carton	10	Tomato		
Pepper			Cherry	Carton holding 12 pints	16-18
	Green	Bushel carton	Mature green	Carton	25
Chili			Pinks & ripes	2-layer flat, carton or tray pack	20
	Green	1½-bushel wirebound crate		3-layer lug or carton	30
	Carton	27-34		Carton, loose pack	20
	Lugs or carton, loose pack	16-25	Turnip		
Potato			Topped	Film bag	25
	100-lb. sack	100		Film & mesh bag or bushel basket	50
	50-lb. sack or carton	50		Carton holding 24, 1-lb. film bags	24
	20-lb. film or paper bags	20			
	5, 10-lb. film or paper bags	50			
	10, 5-lb. film or paper bags	50			
Pumpkin	Bulk	Semi-load			
	Bulk bins	900-1,200			
	1½-bushel crate	40 or 50			
	½- to ⅝-bushel crate	40			
Radish					
Bunched	Carton holding 4-dz. bunches	25			
Topped	Carton holding 24, 8-oz. film bags	12			
	Carton holding 30, 6-oz. film bags	11-12			
Rhubarb	Carton or lug	20			
	Carton	5			
Rutabaga	Bag or carton	25			
	Sack or carton	50			

Table 2. Standard size and net weights of common containers used for fresh fruits.

Commodity	Container	Capacity cu. in.	Net weight (lb)
Apples	Tray pack carton	2,880	40–45
	Bushel carton (face and fill)	2,150	40–44
	Carton, cell pack	—	36–38
	Carton, tray pack	2,785	41–43
	Northwest wood box	2,174	41–43
Apricots	Lug	630	14 min.
	Lug	1,449	28 min.
Berries	24 qt. wirebound crate	1,613	27–36
	24 qt. wirebound crate	806	13–18
	12 pt. tray	403	7–9
Cherries, Sweet	Wood lug (face and fill)	610	15 min.
	Wood lug (loose)	870	20 min.
Grapes	Wood lug or carton	1,250	26–28
	12 qt. basket, eastern grapes	806	18
Nectarines	Wood box	778	18
	Carton	1,066	25
	4-basket crate	1,286	29
Peaches	¾-bu. basket (bulge)	1,613	36–39
	½-bu. basket (flat)	1,075	24–26
	Wirebound crate	1,820	38–42
	Wood lug	1,250	22–24
Pears	Standard wood box	1,760	44–46
	Wood lug	880	21–24
Plums and Fresh Prunes	L.A. wood lug	1,252	27–32
	4-basket crate	1,070	25–27
	Northwest prune lug	532	12–14
	½-bu. basket	1,075	25–32

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF-979

March 1991

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