“Fresh-cut” refers to raw fruits and vegetables that are harvested, cut, washed, packaged, refrigerated, and made ready to eat or cook. Its sibling term, “value-added,” covers the same process but emphasizes how this preparation offers consumers value by providing convenience and ease of use. Because these items have not been processed by other techniques such as freezing, cooking, drying, or canning, they are more perishable and will spoil quickly if not sufficiently cooled during shipping and storage.

Fresh-cut produce may be a single commodity or two or more mixed in the same package such as bagged lettuce blends, cole slaws, or fruit salads.

References: UC Davis Postharvest Technology website, USDA.

TYPES, VARIETIES & CUTS

Fresh-cut varieties continue to increase, but the most common include apples, broccoli, carrots, celery, garlic, melon mixes, lettuce salad blends, citrus groupings, and many types of chopped or sliced fruit salads. Cabbages and broccoli are made into a number of creative cole slaw dishes, with other vegetables and fruits thrown into the mix for color and flavor.

Stir fry mixes include a broad array of fresh produce, and tropical salads bring old stalwarts like apples and grapes together with berries, kiwifruit, mangos, melon, citrus, papaya, pineapple, pomegranates, star fruit, and more. Soup and stew preparations may include a number of vegetables and herbs.
TYPES, VARIETIES & CUTS — CONTINUED

Nearly two-thirds of fresh-cut product is packaged salads, with other vegetables like carrots and celery accounting for more than another quarter, fruit comprising the balance. Top chopped and sliced fruits include apples and various melons, with mixed fruit trays making up about a fifth of all fresh-cut fruit offerings.

Styles of cuts for fresh-cut produce depend upon the commodity, but can be broken down into several categories, including:

- **balls** – used for cantaloupe, honeydew, and watermelon; pieces are cut into bite-sized spheres that are ridged or smooth
- **buds, florets, or crowns** – used for broccoli and cauliflower; usually attached by part of the stem and include flowers or clusters from the head
- **chopped or shredded** – used for cabbage, carrots, lettuce, romaine and other leafy vegetables; items are cut into squares, rectangles, irregular shapes, or long narrow shreds
- **coined, cross-cut, rings, or slices** – used for broccoli stems, carrots, celery, onions, sweet peppers, potatoes, and tomatoes; cross-cut, uniform pieces may be smooth or ridged and slices can be cut straight across the item or at an angle
- **diced, cubed, chunks, or wedges** – used for broccoli stems, celery, melons, pineapples, potatoes, onions, and tomatoes; commodity is cut into square or rectangular shapes or irregular chunks
- **julienne, slivered, strips, spears, stalks, or sticks** – used for broccoli stems, carrots, celery, onions, sweet peppers, pineapples, or potatoes; cuts are length-wise either with ends intact, squared off, or tapering
- **whole-trimmed and cleaned, whole-trimmed and cored, or whole peeled** – used for cabbage, carrots, cauliflower, celery, garlic, grapes, lettuce, romaine and other leafy greens, onions, potatoes, and strawberries; the original shape of the item is generally maintained but washed and cut, with excess leaves and/or stems removed
- **random cut** – can be any commodity cut into random shapes and sizes.

References: International Fresh-Cut Produce Association, UC Davis Postharvest Technology website, USDA.

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PESTS & DISEASE

Injured produce is more susceptible to microbial growth, particularly if temperature is not controlled. By definition, fresh-cut produce is injured product. The act of cutting, peeling, or slicing wounds fruits and vegetables and can transfer pathogenic microorganisms from the item’s surface to the tissue inside. In addition, pathogens can grow and multiply quickly on fresh-cut produce.

Edible coatings can provide a modified atmosphere around surfaces to help preserve and extend shelf life; the coatings act as a barrier to oxygen or water loss, as well as gas exchange. Cellulose-based edible coatings are generally used on cut apples while edible wax is preferred for citrus.

The most common spoilage symptoms include:

- **browning, discoloration, yellowing** – common in apples, asparagus, beets, snap beans, broccoli, shredded cabbage, cauliflower, celery, garlic, jicama, leeks, lettuce, mushrooms, bulb onions, green onions, peaches, pears, peppers, persimmons, pineapple, pomegranates, potatoes, rutabagas, strawberries, and summer squash
- **softening, texture loss, translucency** – common in asparagus, jicama, kiwi, melon, bulb onions, peppers, persimmon, strawberries, and watermelon
- **leakage** – common in beets, carrots, cucumbers, kiwi, melon, bulb onions, green onions, oranges, pomegranate, summer squash, strawberries, tomatoes, and watermelon
- **off-odors** – common in broccoli, cauliflower, and spinach
- **drying and cracking** – common in carrots, celery, potatoes, and rutabagas
- **sprout growth** – common in garlic and green onions.

References: UC Davis Postharvest Technology website, University of Florida, U.S. Food & Drug Administration, USDA.

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POSTHARVEST STORAGE & PACKAGING

Commodities for fresh-cut processing are put through a series of steps that begin immediately after harvest. Whole produce, placed in bins for transport to the processor, are emptied onto conveyors for rinsing, trimming, coring, and removal of excess parts such as stems, peels, and outer leaves. Next, trimmed produce is put through cutting machines for the desired form (balls, cubes, slices, florets, etc.), inspected for uniformity, then thoroughly washed (up to three times) with cold, sanitary water. Clean produce is spin or air dried and placed into plain or modified atmosphere packaging (MAP), specially designed to preserve freshness and quality.
POSTHARVEST STORAGE & PACKAGING—CONTINUED

Perhaps the most important condition for quality fresh-cut is temperature control—to reduce microbial growth and maximize shelf life. Products should be prepared at a refrigerated temperature from 35 to 44°F. Sanitized water for washing should be approximately 32°F.

Cutting blades must be sharp to minimize injury. Sliced or chopped fruits are more susceptible to bruising and injury than root vegetables or leafy greens. Proper equipment and employee sanitation practices are particularly important; mild disinfection agents (like chlorine) are added to rinse and wash water, while other additives such as ascorbic or citrus acid can help minimize discoloration and texture loss. Edible coatings may be added to commodities like carrots or apples to maintain surface moisture.

Packaging of fresh-cut produce is an ever-evolving science. Modified atmosphere packaging is designed to reduce water loss and wilting, be gas permeable, and should be able to modify its own internal atmosphere by interacting with the respiration rate of the commodity. Packaging that reduces O₂ to inhibit oxidation and browning and elevates CO₂ to reduce microbial growth is ideal, although the balance must be precise as too little O₂ in the package may cause off-flavors and odors. Packaged fresh-cut commodities should be stored between 32 and 41°F.

Shelf life for fresh-cut varies depending on the commodity and product. Assuming proper storage temperatures, the most perishable fresh-cut items with a shelf life of only 2 to 9 days are strawberry slices, melon chunks, mango cubes, citrus segments, sliced kiwi, peaches or pears, and grape berries.

Next, at 4 to 9 days, are diced peppers and tomatoes, jicama sticks, and sliced cucumbers, squash, or mushrooms. Shelf life of 10 to 14 days can be expected from fresh-cut broccoli or cauliflower florets, shredded cabbage or lettuce, broccoli stems, celery and carrot sticks, apple wedges, pineapple chunks, and pomegranate arils. Even more hardy at between 14 and 18 days are lettuce salads, whole lettuce leaves, small leaf mixes, spinach leaves, peeled potatoes, and sliced root mixtures. The hardiest fresh-cut items with a shelf life of over 21 days are baby carrots, peeled onions, and peeled garlic.

References: UC Davis Postharvest Technology website, University of California Cooperative Extension, University of Florida, U.S. Food & Drug Administration, USDA.

GOOD ARRIVAL GUIDELINES & GRADE STANDARDS

While there are no set good arrival guidelines or grade standards for fresh-cut produce, there are guidelines for quality. Negative defects for fresh-cut produce can include off-color or discoloration, odors, or packages containing excessive moisture and/or soggy product.

Other negative characteristics include size (pieces too large or too small), core or end pieces, roots, or peels. Product should also be free from mechanical damage, breakage, and bruising, or foreign material (detritus, dirt, or soil).

Positive freshness attributes for fresh-cut produce include crisp, firm cut pieces; defects include browning and wilting, water-soaked pieces, shriveling, drying and cracking, slime, mold, or decay—again depending on the type of fresh-cut product and commodity. For commodities like cabbage, lettuce, celery, or other leafy items, too many stems, strings, or ribs are often less than ideal.

References: North Carolina State University College of Agriculture & Life Sciences, UC Davis Postharvest Technology website, U.S. Food & Drug Administration, USDA.