

Lesson 12: Processing Fruits, Vegetables, and Nuts

Fruit, Vegetable, and Nut Processing

Fruits and Vegetables - Fruits and vegetables are high water content foods. This promotes bacterial, yeast, and mold growth. If fruits and vegetables become partially dehydrated or wilted because of bruising or rough handling, their economic value sharply decreases. Processors, therefore, must practice superb techniques in handling and transporting these commodities. Processing techniques must also minimize natural enzymatic deterioration.

Much of today's harvesting is accomplished by mechanical pickers or harvesters. Because fruits and vegetables are delicate items, harvesting is usually conducted before maturity is reached. Ripening chambers containing ethylene gas are an important part of the processing of certain fresh fruits and vegetables. Other controlled atmospheric conditions, like temperature, humidity, O₂ levels, and light, are used to regulate shelf-life. Potatoes need large amounts of O₂, 5-7 days post-harvest, to develop their hard skin. Then they can be successfully stored under normal conditions.

Processors realize the need for immediate cooling of freshly picked produce. This has led to the development of mobile processing units that super cool produce immediately after harvest. Jet streams wash the product and begin to remove internal heat, and super coolers remove the remaining heat.

Freezing and canning are frequently used in the processing industry. Many fruits and vegetables are pitted, stemmed, cut, or cored before being frozen to a temperature of 20°F or less. Some fruits and vegetables may also be blanched. Canning operations include: blanching, peeling and/or coring, can filling, removal of air, sealing, retorting, cooling, and labeling.

The peels of fruits and vegetables may be removed by rotating drums; quick exposure to steam to expand the skins, immediately followed by water jets to remove peel; exposure to hot lye, followed by washing; or exposure to a burning flame, as in the case of onions.

Blanching, or inactivation of enzymes, is a critical step in fruit and vegetable processing. Blanching is heating the produce to 200° F for 2-5 minutes to deactivate the enzymes. For example, blanching prevents orange juice concentrate from becoming bitter, lipid or fat oxidation in frozen peas, and browning in cut potatoes.

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An alternative to blanching would be to use an additive such as sodium bisulfite to prevent peeled potatoes from enzymatic browning. Excessive browning when sun-drying apricots and peaches is prevented with sulfur dioxide (SO₂).

Nuts - Commercial nut producers harvest their trees with mechanical tree shakers. Nuts are hulled as soon as possible by mechanical nut hullers. Sorting machines separate nuts by size and/or color. Pecans are dried to a 4.5 percent moisture level to prevent molding, discoloration, and breakdown of their oil.

When processing for nut meats, pecans are re-moistened to around 8 percent to reduce breaking of the meats. Then they are shelled. The meats are then packaged.

Processing in-shell pecans involves bleaching by washing in wet sand to remove black streaks, polishing, and waxing.

Roasted nuts are heated at 300°F in vegetable oil. After cooling, an oil coating is applied along with salt. The nuts are cooled a second time and then receive a "shine" oil treatment which seals on the salt. Dry roasted nuts are heated without oil.

If a nut butter such as peanut butter is to be produced, the nuts would undergo shelling, roasting, removal of skins, grinding, salting, and sugaring (optional) before becoming butter. Then the butter is packaged.

Nutritional Quality

Generally, fresh fruits and vegetables are highest in nutritional value. Frozen fruits and vegetables would rank second in nutritional quality. Canning fruits and vegetables requires a long processing period causing the destruction of many of the water-soluble vitamins. Dried fruits contain only trace levels of vitamin C.

The composition of nuts is not generally affected by processing treatments.

Treatments and Packaging

Fresh fruits and fresh vegetables are regular items at the grocery store. Many of these items have been transported hundreds of miles. Without certain treatments and proper packaging, these commodities would only be available on a regional or seasonal basis.

Fruits and vegetables may be treated with: ethylene gas to promote maturation; sodium bisulfite or sulfur dioxide (SO₂) to retard browning; waxes to prevent dehydration in apples and nuts; irradiation to inhibit sprouting in potatoes; and cool temperatures to slow enzymatic reactions.

Modern packaging places nuts in opaque containers to avoid the red spectrum of light which can cause rancidity. Fruits and vegetables are packaged in plastic with ventilation holes. This allows for a normal respiration process without moisture build-up. Certain produce is treated to improve the color or shine of the skin to increase eye appeal.

Organization of Industry

The fruit, vegetable, and nut processing industry is very complex. Processing plants are scattered over the nation. A growing number of producers are contracted by processors to supply a known quality and quantity of products. Cooperatives play a major role in pooling, processing, and marketing member production. Very large parent companies play a major role in fruit, vegetable, and nut processing. They often supply the necessary financial support and the name recognition of national brands. This is an industry known for its use of immigrant and migrant labor, and its reliance on national organizations to promote its products.

Summary

Fruits and vegetables are delicate and highly perishable items; therefore, careful attention to handling and transporting is essential. Because of the high moisture levels in fruits and vegetables, microbial and enzymatic deterioration must be carefully controlled.

Shelf-life and appearance enhancement are promoted with a variety of agents. These include additives, controlled atmosphere, coatings, irradiation, and packaging.

Independent producers, cooperatives, contract producers, large processing companies, promotional organizations, and migrant labor all play a part in fruit, vegetable, and nut production.

Credits

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Potter, Norman N. *Food Science*. 4th Ed. Westport, CT: AVI Publishing Co. Inc., 1986.

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