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| ***Fruit and Vegetable Technology*** | |
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**1. Introduction**

Fruits and vegetables, which are of great importance in terms of nutrition, have been processed for centuries using various production technologies for the purposes of increasing their usage area and possibilities, improving their nutritional and quality characteristics, extending their shelf life, and increasing their accessibility by eliminating the dependency on periods and seasons.

After giving information about the general composition of fruits and vegetables, we can summarize the common technologies used in the processing of fruits and vegetables under 7 main headings:

* Freezing technology
* Drying technology
* Canning technology
* Juice technology
* Jam technology
* Tomato paste technology
* New or alternative technologies

Packaging and preservation of fruits and vegetables are not included in this unit because they are technological applications that are aimed to be applied without changing the physical and chemical properties of the products as much as possible.

**2. General Composition of Fruit and Vegetables**

Fruits and vegetables are nutrients that increase the pleasure of eating with their color and aromatic properties. In the diet, they are a source of energy, vitamins, antioxidants and dietary fiber. The US-FDA dietary guidelines recommend consuming fruits and vegetables 5 times a day[1,2].

Different foods meet the needs of people in different food groups, but fruits and vegetables do not contain components such as cholesterol and saturated fat, although they contain components that have a positive effect on health. Vegetables, in particular, have very little sugar content. Although fruits and vegetables contain very little sodium, they contain plenty of potassium[3].

The composition of fruits and vegetables is very variable. Even the same fruit can have very different compositions. Fresh fruits and vegetables taken daily in the US diet provides 91% of vitamin C, 48% of vitamin A, 27% of vitamin B6, 17% of vitamin B1, 15% of niacin, 26% of magnesium and 19% of iron[4].

The presence of enough dietary fiber in the diet is the first condition for the regular functioning of the intestines. The most important source of cellulose, hemicellulose, lignin and pectic compounds that make up dietary fiber are fruits and vegetables[3,5].

There is a relationship between insufficient antioxidant intake and some diseases. Especially in recent years, it has been emphasized that the diet should contain enough antioxidants. Especially vitamins C and E, phenolic compounds and some carotenoids are the most important antioxidant sources. In this respect, fruits and vegetables are the main source. To give some examples[5]:

* Rich in carbohydrates: Banana, persimmon, prune, grape, raisin, carrot, potato
* Rich in proteins: Nuts, figs
* Rich in oils: Olives, nuts

**2.1. Composition of Fruits and Vegetables**

The quality of processed fruits and vegetables directly depends on the quality of the raw material. Therefore, the maturity level at harvest, harvesting method and post-harvest processes affect the product quality.

The main quality criteria in fresh fruits[5];

* Appearance: Size, shape, color, presence of defects and rot
* Texture: Tissue firmness, crispness and juiciness
* Flavor: sweetness, acidity, astringency, bitterness, aroma and off-flavor
* Nutritional value: vitamins, minerals, dietary fiber, carbohydrates, proteins and antioxidants

Apart from these quality factors, safety is also important. In particular, the presence of pesticides and heavy metals, mycotoxins and microbial contaminations are important.

Post-processing losses also occur in fresh fruits and vegetables. These losses can be quantitative (water loss, physical damage, physiological deterioration, decay) or qualitative (acid, flavor, color and nutrient loss). These quality losses in fruits and vegetables can occur in orchard, transportation and pre-treatment such as sorting, ripening, cooling and storage[6].

The time between harvest and processing also affects the quality, and this period should be kept to a minimum, especially in perishable fruits such as strawberries, cherries, mulberries, and peas[6].

**2.2. Classification of Fruits**

Classification is usually made according to the climate in which the fruits are grown[6]:

a. Temperate Climate Fruits

Pome fruits: Apple, pear, quince

Stone fruits: Apricot, cherry, sour cherry, peach, plum

Berries: Grapes, strawberries, blackberries, raspberries etc.

b. Fruits of Sub-tropical Climate

Citruses: Orange, mandarin, grapefruit, lemon

Non-citrus: Kiwi, pomegranate, fig, olive, avocado

c. Tropical Fruits

Commercially important: Banana, pineapple, mango, papaya

Less commercially important: Guava, litchi, cashew apple

**2.3. Classification of Vegetables**

The classification of vegetables is more complex than fruits and there are different classifications[6]:

a. Botanical Classification

Monocotyledon (Corn, asparagus and onion)

Dicotyledonous (Most vegetables are dicotyledonous)

b. Classification by Edible Part

Root: Carrot, beet, radish

Stalk-tuber: Asparagus, potatoes

Leaf: Lettuce, kale, spinach

Immature flower bud: Broccoli, cauliflower, artichoke

Immature fruit: Peas, okra, beans, eggplant, cucumber

Ripe fruit: Pumpkin, tomato, pepper

Sprout: Soy

c. Classification by Climate

Cool climate: Cabbages, cauliflower, broccoli, radish, celery, beetroot, onions, garlic, leeks, spinach, parsley, mint, peas, broad beans

Cold climate: Tomato, pepper, eggplant, melon, watermelon, cucumber, pumpkin, beans, okra, sweet corn

d. Classification by Lifetime

Annual: The majority of vegetables are annuals.

Perennial: First-year; broccoli, cauliflower, cabbage, carrot and, true perennial; artichoke, asparagus