

FRUIT AND NUTS

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Summary

This work discusses the classification of fruits and nuts, as used by botanists and horticulturists. Information is presented on various methods of growing and marketing of fruits. Most of the nuts in world production are described, from both a scientific and trade point of view.

1. Introduction

Fruit is the part of a flowering plant that contains the plant's seeds. Fruits include acorns, cucumbers, tomatoes, and wheat grains. However, the word 'fruit' is commonly used to refer to the juicy, sweet or tart kinds that people enjoy as desserts or snacks. The word comes from the Latin word 'fruit', meaning 'enjoy'. Popular fruits include apples, bananas, grapes, oranges, peaches, pears, and strawberries.

Many fruits are nutritious as well as appetizing. For example, oranges and strawberries contain large amounts of Vitamin C. Most fruits have a high sugar content and so they provide quick energy. Fruits alone cannot provide a balanced diet, however, because the majority of them supply little protein.

The world's fruit growers raise millions of tons of fruit annually. Fruit growing is a branch of horticulture, a field of agriculture that also includes the raising of nuts, vegetables, flowers, and landscape crops. Most nuts are actually fruits, as are such vegetables as cucumbers, green peppers, and tomatoes.

2. Classification of fruits according to the horticultural scientist

To prevent confusion, horticultural scientists define a fruit as an edible seed-bearing structure that: a) consists of fleshy tissue, and b) is produced by a perennial. A perennial is a plant that lives for more than two years without being replanted. The horticultural definition of a fruit excludes nuts and vegetables. Nuts are firm rather than fleshy. Most

vegetables are annuals; i.e. the plants live for only one season. One exception, however, is asparagus, which is one of the few perennial vegetables.

In some cases, the horticultural definition of a fruit conflicts with the definition used by botanists and with common usage. For example, watermelons and muskmelons are fruits, and most people regard them as such. But they grow on vines that must be replanted annually, and so horticulturists regard melons as vegetables. Rhubarb is sometimes considered a fruit. But people eat the leafstalk of the rhubarb plant, not the seed-bearing structure. Therefore, horticulturists classify rhubarb as a vegetable.

This article discusses fruits mainly from a horticultural point of view. The last section considers fruits from a botanical viewpoint.

The horticulturists classify fruits according their temperature requirements. Most of the fruits that are widely raised in America were originally brought from other regions. For example, apples, cherries, and pears originated in Europe and western Asia. Apricots and peaches first came from China, and lemons and oranges from China and Southeast Asia. All these fruits are now grown in any part of the world that has a favourable climate.

All fruits need at least some moisture, and most require considerable amounts. Dates and olives are among the few fruits that can be grown in dry regions without irrigation. Horticulturists classify fruits into four groups, based on their temperature requirements for growth:

1. Northern latitude fruits,
2. Temperate zone fruits,
3. Subtropical fruits, and
4. Tropical fruits.

Fruit growing in the Northern Latitudes is subdivided according to the Köppen system as follows: humid continental climate, continental subarctic climate and tundra climate. The humid continental climate is primarily in the northern hemisphere, since landmasses are scarce at significant latitudes in the Southern Hemisphere. These climate groups occupy a region between latitudes 30° and 60°. The continental subarctic climate occurs from about 50° to 70°N. Tundra climates occur between 60° and 75°N.

The article *Fruits in Northern Latitudes* presents general up to date information, including production methods, on apple, pear, plum, blackberry, blueberry, cranberry, currants, gooseberry, and raspberry.

Temperate fruits must have an annual cold season to grow properly. They are raised mainly in the Temperate Zones, the regions between the tropics and the polar areas. Most temperate fruits come from Europe and North America, but Asia and Australia also have major producing areas.

According to the Köppen system, location in the middle latitudes tend to have temperatures around the average of those of the equatorial and polar areas. The middle

latitudes lie between the Arctic Circle and the Tropic of Cancer in the Northern Hemisphere, and between the Antarctic Circle and the Tropic of Capricorn in the Southern Hemisphere. Middle latitude locations receive much direct, high intensity sunlight in the summer and much lower intensity sunlight in the winter.

The article presents general up to date information on peach, apricots, cherry, sour cherry, and strawberry. Including production methods.

Subtropical fruits require warm or mild temperatures throughout the year but they can survive an occasional light frost. They are grown mainly in subtropical regions, i.e. those situated between the two tropics and about 40° latitude. Here the summer is hotter and the winter cooler than in the tropics. Humidity is generally lower and the difference in daylength is greater. A better definition, in environmental terms, is that the subtropics are bounded by the 10 °C isotherm for the average temperature of the coldest month.

The article *Subtropical Fruits* presents information on citrus fruits, date palm, olives, pomegranate, grapes, fig, kiwi fruit, and persimmon, including use and production. Subtropical regions are also important for stoned fruit such as peaches, apricots and plums. The most widely grown subtropical fruits are the citrus family, which includes grapefruit, lemons, limes, and oranges. Oranges, the leading citrus crop, are grown throughout the subtropics, from southern Japan to southern Europe. In USA, Florida produces by far the most oranges. Citrus crops are also raised on some farms in the tropics, but the somewhat cooler climate of the subtropics produces better-tasting and more attractive fruit.

Tropical fruits are raised mainly in the tropics, i.e. between 23.5°N and 23.5°S. They cannot stand even a light frost. Bananas and pineapples, the best-known tropical fruits, are grown throughout the tropics, and much of each crop is exported. The average temperature is 27 °C and the warmest month is only a few degrees warmer than the coldest. The difference between day and night is greater than between winter and summer. The article *Tropical Fruits* presents general information on banana, mango, pineapple, papaya, avocado, guava, coconut, passion fruit, litchi, longan, soursop and other *Annona* species. The majority of other tropical fruits are, for the most part, consumed locally. They include cherimoyas, litchis, mangoes, mangosteens, and papayas.

Most species of fruits grow on plants that have a woody stem, i.e. trees, bushes, or woody vines. Fruits that grow on trees include apples, cherries, lemons, limes, oranges, and peaches. Most small fruits grow on bushes, but grapes grow on woody vines. Bananas and strawberries grow on plants that have a soft, rather than a woody, stem.

Fruit crops, unlike most other crops, are not grown from seed. Plants grown from seeds may vary in many ways from generation to generation, but growers strive to produce plants that will bear fruit of uniform type, appearance, and quality. Such fruits attract the highest prices when marketed.

Fruit plants produce fruits of uniform quality if grown vegetatively, i.e. from selected parts of desirable plants, such as stems, buds, and roots. The part that is grown develops

new tissues identical to those of the parent plant.

Fruit plants are produced vegetatively in three main ways: 1. by grafting, 2. from cuttings, and 3. from specialized plant structures. Grafting reproduces most fruit trees. A rootstock is a root plus a stem, which may have been grafted on. The resulting tree will have most of the same characteristics as the tree from which the stem was taken. However, the rootstock may determine such characteristics as the size and productivity of the new tree.

Some fruit plants are produced from cuttings or from specialised structures. Most cuttings are pieces of stem that grow roots when placed in water or moist soil. Specialised structures called runners are used to grow strawberry plants. Runners are long, slender shoots that mature strawberry plants send out along the ground. A runner placed in soil develops into a new plant.

Some fruit growers produce their own plants from grafts, cuttings, or specialised structures, but most growers buy plants from nurseries that specialise in producing them.

The branch of horticulture that deals with fruit growing is called pomology. Pomologists have developed highly efficient methods of planting and caring for fruit crops, and most fruit farms use these techniques.

There are three main steps in growing fruit: 1. planting, 2. caring for the crop, and 3. harvesting. Fruit crops are perennials, and so they do not have to be replanted annually as do most other crops. After the original planting, a fruit farmer need only replace plants that become unproductive. Many fruit plants remain productive for 30 to 50 years or even longer. In mild climates, farmers generally plant trees, bushes, and vines in autumn. In cold climates, planting usually takes place in spring.

Most bushes are planted from 0.9 to 1.5 meters apart, in rows that are 1.8 to 3 meters apart. Rows of grapevines are spaced about 3 meters apart. In the past, farmers almost always grew full-sized fruit trees. In most cases, the trees were planted from 6 to 12 meters apart to allow room for growth. Today, many farmers prefer to grow dwarf trees, which are planted close together. The branches of each tree may grow up a supporting framework called a trellis. The trellis enables all the fruit to receive the maximum amount of sunlight, and so the crop ripens better and faster than it otherwise would. Fruit is also easier to harvest from dwarf trees than from full-sized trees.

Most fruit growers use special machinery to fertilize, cultivate, and otherwise care for their crops. Fruit crops must be fertilized at least once a year. Some fertilizers are applied to the soil, and others are sprayed on the plants. Many fruit growers cultivate the soil around young fruit plants periodically. This practice helps to control weeds and thus encourages the growth of the crop. Most fruit crops grown in very dry regions must be irrigated. Farmers use various methods, such as ditches and sprinklers, to distribute irrigation water.

In many cases, the branches of a young fruit tree must be trained so that the tree

develops a uniform shape and a sturdy structure. Training may involve propping the trunk or tying the branches, or it may consist entirely of pruning. Pruning strengthens a plant by ridding it of unproductive branches. Nearly all fruit plants have to be pruned at least once annually. In addition, most fruit farmers remove some of the crop from the trees during the early stages of the fruit's growth. This practice, called thinning, helps increase the size of the remaining fruit.

The majority of fruit growers use chemical pesticides to protect their crops against disease and insect pests. Most pesticides are sprayed or dusted on crops by tractor-driven machinery or specially equipped light aeroplanes or helicopters. Plant breeders have also developed varieties of fruit plants that resist certain diseases and harmful insects.

Sudden spring frosts can endanger fruit crops in temperate or subtropical regions. Farmers use water distributed by sprinklers to protect small-fruit crops from frosts. Water releases heat as it freezes. If it is sprinkled onto the crops continuously, it stops the tender flowers and young fruits from freezing. Farmers use heaters to protect tree crops from spring frosts.

Fruits are bruised more easily than most other crops, and so they must be harvested with greater care. Most are picked by hand. However, the increasing cost of hand labour has encouraged the use of fruit-harvesting machines. Some of these machines have arms that shake the fruit loose from the plants. The loosened fruit drops onto outstretched cloths, mesh or nets.

Most fruit is usually sold fresh. It is taken from the orchard or field by truck and delivered to a packinghouse. Many large fruit farms have their own packing facilities. Commercial packinghouses are centrally located in fruit-growing regions, and most of them are fully mechanized. Machines wash the fruit, sort it according to size and quality, and pack each batch into containers. The fruit is then shipped to market or stored for future delivery. Railroads and trucks carry most overland shipments of fruit. Most overseas shipments travel by ocean freighter.

Fruits can be stored for varying lengths of time under controlled conditions. Temperate tree fruits must be stored at temperatures near freezing. Some kinds of apples can be kept fresh for about a year under such conditions. On the other hand, most small fruits remain fresh only a few days or weeks in cold storage. Tropical and subtropical fruits can be stored for a few weeks or months under temperature-controlled conditions. The temperatures, though cool, must be well above freezing. .

Much fruit is shipped directly from farms to food processors. Processing plants preserve fruit by such methods as canning, drying, and freezing.

Occasionally, an individual plant develops an unexpected characteristic. For example, a fruit tree may suddenly start to bear fruit of a different colour; such a plant is called a sport. Growers have used sports to develop many new cultivated varieties of fruit. Cultivated varieties are also known as cultivars. The trees of Delicious apples originally produced only pale-coloured, striped fruit. Then, some of the branches on individual

trees began to bear solid-red apples. By grafting these branches onto appropriate rootstocks, growers produced the attractively coloured varieties of Delicious apples available today.

Sports often play an important role in the development of new varieties of fruit, but a process called selection produces the majority of new varieties. In selection, plants grown from seed are examined for various desirable qualities. An individual plant may thus be singled out for high productivity or for the superior colour, texture, or flavour of its fruit. By reproducing this plant vegetatively, the desirable characteristic is preserved from one generation to the next. If the characteristic persists, the fruit may be classed as a new variety.

In addition to selection, modern fruit growers also use a technique called crossing or hybridization. In this process, pollen is taken from a plant that has been selected for a particular desirable trait. The pollen is placed in the flower of a plant selected for another desirable quality. Some of the plants grown from the resulting seed may have the desirable characteristics of both parents. Occasionally, one of these plants may prove worthy of being classed as a new variety. In most cases, however, the entire process of selection and hybridization must be repeated many times to produce a new variety. Hybridization is a highly useful technique because it enables growers to produce varieties with more and more desirable qualities.

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Biographical Sketch

Dr. Béla Berényi, born 1948, in Budapest, Hungary. From 2002, Dr. Béla Berényi is a guest lecturer in the Department of Pharmaceutical plants and spices production at University of West Hungary, Faculty of Agricultural and Food Sciences, Hungary.

Education and Qualification:

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Work experience:

1973-1981 I was a general manager in agricultural co-operation on large-scale farm in Csákvár, county Fejér, in Hungary.

1981-2001 - assistant professor, lecturer on the Department of Tropical and Subtropical Agriculture, Szent István University of Agricultural Sciences in Gödöllő, Hungary, for environmental friendly non-polluted vegetables. Research field of HACCP for plants.

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