Fruit Types & Classifications

Introduction

Although most of us have a good idea what fruits and vegetables are when we eat them, it would be difficult to provide a definition for someone of just what makes one food a vegetable and another a fruit. For a botanist, the definitions are easier; a fruit is a reproductive structure of an angiosperm which develops from the ovary and accessory tissue, which surrounds and protects the seed. Fruits are important in seed dispersal. A vegetable is a part of one of the vegetative organs of the plant: roots, stems or leaves, or shoot systems. There are a few "vegetables" which are difficult to "classify"; broccoli and cauliflower are inflorescence buds, and artichokes are the entire florescence. Since flowers, the reproductive organ of the plant produce fruits and seeds, perhaps those vegetables which are inflorescences are more similar to fruits than they are vegetables. No matter what we call our nutritious dietary components, in botany what constitutes a fruit is straightforward, and this hand-out looks at the structure and classification of fruits.

The process of fertilization initiates both seed and fruit development. While seeds develop from the ovules, the ovary tissue undergoes a series of complex changes which result in the development of fruit. Many fruits are fleshy and contain sugars which attract animals who then disperse the enclosed seeds to new locations. Other, non-fleshy fruits use other mechanisms or seed dispersal. In some plants, fruits can develop without fertilization. This is called parthenocarpy, and such fruits are seedless. Some of the watermelons and grapes that you buy at the supermarket are produced this way so as not to have seeds.

As the ovary develops into a fruit, its wall often thickens and becomes differentiated into three, more or less, distinct layers. The three layers together form the pericarp, which surrounds the developing seed or seeds.

The three fruit layers are:

- Exocarp—the outermost layer often consisting of only the epidermis
- Mesocarp—or middle layer, which varies in thickness
- Endocarp—which shows considerable variation from one species to another, is the inner-most layer of the fruit

Fruit Classification

All fruits may be classified into three major groups on the basis of the number of ovaries and the number of flowers involved in their formation. The following outline includes most of the common types of fruits.

A. Simple Fruits—simple fruits develop from a single matured ovary in a single flower. Accessory fruits have some other flower part united with the ovary. There are two basic kinds of simple fruits: fleshy fruits and dry fruits.

1. Fleshy Fruits—defined as having a fleshy pericarp at maturity. There are five basic kinds of fleshy fruits.

a. Berry—consisting of one or more carpels with one or more seeds, the ovary wall is fleshy. Examples of berries include:

1) grape
2) tomato

b. Pepo—an accessory fruit is defined as a berry with a hard rind, the receptacle partially or completely encloses the ovary. Examples include:

1) watermelon
2) honeydew melon
3) cantelope
4) cucumber

c. Hesperidium—a specialized berry with a leathery rind. Examples include:

1) orange
2) lemon
3) grapefruit

d. Drupe—sometimes called a “stone” fruit. It is derived from a single carpel and usually containing one seed (pit). The exocarp of a drupe consists of a very thin skin. Examples of the drupe include:

    1) Peach
    2) Apricot
    3) Plum
    4) Coconut (fibrous walls instead of fleshy walls)
    5) Cherry

e. Pome—(an accessory fruit) is derived from several carpels, receptacle and outer portions of the flower. The pericarp is fleshy with an inner portion of the pericarp papery or cartilaginous forming a core where the seeds are located. Examples of a pome are:

    1) apple
    2) pear

2. Dry Fruits—are defined as having a dry pericarp upon maturity. The Dry Fruits are classified into two groups: the dehiscent fruits and the indehiscent fruits.

    a. Dehiscent Fruits—these fruits will split open when mature. The splitting process is known as “dehisce”…hence the name for this group of fruits. There are four basic types of dry dehiscent fruits:

        1) Follicles—composed of one carpel and splitting along one suture line. Examples of follicle fruits are:
            a) Columbine
            b) Milkweeds

        2) Legumes—composed of a single carpel and splitting along two suture lines. Examples of legumes are:
            a) Peas
            b) Peanuts

        3) Capsule—composed of several carpels and opening at maturity in one of four ways: 1) along the line of carpel union (septicidal dehiscence); 2) along the middle of each carpel (loculicidal dehiscence); 3) by pores at the top of each carpel (poricidal dehiscence); 4) along a circular, horizontal line (circumscissle dehiscence). Examples of the capsule type fruits:
            a) Lily
            b) Sweet Gum

        4) Silique—composed of two carpels which separate at maturity leaving a persistent partition between them. Examples of the silique fruit:

            a) Members of the Mustard Family

    b. Dry Indehiscent Fruits—are defined as fruits that do not split open at maturity. There are several categories of dry indehiscent fruits.

        1) Achene (or sometimes called an akene)—defined as a one-seeded fruit with the seed attached to the fruit at one point only. Examples of achenes are:

            a) Dandelion parachutes
            b) Sunflowers

2) Caryopsis or Grain—is defined as a one-seeded fruit in which the seed is firmly attached to the fruit at all possible points. Examples of grain include:

    a) Corn
    b) Rice
    c) Wheat
    d) All grasses

3) Samara—a one- or two-seeded fruit with the pericarp bearing a wing-like outgrowth. The samara is really a modified achene. We sometimes refer to this type of fruit as "helicopter" seeds. Examples include:

    a) Elms
    b) Maples
    c) Ashes

4) Schizocarp—consists of two carpels which at maturity separate along the midline into two one-seeded halves, each of which is indehiscent. Examples of schizocarp fruits are:

    a) apiaceaes

5) Nut—a hard one-seeded fruit, generally formed from a compound ovary, with the pericarp hard throughout. Examples of true nuts are:

    a) acorns
    b) chestnuts
    c) walnuts
    d) pecans brazil nut

B. Aggregate Fruits—consist of a number of matured ovaries formed in a single flower and arranged over the surface of a single receptacle. The individual ovaries of the aggregate fruit are known as fruitlets. Each individual fruitlet will contain a stony pit…so in reality an aggregate fruit is composed of many tiny drupes. Examples of aggregate fruits are:

    1. Raspberries
    2. mulberries
    3. strawberries

C. Multiple Fruits—consist of the matured ovaries of several to many flowers more or less united into a mass. Multiple fruits are almost invariably accessory fruits. Examples of multiple fruits are:

    1. Pineapples
    2. Jackfruit
    3. Breadfruit

I have many links on the Biology 2 website which show pictures and other examples of the types of fruits described above. There are many ways in which fruits are defined, and you will find that some examples are hard to distinguish from each other, that is alright. If you follow the progression of fruits defined in this hand-out that will be sufficient for the Biology 2 class.