CHAPTER 1

Classification of Plants

PERFORMANCE OBJECTIVES

At the end of this chapter, students should be able to: classify plants based on:

- botanical techniques.
- agricultural techniques.
- life cycle.

INTRODUCTION

Classification of plants is the act of placing plants into groups based on their common fea- tures. The branch of biology concerned with identifying, naming and classifying plants is called Plant Taxonomy. The kingdom plantae (plant) is one of the five kingdoms of organ- isms as classified by R.H Whittaker in 1969. Plants refer to the multicellular photosynthetic eukaryotes with well-developed tissues. They are adapted to terrestrial and aquatic habitats. Plants are basically classified for the following reasons:

(i) To create orderliness in the plant kingdom

(ii) To establish natural relationship among plants.

(iii) To trace the phylogeny (origin) of related plants

Plants are commonly classified based on the following three techniques:

(i) Botanical classification

(ii) Agricultural classification

(iii) Classification based on life cycle

BOTANICAL CLASSIFICATION

Botanical classification is based on the structural complexity of plants and their life history. This uses the binomial system of nomenclature in which every plant is given two names, i.e., generic (Genus) name and the specific (species) epithet. When writing the binomial system, the following rules are observed:

(i) The genus and species names are written separately

(ii) They are either written in italics or underlined separately.

(iii) The first letter of the genus name is written in capital letter, whereas the species name is written in small letters.

(iv) The generic name is always written first, followed by the species name.

(v) When there are more than one species under the same genus, the first letter of the genus name can be abbreviated, followed by the species name. e.g., Dioscorea spp.: D. cayenensis, D. alata, D. rotundata, (for varieties of yam). For Citrus spp. (orange): C. limon, C. aurantifolia and C. paradisi.

The most recent botanical classification of plants is based on four divisions, which include the following:

(i) Thallophyta

(ii) Bryophyta

(iii) Pteridophyta

(iv) Spermatophyta

THALLOPHYTA

These are mostly aquatic green plants that have filamentous or thalloid bodies, devoid of roots, stems or leaves, e.g., algae, fungi and lichens.

BRYOPHYTA

These refer to simple plants that commonly grow in damp places on land. They possess simple leaves and rhizoids in place of roots, e.g., moss and liverwort.

PTERIDOPHYTA

These are the vascular non-flowering, spore producing plants. They possess vascular tissues for conducting water and food. They are known as land plants, e.g., ferns and club moss.

SPERMATOPHYTA

These are vascular seed bearing plants having well-developed roots, stems and leaves. Their seeds develop from embryos, e.g., all seed plants.

The spermatophyte is divided into two types:

(i) Gymnospermae – non-flowering plants that produce seeds.

(ii) Angiospermae – flowering plants that produce seeds.

Angiosperms are the largest group of plants numbering about 200,000 known species. They are further divided into two types:

(a) Monocotyledons – those with one seed leaf. (b) Dicotyledons – those with two seed leaves.

There are older classifications that are still often used for plant group names. These are as follows:

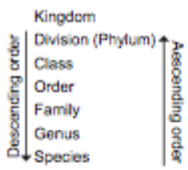
(i) Cryptogams: These are plants that do not bear seeds, but produce spores. They have microscopic reproductive organs, e.g., thallo- phytes and bryophytes.

(ii) Vascular cryptogams: These include plants with differentiated vascular tissues but do not produce seeds, e.g., pteridophytes.

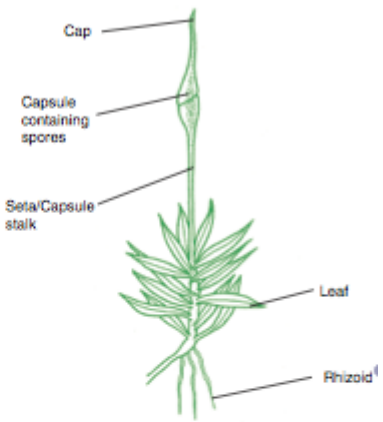
(iii) Phanerogams: These are higher plants with microscopic reproductive structures, which produce flowers and seeds, e.g., spermatophytes.

(iv) Archegoniate: These are plants with an archegonium. A structure for producing female gametes, e.g., bryophytes and pteridophytes.

In botanical classification, it is common to place plants in hierarchies depending on their levels of relationship as follows:

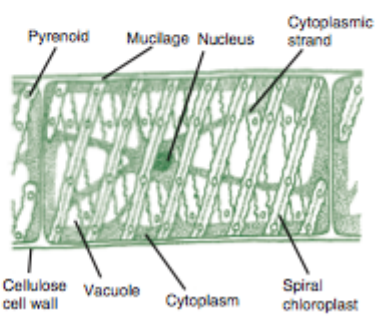


▲ FIGURE 1.1 A monocot plant (Banana)



▲ FIGURE 1.3 A moss plant

▲ FIGURE 1.2 A dicot plant (hibiscus)



▲ FIGURE 1.4 Spirogyra

▲ FIGURE 1.5 Marchantia (a liverwort)

▲ FIGURE 1.6 Pine tree

Botanical classification of some plants in their systematic positions is given below.

	A	B	C	D	E	F
Kingdom	Plantae	Plantae	Plantae	Plantae	Plantae	Plantae
Division	Chlorophyta (thallophyta)	Bryophyta	Magnoliophyta	Spermatophyta	Magnoliophyta	Spermatophyta
Class	Chlorophyceae	Hepaticopsida	Magnoliopsida	Angiospermae	Liliopsida	Angiosper-matophyta
Order	Zygnematales	Marchantiales	Fabales	Leguminales	Liliales	Rosales
Family	Zygnemataceae	Marchantiaceae	Fabaceae	Caesalpiniaceae	Liliaceae	Rosaceae
Genus	Spirogyra	Marchantia	Glycine	Caesalpinia	Allium	Rosa
Species	*S. elongata*	*M. palmata*	G. max (Soya bean)	*C. pulcherrima*	*A. cepa* (onion)	*R. canina*
	S. maxima					

AGRICULTURAL CLASSIFICATION

In agriculture, plants are classified based on their uses or products as follows:

LEGUMES

These are plants, which are sources of protein for animals including humans. They are primarily grown for their seeds, e.g., cowpeas, lima beans, pigeon peas, soya beans, groundnuts and beans.

CEREALS

These plants belong to the family Gramineae. They are grasses and are grown for their grains, e.g., barley, maize, millet, oats, sorghum and wheat.

ROOT TUBER CROPS

These are crops grown primarily for the food stored in their swollen roots, e.g., cassava, car- rots and sweet potatoes.

STEM TUBER CROPS

These are underground stems, which are swol- len with food reserve, e.g., cocoyam, Irish potato and yam.

VEGETABLE CROPS

These are plants grown chiefly as vegetables, e.g., cabbage, carrot, egg plants, lettuce, okra, onion, pawpaw, spinach and tomatoes.

OIL CROPS

These are crops grown mainly for the oil that could be extracted from their fruits and seeds, e.g., coconut, groundnut, oil palm, Shea butter and sunflower.

SPICES

These are used mainly to add special flavours to food, e.g., green or red peppers (Capsicum spp.), black pepper, ginger, sugarcane and cinnamon.

FORAGE CROPS

These are grown mainly to feed animals. They consist mainly of legumes and grasses.

EDIBLE OR CULTIVATED FRUITS

These are crops grown mainly for their fruits, e.g., avocado pears, bananas; citrus fruits, Dacryodes edulis (local pear), guavas, mangoes, pawpaws, pineapples and plantains.

BEVERAGES AND DRUG PLANTS

These are plants used as beverages and for making drugs, e.g., cocoa, coffee, kola nut, tea, tobacco, neem (Azadirachta indica) and lemon grass.

RUBBER OR LATEX CROPS

The latex of these cultivated plants is collected and coagulated to form rubber, e.g., Para rubber (Hevea brasiliensis), Ficus elastica, Funtumia elastica (Lagos rubber) and Landolphia owariensis.

FIBRE CROPS

These are crops cultivated mainly for their fibres. Fibres from plants are used for making cloths (e.g., cotton and pineapple), ropes (e.g., sisal hemp, sorrel plant, jute, guinea hemp and baobab), sack (e.g., jute) and paper. Fibres are obtained from the plantsâ€™ stems (e.g., flax, jute or Corchorus oli- torius), seeds, fruits (e.g., cotton and silk cotton) and leaves (e.g., hemps and pineapples).

WOOD CROPS

Some trees provide hardwood, which is used mainly for making furniture or building materials, e.g., ebony, mahogany and iroko (Chlorophora excelsa). Some trees yield softwood used for wood pulp and paper, as well as for buildings.

CLASSIFICATION BASED ON LIFE CYCLE

On the basis of their life cycle, plants are classi- fied into four groups, namely:

EPHEMERALS

These are plants that complete their life cycles and die within 3–4 months. They undergo two or three life cycles in one growing season, e.g., tomato, waterleaf, lettuce and okra.

ANNUALS

These are plants that complete their life cycles in one year (one growing season). They germinate, grow, mature, produce seeds and die within one year. Most of the annuals are herbaceous plants, e.g., maize, beans, rice, groundnut, cowpea, mil- let, jute, flax and sorghum.

▲ FIGURE 1.7 Maize plant

BIENNIALS

These plants complete their life cycles within 2 years. During their vegetative year, they grow and store food as reserves. In the second grow- ing season, they make use of their reserved foods to produce flowers, fruits and seeds, and die afterwards, e.g., cassava, carrot, onion, ginger, cocoyam, cabbage, radish and turnip.

PERENNIALS

These are plants that live for several years, pro- ducing fruits every season, sometimes twice in a year or once in several years. Agriculturally important

perennials include rubber, oil palm, cocoa, mango, coconut, pea, orange, Hibiscus, Allamandes and Croton. Most of the perenni- als shed their leaves once a year and are called deciduous evergreen.

SUGGESTED PRACTICALS

ACTIVITY 1

Visit a nearby botanical garden (school gar- den), collect specimens of different plants and classify them based on the three classification techniques.

CHAPTER SUMMARY

â– Classification of plants is the act of placing plants into groups based on their common features.

â– Plants are mainly classified to create orderliness in the plant kingdom, to establish natural relationship among plants and to trace the phylogeny of related plants.

â– Plants are generally classified based on the botanical techniques, agricultural techniques and on their life cycle.

â– Botanically, the four main divisions of plant kingdom are thallophyta, bryophyta, pteridophyta and spermatophyta.

â– In binomial system of nomenclature, a plant is given two names: the generic name and specific epithet.

â– The older classifications still used for plant group names are cryptogams, vascular cryptogams, phanerogams and archegoniate.

â– Agriculturally, plants are classified on the basis of their uses and nature of products.

â– The four classifications of plants based on their life cycle are ephemerals, annuals, biennials and perennials.

REVISION QUESTIONS

OBJECTIVE QUESTIONS

Choose the correct options to the following questions.

1. The branch of biology that deals with identifying, naming and classifying plants is called .

a. Plant Morphology. b. Binomial System. c. Plant taxonomy. d. Botany.

2. In botanical classification, family names usually ends with

a. -aceae b. -ales c. -phyta d. idea

3. _____and_____are used in naming plants in the binomial system of nomenclature.

a. Genus and Species b. Genus and family c. Division and class d. Order and species

4. *Allium Cepa* is the botanical name for
a. guava b. orange c. onion d. ginger

5. Plants that do not bear seeds, but produce spores in microscopic reproductive organs, belong to older plant group called

a. Phanerogams. b. Cryptogams. c. Archegoniate. d. Spermatophyta.

ESSAY QUESTIONS

1. (a) State the purposes of classifying plants.

(b) List the seven hierarchies of classification in descending order.

2. List four main divisions of plant kingdom with one example for each.
3. Explain the binomial system of nomenclature.
4. Give any three examples of plants classified using the binomial system of nomenclature.

5. (a) List and explain the agricultural classification of plants.
(b) State the four groups of plants based on their life cycle with one example for each.