

CLASSIFICATION OF PLANTS

2



SYLLABUS

Plants may be classified into groups :

- Herbs, shrubs and trees.
- Annuals, biennials and perennials.
- Flowering and non-flowering plants.
- Common examples of these categories.

- * Practical observation (in garden/park) of different groups of plants (E).
(This is an opportunity to train students not to break twigs/branches, or pluck more than one specimen of each kind).
- * Drawing leaves.
(Drawing from specimens is an essential skill in which students need practice)
- * Identification/labelling of trees/plants in the school garden (E).

INTRODUCTION

You have learnt that the subject Biology is concerned with living things — plants and animals. In this and the next lesson, you will study about the systematic classification of plants and animals.

CLASSIFICATION AND ITS NEED

There are numerous varieties of living organisms on this earth. It is not possible to remember all of them and their characteristics individually. To make their study systematic, they are classified into various groups based on certain similar characteristics. Thus, all living things are classified into **plants** and **animals**. Both plants and animals are

further divided into various groups and classes. On the basis of this grouping, the living organisms can be studied easily and systematically. Thus, *classification means grouping things together on the*



Fig. 2.1 Plants and animals

basis of certain common features. It is actually the method of putting similar things into one group.

Classification helps us to identify the living organisms and to study them more easily and systematically.

CLASSIFICATION OF PLANTS

Plants show a great variety.

- Some plants are very large, some are small and some are tiny.
- Many plants produce flowers and others do not.
- Some plants produce fruits containing seeds, while others may neither produce fruits nor seeds.
- Some plants show distinct parts such as stem, leaves and roots whereas in others, there is no such differentiation of parts at all.

Considering the above characteristics, plants can be categorised by their size and their nature of producing flowers, fruits, etc., into different groups that have been discussed below.

On the Basis of Size and Shape

On the basis of their size and shape, plants are divided into the following three categories :

(i) Herbs, (ii) Shrubs, and (iii) Trees

Herbs — Plants which have soft, green and perishable stems are called **herbs**. They are generally small in size, not more than one metre in height and may live for 1-2 seasons. *Examples* : grass, maize, rice, mint, coriander, etc.

Shrubs — Plants with woody stems,

with branches of almost equal size arising from the stem immediately above the soil are called **shrubs**. They look like bushes and are medium-sized plants. They survive for many years, though less than trees. *Examples* : China rose, lemon, pomegranate, jasmine, nerium, etc.

Trees — Trees are tall and big plants and have one hard, woody stem called trunk. It bears woody branches, twigs and leaves at some distance above the ground. Coconut and palm are also trees, though they do not have branches. Trees generally survive for many years. *Examples* : Mango, neem, palm, banyan, etc.



Fig. 2.2 (a) Herb, (b) Shrub and (c) Tree

Note : This is the simple classification of plants as you see in your surroundings. These plants are further classified into many types on the basis of several other characteristics as discussed ahead.



ACTIVITY 1

Visit a garden park with your teacher or parents and take along with you, a notebook and a pencil. In the park, you would see a large variety of plants — some **very small**, some with **average height** and some **very tall**. These plants differ in their features like **shape**, **size** (small/medium/tall) and **life span**. Observe these features carefully (you may even take help from the gardner) and note down in the table given below. Classify these plants in their respective appearance and categories :

S.N.	Name of the Plant	Height	Size	Stem	Herb/shrub/tree
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Plants are classified mainly into two categories :

1. Non-flowering plants, and
2. Flowering plants

A. NON-FLOWERING PLANTS

The non-flowering plants neither bear flowers nor seeds. They are further classified under three groups :

1. Bacteria, Fungi and Algae (*Thallophyta*)
2. Mosses (*Bryophyta*)
3. Ferns (*Pteridophyta*)

Let us study each of these groups one by one.

Bacteria, Fungi and Algae (*Thallophyta*)

The term **Thallophyta** is used to describe undivided bodies called **thalli**. They are sometimes also called 'thalloid plants'.

These are mostly microscopic. They do not bear roots, stems or leaves. They are further divided into three groups :

- (a) Bacteria (b) Fungi (c) Algae

Bacteria (sing. "bacterium") : Bacteria are microscopic single-celled organisms. They occur everywhere — in air, soil and water, and sometimes, even in the food we eat. Besides these common habitats, bacteria are also found inside our bodies particularly the intestines. Bacteria have mainly three

shapes — **Spherical** (cocci), **rod like** (bacilli), **spiral-shaped** (spirilla).



Spherical (cocci)



Rod-like (bacilli)



Spiral-shaped (spirilla)

Fig. 2.3 Different shapes of bacteria

Some bacteria live naturally in our intestine causing no harm. But sometimes, harmful bacteria enter our body and cause diseases.

Fungi (sing. Fungus) : They may be single-celled or multi-celled. Fungi do not have chlorophyll and thus cannot prepare their own food. Most fungi live on dead and decaying organic matter. That is why, they are also called **saprophytes** (*sapro* : rotten). The blackish cottony growth on a stale bread is a type of fungus called **bread mould**. Another common fungus is the white umbrella-like **mushroom**, that generally grows on decaying wood or on garbage.



Bread mould



Mushroom

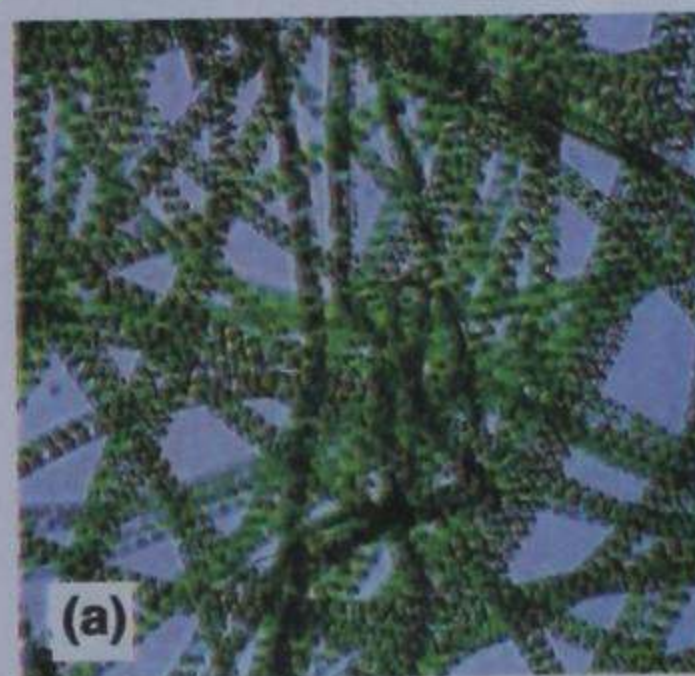
Fig. 2.4 Bread mould and Mushroom



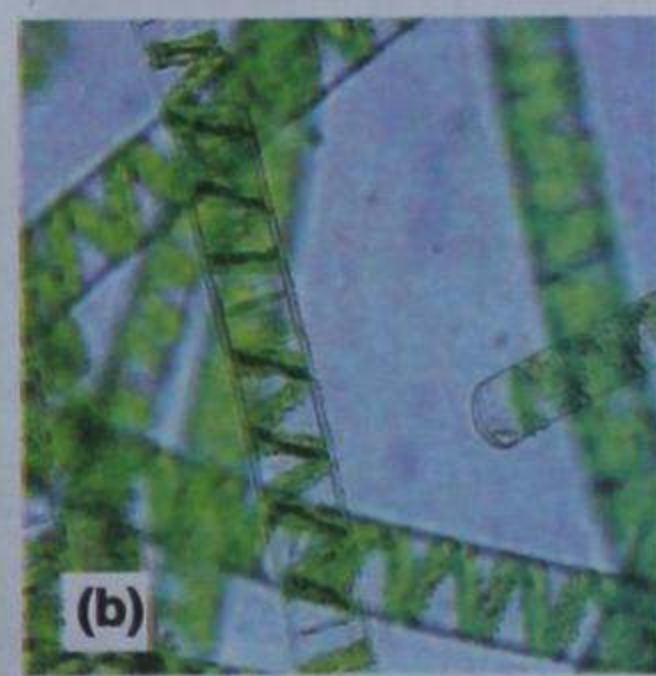
ACTIVITY 2

Take a few slices of bread and moisten them by sprinkling some water. Keep them for 2-3 days in open and observe. You will see bluish fur-like outgrowth on these bread pieces. This is a fungus called *Rhizopus*, commonly known as bread mould.

Algae (sing. Alga) : Algae are found in stagnant water of ponds, growing as green scum. These may be single-celled or multi-celled. They are usually green, having chlorophyll. *Spirogyra* is a filamentous alga most commonly found in ponds. Some algae have different colours such as brown or bluish-green.



(a)



(b)

Fig. 2.5 (a) Spirogyra Filaments
(b) The same as seen under microscope

Mosses (*Bryophyta*) (Fig. 2.6)

Mosses grow as green, velvety layers but only at moist places such as on damp soil, on the bark of trees, and on damp walls. Such plants have stems and leaves, but no roots. Instead, they have thread-like structures called *rhizoids* by which they stick to the surface and absorb water. They are also called '**amphibians of the plant group**' as they need water to reproduce.



Fig. 2.6 Moss

Ferns (*Pteridophyta*) (Fig. 2.7a & b)

Ferns are grown in most of the gardens for their beautiful leaves. They bear well-formed leaves, stems and roots but do not produce flowers and seeds. Their leaves produce small rounded bodies on their undersurface. These bodies contain tiny **spores** which get

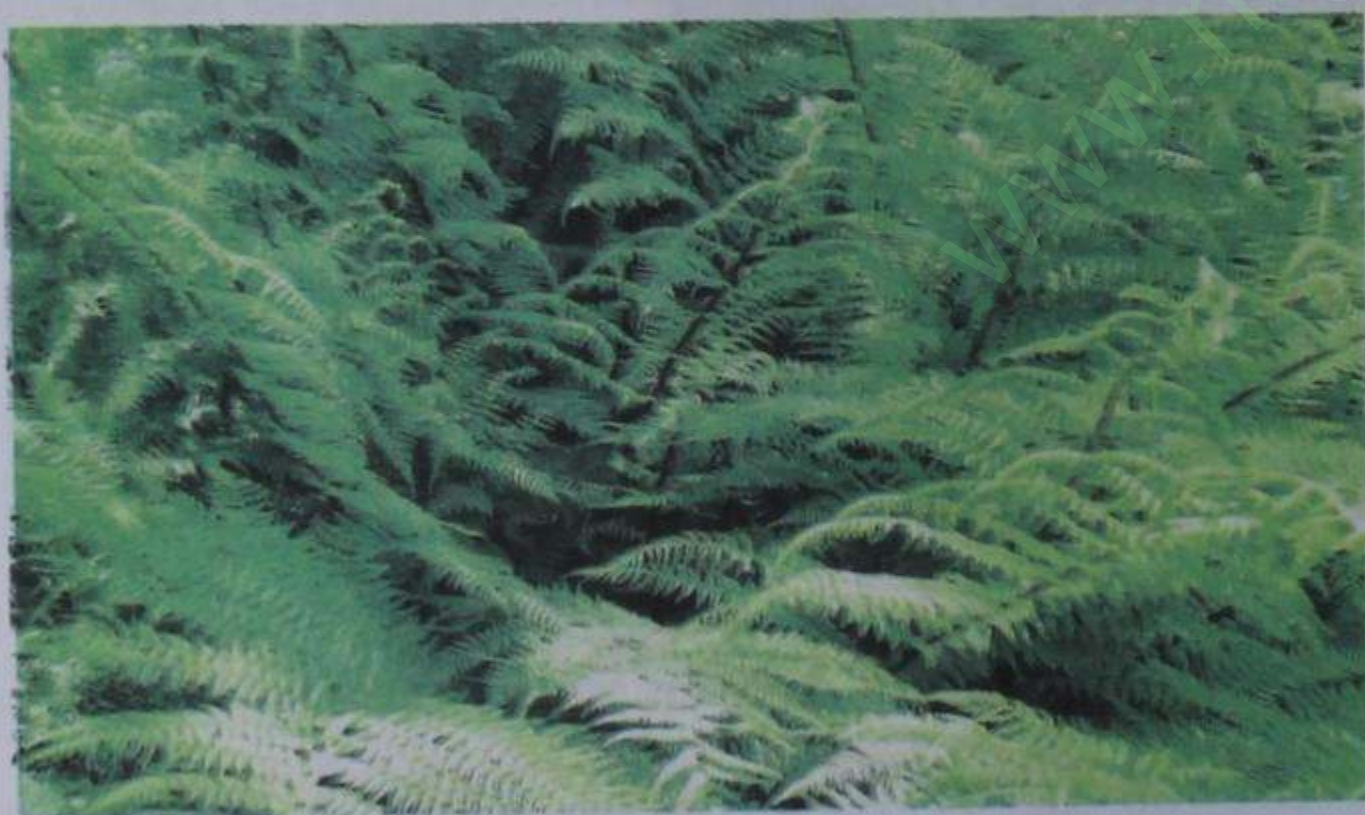


Fig. 2.7

(a) Garden fern

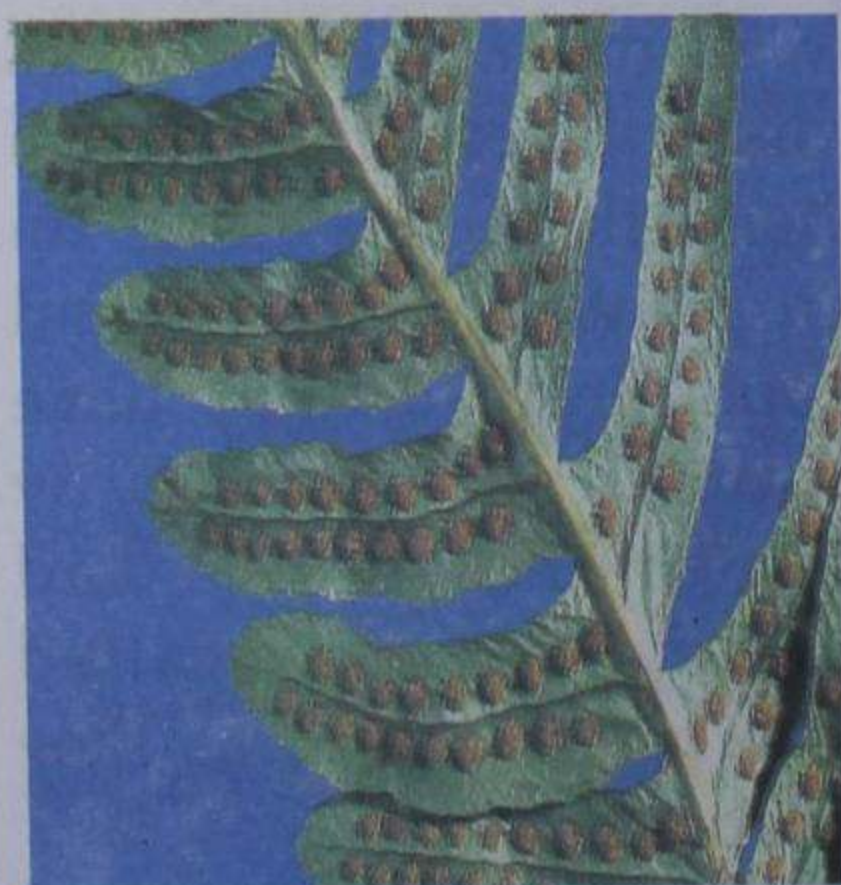


Fig. 2.7 (b) A single leaf of the garden fern to show the spore-containing bodies on its lower surface

scattered to produce new plants. Spores are not seeds. Remember, seeds are produced in flowers, through the union of male and female gametes.

Spores are tiny structures capable of producing new plants.

B. FLOWERING PLANTS [Phanerogams]

The word **phanerogams** (literally means "visible marriage", referring to "pollination") is a biological term for the flowering plants.

The flowering plants bear flowers and seeds. They are further grouped into two categories :

(i) Gymnosperms, (ii) Angiosperms

(i) Gymnosperms

The flowering plants that bear seeds but no fruit are called **Gymnosperms**. Their seeds are thin and naked, not enclosed in fruits (*gymno* means naked; *sperm* means seed).

Most gymnosperms are evergreen *i.e.* they do not shed all their leaves at one time. Some examples are pine, fir, cedar (Fig. 2.9) and spruce trees that



Fig. 2.8 Pine cones



Pine



Fir



Cedar

Fig. 2.9 Some gymnosperms

grow in mountainous areas. Pine and fir are usually big trees. They do not bear true flowers, but they bear seeds inside the **cones**. Some cones are male and some are female. The male cone produces *pollen*, the male powdery substance. The **pollen** is blown away by wind to reach the female cone. The other characteristic features of gymnosperms are :

- the roots are well-developed,
- trunk is thick and woody,
- the leaves are long and pointed (needle-shaped). The needle-shaped leaves are not harmed by frost or snow. They also help to conserve water by reducing loss of water as water vapour (transpiration) due to narrowness.

(ii) Angiosperms

The flowering plants which bear flowers, fruits and seeds are known as **Angiosperms** ("*angios*" means 'case' referring to the fruit and "*sperm*" means 'seed'). Some common examples are sugarcane, mint (Fig. 2.10), mango, peas, etc. In angiosperms, the seeds develop



Sugarcane



Mint

Fig. 2.10 Examples of some angiosperms

within the female part of the flower, called *ovary*. The ovary grows as *fruit* containing the seeds inside.

Think of the plants such as sugarcane and mint (*pudina*), or even lawn grass. Do they bear flowers? They are flowering plants indeed. If you observe the lawn grass carefully, you can, at times, see tiny flowers on it. Similarly, sugarcane and mint also bear flowers. Since these plants are cut for human use before they mature to produce flowers, we do not see their flowers.

Types of Angiosperms

If you observe a germinated gram seed, you will notice two thick “seed-leaves” that store food and form the bulk of the seed.

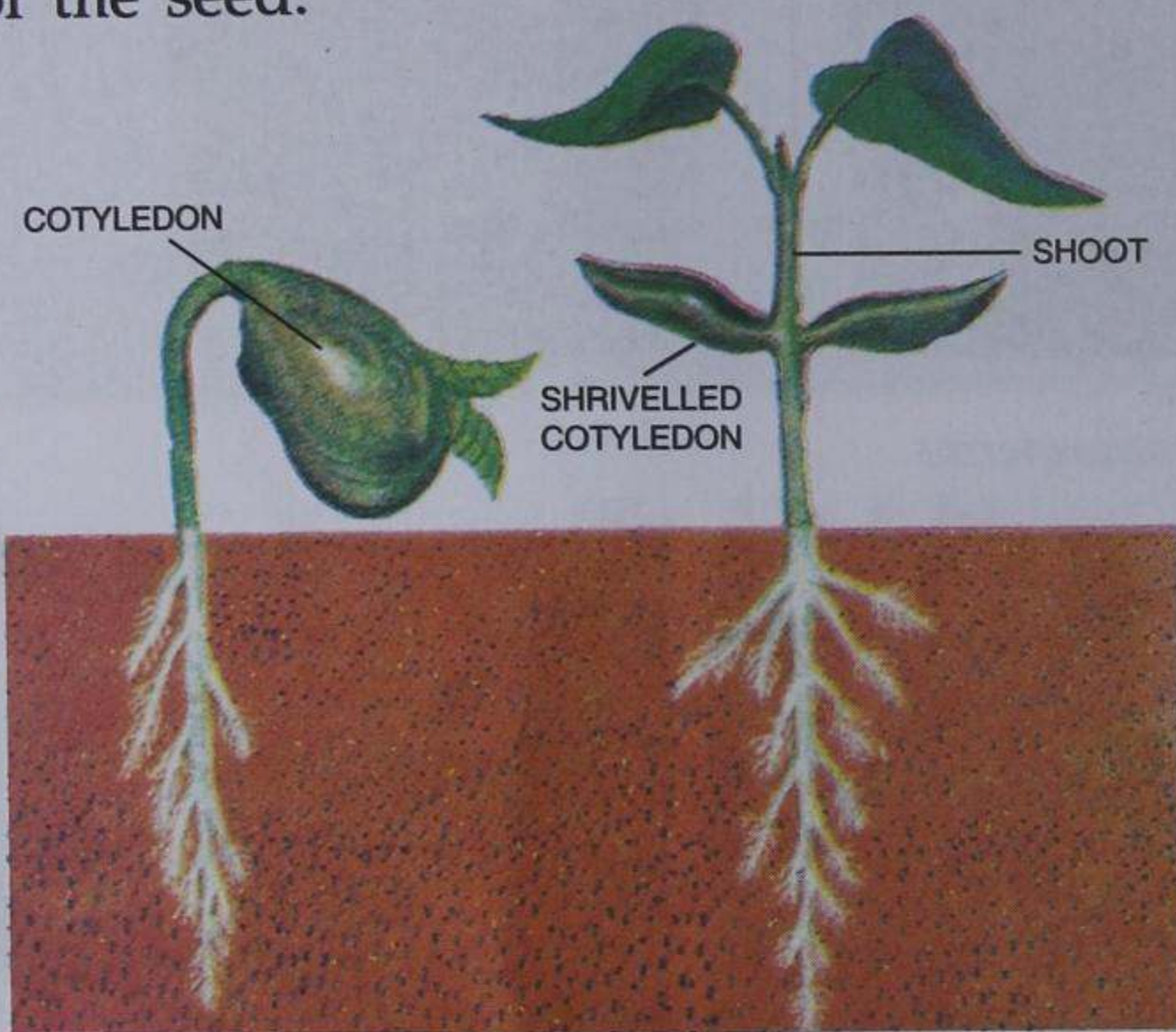


Fig. 2.11 Two cotyledons in pea seed

Similarly, when you eat peeled ground-nuts, you find two thick bits in a single seed. These are called **cotyledons**. In some plants, cotyledons may be single as in maize and in some, they are double (as in pea). On the basis of this, angiosperms are divided into the following two categories :-

(1) Monocotyledon plants contain only one cotyledon in their seeds.

Examples : rice, grass, maize, etc. (Fig. 2.12).



Fig. 2.12 Maize : a monocotyledon plant

(2) Dicotyledon plants contain two cotyledons in their seeds. *Examples :* rose, balsam, mango, sunflower, pea, brinjal, etc. (Fig. 2.13).



Fig. 2.13 Brinjal : a dicotyledon plant



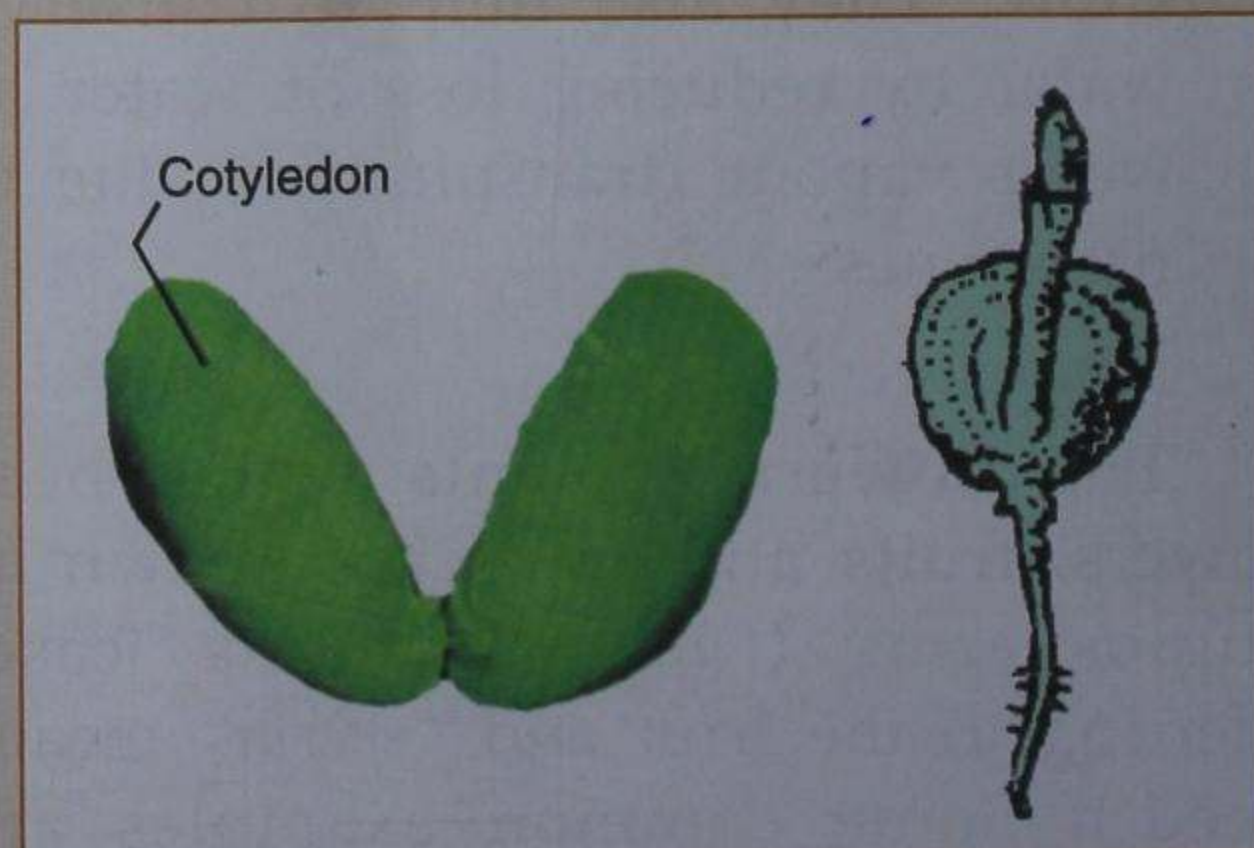
ACTIVITY 3

Take a few gram and maize seeds. Soak them in water for about 5-6 hours. Take out a swollen seed of both gram and maize and gently remove its seed coat.

You will see two parts in gram seed. Each part of the seed is called cotyledon. In maize seed, you will see only one cotyledon. Can you tell which seed among them is monocotyledon and which is dicotyledon ?

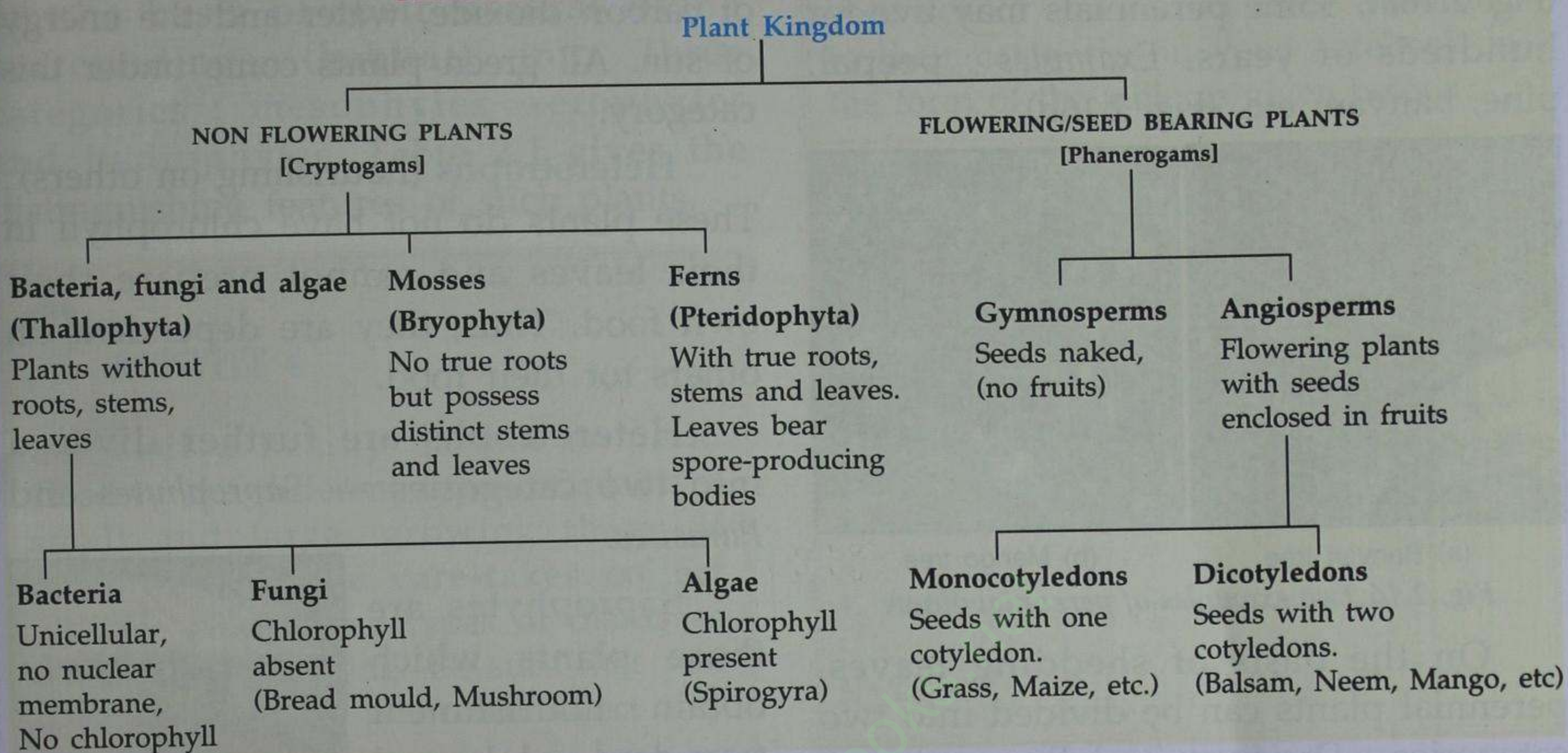
Monocot :

Dicot :



Cotyledons of gram and maize seed

CLASSIFICATION OF PLANTS AT A GLANCE



SOME OTHER CRITERIA OF CLASSIFICATION OF PLANTS

On the Basis of Life Span — Annuals, Biennials and Perennials.

Annuals — Plants which live for only one season in a year such as wheat, sunflower, mustard, rice, pea, etc. (Fig. 2.14).



Rice



Pea

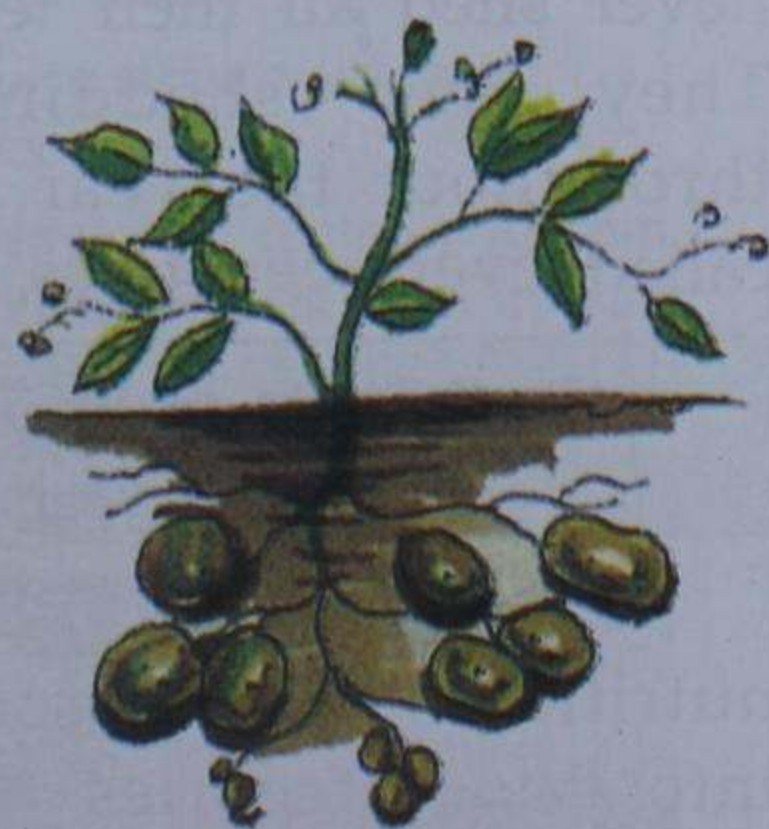
Fig. 2.14 Two annual plants

Biennials (bi : two) — These plants complete their life cycle (from seed to

flowering) in two years. In the **first year**, they bear vegetative parts i.e. roots, stems and leaves and in the **second year**, they bear flowers, fruits and seeds. Examples: cabbage, carrot, beet-root, radish, turnip, potato, etc. (Fig. 2.15).



Turnip



Potato

Fig. 2.15 Two biennial plants

Perennials — These are the plants which live for several years and bear flowers, fruits, and seeds every year.

Examples : rose, neem, mango, etc. (Fig. 2.16a). Some perennials may live for hundreds of years. *Examples* : peepal, pine, banyan, etc. (Fig. 2.16b).



(a) Banyan tree

(b) Mango tree

Fig. 2.16 Two examples of perennial plants

On the basis of shedding leaves, perennial plants can be divided into two categories : *Deciduous* and *Evergreen*.

Deciduous trees : Some perennial trees shed their leaves once in a year, usually before winter. These are called **deciduous trees**. *Examples*: oak, mulberry.

Evergreen trees : Some perennial trees like pine, guava, mango, etc., never shed all their leaves at one time. They keep shedding some leaves throughout the year. Such plants are called **evergreen trees**.

‘Bodhi’ tree in Sri Lanka is about 2000 years old.

On the basis of their mode of nutrition, the plants can be classified into two categories : **Autotrophs** and **Heterotrophs**.

Autotrophs (self “food-makers”) : The plants that can produce their food themselves are called autotrophs. They have chlorophyll in their leaves and thus

can prepare their own food with the help of carbon dioxide, water and the energy of sun. All green plants come under this category.

Heterotrophs (nourishing on others) : These plants do not have chlorophyll in their leaves and cannot prepare their own food. Thus, they are dependent on others for their food.

Heterotrophs are further divided into two categories — *Saprophytes* and *Parasites*.

Saprophytes are those plants which obtain nourishment from dead and decayed plants or animal matter. Mushroom is a good example of saprophytes (Fig. 2.17).



Fig. 2.17 Mushroom

Parasites are those plants which live on other living organisms (hosts) and obtain nourishment from them. Dodder is a good example of parasitic plants (Fig. 2.18).

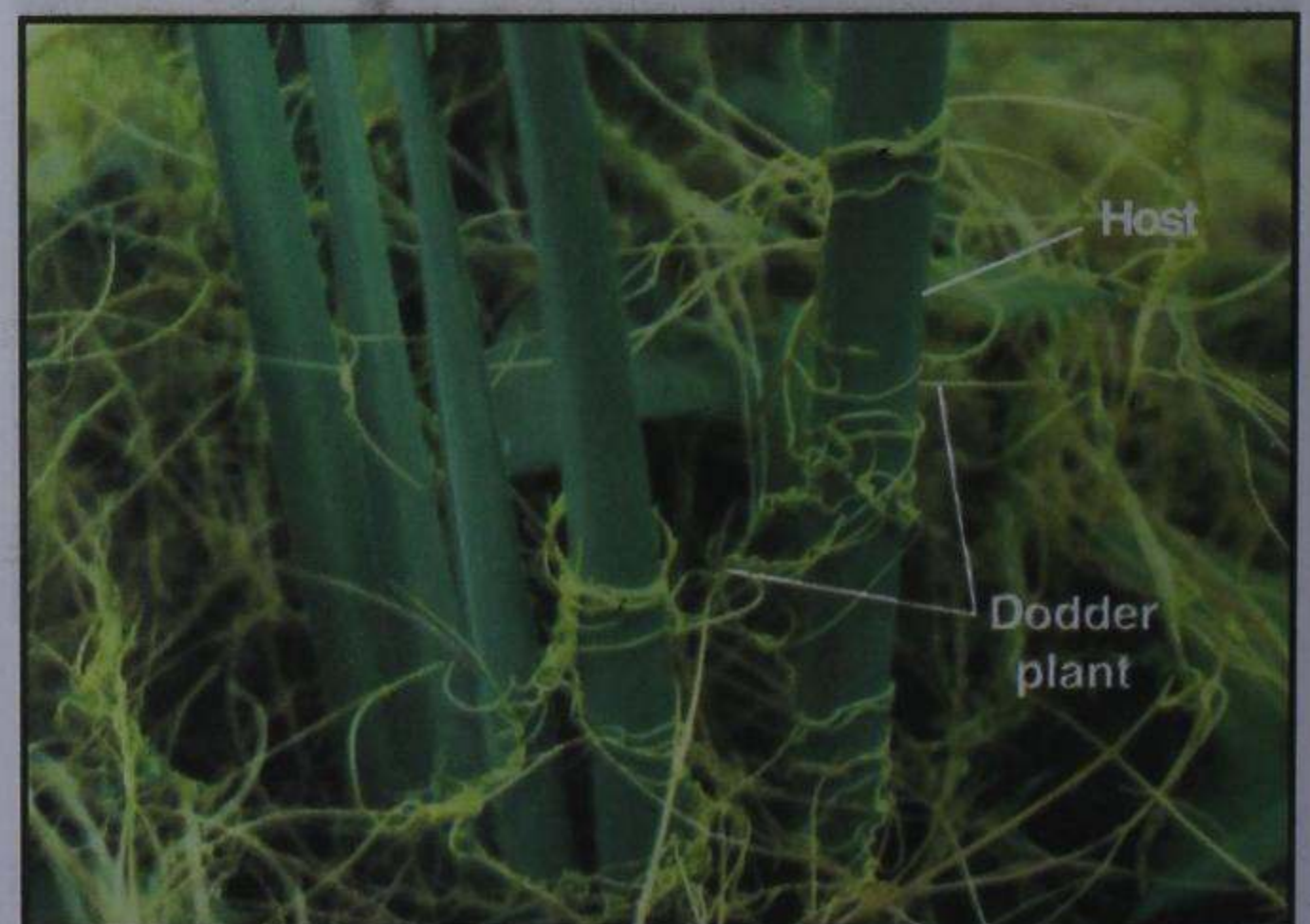


Fig. 2.18 Dodder (“Akash-bel”)

Plants can also be classified on the basis of their natural living surroundings (habitat) into three categories : **mesophytes**, **xerophytes** and **hydrophytes**. Table 2.1 gives the distinguishing features of such plants.



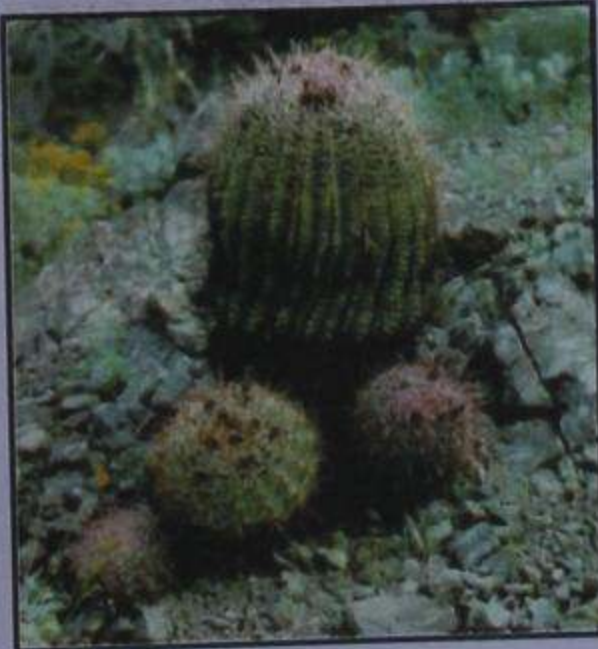
ACTIVITY 4

Visit a nearby garden or park. Observe the different types of plants – small and large, growing there. If permitted by the care-taker collect samples of as many types of plants as you can by plucking. Be sure that you do not damage the plant and collect only

one specimen of each type. Take them to your school and record them according to their categories in your notebook in the form of the table as given below :

Category of the plants	Part collected	Examples
1. Flowering plants :		
2. Non-Flowering plants :		
3. Herbs :		
4. Shrubs :		
5. Trees :		

Table 2.1 : Differences between mesophytes, xerophytes and hydrophytes

Mesophytes ("Meso" means moderate, "Phytes" means plants)	Xerophytes ("Xero" means "dry" referring to desert, "Phytes" means plants)	Hydrophytes ("Hydro" means water, "Phytes" means plants)
1. These plants grow on land & need moderate amount of water supply for their survival. 2. They have medium-sized roots. 3. They bear normal green leaves. 4. <i>Examples :</i> Mango tree, Apple tree.	These plants grow in deserts and need minimum amount of water for their survival. They have long roots which go deep into ground. They bear thin and spiny leaves to minimise water loss. <i>Examples :</i> Cactus, Babul.	These plants need maximum amount of water. Hence, they grow in water. They have either very small or no roots. Their leaves are coated with thin film which protects them in water. <i>Examples :</i> Lotus, Water lily.
 <i>Mango tree</i>	 <i>Cactus</i>	 <i>Water lily</i>

REVIEW QUESTIONS

1. Name the categories of the following :
 - (i) Plants which do not have roots, stems, and leaves : _____
 - (ii) Plants with no roots, but have stems and leaves : _____
 - (iii) Plants with roots, stems, and leaves, and which bear spore-producing bodies : _____
 - (iv) The amphibians of the plant kingdom _____
2. Give **two** characteristics and one example for each of the following :
 - (i) Algae
 - (ii) Fungi
 - (iii) Monocot
 - (iv) Dicot
 - (v) Bryophyta
 - (vi) Pteridophyta
 - (vii) Thallophytes
3. Differentiate between :
 - (i) algae and fungi.
 - (ii) monocot and dicot plants.
 - (iii) autotrophs and heterotrophs.
 - (iv) saprophytes and parasites.
 - (v) mesophytes and hydrophytes.
 - (vi) angiosperms and gymnosperms.
4. Match the items given under **column I** with those given under **column II** :

Column I	Column II
(i) Bread mould	(a) Has chlorophyll
(ii) <i>Spirogyra</i>	(b) Leaves with spores
(iii) Moss	(c) Hidden seeds
(iv) Fern	(d) Saprophyte
(v) Gymnosperm	(e) Has rhizoids