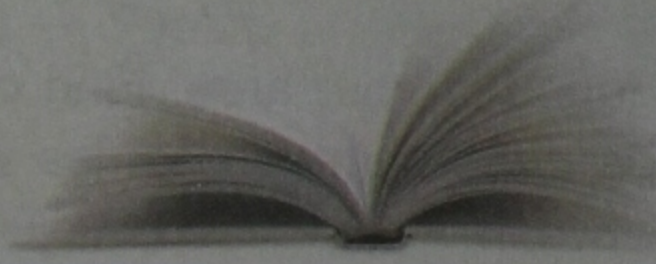




LEARNING OBJECTIVES

After completing this chapter you will be able to

- classify plants as non-flowering and flowering.
- differentiate between gymnosperms and angiosperms.
- classify plants as annuals, biennials and perennials on the basis of time taken to complete their life cycle.
- classify plants as herbs, shrubs and trees on the basis of their size.
- classify plants into mesophytes, hydrophytes and xerophytes on the basis of their habitats.
- give characteristic features of major categories of plants.



Classification of Plants

The plant kingdom can be classified into two broad categories, that is, non-flowering plants or **cryptogams** and flowering plants or **phanerogams**. Flowering plants bear flowers and seeds. However, non-flowering plants do not produce flowers and seeds.

CRYPTOGAMS

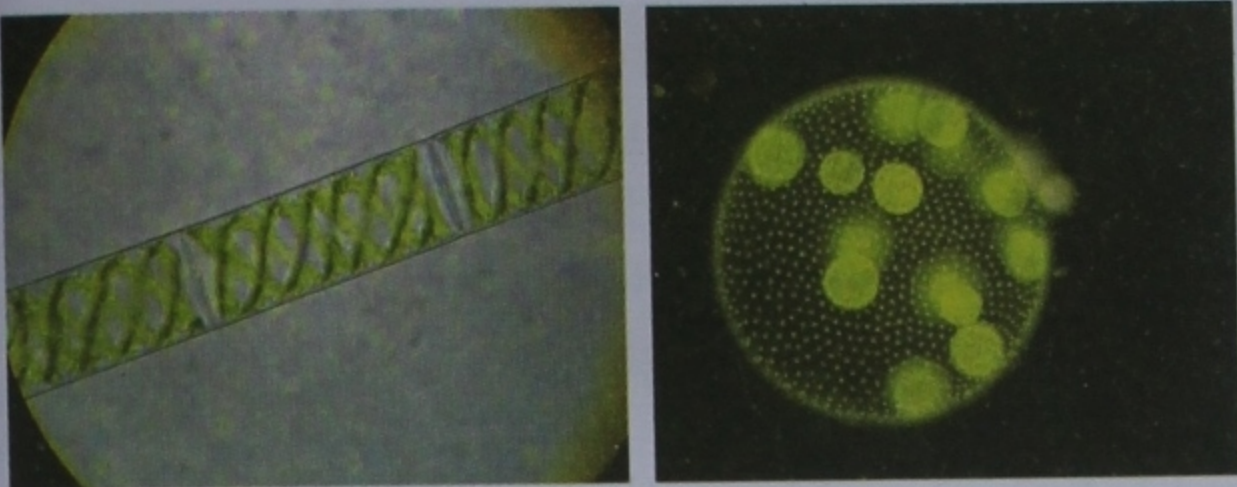
Non-flowering plants or cryptogams are divided into three groups—Thallophyta, Bryophyta and Pteridophyta.

Thallophyta (Algae, Bacteria, Fungi)

Thallophyta do not bear roots, stems or leaves. They rather have an undifferentiated body. They are further divided into three categories—algae, bacteria and fungi.

ALGAE

Algae may be unicellular or multicellular. Algae mostly grow in stagnant water, may be in puddles, streams or pond. The green layer seen on the surface of water in a pond is algae



Spirogyra

Volvox

Fig. 3.1 Some examples of algae

(Singular: alga). As all algae contain the green pigment chlorophyll, they make food on their own. In addition to chlorophyll, algae may also possess pigments of other colours like green, brown and red. Both red and brown algae are found in sea water. Brown algae called **kelp** are among the largest known plants and may grow up to a length of 60 metres. Some examples of algae are *Spirogyra*, *Chlamydomonas* and *Volvox* (Fig. 3.1).

BACTERIA

Bacteria are unicellular microscopic organisms. They are mainly found in three different shapes, that is, cocci (spherical), bacilli (rod-like) and spirilla (spiral-shaped). They are present almost everywhere, even inside our bodies. Some bacteria cause many harmful diseases.

FUNGI

Have you ever seen a cotton-like growth on bread, *chapatti* or cheese? This cotton-like



Agaricus (mushroom)



Penicillium

Fig. 3.3 Some examples of fungi

growth is fungus (plural: fungi). They lack chlorophyll and cannot prepare food on their own, and therefore, feed on organic matter. Fungi include moulds, yeast, mushrooms and toadstools. They may be **parasitic**, that is, derive their food from other living organisms, or **saprophytic**, that is, derive food from dead or decaying organisms. Fungi reproduce by spore formation, budding and fragmentation.

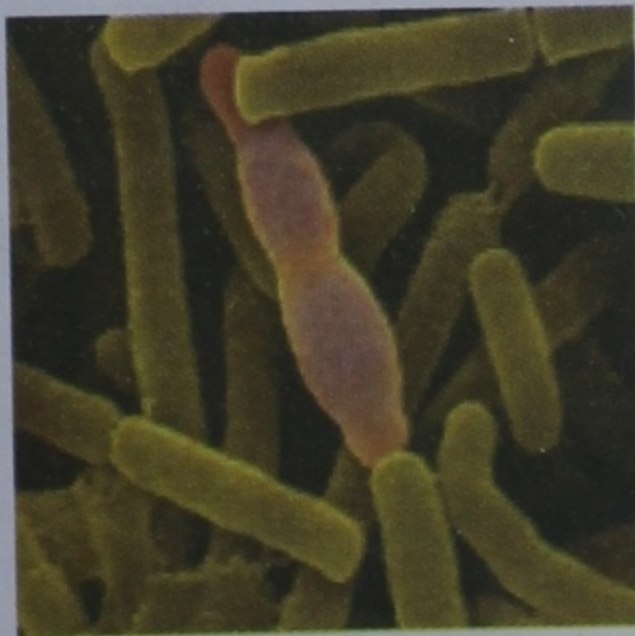
Fungi may be single-celled or many-celled. They can sometimes be seen in your shoes, on your food and skin also. They grow best where warmth and moisture are available.

ACTIVITY 1

Collect a sample of stagnant water with the help of a dropper. Put a few drops of water on a slide. Put a coverslip over it and observe it under the microscope. Draw the diagram of the living organisms which you may spot. Try to identify these organisms.



Cocci—spherical



Bacilli—rod-like



Spirilla—spiral-shaped

Fig. 3.2 Different shapes of bacteria



Fig. 3.4 Instead of roots, mosses have thread-like structures called rhizoids.

Bryophyta (Mosses)

These plants grow at moist places and need water to reproduce. Since they grow on land but need water for reproduction they are called the '**amphibians of the plant kingdom**'. Bryophytes mostly include mosses (Fig. 3.4) and liverworts. These plants do not have true roots. Instead of roots, they have thread-like structures called **rhizoids**. Rhizoids help plant to anchor with the soil and absorb water and minerals. Commonly mosses can be seen on damp soil and on the bark of trees.

Pteridophyta (Ferns)

These plants grow in damp and shady areas. Ferns have well-developed leaves, stems and roots but no flowers and seeds are produced. The plants either have underground stems called **rhizome** or stems above the ground. The leaves



Fig. 3.5 The leaves of ferns are called fronds and the lower side of fronds bear sori.

Did you know?

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

are called **fronds** and are divided into leaflets. The lower side of the leaves bear small rounded brown structures called **sori** (Fig. 3.5) which contain spores for reproduction.

CHECK YOUR PROGRESS 1

Write True or False.

1. *Spirogyra* and *Volvox* are examples of bryophytes.
2. Bryophytes have root-like structures called rhizoids instead of roots.
3. Instead of roots, mosses have rhizoids.
4. The leaves of pteridophytes are called sori.
5. The lower side of the leaves of ferns bear sori.

PHANEROGAMS

Flowering plants are further divided into two categories—gymnosperms and angiosperms (Fig. 3.6).

Gymnosperms

They are either tall trees or bushes. Instead of flowers, gymnosperms produce **cones** (Fig. 3.7). Cones are woody reproductive structures that produce thin and naked seeds, that is, the seeds are not enclosed in fruits. Due to presence of naked seeds, these plants are called gymnosperms (*gymno*—naked, *sperm*—seed). Some cones are male and produce pollen, while some are female.

Gymnosperms have well-developed roots, thick and woody stems and long and needle-shaped (pointed) leaves. Pointed leaves do not

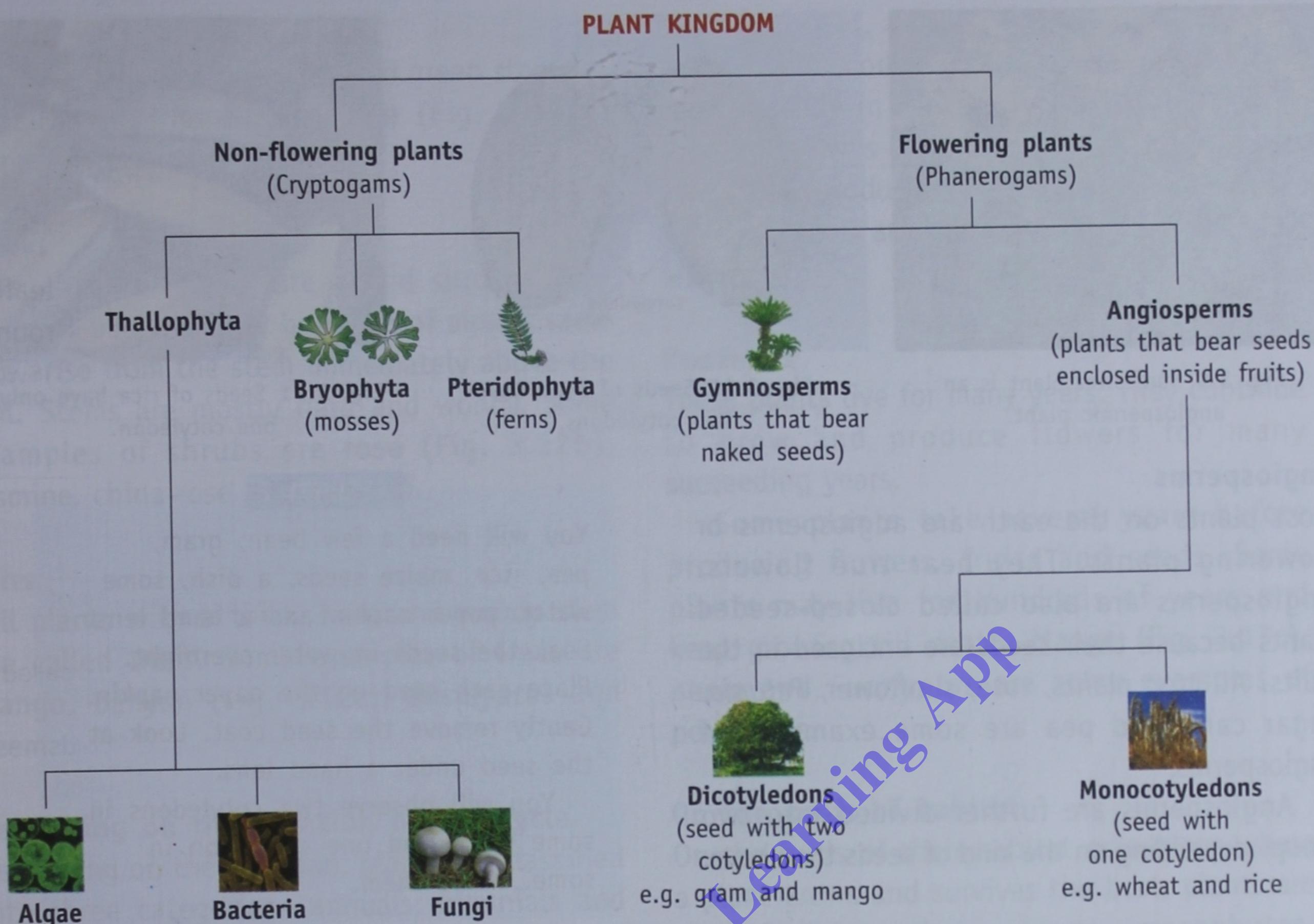


Fig. 3.6 Classification of plants based on the presence or absence of flowers and seeds
(NOTE: This classification is based on the old two-kingdom classification)

allow snow to stick to them, thus, the plants are not affected. Water is also conserved as there is less transpiration.

Most gymnosperms do not shed all their

leaves at one time and remain green throughout the year. So, they are called **evergreen plants**. Cedar, pine, *Ginkgo*, juniper, spruce and *Cycas* are some examples of gymnosperms.



Pine



Cycas

Fig. 3.7 Some examples of gymnosperms



Fig. 3.8 Instead of flowers, gymnosperms produce cones.



Fig. 3.9 Sunflower plant is an angiospermic plant.

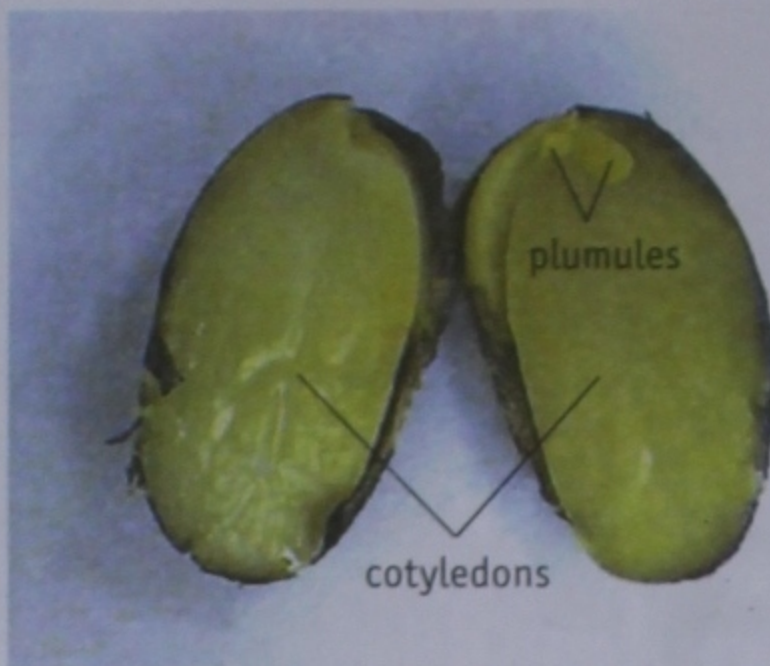


Fig. 3.10 Seeds of bean have two cotyledons.



Fig. 3.11 Seeds of rice have only one cotyledon.

Angiosperms

Most plants on the earth are angiosperms or flowering plants. They bear true flowers. Angiosperms are also called closed-seeded plants because their seeds are enclosed in the fruits. All crop plants, rose, sunflower, *Petunia*, sugar cane and pea are some examples of angiosperms.

Angiosperms are further divided into two groups depending on the kind of seeds they have.

DICOTYLEDONS

These plants bear seeds which are divided into two parts or cotyledons. For example, gram, pea, bean and so on.

MONOCOTYLEDONS

These plants bear seeds which have only one part or cotyledon. For example, wheat, maize, rice and so on.

ACTIVITY 2

You will need a few bean, gram, pea, rice, maize seeds, a dish, some water, paper napkin and a hand lens. Soak the seeds in water overnight. Place each seed on the paper napkin. Gently remove the seed coat. Look at the seed under a hand lens.

You will observe two cotyledons in some seeds and one cotyledon in some. Name them.

OTHER CLASSIFICATIONS OF PLANTS

Plants can also be classified on the basis of certain other criteria.

Depending on the size

Depending on the size, plants are classified into three groups. They are herbs, shrubs and trees.



a. Rice—a herb



b. Rose—a shrub



c. Banyan—a tree

Fig. 3.12 Depending on the size plants are classified into herbs, shrubs and trees.

HERBS

Very small plants with a soft and green stem are called herbs. Mint, pea, rice (Fig. 3.12a), spinach and mustard are herbs.

SHRUBS

Medium-sized plants are called shrubs. They look like bushes. Many branches of almost same size arise from the stem immediately above the soil. Stems are mostly hard and woody. Some examples of shrubs are rose (Fig. 3.12b), jasmine, china rose and *mehandi*.

TREES

Tall plants with a thick, hard and woody stem are called trees. Some examples of trees are mango, banyan (Fig. 3.12c), *Eucalyptus* and neem.

Depending on the duration of life cycle

Depending on the life span, plants are classified into three categories—annuals, biennials and perennials.

ANNUALS

These plants complete their life cycle in one season in a year or in one year. The plants germinate, flower and produce seeds within a season. Some examples are paddy, wheat (Fig. 3.13a), maize and mustard.



a. Wheat—an annual



b. Turnip—a biennial



c. Mango tree—a perennial

Fig. 3.13 Depending on the life span, plants are classified into annual, biennial and perennial.

BIENNIALS

These plants complete their life cycle in two years. Usually in the first year they bear root, stem and leaves and store food. In the second year, they produce flowers, fruits and seeds. Some examples are cabbage, turnip (Fig. 3.13b) and radish.

PERENNIALS

These plants live for many years. They continue to grow and produce flowers for many succeeding years.

Some plants take several years before producing flowers, fruits and seeds. Some plants may live for hundreds of years and keep growing till death. Mango (Fig. 3.13c), neem and *Eucalyptus* are some examples of perennials.

On the basis of habitat

On the basis of their habitat or a place where a plant grows and survives the best, plants are classified into three groups—mesophytes, hydrophytes and xerophytes.

MESOPHYTES

Plants which grow on land and need moderate amount of water are called **mesophytes**. Potato (Fig. 3.14a), tomato and mustard are some mesophytes.



a. Potato—a mesophyte



b. Water lily—a hydrophyte



c. Cactus—a xerophyte

Fig. 3.14 On the basis of habitat, plants are classified into mesophytes, hydrophytes and xerophytes.

HYDROPHYTES

Plants that need maximum water to grow are called **hydrophytes**. For this reason, they live in water. Some hydrophytes may be floating while others may be submerged partially or completely. Leaves have a waxy coating to protect themselves in water. Some examples are water lily (Fig. 3.14b), lotus, *Hydrilla*, *Vallisneria* and water hyacinth.

XEROPHYTES

Plants that grow on dry land like deserts where there is a scarcity of water, are called **xerophytes**. Leaves of these plants are reduced to spines to minimize the loss of water. These plants have long roots which grow deep into the ground to absorb water. Cactus (*Opuntia*) (Fig. 3.14c), babul (*Acacia*), and Indian plum are some examples of xerophytes.

On the basis of the mode of nutrition

On the basis of the mode of nutrition, plants can be classified in two categories—autotrophs and heterotrophs.

AUTOTROPHS

The plants which make their own food from carbon dioxide and water with the help of sunlight and chlorophyll are called **autotrophs**. All green plants are autotrophs.

HETEROTROPHS

Non-green plants which lack chlorophyll and cannot make their own food are called **heterotrophs**. They depend on other plants or animals for their food. Based on the source of their food, these plants are classified into two categories—parasites and saprophytes.

Parasites. These plants live on other living organisms and get their nutrition from them. For example, *Cuscuta* (amar-bel) (Fig. 3.15). The living organisms from whom they derive nutrition are called **hosts**.

Saprophytes. These plants are also called **decomposers** since they derive their nutrition from dead and decaying animal and plant matter. Some examples are mushroom, yeast and bread mould.



Fig. 3.15 *Cuscuta* (amar-bel) is a parasitic plant.

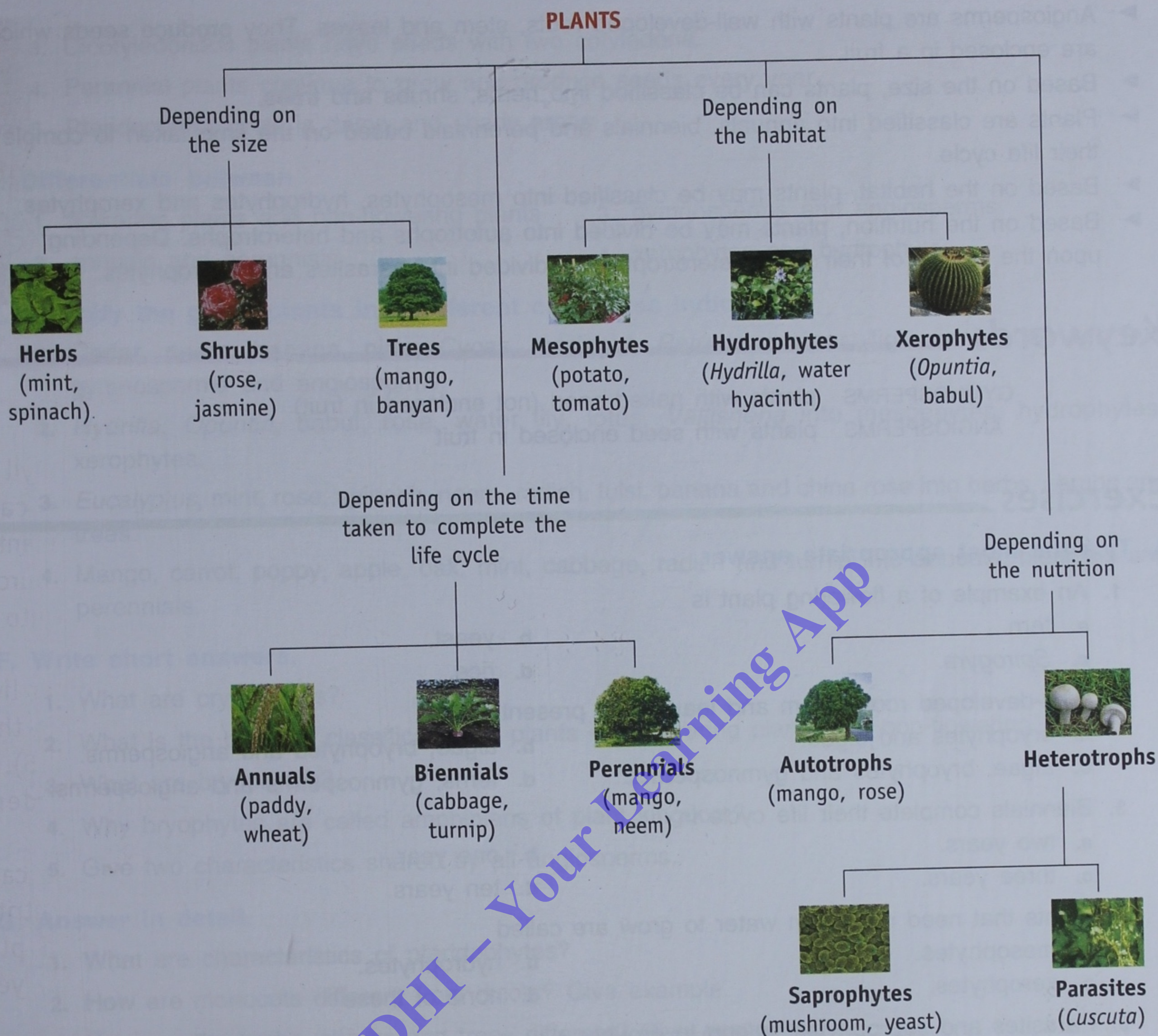


Fig. 3.16 Classification of plants on the basis of criteria other than presence or absence of flowers and seeds

Now you know

- ▶ The plant kingdom is classified into two categories—non-flowering plants or cryptogams and flowering plants or phanerogams.
- ▶ Non-flowering plants or cryptogams are classified into three groups—Thallophyta, Bryophyta and Pteridophyta.
- ▶ Thallophyta contain algae, bacteria and fungi, and do not bear roots, stems or leaves.
- ▶ Algae may be unicellular or multicellular. Bacteria are unicellular microscopic organisms. Mosses grow at moist places and need water to reproduce.
- ▶ Ferns grow in damp and shady areas.
- ▶ Flowering plants are further classified into two categories—gymnosperms and angiosperms.
- ▶ Gymnosperms are either tall trees or bushes, and instead of flowers, they produce cones.

- ▶ Angiosperms are plants with well-developed roots, stem and leaves. They produce seeds which are enclosed in a fruit.
- ▶ Based on the size, plants can be classified into herbs, shrubs and trees.
- ▶ Plants are classified into annuals, biennials and perennials based on the time taken to complete their life cycle.
- ▶ Based on the habitat, plants may be classified into mesophytes, hydrophytes and xerophytes.
- ▶ Based on the nutrition, plants may be divided into autotrophs and heterotrophs. Depending upon the source of their food, heterotrophs are divided into parasites and saprophytes.

Keywords

GYMNOSPERMS plants with naked seed (not enclosed in fruit)
 ANGIOSPERMS plants with seed enclosed in fruit

Exercises

A. Tick the most appropriate answer.

- An example of a flowering plant is
 - fern.
 - yeast.
 - Spirogyra*.
 - rice.
- Well-developed roots, stem and leaves are present in
 - bryophytes and algae.
 - algae, bryophytes and angiosperms.
 - algae, bryophytes and gymnosperms.
 - ferns, gymnosperms and angiosperms.
- Biennials complete their life cycle in
 - two years.
 - one year.
 - three years.
 - ten years.
- Plants that need maximum water to grow are called
 - mesophytes.
 - hydrophytes.
 - xerophytes.
 - none of these
- Parasites and saprophytes belong to group
 - autotrophs.
 - xerophytes.
 - heterotrophs.
 - mesophytes.

B. Fill in the blanks.

- _____ are the simplest non-vascular green plants that contain chlorophyll and usually live in water.
- _____ are simple plants that do not have chlorophyll.
- In _____ the seeds are not enclosed in a fruit.
- The _____ of ferns grows under the ground.
- Fungi reproduce through _____

C. Write true or false for each statement. Rewrite the false statements correctly.

- Bryophytes grow in dry areas.
- Plants that have seeds in cones are called ferns.

3. Dicotyledonous plants have seeds with two cotyledons.
4. Perennial plants continue to grow and produce seeds every year.
5. Pteridophytes grow in damp and shady areas.

D. Differentiate between

1. flowering plants and non-flowering plants
2. annuals and perennials
3. gymnosperms and angiosperms
4. xerophytes and hydrophytes

E. Classify the given plants into different categories indicated.

1. Cedar, neem, banana, pine, *Cycas*, marigold, *Petunia*, juniper, fig, orange, *Ginkgo* into gymnosperms and angiosperms.
2. *Hydrilla*, *Opuntia*, babul, rose, water lily, lotus, *Vallisneria* into mesophytes, hydrophytes, xerophytes.
3. *Eucalyptus*, mint, rose, spinach, neem, radish, tulsi, banana and china rose into herbs, shrubs and trees.
4. Mango, carrot, poppy, apple, oak, mint, cabbage, radish and turnip into annuals, biennials and perennials.

F. Write short answers.

1. What are cryptogams?
2. What is the basis of classification of plants into flowering plants and non-flowering plants?
3. What are bryophytes?
4. Why bryophytes are called amphibians of plant kingdom?
5. Give two characteristics shared by all angiosperms.

G. Answer in detail.

1. What are characteristics of pteridophytes?
2. How are monocots different from dicots? Give example.
3. How are the herbs, shrubs and trees different? Give examples.
4. Classify plants on the basis of (i) habitats in which they live, and (ii) time taken to complete their life cycle.

Fun to do

You go from home to your school. On the way you see many plants. List all these plants in your notebook. List the plants in your school. Now categorize these plants into

1. Flowering and non-flowering
2. Herbs, shrubs and trees
3. Annual, biennial and perennial
4. Mesophytes, hydrophytes and xerophytes

Do you find any difference on the type of plants planted in your school and on the roadside on the way from your home to school? Can you give reasons for the same?