# 01 Plant Diversity

# **1.1** Morphological features of flowering plants

Flowers and fruits naturally come to our mind when we state about trees. Do all varieties of trees produce flowers? Pay your attention to the ornamental plants in the garden given in Figure 1.1.



Figure 1.1 A view of a garden

You can observe plants with flowers and without flowers. There are different varieties of plants in our environment. Engage in Activity 1.1 to find out whether all the trees bear flowers.



#### Activity 1.1

Names and the pictures of several plants are given below. Although most of them are familiar to you, certain plants may not much familiar to you.











Gardenia



Rose

Fern

Water Lily (Olu' / Alli)Turpentine SafagalingamiSafa SafagalingamiWater Lily (Olu' / Alli)Turpentine FagalingamiSafa SafagalingamiWater Lily (Olu' / Alli)Turpentine FagalingamiSafa SafaWater Safa Safa Safa Safa Safa SafaSafa Safa Safa Safa Safa Safa Safa Safa Safa Safa Safa SafaSafa SafaSafa 	$\left  \begin{array}{c} \left  \end{array}{c} \right  \right } \right  \right  \right }{c} \right  \right }{c} \right  \right  \right  \\ \left  \begin{array}{c} \left  \left  \begin{array}{c} \left  \left  \begin{array}{c} \left  $
Plants which bear flowers	Plants which do not bear flowers
Rose, 'Idda', Gardenia, Balsam, Water lily, 'Sal', Lotus, Shoe flower, Curry leaves, 'katarolu', Jasmine, Coconut, Long bean	<i>Cycas</i> , Turpentine, <i>Salvinia</i> , Cyperus, <i>Drynaria</i> , Ferns

Now, it is clear to you that there are plants which produce flowers and that do not produce flowers in our environment. Plants which produce flowers are called flowering plants and plants which do not produce flowers are called non flowering plants.



- Observe plants in your home garden or in your school premises.
- Identify them as flowering plants and non flowering plants.
- Tabulate the plants you identified as flowering plants and non-flowering plants.

# **1.2** Main parts of a flowering plant

Observe the flowering plants in your surroundings. They are of different sizes. When you look at the trees you can observe small palnts as well as big trees among them. Their stems, roots, flowers and fruits are also different from each other. Therefore, plants show a great diversity in their size and morphological features, but all flowering plants have some common parts. Let's do Activity 1.2 to identify the main parts of a flowering plant.

# Assignment 1.2

#### Identification of main parts of a flowering plant

• Select a small plant that produces flowers and fruits.

e.g.:- 'Monara Kudumbiya', / 'Seethaviyar Selugkaluner' 'Kuppameniya' / 'Kuppaimani'

- Uproot it from the soil without breaking roots.
- Remove soil around roots carefully
- Press it between pages of newspapers.
- Prepare a field book and paste the specimens in it after about one week.



#### Activity 1.2

The Figure 1.3 shows the parts of a flowering plant. The main parts are labelled from 1 to 11.

- 01. Tap root02. Lateral roots
- 08. Branches 09. Fruits

10. Flowers

11. Shoot

- 03. Root system
  - 5. KOOL System
- 04. Stem
- 05. Lateral buds (Axillary buds) 06. Leaves
- 00. Leaves
- 07. Apical bud

Figure 1.3 A Parts of a flowering plant



Identify the basic parts of a plant in Assignment 1.2 referring to Figure 1.3. Compare the pressed plant you have, with the pressed plants your friends have. Observe similarities as well as dissimilarities among the main parts of them.

# **1.3** Diversity of the parts of flowering plants

The characteristic feature of the flowering plant is formation of flowers. Almost all parts such as stem, leaves, roots, buds, flowers and fruits can be seen in most of the plants. Plants show a great diversity among these parts.

# **Diversity among roots**

### Assignment 1.3

- Select a small grass plant and a 'Kuppameniya' / 'Kuppaimani' plant.
- Uproot them carefully without damaging roots.
- Wash the soil of the roots and press it.
- Paste it on the field book after one week.

Normally root system remains underground in the soil. There are two types of root systems.

• Some plants have a single large root which originates from the base of the stem. It is called the tap root. Large number of roots are originated from the tap root. They are called lateral roots. This type of root system is called a **tap root system**.

e.g.:- 'Kuppameniya'/ 'Kuppaimani', Mango, Cashew

• Some plants have a large number of small roots which are originated from base of the plant stem. This type of root system is called a **fibrous root system**.

e.g.:- Coconut, Arecanut, Bamboo, Grass, 'Kitul'





- Look at the root systems of two plants you pasted in your fieldbook
- Observe the differences between root systems of those two plants.

You will notice that 'kuppameniya', mango, cashew like plants have a tap root system whereas grass, coconut, arecanut, and bamboo trees have a fibrous root system.

# **Functions of plant roots**

- Fix the plant to the soil
- Absorb water and minerals dissolved in water (absorption)
- Involve in vegetative propagation (vegetative reproduction)

e.g.:- Curry leaves, 'Beli'/ 'Vilvam', Bread fruit

In addition to these there are roots adapted for other functions. Let's do Assignment 1.4 to identify such roots.

# Assignment 1.4

- Uproot a mimosa plant without breaking its roots and wash the roots carefully
- Draw the root system of it in a white drawing paper.
- Paste it in the fieldbook.
- Observe the yams of beetroot, carrot, sweet potato and manioc
- Draw them on a white drawing paper and paste it in your fieldbook.



Small nodules like structures can be seen in the root system of *Mimosa* plant. Such nodules are known as root nodules. There are micro organisms called bacteria live inside them. These bacteria supply nitrogen nutrients required for the growth of *Mimosa* plant and root system supplies nutrients for the bacteria which live inside the nodules. Such nodules are present in plants such as 'kathurumurunga', beans and winged beans which belong to family Leguminosae.

The other roots shown in Figure 1.5 are generally called as yams because food is stored in those roots. Food can be stored in tap root as well as lateral roots.

Naturally roots grow downward into the soil, but you can observe some roots that grow above the soil. Figure 1.6 shows different types of roots that grow above the soil level.



Climbing roots of betel Respiratory roots of 'Kirala'/ 'Kinnai' Figure 1.6 A Roots adapted for various functions

Arrange a field visit and identify the different types of roots shown in Figure 1.6.

Study Table 1.2 and try to understand various functions of root types. Table 1.2 Different types of roots and their functions

Type of root	Example	Functions				
Prop roots	Banyan	Support the branches				
Stilt roots	Pandanus, 'Rampe'	Support the stem				
Aerial roots	Orchid	Absorb water vapour from the atmosphere Some roots carryout photosynthesis				
Climbing roots	Pepper Betel	Helps to climb the stem by attaching to another stem				
Respiratory roots	'Kandol'/'Kandal' 'Kirala' / 'Kinnai'	Exchange of air with the atmosphere				
Storage roots	Carrot Beet Manioc Sweet potato	Store food				
Roots with root nodules	<i>Mimosa</i> Legumes (eg: Beans, Long beans, Winged beans)	Bacteria live inside root nodules add nutrients to the soil. Thus make the soil fertile.				

# For extra knowledge

Corks used as stoppers of bottles are taken from respiratory roots of 'Kirala'/'Kinnai' plant. The porous or sponge nature of 'Kirala' / 'Kinnai' corks occur due to presence of very tiny pores and spaces in their roots.

# **Diversity among stems**

Recall the nature of plant stems that you have observed in your surrounding. You may have observed very strong stems, stems with thick bark as well as stems with various colours. There are plants that grow up with the help of supporters and run on the ground due to their weak stems. The basic difference in any type of the stem is that whether the stem divides into branches or not.



Figure 1.8 A plant with branched stem

Figure 1.7 A plant with unbranched stem e.g.:- Coconut, Arecanut, Kitul, Palmyrah, Paddy, Bamboo

Figure 1.8 ▲ A plant with branched stem e.g.:- Mango, Rambuttan, Cashew, Guava, Shoe flower

# **Functions of plant stem**

- It bears flowers, leaves, buds, fruits, seeds etc.
- It supports the plant, by keeping rigid.
- It transports water and food through plant body
- Many plants produce new plants by stems. (vegetative reprodution)
  - e.g.:- Shoe flower, Jasmine/ 'Saman pichcha' / 'Sadimalligai', Sweet potato, Manioc
- Some plants have green colour stems to carryout photosynthesis

```
e.g.:- 'Nawahandi' / 'Kally', 'Heeressa' / 'Pirattai', Cotton,
'Hathawariya'/ 'Sathavari'
```

- Some aerial stems store food.
  - e.g.:- Sugar cane, kitul

Eventhough most stems grow above the soil, some stems grow inside the soil. They are called **underground stems**. Underground stems, that grow inside soil, conduct (carryout) all the other functions, except photosynthesis. Examples for underground stems are given in Figure 1.9



### **Diversity among leaves**

Plant leaves also display a great diversity like other parts of the plant; based on shape, size and colour. Let's engage in Activity 1.5 to learn about diversity of leaves.



### Activity 1.5

- Collect about ten different types of leaves from your home garden.
- e.g.:- Manioc, Curry leaves, Jak, Grass, Croton,
  - 'Akkapana' / 'Sadaikaraichchan', Pumpkin, 'Hathawariya'/'Sathavari', 'Katurumurunga'/ 'Agathi'. Study their similarities as well as dissimilarities, by observing them.

Photosynthesis mainly occurs in a leaf of a plant. Plant leaves get energy from sunlight to do photosynthesis. Therefore leaves are arranged on the stem in a way to get maximum amount of sunlight.

Eventhough leaves have different shapes, sizes and different colours, they all have common parts. Those common parts are shown in Figure 1.11.



Figure 1.10 Arrangement of plant leaves in plants to absorb maximum amount of sunlight



#### Leaf venation

The arrangement of veinlets in the leaf is called leaf venation. There are two main venation patterns occur in plants.

• Reticulate venation



Figure 1.12 A part of a plant leaf with reticulate venation

The branches initiated from the mid rib spread as a net through out the leaf

eg:- Shoe flower, Mango, Jak, 'Gotukola'/ 'Vallarai'

• Parallel venation



Figure 1.13 ▲ A part of a plant leaf with parallel venation Veinlets parallel to the midrib spread in the leaf eg:- Grass, Bamboo, Coconut, Arecanut

You can observe leaf venation by observing lower surface of the plant leaf clearly.



### Simple and compound leaves

When the leaf blade of a leaf is not divided into segments it is called a simple leaf.

e.g.:- Shoe flower, Jak,

The leaf blade of some leaves are partially divided into segments. e.g.:- Manioc, Papaw



Figure 1.14 Several simple leaves

Leaf blade of a compound leaf is completly divided into small leaf like parts called leaflets. These types of leaves with leaflets are called compound leaves.

e.g.:- Coconut, Long beans, 'Katurumurunga'/ 'Agathi', Tamarind, Curry Leaves



Coconut





Tamarind 'Katu Figure 1.15 **^** Several compound leaves

# **Functions of plant leaves**

- The most important function of a plant leaf is photosynthesis. Through photosynthesis plants produce food in leaves.
- Some leaves are adapted to store water

e.g.:- Aloe, 'Akkapana' / 'Sadaikaraichchan'





Figure 1.16 📥 Aloe

Figure 1.17 🔶 'Akkapana'/ Sadaikaraichchan'

Some leaves produce new plants. (vegetative reproduction) e.g.:- 'Akkapana', Begonia

### Assignment 1.6

- Place a leaf of bryophyllum in between two blotting papers and keep it between the pages of a book for few days
- Observe it after few days
- Identify the roots arising from leaf margin. They are called adventitious roots
- Cut the leaf into pieces and get new plants by planting those pieces

# Parts of a flower and thier diversity

The main function of flowers is to produce fruits. The seeds inside the fruits produce new plants. These seeds are dispersed by various methods (by animals, wind, water, explosive mechanism)

Flowers bear male and female reproductive structures. They combine and form seeds by sexual reproduction.

### Flower is the structure adapted for the sexual reproduction.

### Structure of a flower

The most attractive part of the plant is the flower. They differ greatly in size, smell, shape and colour.





Flowers show great diversity among them, but they have a common structural plan. A typical flower consists of the following three parts.

• Sepals • Petals • Gynoecium/ Androecium

All these parts can be easily observed in a shoe flower. Let's identify parts of a flower by observing longitudinal section of a shoe flower. (Figure 1.19)

- Select a bigger flower (e.g.:- Shoe flower, Thunbergia)
- Cut and separate the flower into two parts longitudinally by carefully cutting it from the pedicel using a sharp blade
- Use Figure 1.19 to show a diagram of the longitudinal section of a flower. Identify its parts and name them

### **Sepals**

Sepals are generally green in colour. The main function of sepals is the protection of flower buds.

### Petals

Petals are brightly coloured. They attract insects for pollination as well as protect the internal parts of the flower.

### Androecium

Stamen of a flower is called androecium. Each stamen is made up of two parts

- anther
- filament



Figure 1.20 A stamen of shoe flower

The function of androecium is production of pollen.

Different shapes of stamens can be seen in flowers



Figure 1.21 

Different shapes of stamens in flowers

### Gynoecium

Gynoecium contains following parts.

- Stigma
- Style
- Ovary

The function of gynoecium is the production of seeds.





# Activity 1.8

Using maximum number of examples complete Table 1.3 further with the help of the features of flowers that you have observed. One example is given for each section.

Table 1.3 🗸					
White coloured flowers	'Idda'/ 'Oosi mallikai',				
Flowers with colourful petals	Rose,				
Flowers that bloom at night	'Sepalika'/ 'Pavala mallikai'				
Flowers with sweet smell (fragrance)	Jasmine/ 'Samanpichcha'/'Sadimalligai'				
Flowers with nectar	'Kathurumurunga' / 'Agathi'				

# **Diversity of fruits and seeds**

Fruits are formed from the flowers of flowering plants. Seeds are found inside the fruits. Seeds produce new seedlings.

# Assignment 1.8

- Collect fruits and seeds that are fallen near trees in the school garden. (Collect the seeds into a seed box)
- Collect fruits and seeds that are fallen under trees in your home garden.
- Collect different types of fruits and seeds that are not found regularly. (Try to find the names of those plants)

Fruits and seeds are naturally adapted for dispersion. e.g.:-Cotton, 'Wara'/'Eruku', 'Hora'/'Ennai', 'Gammalu'/'Thanakku'



'Wara'/'Eruku' 'Hora'/'Ennai' 'Gam Figure1.23 ▲ Fruits and seeds which are dispersed by wind Cotton 'Gammalu'/ 'Thanakku'

# Assignment 1.9

Collect fruits and seeds as shown in Figure 1.23. List out the adaptations they show to be propagated by wind. Get assistance from your teacher.



'Diya kaduru' Coconut Kottamba'. 'Kottankachchi' 'Kulliththy' Figure 1.24 Fruits and seeds which are dispersed by water



Collect fruits and seeds as shown in Figure 1.24. List out the adaptations they show to be propagated by water. Get assistance from your teacher.



Figure 1.25 A Fruits and seeds which are dispersed by animals

'Nagadarana' 'Pulinagam'



Assignment 1.11

• Collect fruits and seeds as shown in Figure 1.25. List out the adaptations they show to be propagated by animals. Get assistance from your teacher.

### **1.4** Monocotyledonous and dicotyledonous plants

Flowering plants are mainly divided into two groups as monocotyledonous (monocots) and dicotyledonous (dicots).

Do Assignment 1.13 to identify differences between two types of plants.

Assingment 1.12					
• Collect many seeds as far as possible from your kitchen					
e.g.:-Gram, Paddy/Rice, Green gram, Tamarind, Cowpea, Beans, Long beans, Cashew, Arecanut, Maize, Jak seeds					
• Take about five seeds from each type and soak them in water					
• Take the seeds out of water after about 24 hours carefully					
• Divide them according to number of cotyledons (seed leaves) inside the seed and add to Table 1.4					
Table 1.4 - monocot and dicot seeds					
Seeds with single seed leaf	Seeds with two seed leaves				
Arecanut, Paddy, Maize	Bean, Long Beans, Cashew,				
	Gram, Green gram, Tamarind,				
	Cowpea, Jak seeds				

You may have seen that certain seeds can be divided easily into two seed lobes whereas other seeds cannot be divided easily like that. There are two seed lobes. These seed lobes are called seed leaves. Seeds with two seed leaves are called dicot seeds.

Some seeds cannot be divided into two seed lobes because they have only one seed leaf. This type of seeds are called monocot seeds. Germination

of monocot and dicot seeds are different from each other.



• Observe the plants/ trees found in your school garden and group them as monocots and dicots.

Let's do Activity 1.9 to learn more about nature of those seeds.



You have learnt about the variations of the basic parts of plant throughout this lesson. Now study the differences of basic parts of monocot plants and dicot plants that you have observed. Compare the differences you observed with Table 1.5.

Dicot plant			
Reticulate venation			
etals or its ples			
l lobes			
hed			
system			



• Create a model to show the basic differences between main parts of dicot and monocot plants that you have already observed.

Now you must have a proper understanding about the vast diversity of members of the plant world, upon observing and studying morphological variations of them.

The fieldbook that you prepared would display the diversity of plants very well.

### Summary

- Plants which produce flowers are called flowering plants whereas plants do not produce flowers are called non flowering plants.
- The main parts of the flowering plants are roots, stem, leaves, flowers, fruits and seeds.
- Although main parts of a plant usually perform one specific function, sometimes they are adapted for several other functions.
- A vast variation can be seen among main parts of the plants.
- Flowering plants can be divided into two groups as monocotyledonous (monocot) plants and dicotyledonous (dicot) plants.

### Exercise

1. The table below indicate several kinds of plants with numbers identified by a group of students in a field trip to a forest.

Name of the plant	'Kitul'	Cashew	'Dan' 'Naval'	'Kottamba'	'Beduru'	Cycas	'Madu wel'	Mimosa
Number of plant	2	3	4	4	2	1	10	12

- II. Display the data in a bar chart.
- III. What is the most abundant plant found in this forest?
- IV. Name a plant/plants in the above forest, that found with these features
  - (a) A weak stem
  - (b) An unbranched stem
  - (c) No flower
  - (d) A fibrous root system
  - (e) Compound leaves
  - (f) Fruits with fibrous outer layer
  - (g) Having nodules

- V.
- (A) Select a monocotyledonous and a dicotyledonous plant out of the plants given above.
- (B) Write one major difference of (a) leaves (b) Stem(c) roots and (d) seeds of above two plants.

	Te	echnical Term	S	
Monocotyledonous	-	ඒකබීජපතී ශාක	-	ஒரு வித்திலைத்
5				தாவரம்
Dicotyledonous	-	ද්වීබීජපතීු ශාක	-	இருவத்திலைத
Flowering plants	-	සපුෂ්ප ශාක	-	தாவரம பூக்கும் தாவரங்கள்
Non Flowering	-	අපුෂ්ප ශාක	-	பூக்காத் தாவரங்கள்
plants				
Gynoecium	-	ජායාංගය	-	பெண்ணகம்
Androecium	-	පුමංගය	-	ஆணகம்
Petals	-	දලපතු	-	அல்லிகள்
Corolla	-	මුකුටය	-	அல்லி வட்டம்
Sepals	-	මණිපතු	-	புல்லிகள்
Stigma	-	කලංකය	-	குறி
Style	-	කීලය	-	தம்பம்
Ovary	-	ඩිම්බ කෝෂය	-	சூலகம்
Venation	-	තාරටි	-	நரம்பமைப்பு
դ		විනාාසය		