Notes

# 32

# FLORICULTURE, MUSHROOM CULTURE AND HYDROPONICS

Advances in agricultural practices have led to the introduction of many new methods in raising different kinds of plants. Floriculture, mushroom culture and hydroponics are few of these techniques which increase the commercial value of flowers, mushrooms and other plant products. In this lesson you will learn about these three methods.

## OBJECTIVES

After completing this lessons, you will be able to :

- *identify different types of ornamental plants;*
- *classify ornamental plants into different categories;*
- *explain the difference between flowering and foliage shrubs and the methods of raising them;*
- *classify different types of trees, climbers and bulbous plants with few examples of each;*
- *mention the ways by which indoor plants can help to decorate our homes and the techniques of growing them;*
- *explain the importance of indoor decorative plants with examples;*
- *list some facts about designing a home garden;*
- *list the steps of mushroom culture;*
- *define hydroponics, explain its methods and its limitations.*

## 32.1 FLORICULTURE

**Floriculture is the study of different types of ornamental plants and their cultivation**. It also includes propagating, growing and marketing of all kinds of



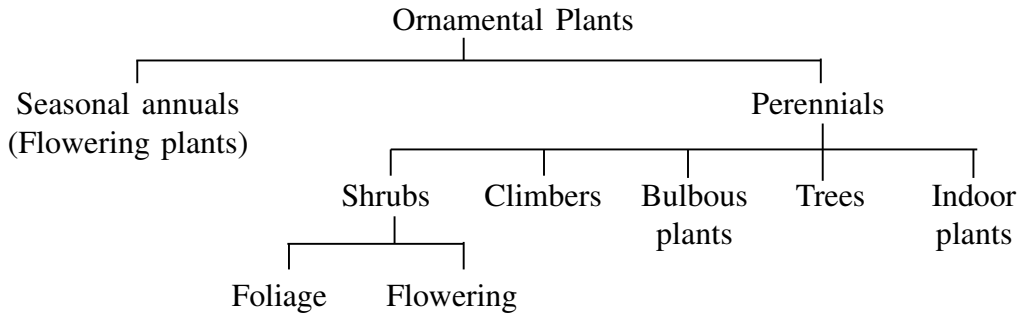
flowers, flower seeds and seedlings, growing bulbs, nursery operations, chemical protection of plants, post harvest storage and handling and use of preservatives.

## 32.2. ORNAMENTAL PLANTS

What are ornamental plants?

Ornamental plants are the cultivated plants.

Ornamental plants, both flowering and non-flowering may be classified as below:




Most seeds are sown in suitably prepared seed pans or seed beds and the seedlings transplanted to the main beds at the proper stage. However, the seeds of some plants like Larkspur, Lupins and Californian poppy have delicate roots and are sown directly into small pots.

Some flowering plants are given below in Table 32.1

**Table : 32.1** The time and type of soil for growing certain flowering plants

| Soil | Climate/Season | Name |
|---|---|---|
| Porous, fairly deep well drained, rich and loamy soils | Seeds may be sown in February-March | *Portulaca* |
| Porous, fairly deep, well drained, rich and loamy soils | Seeds may be sown in February- March | *Zinnia,* Lady's *face* |
| Porous, fairly deep, well drained, rich and loamy soils | Seeds may be sown in September-October | Larkspur Sunflower Marigold |
| Porous, fairly deep, well drained, rich and loamy soils | Seeds may be sown in September- October | *Petunia, Phlox, Salvia* |

**Uses of flowers**

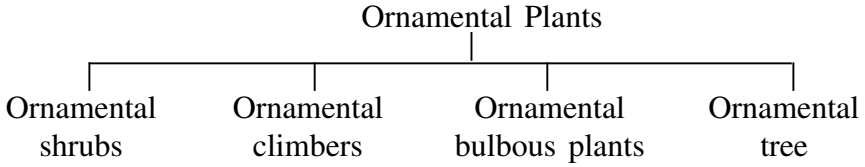
(i) They impart colour and beauty to the garden within a short time.

(ii) They are grown in pots and soil beds to decorate our homes.

(iii) Flowers are used for making bouquets, flower arrangements, on festive occasions and for interior decoration.

(iv) Flowers are also used for personal adornment by ladies and for religious and ceremonial offerings.

### 32.2.1 Types of Ornamental Plants




**1. Ornamental Shrubs**

Shrubs may bear either flowers or beautiful foliage. They are perennial and they live for many years. Foliage shrubs have coloured or attractive leaves and may be evergreen or deciduous. Flowering shrubs are grown for their beautiful flowers. Some examples of foliage shrubs are mehndi, croton, Acalypha and jasmine.

**Soil and climate requirements for cultivated shrubs**

The soil should be rich, well drained and fairly deep. The sub-soil should be free from hard substratum and be able to retain moisture. Shrubs are tropical, subtropical and temperate plants.

**Uses of shrubs**

(i) Shrubs are mainly used for garden decoration and various types of landscape work.

(ii) They can be used for developing hedges around the garden.

(iii) They are sometimes used for covering ugly sites like manure pits, potting sheds etc.

**2. Ornamental climbers**

Climbers are plants which have special structures (tendrils, thorns etc.) to climb on a support. These add beauty to the garden due to attractive flowers or foliage.

**3. Ornamental bulbous plants**

The word **bulb** includes underground modified stems e.g. corms, tubers. On growing they give attractive coloured flowers e.g. Lilies, Dahlia, Canna, Gladiolus. Some examples of bulbous ornamentals grown for their attractive leaves are money plant, Colocasia, *Monstera* and Ferns.

**4. Ornamental trees**

Ornamental trees are the most important perennial hardy plants with a single straight stem. They are grown in gardens, parks and on the roadside to provide shade and beauty and to create a good landscape.

Trees are classified as flowering trees, foliage trees (evergreen and deciduous) shady trees with a dense foliage and medicinal trees which are used to provide medicines from their various parts.

Some examples of ornamental flowering trees are Gulmohar, Amaltas, Silk cotton tree and *Acacia*.

## INTEXT QUESTIONS 32.1

1. Differentiate between foliage and flowering shrubs.

   .....

2. Classify the following shrubs into foliage and flowering types:

   Mehndi, Crotons, Jasmine, Acalypha,

   (i) .....

   (ii) .....

3. The names of some bulbous plants bearing pretty flowers and those bearing attractive leaves are given below. Separate them into their respective groups.

   *Iris*, *Caladium, Gladiolus, Monstera, Ferns.*

   .....

4. Mention the main method by which bulbous plants can be propagated.

   .....

## 32.3. INDOOR PLANTS

**Indoor plants** are those plants, which thrive in the living room of a house under normal conditions of light and humidity.

Plants are grown indoors because:

(i) Indoor plants are never out of season.

(ii) They are especially useful in places where people live such as in condominiums or flats that may not have space for gardens.

(iii) They provide charm and beauty to the house and add to the interior setting.

### 32.3.1 Different types of indoor plants are:

(i) **Foliage plants** with green or variegated leaves in different shapes e.g. *Asparagus*, *Tradescantia*.

(ii) **Ferns** which are attractive, non-flowering and shade loving e.g. Maiden hair fern, Silver fern, etc.

(iii) **Palms** with a single stem and large leaves suitable for growing in large rooms or halls e.g. Dwarf palm, Pygmy date palm.

(iv) **Cacti and succulents** are plants with thick fleshy leaves or stem, which store water. They are of various forms, shapes and sizes and bear attractive flowers e.g. Cacti like *Opuntia*, *Epiphyllum* and succulents like, *Bryophyllum* and *Euphorbia*.

(v) **Bonsai** are dwarf adult plants grown in shallow pans which add to the decor of drawing rooms and are grown by a special technique.

**Fig. 32.1** Indoor plants

### 32.3.2 Terrariums

**Terrariums** are set up in glass cases like that of an aquarium, and using different types of plants. They add beauty and variety to the internal decor. Common techniques for propagating indoor plants are cuttage, layerage and budding.

When there is no space for growing plants in the ground, plants are grown in pots. Also ornamental foliage plants and some other indoor plants are normally grown in pots of different types e.g**.** earthen, metallic, plastic, wooden or cement.

## INTEXT QUESTIONS 32.2

1. What are the different types of indoor plants?

   .....

2. Why are plants grown indoors?

   .....

3. Name different types of pots which are used for cultivating various ornamental plants?

   .....

4. What is a terrarium?

   .....

## 32.4 DESIGNING A HOME GARDEN

A garden in a home not only adds to its beauty but also increases its real estate value. The following points may help in designing a home garden. It can be changed according to the plant and size available.

1. It is essential to have variety in colour, size and type of plants.
2. It should be properly maintained with the hedges trimmed, lawn properly mowed and the flowerbeds regularly weeded.
3. In the small home garden seasonal vegetables can be grown to raise a kitchen graden which can provide vegetables for every day use.

## 32.5. MUSHROOM CULTURE

### 32.5.1 Mushroom

Mushroom is fleshy fungus belonging to the **kingdom Fungi**. They first appear as white tiny balls consisting of a short stem and a cap, which opens like an umbrella later. They cannot prepare their food themselves due to lack of chlorophyll. There is a large number of mushroom species some growing wild, and some are edible species.

The five most important cultivated mushrooms are :

1. Shutake mushroom (*Lentinus edodes*)
2. Winter mushroom (*Flammillina velutipes*)
3. White button mushroom (*Agaricus bisporus*)
4. Paddy straw mushroom (*Volvariella volvaceae*)
5. Oyster mushroom (*Pleurotus-sajol-caju*)

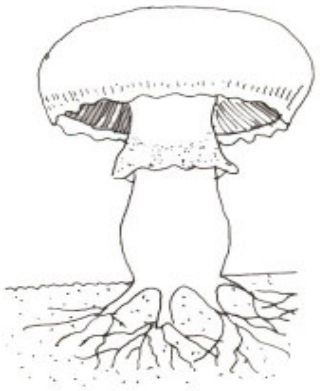


**Fig. 32.2** A mushroom

In India three types of mushrooms are found. They are white button mushroom, paddy straw mushroom and oyster mushroom (Fig. 32.2). In north India, the climate conditions prevailing, different seasons can be exploited for growing mushrooms throughout the year as follows :

**Mid- November to mid- March : White button mushrooms**
**February to mid-November : Paddy straw mushrooms**
**September to November : Oyster mushrooms**

### 32.5.2 Importance of Mushrooms

1. They are good source of high quality proteins and are rich in vitamins and minerals. Mushroom contains 20-33% proteins. They contain good amount of vitamin C and B complex, potassium, phosphorus and sodium.
2. They have medicinal properties. For example-mushroom extracts have a high amount of retene that has an antagonistic effect on some forms of tumours.
3. Mushrooms are capable of agrowaste degradation. Mushroom is grown on organic substances either raw or composted. They are mostly waste materials from farms, plantations or factories. Useless by-products can be recycled as a medium to grow mushroom for human consumption. This also helps to reduce environmental pollution.

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4. Mushrooms have a huge export potential.

5. Mushroom grows independent of sunlight without fertile land.

6. Mushroom-cultivation is a woman-friendly operation. Women in farming system contribute a high percentage of the labour in the field especially in developed countries. It is one agricultural activity in which women can play an important role without sacrificing their household responsibilities.

### 32.5.3 Steps to be followed in the Cultivation of Mushrooms

The use of mushrooms as human food dates back to time immemorial. Today with the development of better technologies and greater realisation of their nutritive value, mushrooms have come to occupy an important place in the diet of people in several parts of the world including India. It is therefore necessary to have knowledge of growing mushrooms.

Since the **white-button mushroom (*Agaricus bisporous*)** is popular mushroom, its method of cultivation is discussed here.

**Requirement for its cultivation**

The optimum temperature for vegetative growth i.e. spread of the mycelium is 22° to 25°C and for the reproductive stage is 14° to 18°C. The following steps are required to be followed:

(a) Composting (b) Spawning (c) Casing

(d) Cropping and harvesting (e) Preservation

**(a) Composting**

Compost is prepared by mixing wheat or paddy straw, chicken manure with a number of organic and inorganic fertilizers in fixed proportions. The compost is kept at a high temperature (Approximately 50°C) for one week and then mushrooms are cultivated on it.

**(b) Spawning**

This is the process of introducing the spawn, which is the "mushroom seed", into the compost. Spawn is merely the vegetative mycelium from a selected mushroom species grown in a convenient medium. The success of mushroom cultivation and its yield depends to a large extent on the purity and quality of the spawn used. The amount of spawn used should be sufficient to help rapid and vigorous coverage of the beds with the organism.

**(c) Casing**

Casing means covering the compost with a thin layer of soil or soil-like material after the spawn has spread in the compost. It gives support to the mushroom,



provides humidity, prevents quick drying of the spawned compost and thus help in better growth of the spawn. Casing also helps to regulate the temperature.

**(d) Cropping and harvesting**

The arrangement is made for maintaining circulation of fresh air around the beds. Temperatures have to be kept low to prevent growth of pests and diseases and regular spraying of insecticides is also required to be done for the same purpose. It generally takes 7 to 8 days to come to the button stage from the first appearance of the formation of a pinhead.

**(e) Preservation**

Mushrooms, like fruits and vegetables are perishable and require a great deal of attention during storage, marketing and processing at the post harvest stage. Discolouration, weight and flavour loss are some of the problems.

The following methods are used to increase their shelf life:

(i) Vaccuum cooling

(ii) keeping in a controlled atmosphere consisting of 9 percent oxygen and 25 percent carbon dioxide.

(iii) giving gamma radiation and storing at 15°C

(iv) freeze drying in a solution of brine, citric acid and ascorbic acid and dehydration.

(v) Canning

## INTEXT QUESTIONS 32.3

1. Mention three advantages of mushroom cultivation.

   .....

2. Name the species found in India.

   .....

3. How can be preserve cultivated mashrooms for a long time?

   .....

4. List the main steps in mushroom cultivation

   .....

## 32.6 HYDROPONICS

The development of hydroponics has not been rapid although this technology is almost 1500 years old.

***Hydroponics is a techniques for growing plants in nutrient solution (water with fertilizers) with or without the use of an artificial medium (sand, gravel, peatmoss, coir or saw dust ) to provide mechanical support.***

Hydroponics involves growing plants in containers filled with water or with coarse sand, gravel or other materials, to which nutrients have been added. The containers are made of glass, metal or plastic. They range in size from small pots for individual plants to huge tanks for large scale growing.

Plants growing without soil require the same amount of light and warmth that they would if they were growing in soil. Growers who use hydroponics indoors provide a source of light and heat.

### 32.6.1 Methods of growing plants through hydroponics

There are two main methods of growing plants without soil. They are water culture and aggregate culture.

**(i) Water Culture** (Fig. 32.3)

In water culture, plants are suspended with their roots submerged in water that contains plant nutrients. The roots absorb water and nutrients, but do not perform the anchoring function. Therefore, the plants must be mechanically supported from above. Air must be regularly pumped or mixed into the nutrient solution.

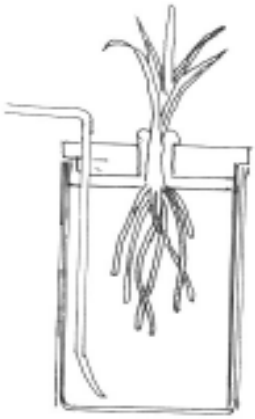

**Fig. 32.3** Hydroponics

**Culture Solution**

There are different kinds of nutrient solutions. A basic solution might contain:

3.4 kg - Potassium nitrate
0.65 kg - Ammonium Sulphate
2.65 kg - Magnesium Sulphate
1.05 kg - Monocalcium Phosphate
3.0 kg - Calcium Sulphate

Mixed together in 5000 litres of water

Once the solution is in the tank, 5 litres of water containing 37 grams of manganous sulphate and 4 to 6 drops of concentrated sulphuric acid should be added to each 5000 litres of solution once a month. In addition, 150 grams of ferrous sulphate in 5 litres of water should be added once a week.

**(ii) Aggregate Culture**

In aggregate culture although plants are grown without soil, the roots not only absorb water and nutrients, but also anchor the plant. Instead of being placed directly in a water and nutrient solution, the roots are placed in a substrate material, such as coarse sand, gravel, peat etc. A nutrient solution is then repeatedly applied to the substrate material. The solution is either pumped up from below the roots or trickled down from above.



### 32.6.2 Importance of hydroponics

Growing plants without soil is an effective way to study the needs of plants. By varying the amounts of nutrients, we can find the best ratio of nutrients for successful growth of the plant.

It is suggested that hydroponics can be used for commercial crop production. In places where soil is not available, such as on ships at sea, deserts and in covered Arctic areas, hydroponics is an effective alternative.

Hydroponics is used in large-scale cultivation of flowers and vegetables. The yield is the same as for soil-grown plants and the technique saves time by automatically watering and fertilizing the crop.

## INTEXT QUESTIONS 32.4

1. Define Hydroponics

   .....

2. State the two methods of growing plants without soil.

   .....

3. Why does air have to be constantly pumped into the nutrient solution? Give reasons for your answer.

   .....

4. What will happen, when plants grown in a nutrient solution have to be mechanically supported from above?

   .....

## WHAT YOU HAVE LEARNT

- Floriculture is the study of different types of ornamental plants and their cultivation.
- There are different types of ornamental plants like seasonal annuals, flowering and foliage shrubs, ornamental trees, climbers, bulbous and indoor plants.
- Seasonal annuals are grouped according to the season of their growth and flowering into summer, winter and rainy season annuals.
- Ornamental shrubs are both of the flowering and foliage types.
- Indoor plants are used to decorate our homes.
- A home garden (kitchen garden) adds beauty to the house. It has to be carefully designed.

- The five species of mushrooms cultivated in India are white button mushroom, paddy straw mushroom,oyster mushroom, shutake mushroom, and water mushroom.
- The main steps in mushroom cultivation are composting, spawning, casing, cropping and harvesting.
- Hydroponics is the method of growing plants without soil.
- Two methods of growing plants without soil are water culture and aggregate culture.
- The nutrient solution contains nitrates, sulphates, phosphates of potassium, magnesium, calcium, manganese and iron dissolved in water.
- Air has to be constantly pumped into the solution.
- Hydroponics is used for commercial production of crops, vegetables and flowers in places where soil is not available.

## TERMINAL EXERCISES

1. What is meant by Floriculture?
2. Define the technique of Hydropnics.
3. What is the importance of flowers in our daily life?
4. List the different techniques used to propagate indoor plants.
5. Which important points would you bear in mind while designing a home garden?
6. What are the advantages of Mushroom Cultivation?
7. Which are the methods used to increase the shelf life of mushrooms?
8. Explain the terms composting and spawning.
9. Give the composition of a basic nutrient solution used in hydroponics.
10. Distinguish between:
    (i) Water culture and aggregate culture
    (ii) Seasonal plants and perennial plants
    (iii) Ferns and palms
    (iv) Casing and spawning
11. List three varieties of mushroom found in India.
12. Give two examples of different types of ornamental plants
13. Describe the required various steps for mushroom culture.
14. Explain in brief about the importance of hydroponics.

## ANSWER TO INTEXT QUESTIONS

**32.1** 1. Foliage shrubs are grown for their decorative leaves while flowering shrubs are grown for their beautiful flowers.

2. Foliage Shrubs – Mehndi, croton, acalypha

   Flowering Shrubs – Jasmine

3. Bulbous foliage plants – *Colocasia, Caladium, Monstera*, Ferns.

   Bulbous flowering plants – *Iris, Gladiolus*, Tulip, Narcissus

4. Bulbous plants can be propagated through offsets, corms, fragments and bulbils.

**32.2** 1. Different types of indoor plants are foliage plants, ferns palms, cacti, flowering plants and bonsai.

2. Plants are grown indoors to decorate our homes specially the flats where there is no space for an outdoor garden.

3. Earthworm, metallic, plastic, wooden or cement.

4. Set up of glass case for growing plants.

**32.3** 1. (i) Mushrooms are richer in proteins, vitamins and minerals than most other vegetables.

   (ii) Mushrooms help to reduce weight.

   (iii) Mushroom cultivation opens new avenues for employment.

2. (i) White button, mushroom.

   (ii) Paddy straw mushrooms

   (iii) Oyster mushroom

3. see text

4. Composting, spawning, casing, cropping and harvesting.

**32.4** 1. Hydroponics is the science of growing plants without soil.

2. Water culture and aggregate culture.

3. Air has to be constantly pumped into the nutrient solution because roots for respiration require oxygen.

4. Plants grown in nutrient solution have to be mechanically supported from above because their roots are unable to provide anchor to them as the medium is a liquid.