

# FUNDAMENTALS OF HORTICULTURE

## UNIT I

The term Horticulture is derived from the Latin words: “hortus” meaning garden and “cultura” meaning cultivation. At present the horticulture may be defined as the science and technique of production, processing and merchandizing of fruits, vegetables, flowers, spices, plantations, medicinal and aromatic plants.

**Definition**-horticulture is a science ,technique and art .it is a branch of agriculture ,deals with the cultivation ,processing and marketing of fruits ,vegetable and ornamental plants ,medicinal aromatic plants and spices.it includes their nurseries also.

### **Branches of Horticulture:**

The following are the branches of horticulture. .

1. Pomology: refers to cultivation of fruit crops.
2. Olericulture: refers to cultivation of vegetables.
3. Floriculture: refers to cultivation of flower crops.
4. Plantation crops: refers to cultivation of crops like coconut, arecanut, rubber, coffee, tea etc.
5. Spices crops: refers to cultivation of crops like, cardamom, pepper, nutmeg etc.
6. Medicinal and aromatic crops: deals with cultivation of medicinal and aromatic crops.
7. Post harvest technology: deals with post harvest handling, grading, packaging, storage, processing, value addition, marketing etc. of horticulture crops.

**Major fruit growing states are-**

Maharashtra,A.P.,Tamilnadu,Karnataka,Gujrat,U.P,J&K.

**Total fruit production 98.5thousand Metric tonn from the area of 66.4thousand hectare(2018-19)-sourceNHB.org**

**Major vegetable growing states are-**

w.bengal,U.P.,M.P.,Bihar,odisha

**Total veg. production 185.8 Thousand metric tonn from the area of101 thousand hectare.(2018-19)source NHB.org**

### **Importance of horticulture**

**1.Nutritional value-**fruits and vegetables are very rich in vitamins and minerals so they are known as “Protective food”.ICMR recommended 120 g fruitsb and 280 g of vegetable per day per capita.

#### **i)vitamin A**

Mango-vit A -4800 IU/100g

Papaya- Vit A-2020I U/100g

Fenugreek leaves-6450IU/100g

Carrot-2810 IU/100g

#### **ii)vitamin B1**

CASHEWNUT-630mg/100g

Walnut-450mg/100g

Apricot-217mg/100g

### **iii)Vit B2-**

bael-1.19 mg/100g

Fenugreek leaves.31 mg/100 g

### **iv)Vit c-**

Barbedos cherry-1000-4000mg/100g

Aonla-600 mg/100g

Guava-299 mg/100g

### **v)Protein**

Cashew-21.20%

Almond 20%

Walnut-15.60%

### **vi)Fat**

Walnut-64.50%

Almond-58.90%

Carbohydrate

Apricot-72.81%

Datepalm-67.30

Karonda-67.10 %

## **2.Food value-**

Banana,potato,sweet potato, are very rich in carbohydrate.almond ,cashew ,walnut are having rich calorific value.fruits and v egetables enhance the nutritive value of our food with carbohydrates,essential minerals,vitamins and fibres.

**3. Industrial development**-plantation crops like tea, coffee ,coconut, rubber are always used after processing.these plants have good marketing value. rose,

jasmine and different kind of flowers used in perfumery industries .Medicinal plants are used for essential oils and pharmaceutical industries.

**4.Employment generation**-horticultural crops are labour intensive..one hectare fruit production generates 860 manpower per annum.grapes ,banana, mango, pineapple tea, coffee, coconut generate much larger employment.

**5.Asthetic value**- Flowering trees,ornamental shrubs,grasses,avenue trees like ashoka,gulmohar,cassia fistula,silver oak,casurina are symbols of life and youth.flowers like rose,marigold,jasmine,carnation,chrysanthemum are enhance the beauty of environment and beautify the place.mango,litchi,sapota can be planted as avenue tree,these trees gives asthetic and peaceful sense to our mind and body.

**6.Religious value**-plant parts like leaves of mango,banana,bael have religious value.these leaves are used as bandanwars and as offering to lord Shiva.leaves ,twigs,branches are used for different relious ceremonies.many fruits bael,coconut,mango guava,are used as offering purpose.

**7.Export value**-among fresh fruits mango,grapes,dates and amon g vegetables onion,potato,tomatohaving good export value.among plantation crops tea ,coffee,rubber,,coconut,arecanut.in medicinal plants turmeric are used for export purpose and they fetch high income return .mainly export of commodities from india is done withGulf countries,UAE,European countries.india ranks first in the productivity of grapes,banana and papaya.india is at 2<sup>nd</sup> position in production of brinjal,cabbage,cauliflower,onion.

## Scope of Horticulture

### (a) Incentives

The biggest incentive for the farmer is money and horticultural crops provide more returns in terms of per unit area production, export value, value addition compared to agricultural crops.

b) **Adaptability**: India is bestowed with a great variety of climatic and edaphic conditions as we have climates varying from tropical, subtropical, temperate. Likewise we have soils like loam, alluvial, sandy etc. and thus a large number of crops can be accommodated with very high level of adaptability.

c) **Necessity**: After having achieved self-sufficiency in food, nutritional security for the people of the country has become the priority. Indians are basically

vegetarians, and to meet their nutritional requirement in terms of vitamins and minerals horticulture crops

**d) wasteland had to be utilized** where cultivation of annuals is under restricted root zone and their used to cultivate hardy horticultural crops like fruits and medicinal plants

e) **International trade** of horticultural commodities is less than one per cent of total trade. Moreover, these commodities (spices, coffee, tea) fetch 10-20 times more foreign exchange per unit weight than cereals

f) **To improve the economic conditions** of the farmers and to engage more labourers to rectify the problem of unemployment.

## Horticultural Zones of India

The Indian subcontinent is bestowed with a great variety of climate and soil conditions. Broadly the country can be divided into tropical, subtropical and temperate regions

(i) **Temperate:** Kashmir, Himachal Pradesh, North Uttaranchal, Sikkim and part of Arunachal Pradesh.

(ii) **N. W. Subtropical:** Punjab, Haryana, Rajasthan, Central Uttar Pradesh and North M.P.

(iii) **N. E. Subtropical:** Bihar, Jharkhand, Assam, Meghalaya, Nagaland, Manipur.

(iv) **Central tropical:** South Madhya Pradesh, Chattisgarh, Gujarat, Maharashtra, Orissa and West Bengal.

(v) **Southern tropical:** Karnataka, Andhra Pradesh and Tamil Nadu.

(vi) **Coastal tropical humid:** Konkan, Goa, Kerala, Western Ghats, Eastern Ghats in Tamil Nadu, Andhra Pradesh and Orissa.

## **Agroclimatic zones of India**

1. Western Himalayan Region: This zone consists of Punjab and Haryana, Union Territories of Delhi and Chandigarh and Sriganganagar .
2. Eastern Himalayan Region: Sikkim and Darjeeling hills, Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Tripura, Mizoram, Assam and Jalpaiguri and West Bengal fall under this region, having high rainfall and high forest cover
3. Lower Gangetic Plains: The West Bengal – Lower Gangetic Plains region consists of four sub-regions.
- 4 Middle Gangetic Plains: This zone consists of 12 districts of eastern Uttar Pradesh and 27 districts of Bihar plains.
5. Upper Gangetic Plains: This zone consists of 32 districts of Uttar Pradesh divided into three sub-zones of Central, North- West and South –West U.P6.
6. Trans-Gangetic Plains: This zone consists of Punjab and Haryana, Union Territories of Delhi and Chandigarh
7. Eastern Plateau and Hills: The eastern Plateau and Hills region consists of the following Sub-region of Wainganga, Madhya Pradesh
8. Central Plateau and Hills: This zone comprises of 46 districts of Madhya Pradesh, Uttar Pradesh and Rajasthan.
9. Western Plateau and Hills: This zone comprises of major parts of Maharashtra, parts of Madhya Pradesh
10. Southern Plateau and Hills: This zone comprises of 35 districts of Andhra Pradesh, Karnataka, and Tamil Nadu.
11. East Coast Plains and Hills: This zone consists of Orissa coastal, North Coastal Andhra and Ganjam, South Coastal Andhra
12. West Coast Plains and Ghats: This zone runs along the west coast, covering parts of Tamil Nadu, Kerala, Karnataka, Maharashtra and Goa

13. Gujarat Plains and Hills: This zone consists of 19 districts of Gujarat

14. Western Dry Region: This region comprises of nine districts of Rajasthan

15. Islands Region: This zone covers the island territories of the Andaman and Nicobar and Lakshadweep

## UNIT II

### METHODS OF PROPAGATION OF HORTICULTURAL CROPS

Propagation of Fruit Plants Propagation is an art and science of multiplication of plants.

The fruit plants are propagated both by sexual and asexual methods and micropropagation

. **A. Sexual Propagation** Sexual propagation is the raising of plants by means of seed, which is formed by the fusion of male and female gametes within the ovule of a flower. plants are produced from seeds are called seedlings. Papaya, phalsa and mangosteen

Advantages of sexual propagation

- 1 .Seedling trees are generally long-lived, bear more heavily .
- 2 . This is the only means of reproduction, where asexual propagation is not possible or economical, e.g., papaya, phalsa, mangosteen etc.
- 3 .Polyembryonic character exists in many fruit plants such as in some citrus species and some mango varieties and give rise to more than one seedling from one seed.

**B. Asexual Propagation-** Propagation of plants through any vegetative parts is called vegetative or asexual propagation

Advantages of asexual propagation

1. Vegetatively propagated fruit plants are true-to-type, uniform in growth, yielding capacity and fruit quality.
2. Vegetatively propagated fruit plants come into bearing earlier.
3. Uniformity in fruit quality makes harvesting and marketing easy.
4. Modifying influence of rootstock on scion can be profitably availed off.
5. It is possible to regulate the tree size, fruit quality, precocity etc., according to one's requirements by using different rootstocks.

**Dormancy** : The dormancy in seeds may be due to hard seed coat, impermeability to water and gases, physiological immaturity of embryo, deficiency of some endogenous growth promoters or excess of endogenous growth inhibitors.

Different methods like stratification, scarification and chemical treatment are used for breaking dormancy in seed to improve germination.

- **Stratification** consists of keeping seeds at low temperature (around 7degree C) by placing them in alternate layers of moist sand.
- **Scarification**, the seeds are either treated with concentrated acid (acid scarification) or the seed coat is weakened mechanically, so as to make it permeable to water and gasses.
- **Chemical treatment**- seeds can be pre-treated with some chemicals like thiourea or potassium nitrate to improve seed germination. Soaking seeds in water also overcome seed dormancy.

### **Methods of vegetative propagation**

There are different methods, which can be used for commercial multiplication of various fruit plants. These include cutting, layering, budding and grafting.

**Cuttings** It is the method of propagating fruit plants in which the part of a plant (generally stem) having at least few buds, when detached from parent plant and placed under favourable conditions develop into a complete plant The shoots of about one-year-old or more can easily be used for preparing hardwood cuttings.eg. grape, pomegranate, phalsa ,

baramasi lemon, the cuttings can be prepared during the spring (February - March) and rainy season (August-September)

**Layering** Layering is a method of vegetative propagation, in which roots are induced on the shoots while they are still attached to the mother plants.

1. **Air layering** The rooting is forced on the shoot itself when it is still attached to the mother plant. In this method, one year old, healthy and straight shoot is selected and ring of bark measuring about 2.5 cm just below a bud is removed. Moist sphagnum moss is placed around this portion and is wrapped with a polythene strip. Air layering can be practiced during February-March and July-August in guava, litchi, sapota, lemon, loquat etc. After few weeks, the roots are developed

2. **Ground layering** : In this method, a branch of plant, which is near the ground, is chosen and a ring of bark about 2.5 cm diameter is removed just below the bud. This branch is then bended and buried in soil when still attached to the mother plant. The soil is regularly watered to keep it moist. Within a few weeks, the roots are formed and new plant is separated from the mother. This method is also known as stool layering and is used for propagation of guava and apple .lemon rootstocks.

## **Budding**

Budding is a method in which only one bud is inserted in the rootstock. This is the most common method of propagation of citrus. This method is very easy and fast. Eg ber, aonla, rose etc.

1. T budding 2. Patch Budding 3. Chip Budding 4, ring budding

## **Grafting**

Grafting is another method of vegetative propagation, where two plant parts are joined together in such a manner that they unite and continue their growth as one plant. Grafting is commonly done in pear, peach, plum, almond, mango etc

1. Tongue Grafting
2. Cleft grafting
3. Approach Grafting
4. Side Grafting
5. veneer grafting

### **Propagation through specialized organs**

**1. Runners :** A runner is a specialized stem that develops from the axil of a leaf at the crown of a plant. It grows horizontally along the ground and forms a new plant

**2. Suckers :** A shoot arising on an old stem or underground part of the stem is known as suckers. In other words, a sucker is a shoot, which arises on a plant below the ground.

**Micropropagation** Propagation of plants under aseptic and controlled conditions of environment and nutrition under lab conditions is called as micropropagation. The technique has been referred as micropropagation because the size of the tissue in culture is very minute as compared to conventional vegetative cutting or any other plant part.

There are four main stages involved in micropropagation of plants, such as .

1) Explant establishment- The establishment of explant depends on several factors such as the source of explant/ genotype, type of explant such as leaf, root, stem from mature or immature plants/seedlings, explant sterilization, the in vitro culture conditions such as culture media, composition, temperature, humidity, light etc. The explants showing growth are considered established.

2) Shoot multiplication- The established explants are subcultured after 2-3 weeks, on shoot multiplication medium. The medium is designed in such a way to avoid the formation of callus, which is undesirable for true-to-type multiplication of plants. Thus, careful use of auxins like NAA, 2,4-D and cytokinins like BAP, kinetin is done in culture medium.

3) Rooting of shoots- The in vitro regenerated shoots are rooted in the medium containing auxins like NAA, IBA. The rooting can also be induced when in vitro shoots are exposed to stress conditions.

4) Hardening and transfer to soil/ field- The in vitro plantlets thus obtained are hardened/ acclimatized before transfer to the field .