

6. Nursery Management

6.1 INTRODUCTION TO NURSERY



Can you recall?

1. What is meant by plant propagation?
2. Do you know the difference between plant propagation and natural reproduction?

6.1.1 Definition : A nursery is a place where plants are propagated and grown to a desired age for transplanting in main fields or for sale.

A nursery is the place where young plants are raised and taken care of until they reach the right size for transplanting.

It includes retail nurseries which sell their plants to the general public, while the wholesale nurseries which sell the plant only to businesses such as other nurseries and to commercial gardens, and private nurseries which supply the needs of institutions or private estates.



Do you know ?

1. Nursery activities.
2. Propagation media.
3. Propagation structures.

Vegetable growers, floriculturists, foresters, orchardists and various plant growers largely depends on the availability of nursery plants in nearby market but such plants may be raised without much care and less attention given towards genetic purity. The main aim of the nursery owner is to earn profit and hence the plant material raised is mostly of average quality. Many growers and producers have gained awareness about quality and it has opened the field of nursery management for profit and production of quality plants.

Nursery management includes raising and selling of nursery plants which is an art and a skill. It needs experience, practice, foresight and technical knowledge about nurseries.

Nurseries may supply plants for raising gardens, for planting in agriculture fields,

for forest purposes and for conservational biology.

6.1.2 Objectives of a nursery :

- To raise healthy and disease free parent material (seedlings/plants).
- To distribute plant material in masses who have little knowledge about the techniques of raising plants.
- To introduce exotic species.
- Planting of nursery grown seedlings is the assured method of developing poor and barren sites.
- Replacement of casualties.



Remember this

In general, plant reproduce to maintain their identity which is the law of nature but the nurserymen multiply plant material for earning money as those plants have the following uses:

- Food material like fruits, vegetables, cereals, roots, tubers, bulbs, etc.
- Fibres like jute, flax, cotton, etc.
- Fuel and timber
- Medicines
- Beautification and landscaping
- Soil covering to check, avoid or minimize erosion
- Improving the ecological balance.

6.1.3 Importance : Establishment of nurseries is important for following advantages

1. **Purity** – Purity of the plant in respect of species and variety is very important. Valuable and precious material, cross-bred or imported plant material need to be grown in a nursery. It requires strict supervision, use of certain techniques for maintaining purity which is possible in reliable nurseries.
2. **Surety** – Assurance about the genuineness (purity) of the plants is very essential. Quality of the nursery produce can be

maintained by controlling all the activities in standardized manner.

3. **Quality** - Nursery grower has full control over the quality of the plant material raised so far as the requirements of various categories and classes are concerned.
4. **Economy** – Nurseries provide genuine planting material at cheaper rate as all the inputs and technical know-how is readily available. If the requirement is small, it is economical to purchase from the big nursery and if the requirement is in large quantity one can produce those by himself.
5. **Easy availability** – To reduce cost on packing, carriage and transport, plants grown in own nursery are better. But to get specific planting material purchasing is done by commercial nurseries.
6. **Timely availability** – Number and type of plants needed at particular time and place can be met by nurseries.
7. **Freedom from diseases and insects** – Since plants are raised under strict supervision of the nursery grower, proper and timely treatment to control diseases and pest are possible in nurseries. Plants which are healthy during their early period of growth are usually more vigorous since they establish rapidly.
8. **Other benefits** – Proper utilization of land and farm resources are also possible. Nursery activities provide opportunities for employment. Production of seedlings in nursery provides sufficient time for preparation and cultivation of land.



Remember this

Types of medium used for propagation depends on the species and the materials available. The following common rooting media are generally used:

Water: Can be used for easily rooting species. Its disadvantage is the lack of aeration. Artificial aeration promotes rooting and impedes rotting.

Sand: The sand used should be fine enough to retain some moisture around the plant cuttings and coarse enough to allow free draining and aeration. The sand should be washed and sterilized before use.

Soil: Well aerated sandy loam soil is preferable. Due to the possible presence of Soil-borne diseases soil may need to be sterilized.

Peat moss: Used together with other materials in order to increase the water holding capacity.

Coconut husk: Widely used in humid tropical environments where it has the same use as peat moss.

Industry manufactured material such as vermiculite, perlite are used separately or in combination with some other rooting media. Their advantage is their lightness, cleanliness and high water holding capacity. Sphagnum moss, saw dust, charcoal powder are the examples of other media.

6.2 TYPES OF NURSERY

Nurseries may be classified according to the time, size of production and kind of material raised.

6.2.1 Types of nursery on the basis of period:

On the basis of period nurseries are classified as Temporary nursery and Permanent nursery -

a. Temporary nursery – This type of nursery lasts for a limited period or few months. In this type of nursery, plants are raised for a specific requirement for a shorter period of time. Vegetable seedlings, flower plant seedlings or forest plants are raised in such type of nursery with specific objectives.

This type of nursery is developed only to fulfill the requirements of the season or a targeted project. The nurseries for production of seedlings of transplanted vegetables and flower crops are of temporary nature. Likewise, temporary arrangement for growing forest seedlings for planting in particular area can also be done in temporary nursery.



Fig. 6.1 Temporary rice nursery

Features of temporary nursery :

1. It is constructed for a short period and in small size.
2. Intensive manuring and fertilization is not necessary in such a nursery as it is constructed at a site which is rich in humus.
3. As it is located near a planting site, the distance between the nursery and the actual planting site is minimum.
4. No major transportation is required.
5. Special supervision is not required in the maintenance of such a nursery.

Advantages :

1. Mortality or injury due to shock of uprooting and transportation of seedlings is negligible due to less distance between the nursery and actual planting site.
2. Initial investment in a temporary nursery is less as compared to a permanent one.

Limitations :

1. Basic facilities like irrigation may not be adequate.
2. Special arrangements need to be made in order to keep the plants and seedlings in healthy condition.

b. Permanent nursery – This type of nursery is established in permanent fields for longer period. In such type of nursery, production of plants is done year after year particularly to supply genuine planting material e.g. fruit nursery. These nurseries may be commercial nursery or small scale nursery. This type of the nursery is placed permanently so as to produce plants continuously. These nurseries have

all the permanent features. The permanent nursery has permanent mother plants. The work goes on continuously round the year in this nursery.



Fig.6.2 Permanent nursery

Features of permanent nursery :

1. It requires a large area and must be well connected by road.
2. Such type of nursery requires intensive management and supervision.
3. High initial cost is involved in the establishment of such a nursery.
4. Permanent nursery comprises office, store, mother blocks, nursery beds, protected structures, irrigation source, electricity, transportation facilities, packing yard, manure, cattle and machinery shed.

Advantages :

1. Greater range of planting stocks, such as seedlings, grafted plants, budded plants, layers, rooted cuttings, etc are available.
2. It becomes a perpetual source for the supply of planting material for many years.
3. As these are concentrated at one place, it's supervision and management is better due to the availability of permanent staff.
4. The initial production cost is reasonable but profit goes up in the long run.

Limitations :

1. The initial investment cost is high.
2. The transportation cost is more.
3. Such a nursery needs intensive labour management.

4. It must be backed by a large market for the sale of plants and seedlings.
5. It requires skilled human resource round the year.

6.2.2. Types of nursery on the basis of the kind of plant material raised :

On this basis the nurseries can be of following types

a. Fruit plant nursery : In this nursery, seedlings and grafts of fruit crops are developed. Fruit crops are mainly propagated vegetatively and need special techniques for propagations as well as maintenance. Mango, guava, pomegranate, sapota, oranges, etc. are propagated with vegetative method. Fruit nurseries are essential for production and maintenance of grafts as well as the mother plants of scions and rootstocks.



Fig. 6.3 Fruit nursery

b. Vegetable nursery : In this nursery seedlings of cauliflowers, cabbage, brinjal chilli, onion, tomato, etc. are prepared. All vegetables except few like potatoes, sweet potato, bulbous vegetables and some other are raised by seedlings. Very few vegetables are perennials like little gourd, drumsticks,



Fig. 6.4 Vegetable nursery

calocasia etc. Seedlings are to be produced on a large scale in a short period.

c. Flowering plants nursery : The seedlings of flowering plants like marigold, carnation, petunia, salvia, rose, chrysanthemum, coleus, aster, dianthus, etc. are developed in these nurseries. Ornamental and floricultural crops are numerous and are propagated vegetatively, like gladiolus, carnation, roses, lilies etc. There is a large group of ornamental plants. It is propagated by seeds and seedling; eg. asters, marigolds, salvias, etc.



Fig. 6.5 Ornamental and flower plant nursery

d. Forest nursery : The seedlings of plants useful for forestation like pine, oak, teak, eucalyptus, casurina, etc. are prepared and sold.



Fig. 6.6 Forest nursery

e. Miscellaneous nursery : In such type of nurseries, plants with great economic value, rare and medicinal, herbal plants are propagated. In this nursery plants like geranium, sandal wood, calendula, and bamboo are propagated.

f. Medicinal and aromatic plant nurseries
There is considerable increase in people adopting ayurvedic medicines which reflects

in more demand for medicinal plants, e.g. shatavari, alovera.



Fig. 6.7 Medicinal plant nursery



Do you know ?

Hi-Tech Nurseries: There is a sudden increase in the demand for certain commercial plants, e.g., tissue culture banana, gerbera and carnation, etc. It is not possible to fulfill this requirement by ordinary or common nursery practices. There is a necessity to have special techniques and methods to meet the demand and only hi-tech nurseries can satisfy this type of demand. These nurseries grow plants in greenhouse, glass house or a plastic tunnel, designed to protect young seedlings from harsh weather, while allowing access to light and ventilation. Modern greenhouses allow automated control of temperature, ventilation, light, watering and fertigation. Some also have fold-back roofs to allow "hardening-off" of plants without the need for manual transfer of plants to the outdoor beds (tissue culture plants) .

6.3 PLANNING AND LAYOUT OF NURSERY

6.3.1 Selection of site :

Following points are considered while selecting site for nursery :

- 1. Location :** A nursery must be located in a pollution-free environment away from brick kilns, smoke-emitting industries and rough motorised roads as dirt and dust settle on plants, covering the foliage, which not only reduces the photosynthetic efficiency of plants but also gives them a dull look. It

must be ensured that the nursery site gets adequate sunlight. However, care must be taken in that the plants are protected against severe heat.

- 2. Topography of land :** The topography of land at the nursery site must be even. If it is undulating, it must be levelled. In hilly areas, it may be divided into levelled terraces.
- 3. Soil :** The soil must be preferably loamy or sandy loam with large quantity of organic matter. The pH of the soil must be near neutral (6.5 – 7.5). It must have adequate water retention capacity and aeration.
- 4. Water :** The quality of water used in a nursery is important for the growth of plants. Saline and polluted water must not be used. It must be ensured that there is an adequate water supply for irrigation. Besides, the nursery must be located near a water source so that there is no water scarcity at any time in the course of raising plants.
- 5. Drainage :** The nursery site must have adequate drainage facility and be free from water logging. Water must not stagnate at any time.
- 6. Transportation :** The nursery site must be accessible by road. It must not be far from potential markets so that there is no damage to the seedlings during transportation.
- 7. Labours :** As nursery work is labour-intensive, the nursery site must have enough number of labours.



Keep in Mind

Qualities of a wood site for nursery :

- i. Nearness to road
- ii. Near a habitat
- iii. Suitable climate
- iv. Neither shady nor exposed area
- v. Sufficient sunlight
- vi. Avoid windy and hail prone areas
- vii. Good irrigational facilities
- viii. Levelled land
- ix. Soil characteristics
- x. Means of transport
- xi. Availability of labour

8. Protection : The nursery area must be protected by fencing so as to prevent damage by stray animals.

9. Market and size : Market plays an important role in the success of nursery business. Various types of inputs like seeds, fertilisers, pesticides, fungicides, plant growth regulators, poly bags, agricultural implements, different

type of spare parts and other miscellaneous items required in the nursery must be available in the nearby market. The nursery must be located near the city or an area from where people can purchase the plants. Alternatively, a mechanism to explore domestic and international markets must also be worked out for the success of nursery business.

6.3.2 Layout of nursery :

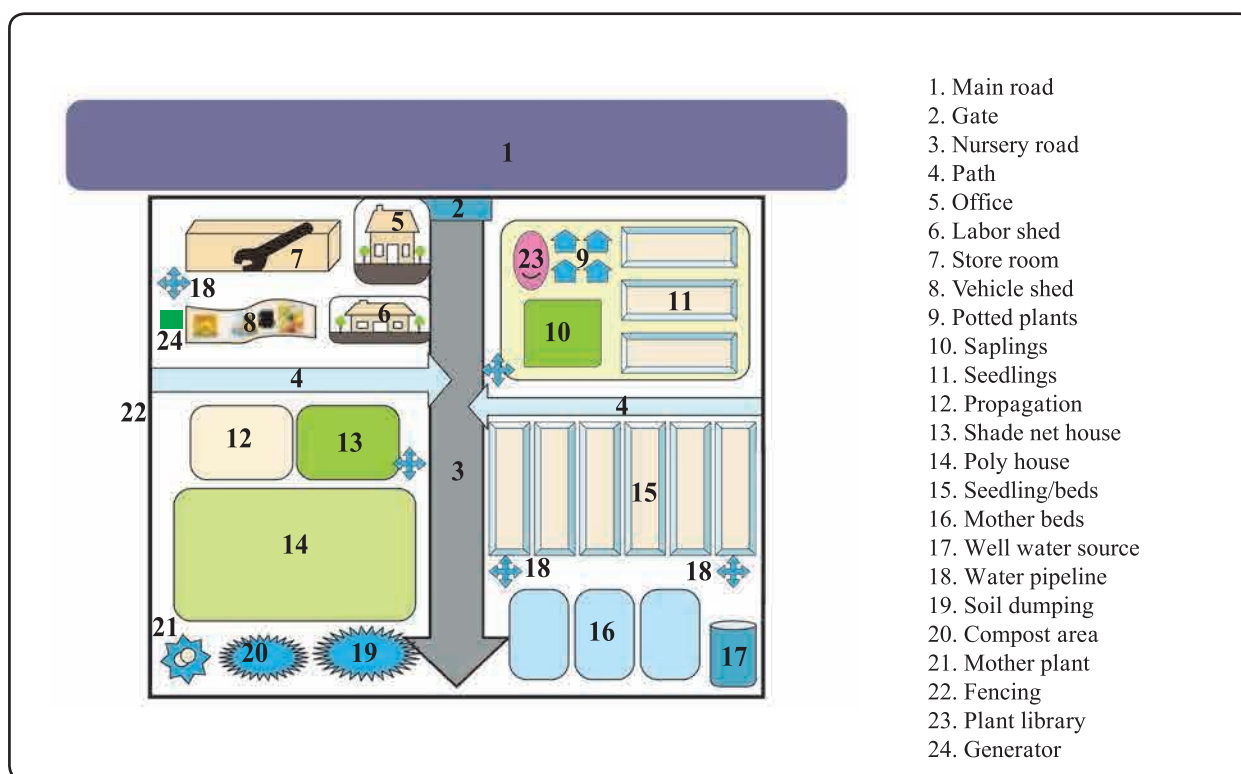


Fig. 6.8 Layout of nursery

A perfect master plan is required otherwise improper layout plan will cause considerable problems to nursery manager in future.

Roads and paths within the nursery should be carefully planned.

Layout should be in such a way that enables operations to carry out smoothly in the nursery so as to save labour and time. Usually, a room/shelter is required for staff and the watchman, and where equipment can be securely stored.

An open area is needed at one end, where work such as sieving of soil and filling of containers can be done easily.

A nursery is easily arranged in a series of beds with pathway between them. There should be proper provision for road and path, irrigation

and drainage channels, mother block, nursery beds, growing structure, store, compost pit, display site-cum-sale counter, etc.

The nursery should be connected by main road for better approach and disposal of produce.

6.3.3 Major steps in nursery layout :

A. Mother block :

The planting stock that maintained as a source for commercial propagation is referred to as a mother block.

Once a superior type of mother plant has been identified, it should be multiplied and maintained under conditions that prevent recontamination and allow detection of any significant change from the original source.

Mother plants are very important constituent of a nursery. There should be proper record and certification of planting stock. As far as possible, mother block should be in the close proximity of the nursery site. The scion shoots should be taken only from mother plants. Therefore, for preservation of pathogen free planting stock; proper isolation, sanitation, periodical inspection and testing and maintenance are very important.



Remember this

- Water should be available throughout the year
- Area should be large enough to accommodate the required seedlings and facilities
- Area could be flat or slightly inclined to allow sufficient drainage
- Area must be accessible or close to the road
- Area must have good soil condition, i.e. dry sandy loam or loam, topsoil of about 30 cm, with 5.5 to 6.5 pH and high quantity of organic matter
- Area must have good exposure to sunlight
- Area must be protected from strong winds with temporary windbreakers using local materials.
- For permanent windbreakers, establish a green belt (trees that can withstand strong winds) around the nursery.

Following are examples of mother plant :

1. Mango: Keshar, Alphonso, Sindhu, Ratna
2. Sapota: Kalipatti, Cricket ball
3. Guava: Sardar (L-49)
4. Pomegranate: Ganesh, (G-137), Bhagawa



Fig. 6.9 Mother plants

5. Ber: Umran, Kadaka, Sannur, Punjab Chuhara, Mehrun.
6. Cashew nut: Vengurla – 4, 5, 6, 7 and 8
7. Coconut: Banavali, T X D, Pratap
8. Grapes: Sonaka, Sharad Seedless, Thompson Seedless
9. Fig: Poona fig, Dinkar
10. Aonla: Banarasi, Krishna.
11. Sweet orange: Nucellar.
12. Mandarin Orange: Nagpuri
13. Rose
14. Champak
15. Hibiscus

B. Seed beds : Seed beds can be accommodated in a comparatively smaller area. They should be nearer to a source of water and to the office so that they can be kept under proper vigilance. The beds should be raised enough to avoid water stagnation due to rain and excess watering. Seed beds should be located in an open place for better germination of seeds and to avoid infection of ‘damping off’ disease. Nursery beds can be prepared in three different ways as sunken beds, level beds and raised beds.



Fig. 6.10 Nursery bed

C. Pot yard - The pot yard is generally used for tender plants, which requires shade as compared to hardy plants. Therefore, pot yards should be in shade and near to water source for frequent watering. Trenches can be provided for keeping the potted plants closely packed together.



Fig. 6.11 Pot yard

D. Packing yard and working shed : The packing yard is used for packing the plants before sale or dispatch to outstations. The yard can be combined with working shed. In packing yard, there should be plenty of space to enable a number of workers for sorting out and packing the plants with ease.

E. Compost pit : Nursery production of horticultural and forestry plants require huge amount of organic manures like F.Y.M, compost, leaf mould, etc. for different purposes. Therefore, arrangements should be made at nursery level to produce enough quantity of compost. One compost pit of permissible size should be located at any corner of nursery layout. At the same time several waste products of nursery can also be utilized for the same.

F. Irrigation : Design and installation of an irrigation system includes several stages or phases, each of which requires different kind of expertise. The main line of irrigation system is taken from the source to seed beds and are generally located along the road between nursery blocks. The main lateral openings are placed at each block followed by sub mains to individual nursery beds. The sprinklers are arranged at each block wherever necessary.

G. Roads and drainage : An adequate road and drainage system carefully planned and constantly maintained, is essential for the efficient operations in the nursery. Outer and internal roads should be permanent and stable. Frequently, roads within seed bed area also serve as drainage channels. Therefore,

they should provide access to seed bed for equipment and drain the surface water rapidly. Roads or channels at ends of the beds should be 5 to 6 feet wide to enable tractor and attached equipments to turn without damaging seed beds.

H. A rest room : A break room and rest room are needed for the nursery staff. Depending on the size of nursery and number of working staff, size of rest room can be varied.

I. Store room : Fertilizers and chemical, require careful storage and should be stored in a separate building. Pesticide requires special security and protection from freezing. Well designed pump house is usually needed to protect pumping equipment.

J. Administration office, lab and working space : One or more offices for staff are needed for the nursery and for records and files. They should be located on the wind ward sides of fields and parallel to seed beds. Working space should be cleanly maintained well ventilated along with good sunlight.

K. Fencing : Nurseries should be fenced if there is potential damage from cattle, dog, sheep, or people. Fences around administrative sites may be needed to protect equipment and building from theft.

6.4 AFTER CARES OF NURSERY

6.4.1 Disinfection of beds :

A. Sanitation : Sanitation is defined as “the formulation and application of measures designed to protect plant health”.

Maintenance of sanitation is necessary in any plant propagation work. If all the necessary sanitary precautions are taken at the outset, the problems would be less in magnitude and its management can be done effectively. It is necessary to use clean growing media, sterile containers, a sanitized bench and pathogen free planting materials in all plant propagation processes. However, soil borne pathogens may contaminate the soil mixture and media even when all precautions are taken. Small outbreaks of diseases can be controlled by using appropriate fungicides.

Sanitation practices in nursery include:

1. Prevention of insects, pests and diseases
2. Inspection for insect, pest and disease incidences
3. Environmental control leading to protection from harmful environment factors like hot sun, freezing temperatures, storms, etc.
4. Eradication of pests, diseases and weeds.

B. Sanitation Treatments :

1. Sterilization of the propagation media, tools, and implements used is necessary in nursery plant production. Propagating media and tools can be easily sterilized by heat or by chemicals. A temperature of about 71°C for 30 minutes is considered to be sufficient to kill almost all disease producing pathogens.
2. Chemicals used for sterilization are chloropicrin, formaldehyde, methyl bromide, etc.
3. Fumigation with chemicals is useful for destroying harmful bacteria, fungi and nematodes in a relatively small quantity of soil that is used for propagation of plants.
4. Drenching the medium with certain fungicides is also useful in eliminating pathogens from the soil, coco peat and other media.
5. Cleanliness of all the implements along with nursery area (inside and outside) is necessary.

C. Methods of sterilization :

i. Temperature method :

It is an environment-friendly method to control soil-borne plant pathogens, including bacteria, fungi, nematodes, insect-pests and weeds. Solar energy increases the temperature of the soil, which helps to control various soil-borne pathogens. The most appropriate time for soil solarisation is May–June when the temperature reaches 40°C or above. This treatment causes physical, chemical and biological changes in the soil.

Procedure : Dig soil at a site where seedbeds are to be prepared. Remove all weeds, stumps, stones, pebbles, etc., from the soil. Crush the

clods and bring it to fine tilth. Level the plot for preparing seedbeds. Irrigate the site thoroughly and cover it with a black polythene film of 200 gauge for 5–6 weeks during summer as wet soil conducts heat better than dry soil and makes soil organisms vulnerable to being killed by heat generation. Make the covering airtight by covering the margins with compressed wet mud to check the loss of moisture and prevent the entry of air from beneath the polythene sheet. The nursery bed may be prepared at the treated site or soil may be used for filling pots or poly bags.

ii. Chemical treatment :

Formalin solution treatment

Formalin solution is used to sterilize the soil. It is prepared by adding 2.5 ml commercial grade formaldehyde per litre of water and the soil is drenched @ 45 litre of solution per m² to saturate the top soil surface upto a depth of 15–20 cm. The drenched area is covered with a black polythene sheet of 200 gauge so that the fumes of formalin penetrate into the soil to kill the pathogens. The polythene cover is removed after 48 hours. The soil is raked so that the fumes of formaldehyde gas escape from it. In poly-house, if the soil is treated with formalin, the doors and side covers of the poly-house must be opened to allow formaldehyde gas to escape. The bed is kept open for 7–10 days prior to seed sowing. It must be ensured that there are no fumes of formaldehyde gas prior to seed sowing.

iii. Soil treatment by fungicide :

Fungicides like captan or thiram @ 5 g/m² are used to control soil-borne pathogens. These fungicides can also be used as soil drench by preparing a solution of 2.5–3 percent and drenching @ 4–5 litre/m².

iv. Soil treatment by insecticide :

Insecticide, such as chloropyrifos @ 2 ml/litre of water is applied to a depth of 15–20 cm in the soil to kill insects including ants, white ants and their eggs, nematodes, etc.

v. Use of bio-agents

Certain biological agents like trichoderma

are used to control soil-borne pathogens. Bio-agents @ 10–25 g/m² are mixed in the soil, and after 2–3 days, the seeds are sown.

6.4.2 Watering :

Irrigation either in the nursery beds or watering the pots is an important operation. For potted plants hand watering is done and for beds low pressure irrigation by hose pipe is usually given. Heavy irrigation should be avoided.

6.4.3 Manuring :

Generally, sufficient quantity of nutrients is not available in the soil used for seedbed. Hence, well rotten F.Y.M / compost and leafy humas is added to soil. Rooted cuttings, layers or grafted plants till they are transferred to the permanent location, require fertilizers. Addition of fertilizers will give healthy and vigorous plants with good root and shoot system. It is recommended that each nursery bed of 10 X 10 m area should be given 300 gm of ammonium sulphate, 500 gm of single super phosphate and 100 gm of muriate of potash.

6.4.4 Provision of shade :

The young and tender seedlings are susceptible to direct sunlight. They are required to be protected from hot sun light by providing shade. Shade may be provided using thatches or by using shadenets.



Remember this

Filling pots and bags : Different kinds of pots and polythene bags are used in nursery. They are filled with soil mixture. This is an important activity in the nursery. Other activities like shifting plants, labelling, potting and repotting, packing, selling, keeping records, etc. are performed in the nursery.

6.4.5 Protection from adverse climate :

The younger seedling is susceptible to strong sunlight and low temperature. For protection from strong sunlight, shading with the help of timber framework of 1 meter height may be used. Net house and green house structures can also be used.



Do this

Note down quantity of material required for filling pots or bags.

Sr. no.	Pot or bag	Size	Volume
1			
2			
3			
4			

6.4.6 Protection from pest and disease :

Adoption of plant protection measures, well in advance and in a planned manner, is necessary for the efficient raising of nursery plants. For better protection from pest and diseases regular observation is essential.

6.4.7 Disease control in seedbed : The major disease of nursery stage plant is “damping off”. For its control good sanitation conditions are necessary. Preventive measures of drenching like treatment with 50% ethyl alcohol, 0.2% calcium hypochloride and 0.01% mercuric chloride is done. These treatments are given for 5 to 30 minutes. Some of the seed treatments are as follows:

- Disinfection :** The infection within the seed is eliminated by use of formaldehyde, hot water or mercury chloride.
- Hot water treatment :** Dry seeds are placed in hot water having a temperature of 48°C – 55°C for 10-30 minutes.
- Protection :** In dry seed treatment organo mercuric and non-mercuric compounds like agallal, aretan –6, and tafasan-6 are used. For this, the seeds are shaken within the seed container. While in wet method, the seeds are immersed for certain period in liquid suspension.
- Soil treatment :** Soil contains harmful fungi, bacteria, nematodes, insects and even weed seeds, which affect the growth and further development of plant. These can be eliminated by heat, chemical treatment etc. For that soil is disinfected by heating to the temperature of about 60°C for 30 minutes.

- v. **Chemical treatment** : The chemicals like formaldehyde, methyl bromide, chloropicrin, etc. are used. Other diseases like rust, powdery mildew, leaf spot, bacterial blight, yellow vein mosaic are also observed. For control of these diseases Bordeaux mixture, carbendazim, redomil can be used. *Trichoderma viride*, a bio-fungicide can also be tried out.

6.4.8 Pest management in nursery :

Infestation symptoms like cuttings on leaf margins, holes in leaves, chewed and damaged parts of plants, spots on leaves, etc. are observed. They are due to the attack of pest. The major pests of nursery plants are -

- a. **Insect pest** : It causes heavy damage to crops. Amongst the one million species of insects, about 200 species can be termed as serious pests in agriculture.
- b. **Microbes** : Fungi, bacteria and viruses cause diseases in plants and insects. Nematodes are also sometimes classified as pathogens.
- c. **Garden snails** : They are called as molluscs. It is a common pest in home gardens, lawns, greenhouses and ornamental plantings.
- d. **Weed** : These are the plants that compete with the main crop which affects yield and quality, and may interfere with the use of land and water resources.
- e. **Vertebrate pests** : These are mainly rodents, birds and some other mammals like bats, rabbits, etc. that cause damage to crops and stored products, agriculture produce.
- f. **Pest control** : In the present day context, pest control includes the use of all those methods which are employed for preventing pests and diseases without disturbing the environment. i.e., IPM and IDM.

6.5 PACKING AND TRANSPORT OF NURSERY PLANTS :

A. Packing : It is defined as placing the nursery plants or propagated materials into a suitable container for maintaining their viability and

vitality during storage and transport. Time to time packing of nursery material is to be done and emphasis should be given on packing plants which are transported over a longer distance. To have a better price of the products, a nurseryman should pay high attention to the packing of the planting material.

B. Advantages of packing : Packaging protects the planting material from hazards caused during transport and keeps them away from microbial and insect attack. It minimizes the physiological and biological changes occurring in the planting material during transportation. Packing must maintain the natural condition of seedlings of nursery plants and increase the shelf life of seedlings. Necessary information like name of seedling, name of nursery, age of seedling, etc. can be mentioned on packing boxes.

C. Principles of packing :

It should deliver the plants conveniently without affecting the quality and also look attractive to the indenters.

It should provide protection against drying out and mechanical injury.

It must be convenient and economical to handle.

It should be well adapted to transport, loading with security and economy in volume and weight.



Fig. 6.12 Packing nursery plants



Remember this

Common possible errors in nursery activities-

- Containers not filled properly.
- Shape of container is not maintained.
- Some times position of container is not maintained in upright direction.
- After each production cycle in nursery used soil and sand in germination beds are not changed.
- Too deep sowing results in poor germination.
- Improper handling of seedlings before transplanting.
- Improper and delayed transplanting of seedlings.
- Inadequate attention to root pruning.
- Improper root pruning while transplanting.
- Improper compaction of the soil around the seedling after transplanting.
- Use of same sprayers for application of weedicides and fungicides.
- Hardening off process is started late or sometimes neglected.
- Dumping of seedlings in nursery is not practised



Exercise



Q. 1 Answer the following questions.

A. Select the appropriate alternative and complete the following statements.

1. Drenching with ----- is useful in eliminating fungus from the soil medium.
 - a. Captan
 - b. Lindane
 - c. Chloropyriphos
 - d. Endosulfan
2. The place where plants are propagated and grown to desired age for planting in is called as -----
 - a. Nursery
 - b. Pack house
 - c. Field
 - d. Forest
3. Seedlings of brinjal are raised in ----- type of nursery.
 - a. Permanent nursery
 - b. Forest nursery
 - c. Temporary nursery
 - d. Medicinal plant nursery
4. The planting stock that maintained as a source for commercial propagation is known as -----
 - a. Nursery
 - b. Mother block
 - c. Pot yard
 - d. Playhouse

5. The major disease of plant at nursery stage is ----- .

- a. Blight
- b. Virus
- c. Damping off
- d. Downy mildew

B. Make the pairs.

- | A | B |
|------------------------|------------------|
| i. Fruit plant nursery | a. Rose plants |
| ii. Vegetable nursery | b. Teak plants |
| iii. Forest nursery | c. Mango plants |
| | d. Paddy nursery |
| | e. Tomato plants |

C. Find the odd one out.

1. Chloropicrin, Formaldehyde, Methyl Bromide, Soil
2. Soil, Sand, Coco peat, Urea
3. Brinjal, Tomato, Santra, Cabbage
4. Croton, Aglonema, Chilli, Hibiscus
5. Vegetable nursery, Forest nursery, Temporary nursery, Fruit plant nursery

D. Write true or false.

1. Fruit plant nurseries do not require license.
2. Onion seedlings are raised in permanent nursery.
3. For getting desired quality fruits of mango use mango seedlings raised from mango stones.
4. In the big cities ornamental nurseries are getting popularity.
5. A temperature of about 71°C for 30 minutes is sufficient to kill almost all the pathogens in soil.

Q. 2 Answer in brief.

1. Define medium used for propagation.
2. Enlist characteristics of good propagation medium.
3. What is vermiculite?
4. Define packing of nursery plants
5. Give examples of soil fumigants

Q. 3 Answer the following questions.

1. Complete the table.

Unit	Plants raised	Basis of classification
Temporary nursery		
Permanent nursery		
Fruit nursery		

2. Explain flowering plant nursery.
3. List out types of nursery on the basis of kind of planned raised.
4. Explain temporary nursery.
5. Write principles of packing.

Q. 4 Answer the following questions.

1. Differentiate temporary nursery and permanent nursery.
2. Write the limitations of nursery.
3. Explain the mother block.
4. State the features of permanent nursery.
5. Describe after cares of nursery.

Q. 5 Answer the following questions in detail.

1. Explain in detail layout of nursery.
2. Explain the points to be considered in selecting the site for nursery.

Q. 6 Answer the following questions in detail.

1. Explain in detail different type of nurseries.
2. Mention different features and advantages of permanent nursery.

**Activity**

Practice grafting of fruit or ornamental plant. Practice transplanting of seedlings in pots or polythene bags.