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## A review on nursery management in horticultural crops: A beneficial way for enhancing income

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### Abstract

The present study is based on the nursery management in horticultural crops for enhancing income. The aim of good nursery management is to make available planting material of the highest possible quality for new development areas and replanting. Poor planting materials lead to low yield and increasing total cost. This study is covered all key aspects of the nursery management including the importance of nursery, types of nursery, management of nursery including various activities like potting the seedling, manuring, irrigation, plant protection measures, weed control, packing of nursery plants, sale management and management of mother plants, plant protection and general safety issues regarding to nursery management and important tools for nursery management.

**Keywords:** Nursery, seedling, propagation, quality, management

### Introduction

A nursery is a place where plants are grown, nurtured and sold out. Generally, various commercial crop growers require a good quality saplings or grafts of genuine type. It can also defined nursery is a place or an establishment for raising or handling of young vegetable or fruit seedlings until they are ready for more permanent planting. The aim of good nursery management is to provide planting material of the highest possible quality for new development areas and replanting. Poor planting materials will lead to low yield and unnecessary thinning cost top rid off runts in planted field. So, the selection of good planting materials and strict culling in nursery are the important step. The importance of the best quality planting material as an initial investment is a well realized factor for persons engaged in Horticulture field. So nurseries have great demand for the production of plants, bulbs, rhizomes, suckers, cuttings and grafts. But in general good quality and assured planting material at reasonable price is not available. So persons having a skill of propagation of plants can go for this avenue as an agro-business of future. Seedling production is a major expense of a forestation and every effort should be made to produce good quality seedlings at a reasonable cost. To this end mastering the techniques of nursery operations is essential means nursery management is very essential. (Mbora et al., 2008) <sup>[6]</sup> India is endowed with a remarkably heterogeneous area characterized by a great diversity of agro climatic zones, allowing for production of a variety of horticultural crops such as fruits, vegetables, flowers, spices, plantation crops, root and tuber crops spices and medicinal and aromatic crops. India ranks second in fruits and vegetables production in the world, after China. Under agriculture sector horticultural crops play very important role to economy (Meena et al., 2013; Meena et al., 2016) <sup>[7, 8]</sup>.

As per National Horticulture Database published by National Horticulture Board, during 2018-19 India produced 98.579 million metric tonnes of fruits and 185.883 million metric tonnes of vegetables (NHB, 2018-19) <sup>[9]</sup>. Horticulture is the cultivation of garden plants, fruits, berries, nuts, vegetables, flowers, trees, shrubs and turf. Horticulturalists use modern nurseries for the production of seedlings and mother plants. These plants are propagated through different methods such as seeds, cutting, layering, budding and grafting. It comprises of nursery beds, paths irrigated channels etc. Nursery bed is defined as a prepared area in a nursery where seed is sown or into which seedlings or cuttings are raised. On the bases of kind of plants growing in them nursery beds are classified into seedling beds and transplant beds, seedlings, beds are those nursery beds in which seedlings are raised either for, transplanting in other beds or for planting out.

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The main suppliers of perennial tree seedlings are the departmental/government and industrial nurseries. They are producing seedlings and vegetative propagules to meet their own seedling demand and also supply them to public to meet their raw material demand. Mostly the vegetable and ornamental seedlings are produced by the farmers themselves, due to the market availability of improved seed and requirement of minimum inputs to establish them. The industrial nurseries are well equipped with infrastructure, manpower, automation and target to produce seedling of short rotation tree species to meet their factory raw material demand such as pulp and paper, plywood, small timber for furniture, juice, jam and pickle making. Hence, different kind of nurseries targets various end products. But nursery is pre requisite for meeting the quality seedlings demand and nursery management is a potential tool to execute the activity in successful way (Krishnan *et al.*, 2014)<sup>[5]</sup>.

### Importance of Nursery and its Role

1. Seedlings and grafts are produced in nursery from which the fruit orchards and ornamental gardens can be established with minimum care, cost and maintenance.
2. The nursery planting materials are available at the beginning of the planting season.
3. This saves the time, money and efforts of the farmers to raise seedlings.
4. There is a wide scope for fruit orchards, ornamental, vegetable, and landscape gardens at public places, highways and co-operative housing societies
5. It assures the production of genetically improved quality planting material
6. It provides employment opportunities for technical, skilled, semi-skilled, unskilled labor.
7. They are an important source supplying the seedlings for meeting the fruit, pulp and paper, fuel wood, timber and other demands of the industries

### Benefit of raising seedlings in nursery

1. It is very convenient to look after the tender seedlings
2. It is easy to protect the seedlings from pests and diseases
3. Economy of land usage
4. Valuable and very small seeds can be raised effectively without any wastage
5. Uniform crop stand in the main field can be maintained by selecting healthy, uniform and vigorous seedlings in the nursery itself.

### Types of nurseries

Nurseries are categorized in different ways:

#### 1. Classification based on size

- Home Nursery: It is in a small area in the garden in which the plants are grown to meet the demands of growers own garden. The main objective is to get good quality and true to type planting material for own garden.
- Commercial Nursery: This type of nursery is established to earn money on the investment. Such establishment requires large area as well as investment. This can again further categorized as Urban Nursery (located in cities/town) and Rural Nursery (villages)

#### 2. Classification based on the business

- Wholesale Nursery: In this type of nursery the plants are produced in large number for sale to retail outlets and mostly located in a place where land and labour cost is

cheaper.

- Retail Nursery: This type of nursery located in the town and largely dependent on house owners for its trade. These nurseries also keep goods which is necessary for raising the garden plants.
- Landscape Nursery: This type of nursery is located in the populous towns or cities and caters the need of landscape plants of urban people for beautifying their homes and locality.
- Mail Order Nursery: It is a specialized wholesale nursery where customer order through the catalogue and receive the plants through mail or parcel services.

### 3. Based on time duration

- Temporary nursery: This type of nursery is established in or near the planting site. Once the seedlings for planting are raised, the nursery becomes part of the planted site. There are sometimes called "flying nurseries". This type of nursery is developed only to fulfill the requirement of the season or a targeted project.
- Permanent 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 all the year round in this nursery. In all cases permanent nurseries must be well-designed, properly sited and with adequate water supply.

### 4. Based on type of plants produced

- Fruit plant nurseries: In this nursery, seedlings and grafts of fruit crops are developed.
- Vegetable nurseries: In this nursery, seedlings of cauliflower, cabbage, brinjal, tomato and other vegetables are prepared.
- Flowering plants nurseries: The seedlings of flowering plants like gerbera, carnation, petunia, salvia, rose, chrysanthemum, coleus, aster, dianthus are developed in this nurseries.
- Forest nurseries: The seedlings of plants useful for forestation like pine, oak, teak, eucalyptus, casuarinas are prepared and sold.
- Miscellaneous nurseries: In such type of nurseries plants with great economic value, rare and medicinal, herbal plants are propagated. In this nursery plants like geranium, rose, calendula, and marigold are propagated. Planning of nursery one has to decide which type of nursery is to be started. At the same time the durations and type of plants propagated should be finalized.

### Selection of site

Site is the basic requirement of a nursery. Site is a place upon which one can produce seedlings of plants.

Qualities of a good site are

Nearness of road

Near a habitat

Suitable climate

Neither shady nor exposed area

Sufficient sunlight

Good irrigation facilities

Good soil condition

Good transport facility

### Management of nursery

Nursery plants require due care and attention after having either emerged from the seeds or have been raised from other sources like rootstock or through tissue culture technique.

Generally they are grown in the open field under the protection of Mother Nature where, they should be able to face the local environment. It is the duty and main objective of a commercial nursery grower to supply the nursery plants with suitable conditions necessary for their development and growth. This is the major work of management in the nursery which includes all such operations right from the emergence of young plantlet till they are fully grown-up or are ready for uprooting and transplanting in the main fields.

### Potting the seedling

Before planting of sapling in the pots, the pots should be filled up with proper potting mixture. Now a day's different sizes of earthen pots or plastic containers are used for propagation. For filling of pots loamy soil, sand and compost can be used in 1:1:1 proportion. Sprouted cuttings, bulbs, corms or polythene bag grown plants can be transferred in earthen pots for further growth.

All the necessary precautions are taken before filling the pots and planting of sapling in it.

### Manuring and irrigation

Generally sufficient quantity of nutrients is not available in the soil used for seedbed. Hence, well rotten F.Y.M / compost and leaf mould 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 10m area should be given 300 gm of ammonium sulphate, 500 gm of Single super phosphate and 100 gm of Muriate of potash. 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.

### Plant protection measures

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. Disease control in seedbed:- The major disease of nursery stage plant is "damping off". For its control good sanitation conditions are necessary. Preventive measures like treatment with 50% ethyl alcohol, 0.2% calcium hypo chloride and 0.01% mercury 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 mercuric 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. 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 and even weeds seeds, which affect the growth and further development of plant. These can be eliminated by heat, chemical treatment. For that soil is disinfected by heating to the temperature of about 60°C for 30 minutes.
- Chemical treatment: The chemicals like formaldehyde, methyl bromide, chloropicrin, vapam 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, Carbendazime, Redomil can be used. *Tricoderma viride* a bio-fungicide can also be tried out.

- Weed control: Weeds compete with plants for food, space and other essentials, so timely control of weeds is necessary. For weed control weeding, uses of cover crops, mulching and use of chemicals (weedicides) are practiced. Pre-emergence weedicides like basaline or post-emergence weedicide like 2,4-D and roundup are useful.
- Measures against heat and cold: The younger seedling is susceptible to strong sun and low temperature. For protection from strong sun, shading with the help of timber framework of 1 meter height may be used. Net house and green house structures can also be used.

### Packing of nursery plants

Packing is the method or way in which the young plants are tied or kept together till they are transplanted. So they have to be packed in such a way that they do not lose their turgidity and are able to establish themselves on the new site. At the same time, good packing ensures their success on transplanting. For packing baskets, wooden boxes, plastic bags are used. In some parts of the country banana leaves are also used for packing the plants with their earth ball. This is useful for local transportation.

### Sale management

In general the main demand for nursery plants is during rainy season. A proper strategy should be followed for sale of nursery plants. For that advertisement in local daily newspapers, posters, hand bills, catalogue and appointment of commission agents can be followed.

### Management of mother plants

Care of mother plants is necessary so as to get good quality propagules and scion. A. Labeling and records B. Certification C. Irrigation D. Fertilization E. Pruning F. Protection from pests and diseases.

### Another best way to manage nursery

A vital part of nursery management is planning the production schedules and data collection. As we know that whole agriculture sector is seasonal and perishable in nature and in agriculture nursery production is highly seasonal. This is particularly marked when producing trees for agro forestry research, as the demand for species or numbers of seedlings will vary considerably depending on current research priorities. Flexibility and planning are therefore essential.

### There are four main tools for planning nursery operations

1. A nursery calendar to help plan necessary actions and purchases of seed, supplies and equipment.
2. A plant development register for collecting species-specific information about seed treatment, germination requirements and duration, plant development, special requirements for potting substrate, watering, shading or disease control.
3. A nursery inventory to keep track of the species and numbers of seedlings in different stages of development.
4. A record of ongoing nursery experiments.

All four can be maintained in tabular form designed for ease of data capture on to computer programs. Computerized

systems have increased the flexibility of data collection and analysis, making it easy for a nursery manager to correlate the collected information to necessary actions rapidly.

### Tools for nursery management

1. Nursery calendars
2. Plant development registers
3. Nursery inventories
4. Records of nursery experiments

These are needed for production management as well as for research. We also discuss the significance of staff training, particularly in the use of pesticides, plant protection and general safety issues regarding to nursery management.

- **Planning tools nursery calendar:** A nursery calendar is a very essential tool in nursery planning. The date for sowing seeds can be calculated by counting backwards from the anticipated date of planting, taking into consideration the number of days needed for germination and further seedling development until the right stage for planting. Different species have different requirements for the planting out period (before or during the rains). The time in the nursery also depends on the site on which the seedlings are to be planted. Seedlings for drier sites may need to be larger and need more time in the nursery. Customers might need to be reminded of this when they order plant material to meet certain deadlines. It is also worth anticipating problems with poor germination and/or damping-off to allow time to sow a second time. Once a nursery calendar has been developed, it will help greatly in making decisions about the need for extra labour and requisition of supplies. Consider the likely delays in procuring and shipment of goods, especially when ordering from abroad. Place orders early enough to allow timely arrival.
- **Plant development register:** For plant development register we should keep a register for each species by seed lot, with information about seed sources used, pre-treatment's, sowing date, time to germination, percentage of germination, percentage of germinants pricked out, potting substrate, microsymbionts used with its origin and type, plant development and condition under which produced. Include pests encountered and control treatments, if any, as well as data of plant and/or substrate nutrient analyses. All this information is important for nursery research and might later help explain unexpected results. It can also be used to compare results with published information and alert you to possible problems originating in the nursery, for example if the development is much slower than is reported elsewhere. It might open additional research areas, for example it might lead to trying different substrates, shading or fertilizer treatments. Good documentation about species handling and development is also necessary when staff changes.
- **Nursery inventory:** A well-kept and up-to-date nursery inventory helps to assess whether the nursery is operating as planned, and whether demands are being met. Your inventory should list all plants currently in the nursery by bed or frame number, and details of delivery of seedlings, including the site, name of owner and site conditions. It can be an important tool to record feedback from the planting sites and can then help to determine whether

seedlings have the right quality for the sites on which they are planted.

- **Record of experiments:** An up-to-date record of past and ongoing nursery experiments is advisable. Simple experiments testing new potting mixtures, watering regimes, seed pretreatments etc. should be part of normal nursery management and, without accurate records of these, valuable information is likely to get lost.

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