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Management Techniques of Commercial Fruit Nursery

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A B S T R A C T

A nursery is a managed site, designed to produce seedlings/ propagules grown under favorable conditions until they are ready for planting. The basic utility of nurseries lies in production of planting materials and their maintenance and care till sale or transplanting. There are different categories of nurseries as per utility and their scale. The site acts as important factor in establishment of commercial nursery. There is sudden surge in the number of new nurseries as there is huge gap between demand and supply. The dearth of authenticated planting materials in terms of varieties, quality and genetic purity paves the way towards establishment of certified nurseries. The seed chain is not being maintained and also genetic purity of seeds are being lost due to mechanical mixtures. The uncertified nurseries do not follow any guidelines of certification and hence the planting materials procured from these nurseries lack authentication of varieties, the commercial size of plant and even different pests are associated with such planting materials as they do not adhere to phytosanitary control measures.

Keywords: *Planting Materials, Variety Authentication, Seed Quality, Certified Nursery*

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1. INTRODUCTION

The production of quality planting materials is a basic necessary input for sustainable horticultural production. But, the dearth of authenticated planting materials and lack of technical know-how in quality planting materials production is a major gap in meeting demand of planting materials. So, establishment of a commercial nursery as per guidelines is a pre-requisite (CIFOR-ICRAF, 2024).

2. OBJECTIVES OF A COMMERCIAL FRUIT NURSERY

a. Production of healthy and vigorous planting material.
b. Maintenance of true-to-type and genetically pure cultivars.
c. Production of disease- and pest-free plants.
d. Rapid multiplication of superior fruit varieties.
e. Production of grafted, budded and layered plants according to crop requirements.

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f. Supply of planting material at the appropriate planting season.
g. Maintenance of suitable mother plants for scion and budwood collection.
h. Providing quality planting material to farmers, institutions and commercial orchardists.
i. Generating employment and income through organized nursery enterprise.

3. NURSERY COMPONENTS

3.1 Site selection

The fertile, medium-textured soil with organic matter and good drainage must be preferred. Waterlogged sites and areas with serious soil-borne disease history must be avoided. A reliable supply of good-quality water throughout the production season should be ensured before establishment of nursery. Assessment of the previous cropping history must be done priorly. A level to gently sloping site supports movement and drainage; prevent runoff from contaminated areas entering propagation blocks. The site must provide suitable light and ventilation while allowing shade or protected conditions for sensitive propagation stages. The site should be convenient enough to provide access for inputs, workers, customers and safe loading of plants.

3.2 Nursery inputs

1. Containers: The purpose of containers is to provide space for growing different planting materials. The commercial nursery utilizes different kinds of containers, *viz.,* polybags, portrays, root trainers, etc.

2. Potting media: The potting media mixes provide base for growth of planting materials. The different potting media uses combination of soil less media such as cocopeat, perlite, vermiculite, sand, vermicompost, etc. for better growth.

3. Planting materials: The commercial and well-established method of propagation of horticultural crops must be followed. The varietal authentication is inevitable for a commercial nursery. The packaging and sale of planting materials produced plays a major role (Hartmann *et al*., 2018, Ravishankar, 2011).

3.3 Mother block management

The clearly identified mother plants of known cultivar and source should be maintained. Inspection of mother plants regularly for pests, diseases, nutrient disorders and off-types must be done. Collection of scion wood, buds, cuttings or other propagules only from suitable healthy plants must be practiced.

4. PROPAGATION METHODS

The fruit crops are propagated both by sexual and asexual propagation methods. These crops being perennial in nature, have long juvenile period, vigorous in nature and show heterozygosity. The seedlings are not true-to-type and have long juvenile period. But there are few crops like papaya, owing to its hollow shoot cannot be propagated by any other propagation method but by seed. The polyembryonic citrus species are preferably propagated by seeds. The rootstocks required for grafting and budding are propagated by seeds. The seedlings are long-lived and more resistant to biotic and abiotic stresses. The seedlings are source of variation which is essential for breeding programs as donor.

The quality of seed is one of the most important factors determining successful nursery production. Proper selection, collection, extraction, processing, and storage of seed (Hartmann *et al*., 2018). Mature fruits should be processed carefully to extract the seeds. Care should be taken to avoid mechanical injury to the seeds during extraction. Rubbing, crushing, or macerating suitable fruits can help accelerate seed extraction. The fruits are allowed to ripe properly before seed extraction. Seeds should be separated from fruit pulp and other unwanted materials. The gelatinous mucilage, if present on seed coat must be removed. The morphological dormancy of the seeds should be broken by scarification, PGR (Gibberellic acid), chemicals, (HNO_3), thawing, etc. If seeds are to be sown immediately after extraction and cleaning, additional drying may not be necessary, depending on the species. However, if seeds are to be stored, appropriate drying (shade drying) is generally required to reduce moisture content and maintain seed viability during storage. The orthodox seeds tolerate drying to relatively low moisture content and can be stored for longer periods under suitable conditions (guava, papaya, citrus, date, etc.). Recalcitrant seeds are sensitive to drying and generally lose viability when their moisture content is reduced below a critical level (mango, litchi, avocado, jackfruit, etc.). Therefore, they should not be subjected to excessive drying and are usually sown soon after collection. Each each seed lot must be labelled with the crop/species, variety, mother plant/source, date of collection, and seed lot number for proper identification and traceability.

The different vegetative/ asexual propagation methods produce true-to-type, uniform and better quality plants. Some fruits such as banana, pineapple, seedless guava and seedless grape varieties can only be propagated through vegetative means. The vegetatively propagated plants are precocious in nature. They help in reviving old or senile plants by grafting. The susceptibility to biotic stresses can be mitigated by grafting onto a resistant rootstock.

The different vegetative propagation commercially used in fruit nurseries are cuttings (stem-hardwood, semi hardwood, softwood, herbaceous, leaf cuttings, root cuttings, etc.), budding (insertion of bud on rootstock, *viz.,* patch, ring, forkert, etc.), grafting (insertion of scion shoot on rootstock, *viz.,* wedge, inarching, softwood, whip, tongue, cleft, etc.) and layering (mound, air, serpentine, etc. There are few fruit crops which are propagated by specialized structures, *viz.,* banana is propagated by specialized suckers named as sword suckers. Pineapple by suckers, slips, crown. Micropropagation is also a type of vegetative method of propagation in which large quantity of quality and disease-free planting materials are produced under controlled conditions. Amongst fruit crops, herbaceous crops like banana, strawberry are easily propagated by micropropagation.

Table 1. List of important fruit crops, propagation methods, time of propagation

Sl. No.	Name of fruit crop	Time of propagation	Method of propagation
1.	Mango	July–September	Seed, epicotyl, inarching
2.	Banana	Throughout the year under suitable conditions; preferably during the rainy season	Sword suckers, micropropagation
3.	Litchi	July–August	Air layering
1.	Guava	July–August, February–March	Air layering
2.	Papaya	April, September	Seeds
3.	Pineapple	March–September	Suckers, slips
4.	Apple	Dormant season for grafting; budding during active growth	T- budding, tongue grafting
5.	Dragon fruit	February–March or during the rainy season	Stem cuttings
6.	Aonla	July–August	T-budding
7.	Jackfruit	July–September or during suitable periods of active growth	Inarching
8.	Ber	July–August	Ring budding
9.	Bael	July-August	Patch budding
10.	Citrus	July–September, February–March	Seeds, T-budding
11.	Pomegranate	July–August	Hardwood cuttings
12.	Strawberry	September–October	Runners
13.	Sapota	July–September	Inarching
14.	Custard apple	July–September	Softwood grafting
15.	Mulberry	February–March or during the rainy season	Stem cuttings

5. PROPAGATION STRUCTURE

Propagation structures are essential for producing healthy, true-to-type, disease-free and quality planting materials of fruit crops throughout the year. The structures will facilitate seed germination, rootstock raising, vegetative propagation, grafting, budding, rooting of cuttings, acclimatization and hardening of nursery plants under controlled or semi-controlled conditions. The different propagation structures include polyhouse, mist chamber, shade-net and hardening facilities. Ensure year-round production of quality fruit planting material. These structures improve grafting, budding and rooting success through better environmental management and reduce plant mortality caused by excessive heat, moisture stress and heavy rainfall.

6. IRRIGATION INFRASTRUCTURE

An adequate irrigation facility, especially drip irrigation, sprinkler irrigation will ensure uniform water supply for seed germination, rootstock raising, grafting, budding, rooting of cuttings, plant hardening and maintenance of mother plants. The system should provide efficient water application, minimize water wastage and protect nursery plants from moisture stress.

7. NURSERY ACCREDITATION AND CERTIFICATION PRE-REQUISITES

1. Availability of own block mother and proper infrastructure.
2. Ensure that clear labelled and tagging of the variety propagated should be done.
3. Planting material should have proper material and tag for each variety.
4. Follow standard operating procedure for good nursery management practices.
5. Production of healthy seedling, free from pest diseases, and nutrient deficiencies.

8. CONCLUSION

Commercial fruit nursery management is a vital component of sustainable fruit production and the horticulture industry. A well-managed nursery ensures the availability of healthy, disease-free, true-to-type, and high-quality planting materials of improved fruit varieties. Successful nursery management depends on the careful selection of the nursery site, maintenance of healthy mother plants, adoption of appropriate propagation techniques, use of suitable growing media, efficient irrigation and nutrient management, and effective control of pests and diseases. Proper labelling, record-keeping, grading, hardening, packaging, and transportation further enhance the quality and marketability of nursery plants. The adoption of modern technologies, scientific nursery practices, quality certification, and standardized operating procedures can improve production efficiency, profitability, and customer confidence.

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