



# Hi-Tech Nursery Production and Management of Citrus

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## Introduction

Citrus is one of the largest and most important groups of fruits of tropical and subtropical regions. It is a slow growing plant and is commercially propagated through budding/grafting on seedling rootstocks. The rootstocks have a great impact on scion vigour and fruit size, fruit yield and juice quality as well as tolerance to salt, cold and drought. Citrus rootstocks also have a considerable effect on leaf mineral content in the scion (Wutscher, 1989). Rootstocks are propagated through seeds in open field nurseries and the nursery site is often infected with citrus nematodes, foot rot and deleterious weeds. These problems are major difficulties for nurserymen to grow healthy citrus nursery stock. Production of containerized citrus nursery plants has increased greatly in recent years and found to be a possible solution against the soil related problems. About 13.00 lakhs disease-free planting material of (Nagpur mandarin, Mosambi sweet orange and acid lime) distributed and generated revenue of Rs.3.50 crores during 2010-11 to 2015-16. Most promising area in vidarbha to grow citrus is Amravati, Nagpur, Akola, Wardha and Washim. Largest area under cultivation in Amravati District ie., Warud, Achalpur, Morshi, Chandurbajar etc.

## Hi-Tech Nursery

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. High Tech Nursery is deployment of any technology which is modern, less environment dependent, capital intensive and has capacity to improve the growth and quality of plants grafts, seedlings. It includes micro-propagation, micro-irrigation, Fertigation, protected cultivation (Green House, polyhouse, net house) and mechanization. It can maintain microclimatic condition in protected structure, the micro-climatic parameters are Temperature, Light, air composition and nature of root medium.

## Why Hi-Tech Nursery

- a. Plants can be propagated through seeds but to get the authentic seed and true to the type variety in fruit plants is very difficult.
- b. The gestation period of fruit plants part through seed is very large.
- c. Orchard established from seed propagated plants shows maximum variability.
- d. Productivity of the orchard is very low. Plants carry several seed born diseases.
- e. Handling of the plants is very difficult. If plants are propagated vegetative, to maintain the purity, disease and virus free nature of the plant.
- f. Genuineness and authenticity of the planting material is a difficult.



### Components of Hi-Tech Nursery

- Soil Sterilization Unit
- Container
- Irrigation
- Nursery Media
- Tissue Culture Lab
- Propagation material
- Water and Fertilizers
- Chemicals
- Tools & Equipment
- Electricity
- Equipment and Machinery
- Skilled Labour
- Mother Blocks
- Seed Garden (Rootstock orchards)
- Polyhouses
- Shade net houses
- Insect proof net houses
- Mist propagation units
- Hot Beds
- Coco peat
- Perlite
- Vermiculite

### Importance of Hi-Tech Nursery

- a. The young plant, young and tender seedlings can be easily maintained in the high tech nursery similarly, it is easy to look after rather than in the field.
- b. Propagation of plants by a sexual means required special skill and care of plants before transplanting in the field, which can be easily done nursery.
- c. Seasoning of seedlings against natural calamities.
- d. Better control Hi Tech Nursery is the only place where people can get genuine quality planting material of their choices.

- e. Over irrigation, fertilizer, etc.
- f. More marketing options.
- g. Higher plant densities.
- h. Quality propagate production.
- i. Quality of planting material production of some important plant species.

### Containerized nursery production under protected conditions

#### Preparation of Potting Mixture

- a. Sterilized potting mixture (Soil Solarization)
- b. It should be spread on this platform as flat bed with height of 45cm. After spreading, water should be applied all over the bed and must be well drenched. A UV stabilized 100 $\mu$  transparent polythene sheet is used for covering these beds.
- c. These operation carried out during the last week of April to May for 4-6 weeks. The solarized beds are then further fumigated with Basamid Granular (Dazomet 98 percent) @50g/m<sup>2</sup> or 50g per square meters during May-June. After duration of three weeks, the polythene sheet covering is removed from the beds and the mixture is subjected to at least three turnings with interval of one week, to remove the fumigants.

#### Primary Nursery

Healthy rootstock trees free from diseases should be tagged and fruit from them need to be used for this purpose.

#### Methods of Rootstocks Raisings

##### A. Rootstock Raising in Trays

Plastic trays with size of 60 x 40 x 12 cm are used by making six hole at the bottom. Sterilized potting mixture of Soil:Sand:FYM



(1:1:1) is used for filling these trays upto top and are place on 1.5 feet elevated cemented platform from ground. Seeds in these trays are sown in row with spacing of 2.5-3 cm at a depth of 1-1.5 cm. Light irrigation should be given after seed sowing in the form of shower.

### B. Rootstock Raising in Portrays

20 cell portray with 18.5 cm length, 14.7 cm breadth and 12 cm depth are placed on raised and movable metallic racks under green house. The portrays are filled with mixture of soil and coco peat in equal proportion. The seeds are sown 1.5 cm deep. Before, every use, the portrays must be sterilized using suitable disinfecting agent.

### Modified Containers System

- For Nursery 1m x 6m x 1m prepared from unused materials, which having asbestos sheets, polythene (200 micron), shednet (90) is used.
- Container having fertile soil, FYM and Bhaswa (2:1:1) ratio filled with 30 cm layer of above praportion before making layer solarization is must.
- Avoid contact of container with soil prepare bricks layer on ground.
- A treated seed of acid lime sown in container at Row-Row distance 10 cm.
- For irrigation purpose Drip irrigation system is used. By the principle of gravity water tank are kept in 12 ft height. And water soluble fertilizer, micronutrients are supply through system.
- 100 micron poly mulching use to conserve moisture.
- For soil sterilization Formaline is used.
- Plants are grown up to 6 month in chamber.
- After that plants are transplant into 6x9 inch size polythene.

- Plants are ready to sell in 15-20.

### Advantage of Modified Container System

- Raised Healthy and Diseased Free seedlings can be maintained
- Acid lime plants are ready to sell in short period
- Less labour required.
- Can be used for any crops.
- Fertigation, Mulching, microirrigation can be effectively manage.
- Low cost of profit.
- Two generation can be raised in a single year.

### Micro Budding: A New Propagation Technique to Minimize the Citrus Nursery Phase

Micro budding is a miniature budding on young citrus root stocks measuring 3 mm diameter in which the bud is inserted on the detopped root stock in a wedge cut and immediately protected by covering with a micropipette tip. After a week, micro buds are observed and then micro tips are removed after their sprouting within 12-14 days. Micro budding facilitates faster propagation with reduced cost. This biotech break has a tremendous scope in commercial propagation and research. It reduces huge cost on labour and maintenance during the commercial propagation on low cost green house. It can be utilized in biological indexing of virus, viroids, greening bacterium and other disease inoculation and expression studies at much faster pace, enable year round multiplication and shortens the nursery phase. Micro budded Nagpur mandarin on 5,000 citrus rootstocks (6 month old) were commercially released to citrus growers in 2015.

### Shoot tip Grafting

In vitro Shoot Tip Grafting (STG) is a miniature grafting which involves grafting a



minute shoot tip (0.1 to 0.3 mm) on two week old seedling rootstock performed under aseptic conditions. It produces true to type, non juvenile disease free plants unlike nucellar embryony in vitro or in vivo. This technique is a prerequisite for cleaning the citrus cultivars / indigenous collections from diseases (virus, virus like diseases and greening bacteria), since absolutely there is no control measure once the virus enters the plant system except Shoot Tip Grafting (STG). Standardized age, type of rootstocks, size and source of shoot tip and growth regulator to improve the efficiency of grafting. The technology developed facilitated cleaning of local selections and production of true to type healthy mother tree from even infected sources.

## Management of Hi-tech Nursery

### 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.

### Hot Water Treatment ?

Dry seeds are placed in hot water having a temperature of 48°C–55°C for 10-30 minutes.

### Soil Solarization

Soil contains harmful fungi, bacteria, nematodes and even weeds seeds, which affect the growth and further development of plant. Soil Solarization and fumigation (Basamid granules) of potting mixture for disinfection.

### Management of Mother Plants

Care of mother plants is necessary so as to get good quality propagules and scion.

- Labeling and records

- Certification
- Irrigation
- Fertilization
- Pruning
- Protection from pests and diseases

Collection and development of new mother plants Fruit Nurseries.

### Biological Indexing

Diagnostics for citrus greening and virus and virus like pathogens through biological and molecular indexing.

### Fertilizer

There is no standard practice for fertilizing Citrus nursery plants media which contain a certain percentages of soil generally do not have problem of fertility water soluble fertilizer NPK, with additional micronutrient should be applied once or twice a week. This should be sufficient for the growth of the young plants.

Slow release fertilizer may be mixed into medium before transplanting.

### Irrigation

Irrigation is a must for healthy citrus seedlings. There are several methods of irrigation. The most common are

- Manual irrigation
- Drip irrigation
- Over head sprinkler

Manual irrigation is the most commonly followed practice in citrus nursery.

Flow is regulated by pressure compensating emitters or drippers place at the root zone. Overhead sprinkler is used at later stage of seedling growth.

### Conclusion

Supply of Disease Free Planting materials on large scale to the farmer is possible by using Hi-Tech nursery practices. Due to the High-Tech Nursery Qualitative planting materials,



insects Disease and Virus Free planting Seedlings Obtained. It may helps in to increased the quality production of citrus which having more demand in market. It could improve production by retaining orchard from soil borne diseases for a longer time

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