CHAPTER

6

MANAGEMENT OF ROOTSTOCKS AND MOTHER STOCKS

OBJECTIVES

After studying this chapter, students will be able to:

- Shortcomings practiced in fruit nurseries
- Know about importance of mother stocks in fruit propagation
- Know about maintenance & management of mother stock
- Know about bud wood certification in fruit crops

INTRODUCTION

Mother block or progeny block

A separate block of generically pure, healthy and disease-free plants of a particular fruit variety.

Fruit crops are mostly composite plants and consists of scion and rootstock except in banana, papaya and strawberry. As reported in the previous chapter that rootstock exhibits a great influence on the performance of scion in terms of production efficiency, yields, quality, adaptability, vigour and resistance against biotic and abiotic stresses. The primary function of a rootstock is to provide anchorage or support to the scion by growing deep into the soil and also regulate the uptake of moisture and nutrients. The rootstock cannot be changed during life-time of a plant so it makes it inevitable to pay more focused attention on it because its functions are long term. Success of any orchard mainly depends upon the availability of right type of planting material. The initial planting material is the basic requirement on which the final crop depends both in terms of quality and quantity. In case, any mistake in done in the initial years, it cannot be rectified in the subsequent years and it will cause everlasting damage to productivity and income of the orchardists. In the recent past, the demand for quality planting material has increased manifold throughout the country due to increasing importance of fruit crops. However, the main bottleneck in the expansion of area under fruits is the non-availability of genuine and quality planting material in adequate quantity from reliable sources.

General shortcomings practiced in fruit nurseries

- Bud wood certification programme is not followed for the production of fruit plants, which are prone to attack of viruses.
- Provision for mother block for scion and rootstocks is not appropriate.
- Pedigree of the mother plants (scion source) is not known or not maintained adequately.
- Scion shoots are taken from such mother plants without knowing its characteristics.
- Scion shoot are collected from disease infected trees.
- Scion shoots are taken from juvenile tree, which can delay fruiting in most nurseries.
- Provision of source for rootstock is lacking.
- Seedling plants are mostly used as rootstocks, which result in variation in the performance of scion cultivars.

- Enough rotation is not practiced in the nursery and same bed is repeatedly used year-after-year.
- Least attention is paid towards phytosanitory conditions of the nursery.
- Transportation of plants along with earth ball is expensive, tedious and less efficient. Often, a number of diseases and pests are also carried along with earth ball.
- For the shake of making money, non-authentic saplings are sold to the growers in the name of quality one by private nurseries.

Classification of rootstocks

Rootstocks can be divided into two groups viz. seedling and clonal rootstocks on the basis of their method of propagation.

Seeding rootstocks

These rootstocks develop from the germinated seeds and have some advantages like, it is relatively simple and economical to raise them through seeds. Such rootstocks are usually well adapted to mass propagation. Moreover in some cases, the root system tends to grow deeper and to be more firmly anchored than the vegetatively propagated rootstocks. Most of the seedling plants do not retain viruses dwelling in parent plants although some exceptions are there like that of citrus. Seedling rootstocks have certain drawbacks, like genetic variation, which results in un-uniform growth and performance of scion cultivar(s) of the grafted plants.

Seedling rootstock: Rootstocks develop from the germinated seeds or stones

Clonal rootstock: Rootstocks, which are developed through vegetative means such as stooling, layering, rooted cuttings or by tissue culture

Seedling rootstocks of mango under shade net

Polyembryonic clonal mango rootstock

Clonal rootstocks

These rootstocks are those, which are multiplied through vegetative means either by stooling, layering, rooted cuttings or by aseptic tissue culture method. In polyembryonic species like citrus, seedlings of nucellar origin are clonal and to great extent uniform in growth.

Management of rootstocks

Rootstock is that part of the plant onto which a scion bud or bud stick is placed. It provides the root system to the grafted or budded plant. It is well known fact that rootstocks have strong influence on the growth, flowering, precocity and fruit quality of the scion variety. Rootstocks also impart resistance to abiotic and biotic stresses. The desired performance of the scion cultivar depends on the correct choice of the rootstocks. It is therefore imperative to pay attention for raising good quality rootstocks and their management in the nursery.

The seeds should be collected from the healthy, disease-free tree. The seeds are to be washed thoroughly and dried in shade prior to sowing. Some seeds need immediate sowing. The spacing and depth of sowing vary with the size of seed, viz. citrus seeds are sown 2 cm apart in rows at a depth of 1 cm whereas mango stones are placed

at a depth of 5 to 6 cm with a spacing of 15-20 cm between rows. The germination of seeds normally commences about three weeks after sowing. The young seedlings are susceptible to extremes of climate. They should be protected against frost in winter and hot desiccating winds during summer months. Light dressing with nitrogenous fertilizers after one month helps in rapid growth of seedling at initial stages. The bed should be kept free from weeds. Irrigation should be given at an interval of 7-10 days during summer months. Seedlings become ready for grafting or budding at the age of one year when they attain a size of pencil thickness at about 15 to 20 cm above the ground level.

Provision of mother block

Each nursery must have provision of mother block of scion and rootstock varieties. Invariably, separate space should be provided for establishment of Mother Block within the premises of the nursery. The pedigree of these plants should be known and any change in its characteristics should be taken care. For example, expression of mutation could result in significant variation in the performance of original one. Following are some issues require attention of nurseryman in the mother block management.

Selection of mother plants

Selection of mother plant as a source of scion wood is of utmost importance and should be done with the greatest care since the performance of progeny depends entirely upon characteristics of mother plant. The mother trees selected for scion wood should have attained full bearing age, since its characteristics will be known only after bearing age. Mother plants performing consistently better and giving higher yield, producing high quality fruits and are free from diseases and insect pests, should be used as scion wood source, i.e., as mother plants.

Procurement of source plants for mother block

Genetic purity and freedom from diseases and insect-pests of the mother plants is of utmost importance. Maximum efforts should be paid for getting plants of specific varieties from the organization which has released that one. If not possible, plants for mother block should be taken from State Agricultural Universities located in different states or ICAR institutes or state horticulture department. If again not possible then make sure to get the plants from a reliable government or private nursery. In case of citrus and apple where viral diseases are common, only indexed plants of specific variety should be taken for mother block purpose.

Establishment of mother blocks

In order to increase the availability of enough scion sticks, mother tree blocks need to be established on a suitable rootstock and planting at a spacing of 3 m x 2 m distance. These plants should be severely pruned to produce enough shoots for propagation purposes. The maintenance of these blocks is to be done rigorously so that these are healthy and free of diseases and insect pests. If there is any congestion and problem of light penetration, then alternate plants first within plant to plant then later on within rows can be eliminated depending upon the situation.

Mother block of Amrapali mango

Maintenance of mother plants

A permanent register indicating the layout of promising varieties of the region needs to be maintained. The maintenance of mother plants, right from the time of planting to the stage of bearing and subsequent years involves timely application of manures and fertilizers, irrigation, weeding and other inter-culture operations, training and pruning and plant-protection measures. These agro-techniques need to be undertaken judiciously, so that vigorous and healthy scion shoots are made available for multiplication. Till scion shoots form elite plants planted in mother blocks are not available, scion woods can be procured from the scion banks of ICAR institutes, SAU's and other district level government nurseries or promising trees in the area marked through a group of experts and scion shoots from these sources may be utilized for multiplication of planting materials.

Management of mother block

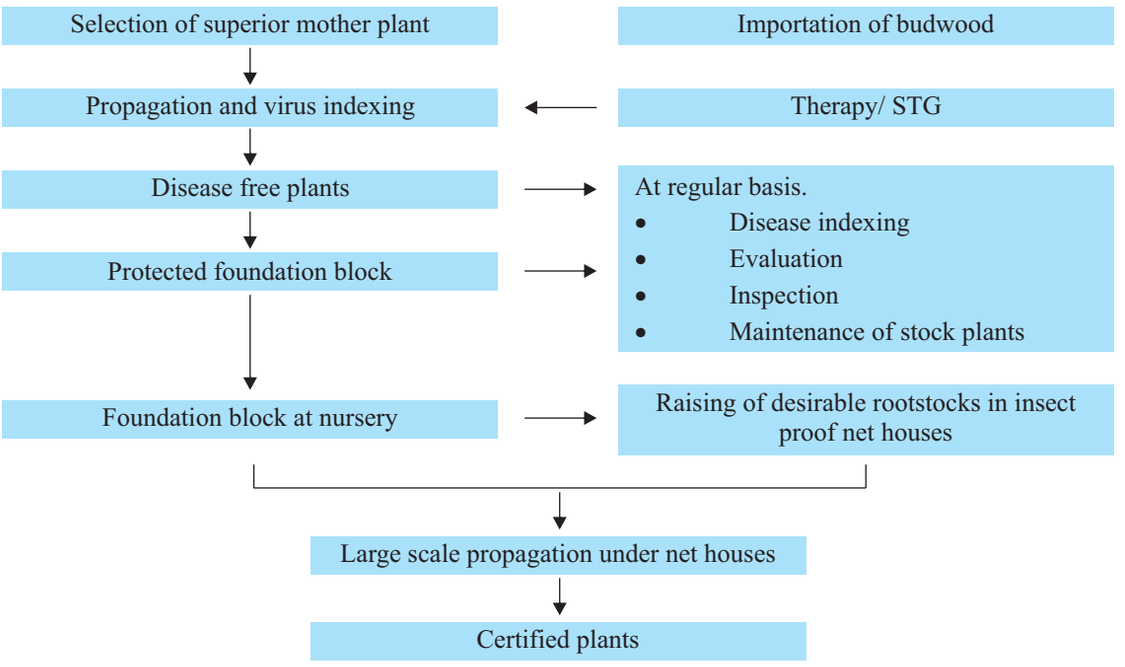
Training and pruning: For proper framework, it is advisable not to allow the growth of shoots from the base. Clean stem should be kept up to 20-30 cm from the ground and then branches are allowed to develop in different directions. After collection of shoots for multiplication, branches should be pruned back severely to induce new growth.

Pest and disease management: A number of pests and diseases attack during different stages of plants in mother block. In order to minimize the incidence, adopt preventive measures and keep proper sanitation as prevention is better than cure.

Protected structure for mother stocks: Poly shelter of plant height in frost and hailstorm prone areas be stretched all over. In fruits like citrus, insect proof net house is required to keep them free from viral contamination. After every two years, virus testing through indexing or other techniques should be got done.

Budwood certification in fruit crops

Most of the fruit crops are propagated vegetatively and may have high rate of infection by viruses, viroids and phytoplasma. To ensure disease-free panting material budwood certification is necessary. Budwood certification programmes have the objective of producing certified nursery plants that will guarantee that the sanitary status i.e., the pathogen free state of the parent material and desirable horticultural characters of candidate mother plant are maintained during commercial propagation. A certification programme is an essential step in producing high quality fruit plants and has to be established in every country, which desires to produce high quality and healthy nursery plants. The use of budwood from infected trees in the nursery for propagation is the primary cause for the distribution of the diseases. The mother plant serves as a source of primary inoculums as it is the source of budwood and secondary inoculums when vectors use the infected budwood to infect adjoining pathogen free trees. Due to this, virus and virus like diseases spread uncontrolled to most of the fruit growing areas of the country. A mandatory certification programme can prevent or eliminate destructive pathogens before they enter the mainstream of budwood supply. A successful certification programme needs careful planning and adequate facilities. An insect free propagation facility, testing laboratory, foundation block, an increase block, a regulatory agency and well trained, motivated proper scientific personnel are needed. The money invested in a certification scheme is bound to pay large dividends to the fruit industry.A schematic representation of methodology of a successful citrus certification progarmme is given below:



Disease indexing methods

The mother plants are monitored regularly for the presence of major viruses and virus-like agents such as citrus tristeza virus, ring spot virus, citrus greening and exocortis. This is done by biological indexing and serological indexing under insect proof controlled conditions.

Biological indexing or bio-diagnosis: Biological indexing is an old method for determining the presence of virus in plant tissue. The virus is detected in the plant tissue by budding or grafting of a scion from plant suspected of having virus onto other susceptible (Indicator) plants identified for specific virus.

Budding in citrus

Serological methods for indexing: The serological methods are indirect method of virus detection. This method is fast and efficient than bio-indexing. In general ELISA (Enzyme linked immune-sorbabent assay) and DIBA (Dot Blot immune binding assay) are performed.

Indicator citrus species	Viruses
Biological indexing	
Mexican lime	Tristeza, vein enation, leaf rugose, witches' broom
Pineapple sweet orange	Psorosis, ringspot, concave gum, cristacortis" impietratura, greening
Dweettangor	Psorosis, ringspot, impietratura, mosaic
Troyer citrange	Tatter leaf, kumquat disease
Etrog citron	Exocortisana other viroids, infectious variegation, tristeza, kumquat disease and satsuma dwarf
Parson's Special mandarin	Cachexia, ringspot
Serological indexing	
ELISA	Tristeza, stubborn, satsuma dwarf, infectious variegation
DIBA	Tristeza, stubborn, satsuma dwarf, infectious variegation

ACTIVITIES/EXERCISES

- Visit fruit nursery in your area, and try to find out if rootstocks or mother stocks are managed properly or not.
- Meet some nurseryman and enquire about the different cultural practices used for rootstocks and mother stocks.

CHECK YOUR PROGRESS

1) Enumerate the general shortcomings practiced in fruit nurseries.
2) Differentiate between clonal and seedling rootstocks.
3) What is biological indexing? Name some indicator plants for specific viruses in citrus.

FILL IN THE BLANKS

1. The primary function of a rootstock is to provide ……. to the scion by growing deep into the soil and also to regulate the uptake of ……..... ……..

2. ELISA stands for ..…….

3. DIBA stands for ..…….

4. Most of the fruit crops are propagated …… and may have high rate of infection by ……... To ensure disease free panting material, ……. is necessary.

5. On the basis of propagation method, rootstocks can be divided into two groups,1. ……..., and 2. …… rootstocks.

SUGGESTED FURTHER READINGS

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