

Production of Good and Genuine Quality Planting Material in Fruit Crops

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Introduction

In India, the horticultural crops are grown in an area of 28.77 million hectares with annual production of 355.25 million tons (MA and FW, 2023-24). The production of Fruits is expected to reach 112.63 million Tonnes, mainly due to increases in production of Banana, Lime/Lemon, Mango, Guava and Grapes. The fruit crops contribute 31.5 % to horticultural production. India accounts for about 13.0 % of total production of fruits in the world. Though India is the largest producer of Mango, Banana, Sapota, Papaya, Pomegranate and Aonla etc, the productivity of these crops is less i.e. 14.33 MT / ha, which could be attributed to chronic fruit production constraints like alternate bearing, fruit drop, mango malformation, spongy tissue, apple scab, guava wilt, citrus decline, incidence of insect – pests and diseases besides shortage of genuine quality planting material and non-adoption of hi tech horticultural practices like High Density Planting (HDP) along with fertigation. Therefore, there is an urgent need to enhance the productivity of fruit crops through alleviation of production constraints and use of high yielding fruit varieties, rootstocks resistant to biotic and abiotic stresses, use of varieties resistant to insect – pest and diseases etc.

The major fruit growing states in India are

1. Andhra Pradesh (13 %)
2. Uttar Pradesh (11 %)
3. Maharashtra (11 %)
4. Gujarat (9 %)
5. Karnataka (8 %)
6. Tamil Nadu (7 %)

7. Bihar (6 %)

Area and Production ranking of states with regard to fruit crops

Area

1. Maharashtra
2. Andhra Pradesh
3. Uttar Pradesh

Production

1. Andhra Pradesh
2. Uttar Pradesh
3. Maharashtra

The major fruits in production order in India

1. Banana (32.6 %)
2. Mango (22.1 %)
3. Citrus (12.4 %)
4. Guava (7.4 %)
5. Papaya (6.2 %)
6. Grape (4.5 %)
7. Apple (3.4 %)

The key issues pertaining to quality planting material production are

- **Improved varieties in fruit crops:** One of the main constraints in fruit crops is the adoption of new varieties by the growers in the past. Hence, replacing a traditional variety becomes extremely difficult. The consumer preference in some of the crops like mango is very strong.
- **Establishment of mother blocks:** The planting stock maintained as a source for commercial propagation is referred to as a "mother block". The mother block is considered to be the heart of the nursery. Mother block for rootstocks should be established from where regular multiplication by layering, stem cuttings etc can be done. The mother block should be in close proximity to the nursery. Ultimately, a healthy mother block will help to produce quality planting material in fruit crops.
- **Recommended rootstocks:** The rootstocks are of vital importance for successful fruit production. However, multiplication of these rootstocks in sufficient numbers with

assured quality is not available for large scale propagation in the regions affected by abiotic stresses i.e. salinity, alkalinity and drought and biotic stresses such as nematodes and pests. In grape, the rootstock ‘Dogridge’ has revolutionized the industry in India. This rootstock possesses tolerance to drought, salinity and nematodes. In mango, polyembryonic rootstocks like Vellaikolumban, Olour, 13 – 1 and Kurukkan are gaining popularity in India. In guava, Pusa Srijan and *Psidium molle* are used to induce dwarf and wilt tolerance.

- **Micropropagation:** Among the fruit crops, banana, pomegranate and strawberry are propagated commercially on a large scale.
- **Hi tech seedling production:** The seedling production in protray or polybags has become a specialized practice. The seedlings of papaya, banana and strawberry hybrids are produced using seedling trays.
- **Quality control mechanism: Government** of India has formed and brought out different legislations to protect the quality of seeds and planting materials.
 - ✚ Seed Act (1966)
 - ✚ Seed rules (1968)
 - ✚ Seed control order (1983)
 - ✚ PPV and FR Act (2001)
 - ✚ National seed policy (2002)
 - ✚ Seed bill (2004)
 - ✚ New seeds Act (2005)
 - ✚ NCS – TCP (National certification system for tissue culture raised plants) established by GOI in 2006.

Factors responsible for poor quality planting material

- ✚ Most old existing nurseries lack modern infrastructure.
- ✚ There is acute shortage of mother plants of recommended varieties.
- ✚ There is absence of mechanism to ensure quality.
- ✚ There is an acute gap between demand and supply in several crops.
- ✚ Micropropagation protocols are not available in many crops requiring large quantity of planting material. e.g. Mango, Litchi, Coconut, Cashew nut, Walnut and Oil palm

Steps to be taken to ensure the supply of genuine quality planting material

- ✚ Nursery registration has to be made mandatory in all states, and a suitable and uniform mechanism for certification of planting material has to be put in place both for seed and planting material of horticultural crops.
- ✚ Standard rootstocks need to be made available and procured.
- ✚ Adoption of new grafting methods like softwood grafting and epicotyl (stone) grafting.
- ✚ Techniques like solarization and fumigation of soil need to be followed in nurseries to avoid large casualties.
- ✚ Labeling of each plot plant in nurseries needs to be enforced.

Recent initiatives in quality planting – material production

Besides traditional methods of propagation such as cuttings, grafting, layering, stooling and direct seeding, few innovative technologies in propagation (with higher percentage success at – low cost) have been standardized for fast multiplication and adoption in different temperate crops. In Apple, rootstocks are playing a significant role in inducing precocity and in providing resistance to biotic and abiotic stresses. For identifying suitable rootstocks for different situations, as many as 21 species/ecotypes of *Malus* (both indigenous and exotic collections) were evaluated for vigour through leaf-stomatal distribution. Micropropagation is an established method of producing millions of identical, disease – free plants in developed countries, but this technique is yet to establish in temperate crops in India. However, a protocol for micropropagation of apple rootstocks has been standardized for large scale production of clonal rootstocks like MM – 111, MM – 106 and M – 7, and a few thousand plants have been produced at centres like TERI, UHF, Solan, SKUAST (K), etc. But, this needs to be promoted at a very large scale for meeting the increasing demand for rootstocks for high-density plantation. To produce quality virus free planting material, micropropagation (using meristems as explants) was standardized for clonal rootstocks of cherry (‘Mazzard’ and ‘Mahaleb’). Micrografting, a new technique which consists of grafting shoot meristem or shoot tip (0.1-0.5 mm), comprising 2 to 3 leaf primordia along with apical meristem, on *in-vitro* raised rootstocks has great potential and has been standardized for large-scale production of disease free *in – vitro* grafted plants of temperate fruits on modified MS medium; but further investigation is needed before exploitation of this technique.

Problems associated with nurseries



1. Age old practices of propagation – since most of these nurseries were involved in multiplication of only ornamentals (which were largely multiplied by cuttings / seeds), they had to up scaled their skills in the latest plant propagation techniques, especially so in perennial fruit crops.
2. Non-availability of skilled man power modern plant material require abundant skilled man power with knowledge of the latest tools of propagation. Sudden rise in demand in the last 10 -15 years has necessitated need for skilled man power.
3. In most of the nurseries, health and sanitary considerations are far from desirable. Either these have not updated their knowledge based on issues, nor have felt the need. Timely availability of healthy plant material should be the order of the day. If health and phytosanitary considerations are not borne in mind, there is every likelihood of the material getting infected in the nursery itself.
4. Even today, there are very few nurseries having their progeny orchards. Today, it is mandatory to have scion and rootstock banks as part of nursery activities. This facilitates pedigree assessment periodically and ascertains true – to – type nature of both scion and stock material.
5. Rootstock bank of a known variety is becoming the order of the day. In crops like citrus, well defined rootstocks are in place where their mother plant blocks need to be maintained. It is also mandatory to periodically ascertain clonal fidelity in these. Similarly, in grapes, currently Dogridge is a widely employed rootstock in vineyards. Even though *in situ* grafting is practiced by all, a good mother plant block should be maintained.
6. Another important issue which is plaguing the nursery industry today is lack of proper labeling and certification of planting material. Hardly are any nurseries today correctly labeling and certifying plant materials that they are selling. There is no mechanism in place to verify and trace the batches to their place of origin. Pedigree of the perennial crop material purchased has no / improper labeling, many a time in leading to mixed populations in orchards.
7. Today, in modern nurseries, quality inputs like UV – stabilized bags, good organic substrates (media), soil solarizers, are all very essential. However, very few nurseries



can boast of having these inputs which can qualitatively improve plant health and subsequent performance in the field.

8. Most of the modern-day nurseries operate from small units around cities; with the result they do not have mother plant blocks which require large space. They depend upon scion wood and stock plant supply either from other sources or their own facility located far away.

Establishment of fruit nurseries and quality control

To ensure production and sale of genuine planting material of improved fruit varieties in quantities sufficient to meet future needs, there is an urgent need to modernize fruit nurseries with effective quality control. Some states have their Fruit Nursery Act in force, while others do not have any such system for regulating quality and sale of planting material.

Fruit plant nurseries should be located at sites, which have access to modern communication and transport facilities, good water source, electricity, and availability of skilled and unskilled labour throughout the season. Professionally qualified and competent manpower must oversee production and quality control in fruit crop nurseries. Places with mild climate, long growing season, and even distribution of rainfall are most suitable for planting material production, while areas with extremes of temperature or those commonly subjected to dry winds, frequent flooding, hail storms or frost pockets may be avoided. Soil should be preferably light to medium in texture, with good fertility, water holding capacity and drainage, ideally pH range of 6.0 to 7.0. Proper nursery records must be maintained, incorporating all information for monitoring quality control, including retrospective identification of probable flaws in the programme. Labeling of all planting material produced should be proper, with necessary details such as crop, variety, rootstock used, date of production, name of the nursery, etc.

Bud sticks / graft wood should always be taken from healthy and true – to – type progeny trees of commercial / new varieties which are free from viruses, disease and pest occurrence. A nurseryman should have progeny trees of all promising cultivars of fruits which can be grown in that particular area.

New developments in propagation techniques

Softwood or cleft or wedge grafting on polythene raised rootstocks has almost revolutionized vegetative propagation in many fruit crops.



Soft wood grafting in tropical and subtropical fruits: This is being commercially used throughout India for fast multiplication of a number of tropical and subtropical fruit crops, such as mango, guava, aonla, bael, sapota, custard apple, tamarind, cashew nut etc. Newly emerged stock shoots on six months to one year old rootstock seedlings are selected for softwood/cleft/wedge grafting.

Micropropagation in fruit crops: It is being followed in fruit crops like banana, Apple, papaya, strawberry, pomegranate and Date palm etc. For citrus, quality planting programme of NRC – Citrus, Nagpur (ICAR), including STG and budwood certification developed for Nagpur mandarin is a recent, significant development.

