

Production of Quality Planting Materials in Cocoa (*Theobroma cocoa* L.) through Improved Propagation and Nursery Management Practices

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INTRODUCTION

Cocoa (*Theobroma cocoa* L.) is one of the most important commercial plantation crops grown in tropical regions of the world. It is widely cultivated for its beans, which are used in the manufacture of chocolate, confectionery products and beverages. The increasing demand for cocoa products has necessitated the expansion of cocoa cultivation and the production of high-quality planting materials.

The productivity and profitability of cocoa plantations depend greatly on the quality of seedlings and grafts used for planting. Therefore, efficient propagation methods and scientific nursery management practices play a crucial role in ensuring healthy plant establishment and higher yields. Cocoa can be propagated through both seed and vegetative methods, each having its own advantages. Improved nursery practices, including proper seed selection, soil management, irrigation, shading, pest and disease control and the use of quality scion materials, contribute significantly to the production of vigorous and disease-free planting materials. This review highlights the various propagation methods and nursery management practices essential for the production of quality cocoa planting materials.

Importance of quality planting materials in cocoa

Quality planting materials are the foundation of successful and profitable cocoa cultivation. The productivity, longevity and overall performance of a cocoa plantation largely depend on the genetic quality and health status of the seedlings or grafts used for planting. The use of superior planting materials ensures uniform growth, early bearing, higher yields and better bean quality.

Healthy and genetically superior planting materials possess greater resistance or tolerance to pests, diseases and adverse environmental conditions, thereby reducing crop losses and management costs. They also exhibit vigorous growth, improved canopy development and enhanced nutrient and water-use efficiency, which contribute to higher productivity throughout the productive life of the plantation. The use of quality seedlings produced from selected mother trees or certified seed gardens helps maintain desirable traits such as high yield potential, good bean characteristics and adaptability to local growing conditions. Similarly, vegetatively propagated plants, such as grafts and budded plants, ensure true-to-type multiplication of elite clones and hybrids, preserving their superior genetic characteristics.

Quality planting materials also improve plantation establishment by providing better survival rates after transplanting and promoting uniform crop stands. This facilitates efficient crop management, harvesting and maintenance operations. Furthermore, the availability of quality planting materials is essential for large-scale cocoa area expansion programmes aimed at meeting the increasing demand for cocoa beans in the chocolate and confectionery industries. Therefore, the production and use of quality planting materials through scientific propagation and nursery management practices are critical for achieving sustainable cocoa production, improving farmer income and ensuring the long-term growth of the cocoa industry.

Propagation Methods

Seed propagation

Self-Incompatibility in Cocoa

Self-incompatibility is a natural mechanism in cocoa that prevents successful fertilization by pollen from the same plant. This promotes cross-pollination and increases genetic diversity within cocoa populations. As a result, fruit set may be reduced when compatible pollen is not available.

Understanding self-incompatibility is important for seed production and breeding programmes.

Hand Pollination and Fruit Set

Hand pollination is carried out to produce hybrids with specific desirable characteristics and to study compatibility among cocoa genotypes. Selected flower buds are protected before opening and pollen from a chosen parent is manually transferred to the stigma. Successful fertilization is confirmed by swelling of the ovary within a few days. This technique helps in producing genetically superior planting materials.

1. Flower buds expected to open the next day are selected and covered with a plastic tube and muslin cloth to prevent unwanted pollination.
2. Flowers from the selected male parent are collected and the pollen-bearing anthers are carefully transferred to the stigma of the female flower.
3. Emasculation is generally not required because cocoa exhibits self-incompatibility, which limits self-fertilization.
4. Pollinated flowers are labelled and successful fertilization is confirmed within 3–5 days by observing ovary swelling.
5. Developing pods are protected with wire mesh and excess naturally formed fruits are removed to improve pod retention.
6. Hand pollination is best performed during the morning hours and a skilled worker can achieve high fruit set under favorable conditions.

Selection of Mother Trees and Seed Pods

Mother trees should be healthy, high-yielding free from major pests and diseases. Trees producing more than 70 pods annually with good bean quality are preferred for seed collection. Mature, well-developed pods from selected trees ensure the production of vigorous seedlings. Proper selection of mother trees is essential for maintaining genetic quality and plantation productivity.

Seed Standards and Viability

Seeds selected for sowing should be bold, healthy fully mature to ensure high germination and vigorous seedling growth. Cocoa seeds are recalcitrant in nature and lose viability rapidly after extraction from the pod. Fresh seeds generally exhibit a germination rate of 90–95 percent under suitable nursery conditions. Therefore, seeds should be sown immediately after extraction to maintain viability.

Seed Storage and Treatment

Mature cocoa pods can be stored in a cool, shaded place for a few days before seed extraction. Extracted seeds should be protected from moisture loss, as they are highly sensitive to drying. Removal of the mucilaginous pulp and seed treatment with appropriate fungicides help improve germination and reduce disease incidence. Proper storage and treatment practices ensure healthy and uniform seedling establishment.

Vegetative Propagation

Grafting

Grafting is the most widely used vegetative propagation method in cocoa for producing true-to-type plants. It involves joining a scion from a superior mother plant to a compatible rootstock. Softwood grafting is commonly practiced and provides a high success rate under nursery conditions. Grafted plants bear earlier and maintain the desirable characteristics of the parent plant.

Budding

Budding is another vegetative propagation technique in which a healthy bud from a selected elite plant is inserted onto a rootstock. Patch budding is commonly practiced in cocoa and ensures the multiplication of superior genotypes. The method is economical and requires less scion material than grafting. Successful budding produces uniform and high-yielding plants.

Selection and Preparation of Scion Materials

Scion materials should be collected from healthy, high-yielding, disease-free mother plants with desirable characteristics.

Semi-hardwood shoots with well-developed buds are preferred for grafting and budding. Leaves are usually removed before use to reduce moisture loss and improve success rates. Proper selection and preparation of scion material are essential for successful vegetative propagation.

Advantages of Vegetative Propagation

Vegetative propagation produces true-to-type plants that retain the superior characteristics of the parent plant. It ensures uniform growth, early bearing, consistent yield and bean quality. This method is useful for multiplying elite clones and disease-resistant varieties. It also helps maintain genetic purity and enhances the overall productivity of cocoa plantations.

Nursery Management

Effective nursery management is essential for producing healthy and vigorous cocoa planting materials. Cocoa nurseries should be established in areas free from vascular streak dieback (VSD) and budwood or scion materials should be collected only from healthy, disease-free mother plants. Adequate shade, fertile soil and a reliable water source are necessary for successful nursery operation. Since cocoa seedlings are highly sensitive to drought, regular irrigation should be provided, while proper drainage must be ensured during the rainy season to prevent seedling blight and root diseases. Weed-free conditions, regular monitoring of pests and diseases and the application of organic amendments such as compost and neem-coated urea promote healthy seedling growth. Advanced nursery technologies, including soil solarization, biopriming, protected nursery structures, polythene mulching, efficient irrigation systems and proper drainage management, further improve seedling health and vigor. Adoption of these scientific nursery management practices helps ensure the production of high-quality cocoa seedlings and grafts for sustainable and profitable cocoa cultivation.

CONCLUSION

The production of quality planting materials is fundamental to the successful establishment and long-term productivity of cocoa plantations. Both seed and vegetative propagation methods play a significant role in producing healthy and vigorous plants. Adoption of improved nursery management practices, including proper seed selection, grafting techniques, irrigation, shading, soil sterilization, biopriming and effective pest and disease management, ensures the production of superior planting materials. The establishment of certified seed gardens and recognized nurseries further contributes to maintaining genetic purity and plant health. Therefore, scientific propagation and nursery management practices are essential for sustainable cocoa cultivation and enhanced productivity in the cocoa industry.

REFERENCES

- Apshara, S. E. (2007). Producing quality planting material of cocoa. *Indian Horticulture*, 52(5), 6–8.
- Apshara, S. E. (2010). *Cocoa planting material production* (Technical Bulletin No. 66). Central Plantation Crops Research Institute, Kasaragod.
- Apshara, S. E. and Hubballi, N. V. (2012). *Calendar for cocoa* (Technical Bulletin No. 76). Central Plantation Crops Research Institute, Kasaragod.
- Suchithra, M. (2018). Cocoa propagation methods. In *Training manual on cocoa production technology* (p. 32).
- Vikraman Nair, R., Mallika, V. K., Prasannakumariam, S., Abraham, K and Balasubramanian, P. P. (2000). *Cocoa cultivation: Science and techniques*. Directorate of Cashew and Cocoa Development, Cochin.