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RAPID MULTIPLICATION OF UNDERUTILIZED FRUIT CROPS THROUGH MICROPROPAGATION

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Abstract: -

Micropropagation is the term used for rapid *in vitro* plant multiplication using any explant (nodes, leaves, flowers, seeds, etc.) under aseptic conditions. In recent years, its use has increased significantly for vegetative propagation in horticulture. It has proven to be rapid multiplication method for creating large amounts plants in a controlled setting that are consistent, stable, disease-free, true to type, and unaffected by seasonal limitations. Indian gooseberry (*Emblica officinalis* Gaertn.), Tamarind (*Tamarindus indica* L.), Karonda (*Carissa carandas* L.), Bael (*Aegle marmelos* Corr.), Jamun (*Syzygium cuminii* L.), and Jackfruit (*Artocarpus hetrophylous* L.) are a few of the prominent but minor fruit crops that are indigenous to India and have substantial commercial significance (medicinal, food, and cosmetics) in addition to high nutritional, medicinal, and therapeutic values. The absence of suitable planting materials limits the commercial production process for these crops. Micropropagation has the potential to significantly enhance the number of innovative cultivars or genotypes of these fruit crops.

Keywords: Micropropagation, aonla, tamarind, karonda, bael, jamun, jackfruit etc.

Introduction:

Minor fruit has important nutritional, pharmacological, and medicinal qualities and can be grown in even the most neglected marginal environments. Some the underutilized fruit crops include jackfruit, tamarind, jamun, bael, karonda, and aonla. These fruits are rich in numerous vital vitamins, minerals, and bioactive compounds that have been connected to antioxidant qualities against various free radicals are

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abundant in minor fruits. In addition to these advantages, these fruit crops are not extensively cultivated, and their commercial trade and consumption are limited both geographically and quantitatively when compared to large fruits. These fruits have the potential to ensure food security and are an essential part of rural and tribal cultures', traditional diets. Due to a shortage of planting material, the commercial production of these crops is restricted. Micropropagation has the potential to significantly enhance the number of noteworthy varieties of these fruit crops. Breeding and selection trials are a particularly difficult method due of the long life cycle. Numerous biotic and abiotic stressors dramatically reduce fruit tree productivity. Since traditional methods are insufficient to address these issues, the urgent integration of plant biotechnology technologies for fruit tree development is necessary.

Aonla (*Emblica officinalis* Gaertn.),

Indian gooseberry (*Emblica officinalis* Gaertn.), also referred to as aonla, is indigenous to tropical South-East Asia, particularly Central and Southern India. Antioxidants and bioactive tannins like emblicannin A and B, which have several health advantages, are abundant in it. Micropropagation has become a successful substitute for true-to-type plant production due to the lack of consistent planting material and the poor performance of traditional vegetative propagation. High success rates were seen in *in vitro* culture utilizing nodal explants on MS media supplemented with kinetin and GA_3, especially when explants were taken between August and November and moderately firm shoots were employed. Browning and pollution were greatly decreased by chemical sterilizing and plant waxing. Shoot elongation and proliferation were significantly influenced by GA_3, and under optimal growth regulator combinations, high multiplication rates were observed. (Mishra *et al*., 2006).Standardized micropropagation methods provide a dependable way to multiply aonla on a big scale to satisfy its increasing demand in the horticultural, pharmaceutical, and nutraceutical industries (Singh *et al*., 2025).

Tamarind (*Tamarindus indica* L.)

Tamarind (*Tamarindus indica* L.) is indigenous to tropical Africa and also to some regions of South India. It is a long-lived tree that grows slowly and reaches a height of over a hundred years. The tree yields fruits that are mostly utilized in chutney and curries because of their acid pulp. Regeneration has primarily been accomplished through adventitious bud production from mature embryo axes, axillary buds, hypocotyl segments, and stem pieces utilizing Murashige and Skoog (MS) medium with particular auxin and cytokinin combinations (most notably BAP, NAA,

zeatin, and GA_3). Type of explant, season, and growth regulator concentration all affected optimal shoot induction and multiplication; axillary buds gathered in May produced the greatest results. On half-strength MS medium with moderate sucrose and low IAA and IBA levels—which were frequently improved by activated charcoal—rooting was most successful. Auxins, charcoal, sucrose, and excessive medium strength all had a detrimental effect on roots. Following acclimatization, regenerated plantlets demonstrated high survival, making these systems appropriate for genetic transformation research and clonal propagation (Mishra *et al*., 2025).

Karonda (*Carissa carandas* L.)

Karonda (*Carissa carandas* L.) shrub belongs to the Apocynaceae family and is well suited to tropical and subtropical regions, however it is susceptible to waterlogging. Although its sour and astringent fruits should not be consumed raw, they are frequently processed into high-value goods including pickles, jams, jellies, syrups, and chutneys.The demand for large-scale planting material is increased by the usage of karonda plants as living hedges and fences. Micropropagation and enhanced vegetative methods have been investigated as ways to get around the drawbacks of traditional propagation. Maximum shoot sprouting from 1.5 cm explants taken in the spring on MS media supplemented with BA was demonstrated *in vitro*, with the largest shoot proliferation occurring at 3.0 mg/l BA. After satisfactory acclimatization, optimal rooting took place on half-strength MS medium containing IBA and NAA(Singh *et al*., 2025). Furthermore, stem cutting tests showed that IBA at 8000 ppm in combination with 4% sucrose produced the best roots and survival, making it appropriate for commercial karonda propagation Dey *et al*., (2017) .

Bael

Bael (*Aegle marmelos* Corr.)is an important medicinal fruit tree belonging to the Rutaceae family (2n = 36). The ripe fruits are used to make value-added goods like sherbet, preserves, and powder since they are high in fiber, vitamins, minerals, and bioactive substances including psoralen and marmelosin. Root sucker propagation is slow, and conventional seed propagation is unreliable because of low viability and a paucity of true-to-type seedlings(Anonymous, 2003). Axillary buds, leaf explants, and nucellar callus procedures have been successfully used for *in vitro* propagation in bael (Arumugam and Rao, 1996; Ajithkumar and Seeni, 1998) (Hossain *et al*., 1994).

Jamun

Jamun(*Artocarpus hetrophylous* L.), is highly valued for its antioxidant-rich fruits that

include vitamins, polyphenols, and flavonoids. It is a good source of iron and is frequently used to treat liver, heart, and diabetes conditions. Nodal explants and juvenile tissues have been used in micropropagation to produce true-to-type plants on a large scale. While reduced-strength MS medium with IBA produced successful roots and acclimation, half-strength MS medium with BAP produced enhanced shoot proliferation (Chaudhri *et al*., 2013).

Jackfruit

Jackfruit (*Artocarpus hetrophylous* L.)(2n = 56), a significant food crop whose ripe fruits are eaten raw or processed, while its immature fruits are utilized as vegetables. Conventional propagation is limited by high heterozygosity and poor planting material. To guarantee true-to-type multiplication, tissue culture methods utilizing nodal explants, shoot tips, or apical buds have been standardized. While maximal rooting happened on half-strength MS medium with 2 mg/L IBA, allowing for effective mass propagation, optimal shoot regeneration was achieved on MS medium supplemented with 2 mg/L BAP(Ashrafuzzaman *et al*., 2012).

Conclusion

Most indigenous minor fruit crops lack micropropagation procedures. It is necessary to improve the micropropagation procedures for significant crops like Indian gooseberry, bael, jamun, tamarind, and jack fruit. In order to promote economic development, guarantee the nutritional security of small and marginal farmers, and develop marginal farmland and wasteland, the micropropagation protocols for must be scaled up for mass multiplication.

Reference

1. Ajithkumar D, Seeni S (1998). Rapid clonal multiplication through *in vitro* axillary shoot proliferation of *Aegle marmelos* (L.) Corr., a medicinal tree. Plant Cell Rep. 1998;17:422-426.
2. Anonymous (2003). Wealth of India-Raw Materials. National Institute of Science Communication, Council of Scientific and Industrial Research (CSIR), New Delhi,India, 1: A (revised): 85-91.
3. Arumugam S, Rao MV(1996). In vitro production of plantlets from cotyledonary node cultures of Aegle marmelos (L.) Corr. Adv Plant Sci. 1996;9:181-186
4. Ashrafuzzaman M, Karl S, Khanam D, Prodhan S (2012). In vitro regeneration and multiplication of jackfruit(*Artocarpus heterophyllus* L.). Res J Biol;2:59-65.
5. Choudhri NA, Swamy GSK, Jagadeesha RC, ChavanM, Mastiholi A, Prabhuling G, et al(2013) . Micropropagationstudies in jamun

(*Syzygium cuminii* L.). Int J Appl Biotechnol Biochem. 2013;3:1-7.

6. Dey K, Ghosh A, Mani A, Bauri FK, Dey A (2017). Root generation of Karonda (*Carissa carandas* L.) cuttings in response to sucrose and IBA. J Pharmacogn
7. Hossain M, Islam R, Karim MR, Joarder OI, Biswas BK(1994) . Regeneration of plantlets from in vitro culturedcotyledons of *Aegle marmelos* Corr. (Rutaceae). Scientia Horticulturae. ;57:315-321.
8. Mishra M, Pati R, Chandra R (2006). Clonal micropropagation of Indian gooseberry (*Emblica officinalis* Gaertn). *Indian J Genet Plant Breed*. ;66(4):359-360.
9. Mishra, M., Chandra, R., Tiwari, R. K., Pati, R., & Pathak, R. K. (2005). Micropropagation of Certain Underutilized Fruit Crops: A Review. *Small Fruits Review*, *4*(4), 7–18. https://doi.org/10.1300/J301v04n04_03 Phytochem.;6:803-806.
10. Singh, R. P., Chand, R., Kumar, K., Singh, D., Mishra, B. K., & Tiwari, R. A. N (2025). Underutilized fruit crop multiplication through micro-propagation technique: A review. https://doi.org/10.33545/26174693.2025.v9.i1Sk.3613