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Micropropagation of Fruit Crops

Adsure R. M.[1], Jadhav C. B.[2] and Dhage V.B.[3]
[1]Assistant Professor, Department of Food Microbiology & Safety, Saikrupa College of Food Technology, Ghargaon (M.S.)
[2]Assistant Professor, Department of Agriculture Botany, Saikrupa College of Agriculture, Ghargaon (M.S.)
[3]Institute of Agricultural and Dairy Sciences, Loni (M.S.)

SUMMARY

Plant tissue culture, also called micropropagation, is a practice used to propagate plants under sterile conditions or in a controlled environment, often to produce clones of a plant. In these processes, tissues or cells, either as suspensions or as solids is maintained under conditions conducive for their growth and multiplication. This article on micropropagation of fruit crops their steps, various factor affecting on it and advantages of micropropagation in horticultural crops.

INTRODUCTION

Micropropagation is a part of tissue culture which deals with the rapid production or multiplication of large number of plants from small plant part, cell or tissue of mother plant under aseptic conditions. In relatively short periods of time and limited space. Micropropagation has been exploited for commercial propagation of several important fruit crops like banana, strawberry etc. Micropropagation arose from the fundamental biological phenomenon named 'totipotency'. The term 'totipotency' was coined by Haberlandt, known as father of tissue culture. Although tissue culture or micropropagation of herbaceous plants has been well studied but it has not received much attention in some woody perennial fruit trees like mango, jamun due to existence of inherent problems like phenolic exudation, explant browning etc.

Advantages of Micropropagation:

Micropropagation technique can be used as a substitute method to traditional asexual propagation method. The rate of production of plants in much higher as compared to the traditional propagation methods. Even a small shoot tip or meristem can be used to produce a number of plants in short time of periods and space. As the plantlets produced through tissue culture can be easily transported to long distance and also can stored as these needs smaller space. This technique can be used to produce sufficient plantlets from single stock plant in short time span, which does not produced seed or have some problems with vegetative reproduction. The cultivated banana does not produce viable seeds due to it triploidy nature. Again, virus and soil borne pathogens creates hindrance in production of quality planting materials in banana through vegetative means (rhizomes or suckers). Micropropagation of banana using the meristem culture is overcoming these bottlenecks. Apart from mass production of disease -free planting materials, it also offers true to type planlets. This method can also be used for germplasm collection and in vitro conservation in a smaller area like unlike the ex-situ fruit crop germplasm conservation, which require more space. Conventional breeding method of perennial fruit crops has several bottlenecks including perennial nature, long juvenile phase, high heterozygosity, genetic drag etc. Biotechnological tools can be used to overcome these inherent problems of conventional fruit breeding. However, micropropagation or tissue culture forms the basis of most of biotechnological interventions in fruit crops like embryo rescue, somatic hybridization, Trans or cis Trans approach, genome editing etc.

Factors Affecting Micropropagation:

Several factors affect the micropropagation of fruit trees. All the fruit crops are not equally responsive to the various techniques of micropropagation. Even within a particular fruit crop, the genotype also plays a major role in success of the technique. Apart from the crop and its genotypes, explants used for inoculation, various methods of surface sterilization, culture medium, plant growth regulators, medium pH, phenol exudation, photoperiod and temperature of growing environment etc., also affect the response and success of micropropagation.

Various Method of Micropropagation:

Micropropagation of fruit crop can be done through various technique, some of these possible techniques include suspension culture, callus culture, meristem culture, shoot tip culture, protoplast culture, embryo culture, anther culture etc. Meristem culture is commercial exploited in banana for faster production of virus -free elite planting materials. In citrus, production of true to type, disease free QPMs can be done using in vitro shoot tip grafting or micro budding. STG along with thermotherapy can be used for elimination virus in the citrus planting materials. Through embryo culture, both the mature and immature embryo can be cultured under in vitro condition to obtain a viable plantlet. Embryo rescue technique has emerged as a boon for seedless grapes breeding. Anther and ovule culture can lead to haploid plants homozygous fruit plants. Naked plant cell without the cell wall is known as protoplasts. Protoplast culture and subsequent somatic hybridization opens the avenue for obtaining noble cybrids.

Steps of Micropropagation:

Primary step in micropropagation is selection of explants. An explant may be a meristem, shoot tip, nodal cutting or embryo etc. Success percentage of the micropropagation varies with the explant used. The explants are established in the culture media. In culture media, various combination of plant growth regulators is used in addition to the basal media. In general, higher concentration of cytokinin promotes shoot induction, while auxin promotes rooting. However, equal ratio of both auxin and cytokinin leads to callus formation. Sub-culturing at regular interval is required for multiplication and maintenance of proper growth and development of the culture. After establishment of the well differentiated plantlets, hardening media of various compositions of perlite, vermiculite, cocopeat etc. Hardening increases the chance or percent of survival of plants under field condition. After this, the plants are planted in the main field.

CONCLUSION

micropropagation has several advantages over conventional asexual propagation methods of fruit crops, but till date it is commercially exploited in a limited number of fruit crops. Phenolic exudations, explant browning is some of the major problems in crops like mango and jamun. Therefore, it is necessary to standardise a suitable micropropagation protocol in these crops. However, micropropagation is well established in fruit crops like banana, strawberry, citrus etc. keeping the advantages of micropropagation under the view, it should be promoted to ensure supply of elite, disease -free true to type, quality planting materials in fruit crops.

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