CURRENT STATE OF THE ART ON USE OF TISSUE CULTURE TECHNIQUES ON VEGETATIVE PROPAGATION OF COCONUT - INDIA

By

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The tissue culture work in coconut was started with the objective of developing techniques in clonal propagation of elite coconut palms of superior agronomic traits so that uniform high yielding plants of known traits can be supplied for planting to increase the productivity as well as production in the country and also to do basic work for further crop improvement progammes. The progress in this field had been rather slow due to the highly recalcitrant nature of coconut tissues and laso due to the non-availability of literature because of the high commercial value of a suitable technology. The conventional breeding for crop improvement in coconut is rather very slow especially due to the biology of the palms. Conventional vegetative propagation methods are further lacking to fix the naturally occuring superior genotypes so that uniform population can be produced. Hence there was necessity to resort to this modern method to fix up suitable genotypes. Various types of tissues of both seedlings as well as mature palms were cultured. The seedling tissues were tender leaves, leaf bases, roots, apical meristem and stem portions while in mature palms in addition to the above tissues, inflorescence were also used. To develop suitable techniques for in vitro germplasm collection, exchange and preservation, embryo culture techniques were worked out.

Of the various types of somatic tissues, seedling leaves which were still non-chlorophyllous and sheathed in the leaf base of the older leaves were found to show

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better in vitro responses ranging from callus formation, rhizogenous growth to direct somatic embryogenesis. Tender leaf explants were found to produce two different types of calli: loose filamentous types from cut surfaces and compact nodular calli from the perivascular and vascular tissues. Several media combinations including Y_3 and MS etc. were found to favour callus induction in presence of high concentrations of 2-4 D. The filamentous types of calli however failed to develop on subculturing while the nodular callus could be sub-cultured. Repeated subculturing of the nodular calli gave rise to only roots.

Leaf explants on media containing NOA, NAA and ABA were found to produce nodules towards the morphologically lower cut ends of the leaf bit from where club shaped structure emerged into the medium after prolonged incubation. Histological studies have shown that these club shaped structures had the shoot root axis as in the zygotic embryos seen perpendicular to the long axis of the embryoid. Up to 48 embryoid were found developing on one explant. Further germination of the embryoid was difficult. On almost all the media tried the root pole develops first and this suppresses the root pole development. Selective removal of the entire root and portion of the haustorial region induced germination in some of the embryoids. The shoots thus obtained by the germination rooted readily on transfer to media containing IBA and high concentrations of activated charcoal. Such plantlets with good shoot to root ratio were planted in polybags and kept in the greenhouse for establishment. Out of various potting mixtures tried sand-farm yard manure and coir dust (1:1:1) soaked with 500 ppm solution of KH_2PO_4 gave better establishment. Few such plants were later transplanted into the field and their growth is comparable to usual seedlings.

The floral tissues collected from inflorescence of different physiological maturities were cultured with the objective of transforming the floral meristems into vegetative bulbils. Such bulbil formations are however seen in nature as freaks. Callusing, normal flower

formation, shoot-like developments and shooting were observed in vitro. The rachillas explants taken from the inflorescences placed at the axil of the 3rd leaf outside the unopened spindle was the ideal stage for the induction of shoot-like as well as shooting structures. The younger inflorescences yielded calli while the older ones produced flowers. The shoot-like structures were formed by the elongation of the floral thalamus and subsequent formation of scally appendages along with the length of the elongated axis. The shoot-like structures in contrast had scale leaves with clear sheathing bases as in case of scale leaves produced on germination of embryos. Serial transfer of the floral primordia through varying levels of hormones was required for the formation of such structures. It is however yet to realise complete plantlets from inflorescence cultures.

Zygotic embryos cultured from tender nuts were found to produce callus as well as germinate to form plants. The matured embryos readily produced shoots and roots on media containing low levels of auxine. Cytokinins were found to promote shoot development but inhibited the root formation. Mature embryos could be stored without any transfers for a period of two years in the tropical climatic conditions. The viability after two years storage was found to be 50%. The methodology for developing plants from zygotic embryos and subsequent transfers to fields were standardised.

REFERENCES ?