1997]

MORPHOGENIC STUDIES ON *DERRIS INDICA* (LAMK) BENNET

SHEELA RANJAN

Department of Botany,
M.N.M.M. College, Bettiah, West Champaran (Bihar)

Introduction

The technique of tissue culture is very suitable for studying the growth, development and differentiation of any plant cell under controlled condition. A survey of literature on morphogenic studies of trees involving tissue culture technique reveals that trees have received scant attention in this regard. Only a few tree species have been brought to culture, till now.

The investigations presented here on an economically important tree *Derris indica* (Lamk) Bennet of Laguminosae is outcome of the research conducted in the Tissue Culture Laboratory, Department of Botany, Ranchi University. It includes results of morphogenesis of seed, cotyledon, hypocotyl, stem and callus as well as anatomy of its root shoot bud differentiated from the callus.

Materials and Methods

Derris indica (Lamk) Bennet is a very dominant tree of Chotanagpur. Previously this plant was known as *Pongamia globra* (Vent). Bennet (1971) after studying the monographic study of Papilionacea changed the name of *Pongamia globra* (Vent) to *Derris indica* (Lamk).

The seeds of *D. indica* showed normal hypogeal germination in culture medium namely Gamborg's medium (B_5 medium) as well as Agar Sucrose medium.

The effect of different auxins were also studied on different parts of the plant. Encouraging results were obtained only in stem and cotyledon cultures as compared to root and leaf cultures. Best callusing was observed with higher concentrations of 2, 4-Diclorophenoxy Acetic Acid (2, 4-D) especially from the cotyledon cultures. There are reports where other auxins in combination with cytokinin support callus growth. B_5 + 2,4-D (5 ppm) + KN (Kinetin 1 ppm) was selected as the best media for callusing in *D. indica*.

In *D. indica* root differentiations was much more common. The differentiation was easily achieved by two ways :

1. The explant first callused and then from this the roots differentiated.

2. The roots differentiated directly on the explant without callusing.

Direct roots differentiated from the parts of stem, hypocotyl and cotyledon with various auxins like NAA (Napthalene Acetic Acid), IAA (Indole 3-Acetic Acid), IBA (Indole 3-Butyric Acid) or with the combination of Kinetin. Roots usually did not differentiate on medium containing 2,4-D.

Organogenesis of roots from callus was

also of common occurrence in the cultures. On plain B_5 medium roots were observed from callus when it was transferred from medium containing combination of NAA and KN. Various auxins like NAA, IAA and IBA when supplemented on B_5 medium showed differentiation of root from callus and also in combination of NAA and KN.

Regeneration of root and shoot from the stem nodes was observed in auxin-cytokinin combination and there was a great increase in the length of the shoot when coconut water (20% v/v) was added to the auxin-cytokinin mixture.

Differentiation of shoot buds from the callus of *D. indica* was also observed. Shoot buds differentiated mostly from the stem callus. This was obtained in B_5 + NAA (2 ppm) + BAP (5 ppm) + coconut water (20% v/v) medium. But there was no differentiation of roots in any of the cultures in which shoot bud had already differentiated.

The anatomical studies showed that differentiation of root was an endogenous but the shoot bud initiated from the peripheral cells of callus. The anatomical study of callus showed cambium like division of the cells which indicates rapid cell division during callus formation.

Discussion

It is rather surprising that though rooting is quite common in *D. indica* all present attempts to bring about root formation at the base of the shoot buds differentiated in callus cultures, proved unsuccessful.

All the cells of an explant carry the same genome, yet the genes responsible for the formation of bud initiation or root formation are depressed only in some of these cells. This is the reason why only some of these cells form buds on roots. It does not seem proper to consider that cells are destined to form either bud or roots, on the contrary the same callii can be triggered to develop into shoot bud on root. This is determined by the appropriate conditions i.e. temperature photoperiod, light intensity, pH, sugar concentration, composition of the nutrient medium and other factors that may have a determining role in organogenesis.

It is apparent that *in-vitro* procedures in the years to come will have wide applications in the developing of genetically improved, economically and medicinally useful tree species, which will have important bearing on the future of our forests.

SUMMARY

Experimental morphogenic studies were conducted on *Derris indica* (Lamk.) Bennet under controlled conditions of temperature and humidity. The *in-vitro* culture of mature seed developed seedling. Callusing on hypocotyl, stem, leaf and cotyledons were raised under aseptic conditions on B_5 medium supplemented with auxins, cytokinins and other growth substances of *D. indica* was also observed. Anatomical investigations were carried out to study cellular differentiation in callus induction and also to study the ontogeny of root and shoot buds, developed in cultures.