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INDUCTION OF DIVERSIFIED ROOT SYSTEM IN *IN VITRO* CULTURES OF *SESAMUM INDICUM* L.

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Effects of indole acetic acid (IAA), indole butyric acid (IBA), naphthalene acetic acid (NAA) and 2,4–dichlorophenoxy acetic acid (2,4-D) were studied on cultured explants of *Sesamum indicum* L. Dedifferentiation and morphogenic responses of hypocotyl and cotyledon explants showed great variation, depending on the auxin used. Rhizogenesis was the only morphogenic response observed in both the types of explants.

Keywords : Rhizogenesis; *Sesamum indicum;* Auxins.

In vitro plant regeneration has been achieved in over a thousand plant species (Brown and Thorpe, 1987). Hormonal regulation is considered the major factor, affecting *in vitro* morphogenesis. It was established that in the interaction between kinetin and the auxin IAA, IAA alone, or a high ratio of IAA to kinetin lead to adventitious root formation (Skoog and Miller, 1957). Keeping this in view a detailed investigation on the effects of various concentrations of exogenous auxins (IAA, IBA, NAA, 2,4–D) on hypocotyl and cotylendon explants was conducted.

Seeds of sesame (*Sesamum indicum* L. var. T–13) were obtained from Agriculture Research Station, Mandore (Jodhpur). The seeds were surface sterilized with 0.1 percent $HgCl_2$ solution for 5 minutes. After repeated washings with sterilized distilled water, the seeds were cultured on hormone-free half strength MS nutrient medium (Murashige and Skoog, 1962) for germination. Hypocotyl segments (*ca.* 1 cm) and cotyledons derived from two week old seedlings were cultured on MS medium supplemented with different concentrations (0.5, 1.0, 3.0 and 5.0 mg/l) of various auxins (IAA, IBA, NAA, 2,4–D). pH of the medium was adjusted to 5.8 and it was solidified with 0.8 percent agar (BDH). All cultures were incubated under continuous fluorescent light at $26 \pm 2°C$ and 50 to 55 percent relative humi-

Table 1 : Response of hypocotyl and cotyledon explants of *Sesamum indicum* to various concentrations of auxins added singly in MS medium

CONCENTRATIONS		HYPOCOTYL		COTYLEDON	
		Nature of response	%	Nature of response	%
IAA	0.5	C^+	60	R*	100
	1.0	C^+, R*	60	R*	100
	3.0	C^+, R*	80	R*	100
	5.0	C^+, R**	60	R**	100
IBA	0.5	C^+, R**	60	C^+, R****	100
	1.0	C^{++}, R*	60	C^+, R****	80
	3.0	C^{++}, R**	80	C^+, R****	100
	5.0	C^{++}, R**	100	C^+, R****	60
NAA	0.5	NR	—	R*	60
	1.0	C^+, R*	60	R**	60
	3.0	R**	100	C^+, R****	80
	5.0	R***	100	C^{++}, R****	100
2,4-D	0.5	Enl	—	Nec	—
	1.0	Enl	—	Nec	—
	3.0	Enl	—	Nec	—
	5.0	Enl	—	Nec	—

C^+ = Scanty callusing; C^{++} = Moderate callusing
Enl = Enlargement; NR = No response
R* = 0–5 roots; R** = 6–10 roots;
R*** = 11–15 roots; R**** = 16-∞ roots.

dity. Observations were recorded four weeks after culture. For such experiments ten explants were used and all experiments were repeated.

Hypocotyl segments and cotyledons did not show any morphogenetic response and eventually necrosed when cultured on hormone free MS basal medium.

Hypocotyl—Lower concentrations of IAA (0.5 mg/l) brought about the induction of scanty callus but no rhizogenesis. NAA at 0.5 mg/l failed to elicit any response and the explant turned necrotic within 4 weeks. IBA (0.5 mg/l) and NAA (1.0m mg/l) induced the formation of a few short projection-like roots along with poor callusing. However, great variation was observed in the colour and form of roots produced by various auxins. IAA (1.0 and 3 0 mg/l) induced a few swollen, yellow coloured roots along with some thin, white, hairy ones. Poor callusing was also obtained. Large amount of callus accompanied by the induction of a few roots was the response elicited on IBA (1.0 and 3 0 mg/l) supplementad media. High concentrations of IAA (5 0 mg/l) produced swollen yellow roots with scanty callus. At 5.0 mg/l of IBA, profuse rooting along with callusing was observed in all the replicates. However, higher concentrations of NAA (3 0 and 5.0 mg/l) induced swollen yellow roots in 100 percent cultures but no callusing was observed (Table 1; Figure 1, a–c).

2,4-D at all concentrations tried (0 5, 1 0, 3.0 and 5.0 mg/l) failed to elicit any morphogenetic response. Though the explants showed meagre swelling at the initial stages, no further development took place and they finally turned necrotic.

Cotyledon—All the concentrations of IAA, IBA and NAA tried (0.5, 1.0, 3.0 and 5.0 mg/l) induced varying degrees of rhizogenesis in cotyledonary explants. IAA concentrations (0 5, 1.0, 3.0 and 5.0 mg/l) did not prove to be effective, as very small number of roots were induced from the cut end in 100 percent of the cultures. However, lower concentrations of NAA (0.5 and 1.0 mg/l) induced the formation of a few long and thin roots in 60 percent of the cultures. IBA (0 5 and 1.0 mg/l) produced profuse rooting accompanied by a meagre amount of callus. Higher concentrations of NAA (3.0 mg/l) and IBA (3.0 and 5.0 mg/l) brought about scanty callusing and profuse rooting in the cotyledonary explants. At 5 0 mg/l of NAA, luxurient growth of callus was supported. Roots were also produced in larger number in all the cultures (Table 1; Figure 1,d–f). 2,4-D at all the concentrations tried (0.5, 1.0, 3 0 and 5.0 mg/l showed deleterious effects on the explants,

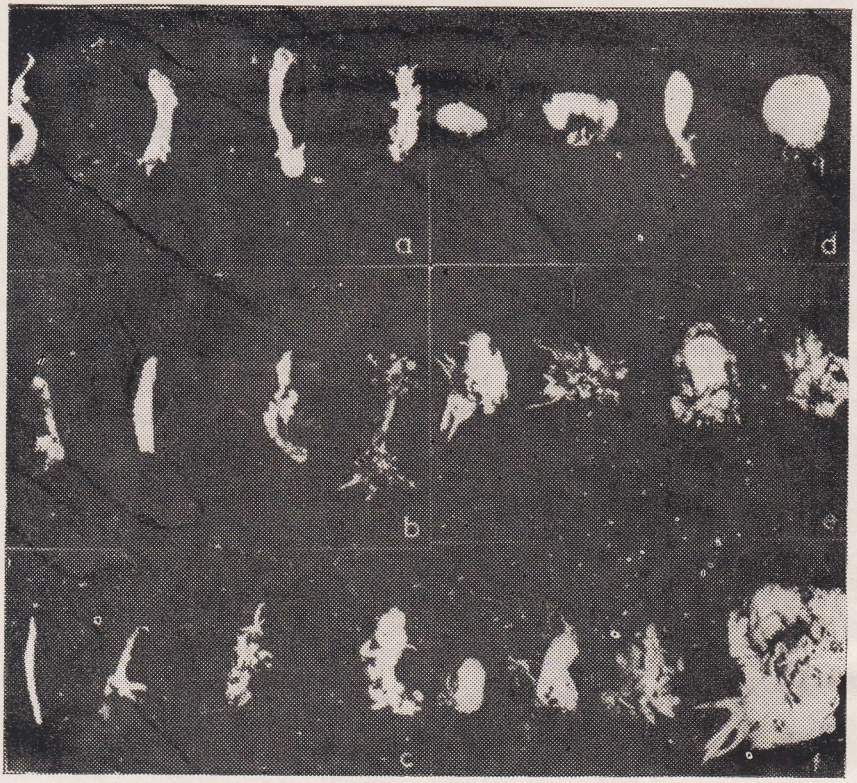

Fig. 1 (a-c) Response of hypocotyl segments of *Sesamum indicum* to various concentrations (from left to right 0.5, 1.0, 3.0 and 5.0 mg/l) of auxins incorporated singly in MS medium.
a—IAA; b—IBA; c—NAA,

Fig 1 (d-f) Responses of cotyledons of *Sesamum indicum* to various concentrations (from left to right 0.5, 1.0, 3.0 and 5.0 mg/l) of auxins incorporated singly in MS medium.
d — IAA; e — IBA; f — NAA.

causing necrosis. NAA (5.0 mg/l) proved to be the optimal concentration for rhizogenesis in both hypocotyl and cotyledon explants. 2,4-D showed deleterious effects on the explants which finally turned necrotic.

Exogenous auxin application is known to promote root formation in *in vitro* cultured explants (Skoog and Tsui, 1948; Chlyah and Than Thanh Van 1975; Rucker, 1982 and Carswell and Locy, 1984). The hormonal requirements for root organogenesis in cell cultures are generally wider than those for shoot organogenesis. Root organogenesis is common during callus initiation and is widespread in species where induction of caulogenesis is very difficult (King *et al.*, 1978) as in the present study. In most cases syntetic auxins are more effective than IAA and phenoxy acids (2,4-D) for rhizogenesis (Biondi and Thorpe, 1982). Varying degrees of callusing and rooting in cultivar PT of sesame have also been reported (George *et al.*, 1987).

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