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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Response of F₁ Tomato Hybrids to Different Levels of Plant Growth Regulators

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Abstract

Callogenesis and regenerative response of *in-vivo* leaf explant of tomato hybrids viz. 'Bornia' and 'Royesta' were studied at different Plant Growth Regulators (PGR) levels. 'Bornia' showed a high frequency of callogenesis than 'Royesta' at various combinations of Benzyl Amino Purine (BAP) and Indol Acetic Acid (IAA). Maximum callogenesis (100%) was recorded on four different combinations of BAP and IAA. A media formulation with BAP @ 6.5 and IAA @ 11 μ M/l found to be optimum for both hybrids. 'Royesta' regenerated higher percentage of shoots at BAP (6.5 μ M/l) alone and with IAA (6.0 μ M/l). Both hybrids regenerated roots at various concentrations of IAA alone.

Introduction

Vegetable crop species have been used extensively in tissue culture research. One of the notable examples include tomato (*Lycopersicon esculentum* Mill.) having a lot of potential in this regard. *In vitro* techniques to multiply plant by embryogenesis, organogenesis and shoot proliferation from diverse explant sources have also been well documented, e.g. Leaf (Lindhout *et al.*, 1987), Stem sections or internodal pieces (Cassells, 1979), Hypocotyl (Gunay and Rao, 1980) and Cotyledon (Kageyama *et al.*, 1988).

Tomato hybrids were the special one due to their unique genetic constitution and off season production under plastic tunnels. Present study was conducted to evaluate callogenesis and regeneration potentials of leaf explants of tomato hybrids.

Materials and Methods

Seeds of tomato F₁ hybrids namely 'Bornia' and 'Royesta' were provided with the courtesy of Royal Sluis of Netherlands. Plants raised in the field furnished the explant source i.e. leaves. Newly emerging leaves from the young plants were carefully excised and treated with 0.5 per cent Sodium hypochlorite (NaOCl) solution for 10 minutes to remove adhering pathogens from the leaf surface. This was followed by three time rinsing with double distilled water. Prior to inoculation explants were made uniform in size (5 x 5 mm). These were then explanted onto the Murashige and Skoog (1962) medium containing various levels of plant growth regulators (PGRs) i.e., BAP (0-6.5 μ M/l) and IAA (0-14 μ M/l). Cultural conditions of the growth room were maintained according to the requirements. Temperature of the growth room varied from 25-29°C and a photoperiod of 16-h with and 2000 lux light intensity was maintained by using white florescent light.

Results and Discussion

Callogenesis: The initial media combinations, lacking BAP and containing the highest concentration of IAA had no callogenesis in 'Bornia', while strong callogenesis was observed in the media combinations containing BAP. The results showed that in 'Bornia' callus induction could be achieved with BAP alone. But for best callogenesis, 'Bornia' was found to be dependant upon both IAA and

BAP. Minimum callus induction was found to be 71.0 per cent on media containing 4.5 μ M/l BAP alone, while maximum callogenesis (100%) was recorded on four different combinations of BAP and IAA; (i) BAP (4.5) and IAA (8.5 μ M/l) (ii) BAP (6.5 μ M/l) alone (iii) BAP (6.5) and IAA (11.0 μ M/l) (iv) BAP (6.5) and IAA (14.0 μ M/l). In case of 'Royesta' (Table 2), different results were obtained indicating a varietal difference. A media formulation having BAP; 6.5 and IAA; 11.0 μ M/l found to be optimal for both hybrids, since a 100 percent callus induction was observed at this combination. Maximum callogenesis (100%) in Royesta was also noted at three media combinations; (i) BAP; 4.5 and IAA; 3.0 μ M/l (ii) BAP; 6.5 and IAA; 0.5 μ M/l, (iii) BAP; 6.5 and IAA; 11.0 while minimum callogenesis (52.0%) was found on media with BAP; 6.5 μ M/l alone. Qualitative characteristics of callus in both hybrids were similar with fine texture and light green to pale green colouration. Similar results were described by Kurtz and Lineberger (1983) who achieved callogenesis on media containing 0.2-1.0 mg/l IAA and 2.5-5 mg/l BAP. Thawanrat (1985) acquired results analog to our findings on MS medium containing IAA (1 mg/l) and BAP (2.5 mg/l). Jatoi *et al.* (1995) also reported alike results from the same explant using MS medium enriched with IAA (1.5-3.0 μ M/l) and BAP (2.0-8.0 μ M/l).

Regeneration: Direct root induction was observed in 'Bornia' and 'Royesta' in response to IAA alone. Rooting frequency was increased with the increase in concentration of IAA from 0 to 14.0 μ M/l in case of 'Bornia' (Table 1) while the same trend was observed in 'Royesta' with IAA from 3.0 to 14.0 μ M/l (Table 2). Rooting was completely inhibited by the addition of even the lowest concentration of BAP. Indirect shoot regeneration (via callogenesis) in both hybrids was displayed at different media combinations with a better response of 'Royesta' to 'Bornia'. Shoot induction in 'Bornia' (18.0%) was only at (BAP 6.5 + IAA 14.0 μ M/l). The highest frequency of shoot regeneration in 'Royesta' (20%) was observed at BAP (6.5 μ M/l) and IAA (6.0 μ M/l). Also the optimum hormonal concentrations for maximum shoot regeneration were different for the two hybrids. Pence and Caruso (1984) achieved direct shoot formations from leaf discs cultured on MS medium containing IAA (1.75 mg/l) and BAP (2 mg/l). Thawanrat (1985) also achieved regeneration on MS medium

Table 1: Callogenetic and rooting response of field grown leaves of "Bornia" to BAP and IAA.

P.G.R. ($\mu\text{M/l}$)		Response			Remarks
BAP	IAA	Callus(%)	Shoots (%)	Roots (%)	
0.0	0.0	-	-	-	-
0.0	0.5	-	-	4.0	DR
0.0	3.0	-	-	61.0	"
0.0	6.0	-	-	100.0	"
0.0	8.5	-	-	100.0	"
0.0	11.0	-	-	100.0	"
0.0	14.0	-	-	100.0	"
4.5	0.0	71.0	-	-	GQC
4.5	3.0	92.0	-	-	"
4.5	8.5	100.0	-	-	"
4.5	14.0	91.0	-	-	"
6.5	0.0	100.0	-	-	"
6.5	11.0	100.0	-	-	"
6.5	14.0	100.0	17.78	-	"

DR = Direct root regeneration, covering the entire surface of explant; GQC = Good quality callus.

Table 2: Callogenetic and rooting response of field grown leaves of "Royesta" to BAP and IAA.

P.G.R. ($\mu\text{M/l}$)		Response			Remarks
BAP	IAA	Callus(%)	Shoots (%)	Roots (%)	
0.0	0.0	-	-	-	-
0.0	3.0	-	-	91.0	DR
0.0	6.0	-	-	100.0	"
0.0	14.0	-	-	100.0	"
4.5	3.0	100.0	-	-	GQC
6.5	0.0	52.0	19.0	-	"
6.5	0.5	100.0	-	-	"
6.5	6.0	65.0	20.0	-	"
6.5	11.0	100.0	9.5	-	"
6.5	14.0	54.5	-	-	"

DR = Direct root regeneration, covering the entire surface of explant; GQC = Good quality callus.

containing IAA (1 mg/l) and BAP (2.5 mg/l). Kartapradja (1989) induced shoots using BA alone from cultured leaf explants earlier than a combination of BA and IAA. Jatoi *et al* (1995) also reported regeneration from the leaf explant using MS medium enriched with IAA (1.5-3.0 $\mu\text{M/l}$) and BAP (2.0-8.0 $\mu\text{M/l}$).

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