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Short Communication

In Vitro Response of Tulips (*Tulipa gesnerina* L.) to Various Growth Regulators

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ABSTRACT

Different explant sources of three cultivars (Beauty of Appledoorn, Page Polka and Toronto) of tulip were studied for their responses to different growth regulators on MS medium. Maximum shoot formation was obtained with NAA (2 mg L^{-1}) and BAP (1mg L^{-1}). Bulblets formation was better on the medium that contained 2 mg L^{-1} NAA combined with 0.5 mg L^{-1} BAP.

INTRODUCTION

Tissue culture is a potentially useful tool for studying growth and differentiation in higher plants. The formation of bulblets in plants such as *Amaryllis hyacinth (*Mii *et al.*, 1974) and Lilly (Nishiuchi 1980a) has been successfully induced through *in-vitro* culture of excised bulb scales. Adventitious bulbs have been successfully achieved with some cultivars and species; however, there has been little success with many cultivars of Tulips (Nishiuchi 1997). The principle of vegetative propagation of tulip bulb scales has been established but further investigations are required to standardize commercial bulb propagation. (Nishiuchi, 1979, 1980b, & 1983)

Nishiuchi (1990) observed varietal differences for organogenesis in scale tissue culture of tulip. The ABA treated bulb scales used for adventitious shoot formation *in-vitro*, showed no stimulatory effect on three cultivars, "Appledoorn", "Oxford's Elite" and "Oxford", while "Red Matador" showed accelerated shoot formation in NAA and GA treated bulb scales.

The objective of the present study was to optimize protocols for enhanced vegetative propagation in 3 elite cultivars of tulip and to study the varietal responses on a particular growth medium. The varieties tested were Beauty of Appledoorn, Page Polka and Toronto.

MATERIALS AND METHODS

Beauty of Appledoorn, Page Polka and Toronto, commercial cultivars were tested. Terminal and axilliary buds were used as the explant source and were sterilized with 15 minutes plunge using sodium hypo-chloride. Excess detergent was removed by thorough washings with sterilized distilled water thrice at 5 minutes interval. MS media supplemented with BAP or Kinetin at levels ranging from 1-2 mg/L was used for inoculation. Cultures were incubated at a temperature of 23^0C with a 16 h photoperiod.

RESULTS

Results indicated varietal differences in eliciting response various combination of growth regulators irrespective of the nature of the bud either auxiliary (Table I) or terminal (Table II). Shoot formation took place after three weeks of incubation and the best results were obtained in Beauty of Appledoorn followed by Page Polka and Toronto. Although all combinations responded to shoot proliferation from both the explant sources, the best results were obtained when the explants were cultured on MS medium supplemented with NAA (2 mg L^{-1}), kinetin and NAA (1 mg L^{-1} each), and BAP (2 mg L^{-1}). Similarly GA_3 (1 mg L^{-1}) in combination with BAP (1 mg L^{-1}) or kinetin and GA_3 indicated satisfactory response.

Bulb formation through micro-propagation. The striking feature was the formation of adventitious bulblets when embryogenic cultures were transferred on MS medium containing NAA (2 & 1 mg L^{-1}) in combination with BAP (0.5 & 2 mg L^{-1}) each respectively. Each bulblet on the average produced 5-7 adventitious bulblets in all the varieties (Table III).

DISCUSSION

The varying success of adventitious shoot formation appeared to be due to the cultivar response. Beauty of Appledoorn manifested best potential. Difference in organogenetic activity has been reported to different growing conditions (Nishiuchi, 1990) while testing success of shoot formation in Dutch and Asalikawa bulb. The stimulatory influence of ABA was observed on shoot formation *in vitro.*

Table I. Shoot formation from auxiliary bud tissues

NAA (mg L^{-1})	KIN (mg L^{-1})	V1	V2	V3
1.0	1.0	6	3	4
2.0	1.0	5	4	3
3.0	1.0	7	2	8
4.0	1.0	8	5	6
GA_3 (mg L^{-1})	KIN (mg L^{-1})	V1	V2	V3
1.0	1.0	4	1	1
1.0	2.0	3	2	2

Table II. Shoot formation from terminal bud tissues

NAA (mg L^{-1})	BAP (mg L^{-1})	V1	V2	V3
1.0	1.0	4	1	-
1.0	2.0	5	4	1
1.0	3.0	3	5	2
1.0	4.0	6	3	2
GA_3 (mg L^{-1})	BAP (mg L^{-1})	V1	V2	V3
1.0	1.0	8	4	2
2.0	1.0	6	1	3

Table III. Adventitious bulb formation from the callus derived of the auxiliary explants

		No. of Plantlet Formation		
NAA	BAP	V1	V2	V3
2.0	0.5	80	60	10
1.0	2.0	60	20	30

V1= Beauty of Appledoorn; V2 = Page Polka; V3 = Toronto

In our study, however, the auxin/cytokinin ratio did not show significant affect on shoot proliferation this was controlled by the cultivar response.

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