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Short Communication

Effect of indole-3-butyric acid (IBA) on *in vitro* root induction in dendrobium orchid (*Dendrobium sabin* H.)

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Root induction pre-developed *in vitro* plantlets of orchid was carried out using indole-3-butyric acid (IBA) (0, 0.5, 1.0, 1.5, 2.0, 2.5 and 3 mM) on basal Murashige and Skoog (MS) medium. Among the concentrations of IBA, the number of roots per plantlet with 1 mM IBA was found to be the highest (2.25 roots per plantlet) followed by 2.0 mM IBA (1.61 roots per plantlet) after 40 days of culture. Significantly high root length (0.96 cm) was found on MS medium supplemented with 1 mM IBA followed by 1.5 mM IBA (0.63 cm). For root initiation, the least amount of time (11.0 days) was required by 1 mM IBA followed by 0.5 mM and 1.5 mM. This study conclude that IBA treatments at lower concentration proved to be effective in root formation of orchid.

Key words: Orchid, IBA concentration, *in vitro* propagation, root induction.

INTRODUCTION

Orchids are grown worldwide with almost 8% share in the world's floriculture trade (Asghar et al., 2011). Due to its shape, assorted colour and enduring blooms, it is considered to be one of the most outstanding genera in ornamentals (Tokuhara and Mii, 2001).

Plant tissue culture and micropropagation techniques play an important role in conservation programs and management of botanical collection (Mahendran and Bai, 2009). Micropropagation system utilizes artificial nutrient medium under a control sterile environment to ensure pathogen-free, true-to-type and rapid production. The plants produced through this technology provide much export potential as they are shipped internationally with limited quarantine restrictions and it has the prospective for developing new cultivars (Kwa et al., 1995).

There is an urgent need for the establishment of a consistent cloning methodology for orchid consequently enabling the rapid propagation and production of a large number of high quality plants (Asghar et al., 2011).

Hence, this present project was undertaken to study the response of orchid to different indole-3-butyric acid (IBA) concentration for rooting. Consequently, this will serve as foundation for mass scale propagation.

MATERIALS AND METHODS

Studies regarding root formation in dendrobium orchid from plantlets devoid of roots were conducted to investigate the suitable conditions for root growth in dendrobium orchids. The objective was to determine the most suitable level for *in vitro* root growth of dendrobium orchids. Pre-developed *in vitro* plantlets of orchid (*Dendrobium sabin* H.) without any root were used to check their effect on *in vitro* rooting in orchids as rooting is a problem in *in vitro* growth.

Data was collected on number of roots, length of root and days to root formation. The media were placed in autoclave for 15 min at 121°C under a pressure of 15 psi. The pH of the medium was maintained at 5.8. The culture conditions were maintained artificially in growth room for *in vitro* regeneration in orchids. Cultures were incubated at 25 ± 2°C under 16/8 h photoperiod (2500 lux) with white fluorescent tubes (Philips TL 40W/54). The experiment was laid out according to a completely randomized design (CRD) with six replications. Data were analyzed using appropriate statistical techniques and significance among treatment means was compared by using Duncan's multiple range (DMR) test (Steel et al., 1997).

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Abbreviations: IBA, Indole-3-butyric acid; **MS,** Murashige and Skoog.

Table 1. Effect of IBA on the number of roots formed, length of root and days to root formation.

Treatment	IBA concentration (mg L^{-1})	Number of root formed			Length of root (cm)	Day to root formation
		20 day	40 day	60 day		
T_0	0	0.220^{e}	0.560^{f}	1.200^{f}	0.408^{e}	16.800^{c}
T_1	0.5	0.300^{d}	0.814^{e}	2.360^{e}	0.362^{f}	17.000^{bc}
T_2	1.0	1.227^{a}	2.255^{a}	4.170^{a}	0.956^{a}	11.000^{d}
T_3	1.5	0.591^{b}	1.410^{c}	3.533^{c}	0.628^{b}	17.000^{bc}
T_4	2.0	0.408^{c}	1.614^{b}	3.837^{b}	0.578^{c}	19.000^{b}
T_5	2.5	0.310^{d}	1.387^{c}	2.837^{d}	0.550^{cd}	22.000^{a}
T_6	3.0	0.206^{e}	1.070^{d}	2.804^{d}	0.534^{d}	22.000^{a}

Means followed by the same letter are not significantly different at $p < 0.05$.

RESULTS

Root number, root length (cm) and days to root formation

Comparatively, the highest number (1.227, 2.255 and 4.170) was observed with 1.0 mM IBA followed by 2.0 mM IBA (0.591, 1.410 and 3.533) after 20, 40 and 60 days of culture, respectively. Regarding root length, a similar trend was observed with the highest mean root length observed at 1.0 mM (0.956^{a}) followed by 1.5 mM (0.628^{b}) and 2.0 mM IBA (0.578^{c}). Maximum and minimum level of IBA produced poor results than the optimum levels. The results show that the effect of IBA concentrations was found significant for days to root formation (Table 1). For root initiation, the least time (11.0 days) was required by 1 mM IBA followed by 0.5 and 1.5 mM.

DISCUSSION

Root number, root length (cm) and days to root formation

The application of auxins to micropropagated shoots seems to intensify the root number by mounting the endogenous contents of enzymes (Asghar et al., 2011). Liu et al. (2002) reported that auxin induces the complicated process of lateral root formation through repetitive cell division. George et al. (2008) suggested that auxins are essential for the maintenance of polarity of the plants. A higher concentration of IBA was reported to have a reduced number and length of roots than the optimum level. Ozel et al. (2006) reported that higher levels of IBA applied to plants inhibit the formation of shoot buds and this might further stop the production of roots as the auxin in the root primordial is shifted from the shoot apex.

In this study, IBA yielded good results of root number because it is very effective to increase endogenous auxin contents and show higher stability against catabolism and in activation by conjugation with growth inhibitors (George et al., 2008; Hasan et al., 2010). The plantlets were also successfully acclimatized at low air temperature and low relative humidity. And this was supported by the report of Chaum et al. (2010), who suggested that the acclimatization step of *Phalaenopsis* orchid plantlets should be effectively implemented at low air temperature (15 to 25°C) and low relative humidity (60 ± 5% RH).

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