Standardizing acidity level for growth and development of Dendrobium wardianum

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Differentiating protocorms of *Dendrobium wardianum* were cultured on MS medium with varying pH (4–7.5) to assess the optimal acidity level for its growth. The acidity levels below pH 5.0 and above 6.5 were not favourable for healthy growth of plantlets. The best growth of plantlets was observed at pH 6.

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Dendrobium wardianum Warner belongs to Orchidaceae, a unique family with huge amount of diversity (both vegetative and floral) coupled with peculiar pollination contrivances and wide natural hybridization. It is a splendid dendrobe of rare occurrence, getting threatened in its natural habitat due to ruthless exploitation of forest resources and its poor natural regeneration. *In vitro* technique provides better understanding of different physiological and biochemical aspects of regeneration at various levels (Kavi Kishore, Mehta 1984). Various factors, physical and nutritional both, affect growth and behaviour of orchid species differently and a species may even respond differetly at various stages of its growth (Arditti 1967). Though several studies have been conducted to investigate the effect of different media on seed germination and seedling development (Arditti et al 1981), not much is known about the acidity effect on their asymbiotic cultures (Curtis, Spoerl 1948; Ito 1955). Studies however, in other plant groups, on the influence of pH on growth (Hewitt 1966), have revealed that healthy seedings can be obtained at a particular pH (Norstog 1973).

The present investigation was carried out to study the effect of pH on growth and development of *Dendrobium wardianum* Warner seedlings.

Materials and Methods

Dendrobium wardianum Warner protocorms of one–leaf stage (size ca 2–3 mm) grown on Murashige and Skoog's (1962) basal medium under sterilized conditions were transferred to fresh MS medium of varying acidity and alkalinity, pH ranging from 4.0 to 7.5, obtained by adding 1N HCl or 1N NaOH as per requirement. The cultures were incubated at 24±2°C under 12 h photoperiod of 2500 lux illumination and observations were made at every 30–day interval for 3 months. Each treatment

consisted of 10 replicates and the experiment was repeated thrice. Cultures were subcultured at every 10–day interval to maintain the stability of the pH as it tends to shift after a certain period owing to the absorbance of ions by the inoculum of the media (Scragg Fowler 1985).

Results

Growth and development of *Dendrobium wardianum* seedling varied markedly due to different pH levels of the medium. Seedling growth was observed to be satisfactory at pH 6.0 which is also manifested by fresh and dry weight of the seedlings (Table 1). However, pH ranging below 5 and above 6.5 was not found to be favourable for seedling growth and development. Lower pH inhibited growth of the protocorms and resulted in thick, stout, stunted bodies. The absorbing hair/-roots and leaf primordia were found to be the highest in number at pH 6.0.

Table 1. Effect of pH on growth and development of *Dendrobium wardianum*

pH	Seedling growth after 90 days of treatment			Remarks
	Average shoot length ± SD $(cm)^2$	Average fresh weight ± SD (g)	Average dry weight ± SD (g)	
4.0	0.46 ± 0.04	0.429 ± 0.051	0.091 ± 0.130	+
4.5	0.63 ± 0.06	0.521 ± 0.062	0.100 ± 0.014	+
5.0	0.97 ± 0.09	0.612 ± 0.073	0.115 ± 0.017	+ +
5.5	1.04 ± 0.10	0.707 ± 0.085	0.117 ± 0.017	+ +
6.0	1.33 ± 0.12	0.890 ± 0.107	0.131 ± 0.019	+ + +
6.5	0.92 ± 0.08	0.600 ± 0.072	0.105 ± 0.015	+ +
7.0	0.85 ± 0.08	0.581 ± 0.069	0.100 ± 0.014	+
7.5	0.62 ± 0.05	0.512 ± 0.061	0.110 ± 0.015	+

+, poor; + +, moderate; + + +, best

Discussion

Acidity level of the media has pronounced effect on the growth of cell, tissue and organ (Smith, Krikorian 1990). Acidity, lower than 4.0 or higher than 8.0 has been found to be inhibitory for seedling growth in case of orchids (Arditti et al 1982). In the present investigation, seedling development was found to be the best in medium with pH 6.0, and minimum below pH 5.0 and above 6.5. Better seedling growth at pH 6.0 in the present study may be attributed to better uptake of nutrients and water from the medium (Knudson 1946; Ito 1955). Besides injury of

root cells, depression in the uptake of potassium and calcium at pH 4.0 or less and precipitation and/or non–utilization of iron compounds at higher pH values could be behind the detrimental effect of the extreme pHs on seedling growth and development (Hewitt 1966). Evidently, pH of the medium surrounding the roots can affect the growth of the plants by controlling the availability of nutrients, thus deciding the rate of uptake by plants. Our findings suggest pH 6.0 to be the most suitable for growth and development of *Dendrobium wardianum*, and the results can be exploited in rearing nurseries and also in *in vitro* technique for mass multiplication of the plant.

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