Biological Forum – An International Journal **16(4): 12-15(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Vegetative Propagation of *Exacum bicolor* (Roxb.) an Endemic Native Ornamental Gentian Plant

Aswathi S. Vasu[1*], Sreelatha U.[1], Mini Sankar[1], Minimol J. S.[2], Rose Mary Francies[3] and Ancy Joseph[4]

[1]Department of Floriculture and Landscaping, College of Agriculture,
Kerala Agricultural University, Thrissur (Kerala), India.
[2]Cocoa Research Station, Kerala Agricultural University, Thrissur (Kerala), India.
[3]Agricultural Research Station, Mannuthy,
Kerala Agricultural University, Thrissur (Kerala), India.
[4]Aromatic and Medicinal Plants Research Station, Odakkali,
Kerala Agricultural University, Ernakulam (Kerala), India.

(Corresponding author: Aswathi S. Vasu)*
(Received: 31 January 2024; Revised: 17 February 2024; Accepted: 10 March 2024; Published: 15 April 2024)
(Published by Research Trend)

ABSTRACT: *Exacum bicolor* (Roxb.) is an endemic herbaceous plant species having aesthetic value as well as various medicinal properties. The plant is enlisted as an endangered species mainly due to habitat destruction and mass uprooting for medicinal and ornamental value. Seed propagation is a tedious task in this species due to very low seed germination and seedling survival. Therefore, rooting of terminal stem cuttings was tried as a method of vegetative propagation in this species. Terminal cuttings were procured and treated with IBA (2.5, 5.0, 10.0, 15.0 & 20.0 mg/L), commercial rooting hormone (Rootex), and charcoal powder. It was found that terminal cuttings treated with IBA at 15.0 mg/L ensured a better survival of cuttings (88.33%) and rooting of cuttings (88.33%) with a greater number (18.63) of longer roots (42.86 cm). Cuttings treated with charcoal powder and commercial hormone powder also recorded substantial rooting of cuttings.

Keywords: *Exacum bicolor*, Gentianaceae, vegetative propagation, IBA, cuttings.

INTRODUCTION

Exacum bicolor is a beautiful herbaceous perennial endemic to peninsular India. The plant belongs to the family Gentianaceae. The plant was commonly seen in Kerala five to eight decades ago, but now it has been listed in the category of endangered plant species due to severe habitat destruction due to soil excavation, conversion into plantation crops and cultivated land, laterite mining, quarrying, etc. The habitats of *Exacum bicolor* are high and low-altitude grasslands. The plant (Fig. 1) grows to a height of 25 to 120 cm with a mature, sturdy, and quadrangular stem, making it non-lodging even in the severe rainfall during the southwest monsoon in the state. Oppositely arranged dark green leaves are sessile and of varying shapes of linear-lanceolate and lanceolate. Flowering season is from August – November in the hillocks and extends upto February in the high ranges of Kerala. Inflorescence is a dichasial cyme (John *et al.* 2001) with an average of 40 flowers and 10-20 buds at any time during flowering. Individual flowers have a field life of 8 to 10 days (Sreelatha *et al.*, 2007).

Flowers (Fig. 2) are the most beautiful part of the plant which are bisexual and tetramerous with four petals, four-winged sepals, four stamens, and a capitate stigma (Sreelatha *et al.*, 2007). Petals are of white color with purple tips and stamens are bright yellow in color. A bunch of flowers is a beautiful blend of purple, white, and yellow, which makes the plant more attractive and a good choice for gardening. The plant is also reported with numerous medicinal properties *viz.* febrifuge, stomachic, tonic properties (Rao, 1914), anti-fungal (Khare, 2008), anthelmintic (Ashwini and Majumdar 2014), thrombolytic, antioxidant, and anti-inflammatory activities (Ashwini *et al.,* 2015).

Most of the habitats of *Exacum bicolor* are under private ownership and are likely to be exploited at any time in the future. Therefore, standardization *ex-situ* conservation is of utmost importance. The seeds of the species are minute and possess dormancy. Seed germination in the habitats is less than five percent (Sreelatha *et al.*, 2007). Seeds require a minimum of two weeks for germination, while seedlings require a juvenile phase of six months for transplanting. The seedling survival rate is low during the juvenile phase. Therefore, standardization of vegetative propagation is of utmost significance. Vegetative propagation through stem cuttings is the easiest method. The Perusal of literature revealed the lack of studies on standardization of propagation aspects in *Exacum bicolor*, especially vegetative propagation. Therefore, the present investigation was formulated with the objective of propagation of *Exacum bicolor*, an endangered endemic

native ornamental, through vegetative propagation of terminal cuttings.

MATERIALS AND METHODS

The study was conducted in the Department of Floriculture and Landscaping, College of Agriculture, Kerala Agricultural University, Vellanikkara, Thrissur, Kerala, from October 2021 to December 2021. Terminal cuttings having two to three nodes were taken from mother plants raised in pots. Procured cuttings were treated with IBA (Indole-3-Butyric Acid) (at 2.5, 5.0, 10.0, 15.0, and 20.0 mg/L), charcoal powder, and commercial hormone powder (Rootex) for one minute and planted in 2" pot containing soil + sand + cocopeat (3:1:1). Cuttings planted directly in the rooting media without any treatment was used as control for comparison. Planted cuttings were kept in a mist chamber to ensure optimum humidity. Procurement of cuttings, treatment with rooting agents, and planting of cuttings are depicted in Fig. 3 and 4. Twenty cuttings were planted for each treatment and control. The experiment was laid out in CRD with three replications. Percent survival of cuttings, percent cuttings rooted, number of roots per cuttings rooted, and length of longest root per cuttings were observed. Percent survival of cuttings was observed at 30 days after planting of cuttings by counting the number of cuttings which were survived by maintaining green colour and without drying out. The number of survived cuttings in each treatment was counted and expressed in percentage. Percent cuttings rooted were observed by counting the number of cuttings rooted in each treatment at 60 days after planting and expressed in percentage. Number of roots and length of longest roots were observed at 60 days after planting. Observed data were statistical analysed in WASP 2.0 software.

RESULTS AND DISCUSSION

The percentage survival of cuttings, percent cuttings rooted, number of roots per cutting, and length of longest roots were observed, and the results are furnished in Table 1 and Fig. 5.

Survival of cuttings. The survived cuttings that retained greenness even after 30 days of planting were significantly higher in all the treatments compared to the control. A survival percentage of 83.33 to 96.67 was observed when cuttings were treated with IBA, commercial rooting hormone (Rootex), and charcoal powder.

Percent cuttings rooted. Significantly higher percentage rooting of cuttings was observed when cuttings were treated with IBA at 2.5, 5.0, 10.0,15 mg/L, commercial hormone powder, and charcoal powder (86.67%, 96.67%, 88.33%, 88.33% 83.33% and 86.67% respectively), while rooting observed in control was only 40.00 percentage.

Number of roots per cuttings. The number of roots per cutting was significantly greater (18.57, 18.63 and 19.45respectively)in treatment with IBA at 10.0, 15.0, and20.0 mg/L.

Length of the longest root. Significantly longest roots were recorded in IBA at 15.0 mg/L (42.86 cm) followed by IBA at 10.0 mg/L (30.56 cm). IBA at 2.5 mg/L and control recorded smaller roots (17.65 cm and 17.66 cm respectively).

Treatment with IBA at 15.0 mg/L was found prominent for improved rooting of cuttings with a greater number of longer roots. Auxin is required for the initiation of adventitious root primordia and its development (Hartmann *et al.*, 1990). The treatment with IBA might have supplemented the auxin requirement and thus resulted in the increased number of roots and longer roots. The results arein confirmation with vegetative propagation of other gentian plants *viz. Exacum ritigalensis* (Perera and Dahanayake 2017) and lisianthus (Bhatia and Sindhu 2019), and in pomegranate by Chaudhary and Singh (2021).

Treatment of cuttings with commercial hormone powder and charcoal powder also recorded a substantial survival of cuttings, percent cuttings rooted, and number of roots per cuttings. Hence charcoal powder and commercial hormone powder can be considered as an alternative to IBA for rooting of the terminal cuttings of *Exacum bicolor*.

Fig. 1. *Exacum bicolor* plant.

Fig. 2. The flowers of *Exacum bicolor.*

Fig. 3. Procurement of cuttings.

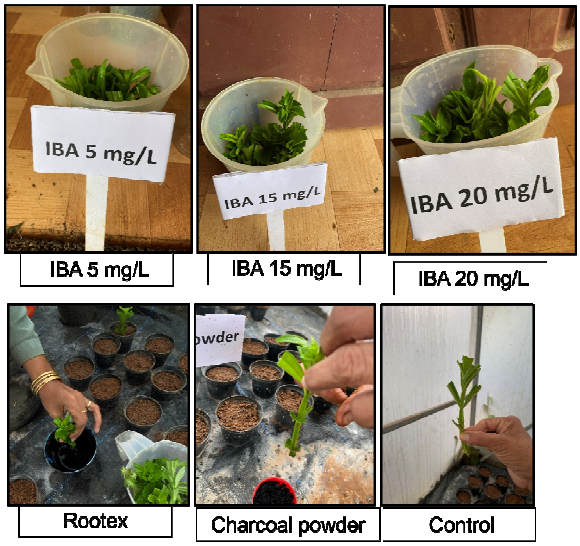

Fig. 4. Treatment of cuttings with rooting agents.

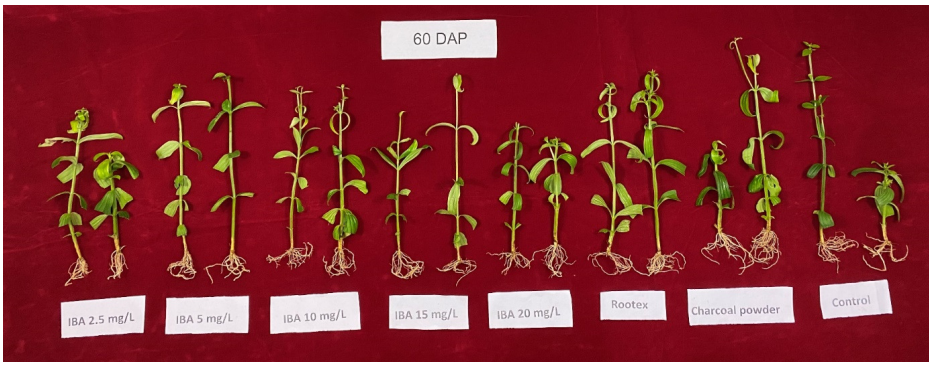

Fig. 5. Root formation in *Exacum bicolor* cuttings at 60 days after planting.

Table 1: Effect of different treatments on rooting of cuttings of *Exacum bicolor*.

Treatment	Per cent survival (%)	Per cent cuttings rooted (%)	Number of roots	Length of longest root (cm)
IBA – 2.5 mg/L	90.00	86.67	16.78	17.65
IBA – 5.0 mg/L	96.67	96.67	17.43	20.81
IBA – 10.0 mg/L	88.33	88.33	18.57	30.56
IBA – 15.0 mg/L	88.33	88.33	18.63	42.86
IBA – 20.0 mg/L	83.33	73.33	19.45	23.58
Commercial hormone powder (Rootex)	86.67	83.33	16.57	21.05
Charcoal powder	90.00	86.67	17.44	19.27
Untreated control	43.33	40.00	10.00	17.66
C.D (0.05)	**12.49**	**17.61**	**1.83**	**2.59**
C.V	**8.66**	**12.65**	**6.27**	**6.18**

CONCLUSIONS

The investigations on vegetative propagation of *Exacum bicolor* disclosed the possibility of propagation through terminal cuttings in *Exacum bicolor*. Cuttings treated with IBA at 15 mg/L ensured more than 80 percent rooting of cuttings, with a greater number of longest roots. Commercial hormone powder (Rootex) and charcoal also expressed comparable survival of cuttings, percent cuttings rooted, and roots per cuttings.

Acknowledgement. Authors acknowledge the funding received from Kerala Agricultural University for the doctoral research work of Ms Aswathi S. Vasu.

REFERENCES

Ashwini, A. M. and Majumdar, M. (2014). Qualitative phytochemical screening and in vitro anthelmintic activity of *Exacum bicolor* Roxb., an endemic medicinal plant from Western Ghats in India. *Acta Biologica Indica*, *3* (1), 510–514.

Ashwini, A. M., Puttarudrappa, L., Ravi, B. V. and Majumdar, M. (2015). GC-MS analysis, evaluation of phytochemicals, antioxidant, thrombolytic and anti-inflammatory activities of *Exacum bicolor*. *Bangladesh Journal of Pharmacology*, *10*, 745-752.

Bhatia, R. and Sindhu, S. S. (2019). Vegetative propagation of Lisianthus genotypes through stem cuttings: a viable alternative to seed propagation. *Indian Journal of Horticulture*, *76*(4), 714-720.

Chaudhary, A. and Singh, J. P. (2021). Effect of IBA and NAA with or without GA3 treatment on Rooting Attributes of Hard Wood Stem Cuttings of Pomegranate (*Punica granatum* L.). *Biological Forum – An International Journal*, *13*(3), 596-600.

Hartmann, H. T., Kester, D. E. and Davies, F. T., Jr. (1990). Plant propagation. Principles and practices. 246-247 pp

John, J. K., Nizar, A. M. and Velayudhan, K. C. (2001). *Exacum bicolor*: a beautiful wild flowering herb. *Indian Horticulture*, *46*, 25.

Khare, C. P. (2008). Indian medicinal plants: an illustrated dictionary. Springer, Berlin, 256p.

Perera, P. C. D. and Dahanayake, N. (2017). Effect of Indole-3-butyric Acid and Maturity Level of Single Node Stem Cuttings on Propagation of Exacum ritigalensis. *Journal of Agri Search*, *4*(1), 41-44.

Rao, M. R. (1914). Flowering plants of Travancore. Bishen Singh Mahendra Pal Singh, Dehra Dun, 268p.

Sreelatha, U., Baburaj, T.S., Narayanankutty, C., Nazeem, P. A. and Bhaskar, J. (2007). Cultivation prospects of *Exacum bicolor* Roxb.-an endangered, ornamental and anti-diabetic herb. *Natural Product. Radiance*, *6*, 402-404.

How to cite this article: Aswathi S. Vasu, Sreelatha U., Mini Sankar, Minimol J. S., Rose Mary Francies and Ancy Joseph (2024). Vegetative Propagation of *Exacum bicolor* (Roxb.) an Endemic Native Ornamental Gentian Plant. *Biological Forum – An International Journal, 16*(4): 12-15.