Environment and Ecology 41 (4C) : 2939—2942, October—December 2023
Article DOI: https://doi.org/10.60151/envec/YQKZ6972
ISSN 0970-0420

Macro Propagation of *Homalomena aromatica* Schott – A Potential Commercial Ornamental Plant

Preeti Hatibarua, Sailen Gogoi, Ningombam Sushma Devi

Received 10 March 2023, Accepted 16 October 2023, Published on 15 December 2023

ABSTRACT

Homalomena aromatica Schott., is an endangered perennial evergreen rhizomatous herb of Northeast India with immense commercial importance for its essential oil content and traditional medicinal uses. So far, commercial cultivation has not been taken up due to the absence of standardized propagation methods. Therefore, present study compared the different methods of rhizome cuttings (top cutting, base cutting, two node cutting, one node cutting, and bit cutting) to identify the best method for sustainable cultivation. It was also observed that top cutting produced superior result in terms of root/plant (2.14), root length (8.45 cm), root diameter (0.29 cm), and rhizome weight (50 g) after one month of planting. Similarly, top cutting also gave best vegetative growth with maximum shoot length (33.5 cm), leaves/shoot (5.12), petiole length (30.4 cm), leaf lamina length (20.86 cm) and leaf lamina breadth (13 cm) after 3 months of planting. Whereas the least root development and vegetative growth were recorded in bit cutting. Based on overall performance of the different methods of cutting used for this study, the top cutting method can be recommended for easy and convenient vegetative propagation for *Homalomena aromatica.*

Keywords Endangered, Medicinal plant, Ornamental plant, Tissue culture, Vegetative propagation.

INTRODUCTION

Homalomena aromatica Schott also known as Sugandhmantri is an erect growing perennial rhizomatous herb of the family Araceae, found growing wild in sparse pockets in the dense humid forests of Indian Eastern Himalayas including the states of Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram, and Tripura (Deb 1983, Khumukcham *et al.* 2019). The evergreen plant possesses extraordinary heart shaped or arrow-headed shaped leaves. Tiny inconspicuous flowers without petals are usually enclosed in greenish spathe hidden by the leaves. It can be grown between 16-32°C with medium to low light exposure, hence it is suitable as a potted ornamental plant. In the various languages of Northeast India, it is referred to as *Gandhsana*/ *Gandhkochu*/ *Sugandhmantri* in Assamese, *Aancheeri* in Mizo, *Gondoi*/*Pankhokmanungshi-eieb* in Manipuri. Its aromatic rhizomes have different medicinal uses such as remedy for joint pain, skin infections, deafness, and blood purifier (Kar and Borthakur 2008) and possess pharmacological properties such as antidepressant, anti-inflammatory, antiseptic, sedative, and antifungal (Singh *et al.* 2000, Policegoudra *et al.* 2012). Also,

Preeti Hatibarua[1]*, Sailen Gogoi[2], Ningombam Sushma Devi[3]

[1, 2]Professor, [3]PhD Scholar,
[1,2,3]Department of Horticulture, Assam Agricultural University, Jorhat 785013, Assam, India

Email: preeti.hatibarua@aau.ac.in
*Corresponding author

Sugandhmantri rhizomes are rich in essential oil (Linalool, Terpinneol, Linalool acetate, Geraniol, and Acetic acid) and find extensive commercial use in perfumery and cosmetic industries. It is marketed as Montria oil (Khan *et al.* 2010) while the crude materials are used in making Dhup (Ahmed 2005). The boiled petiole and leaves are consumed by local communities as a vegetable; the rhizome is used as a flavoring and seasoning powder, as gun powder, and as mosquito repellent (Shukla *et al.* 2015). Sugandhmantri is considered a Non-timber Forest product (Dattagupta and Gupta 2014) , and about 400 MTs of dry rhizomes collected annually from the Barak Valley of Assam are exported from Kannauj, Kanpur (UP), Delhi, Kolkata, and Mumbai (Khan *et al.* 2010). Indiscriminate exploitative extraction of the rhizomes from its natural habitat has resulted in the shrinking of its population. The main reason for the decline in regeneration is its slow growth and also because the propagative part i.e. the rhizome is the economic part of the plant. These factors have resulted in this species being endangered, making conservation of this plant more challenging, but highly necessary. Further, due to ever increasing industrial demand, there comes a pressing need to promote rapid and mass production through tissue culture techniques , which come with certain limitations such as requirement of a sophisticated and costly laboratory setup, technically skilled personnel and regular supply of explants such as axillary buds, all of which are not practically feasible for the layman. Vegetative propagation regenerates clones and bypasses the immature seedling phase, thus attaining the mature phase faster. However, conventional vegetative propagation methods are hardly followed as it is considered is time-consuming and provide a limited number of propagules. Therfore, in order to multiply, maintain and conserve this valuable, endangered indigenous plant for future use as an ornamental and medicinal plant, this experiment was set up to standardize the size of its vegetative propagules for quick establishment and growth.

MATERIALS AND METHODS

This propagation trail was conducted at Horticulture Research Station, Kahikuchi, Guwahati to find out the most suitable size of cutting from rhizomes of Homalomena aromatica. Uniform sized Rhizomes from 3-year-old plants were collected from Rani Reserve Forest, Kamrup, Assam. Rhizomes were cut into pieces with a sharp knife. The cut pieces were graded according to different lengths and sizes and thus the treatments consisted of 5 different types of cutting (T_1) Top cutting, (T_2) Base cutting, (T_3) Two node cutting, (T_4) One node cutting, and (T_5) Bit cutting. The experiment was laid out in CRD design and replicated 4 times. The initial length and diameter of the cutting were recorded (Table 1), and the propagules were sterilized by dipping in 0.2% Saaf for 30 min and then planted in raised beds in sterilized river sand. Rooting of Homalomena aromatica Schott. was checked 1 month after planting and the Vegetative growth of the plant 3 months after planting.

Table 1. Description of various cutting used for propagation *Homalomena aromatica*.

Propagation method	Mean Length of cutting (cm)	Mean Diameter of cutting (cm)
Top cutting (already with mature leaves)	46.71	2.87
Base cutting	3.89	2.93
Two node cutting	3.01	2.08
One node cutting	1.97	2.05
Bit cutting	1.05	1.57

RESULTS AND DISCUSSION

Root parameters

Comparison among the different methods of rhizome cuttings showed superior root development (Table 2) in T_1 (top cutting), with 21.40 roots/plant, 8.50 cm root length and 0.29 cm root diameter. T_1 was not

Table 2. Rooting in *H. aromatica* plantlets at 1MAP from different propagation techniques.

Propagation method	Roots / plant	Root length (cm)	Root diameter (cm)	Fresh weight of cutting 1MAP (g)
Top cutting	21.40	8.45	0.29	50
Base cutting	4.89	5.12	0.27	6.25
Two node cutting	9.69	4.34	0.25	8.54
One node cutting	4.97	3.97	0.24	4.36
Bit cutting	3.36	3.90	0.22	1.23
SEd (±)	0.45	0.19	0.02	0.86
CD (5%)	0.97	0.14	0.04	1.86

Table 3. Vegetative growth of *Homalomena aromatica* plantlets at 3 months from different propagation techniques.

Propagation techniques	Shoots/ cutting	Shoot length (cm)	Leaves/ shoot (Nos)	Leaf petiole length (cm)	Leaf lamin length (cm)	Leaf lamina breadth (cm)
Top cutting	1	33.45	5.12	30.4	20.86	13
Base cutting	1.86	9.33	3.04	5.44	5.44	2.48
Two node cutting	2.13	8.24	2.56	5.53	5.42	2.46
One node cutting	1.30	8.07	2.42	5.07	5.34	2.40
Bit cutting	0.95	6.13	2	4.47	5.12	2.32
SEd (±)	0.07	1.24	0.14	1.03	1.22	0.12
CD (5%)	0.16	2.17	0.30	2.23	2.65	0.26

significantly different from T_2 (base cutting) and T_3 (two nodes cutting) in terms of root diameter (0.27 and 0.25 cm respectively). With decrease in size of the cutting from two nodes to one node, viz. T_3 and T_4 there was progressive decline in the root parameters recorded. The (T_5) bit cutting showed the poorest performance (3.36 roots/cutting, 3.90 cm root length, 0.22 cm root diameter). T_5 was at par with T_4 (one node cutting) in terms root length and root diameter (3.97 cm and 0.24 cm, respectively). It is evident that length and size of the rhizome cutting used for propagation were positively correlated with the rooting ability which were in line with Tchoundjeu and Leakey (1996) and Ramatsobane and Anthony (2020) who reported leaf area and the cutting length in African mahogany significantly improved the early and profuse rooting compare to control. It may be due to the larger accumulation of carbohydrates and food reserves in larger cutting which translate into early rooting (Hartmann *et al.* 2018). The larger surface area of cutting lesion might also enhance the water and phytohormones absorption.

Vegetative parameters

Top cutting (T_1) had significantly better vegetative growth at one month of after planting, with maximum shoot length (33.45 cm), leaves/shoot (5.12), petiole length (30.40 cm). T_2 also produced longer and broader leaves (20.86 cm and 13.00 cm respectively). Maximum shoot production (2.13/cutting) was recorded in T_3 (two nodes cutting). T_4 was followed by T_5 (base cutting), recording 1.86 shoots/cutting, 9.33 cm shoot length, 3.04 leaves/ shoot. There was no significant different between T_2 (base cutting), T_3 (two nodes cutting), T_4 (one node cutting) and T_5 (bit cutting) in terms of length of leaf petiole (ranging between 5.44 to 4.47 cm), lamina length (ranging from 5.44 to 5.12 cm) and lamina breadth (ranging from 2.48 to 2.32 cm) (Table 3). Bit cutting ranked lowest in terms of shoot (0.95/ cutting) and leaf production (2.00/ shoot) respectively. This might be due to the length/size of the cutting used for the study as reported by Umesha *et al.* (2011) that length/size significantly improved the vegetative growth and development in vanilla cutting. It is further supported by Ara *et al.* (2019) in ginger and Jamir *et al.* (2015) in Paris polyphylla that the size, and length of the cutting resulted in better vegetative growth.

Diseases

Although the plants propagated by T_1 (top cutting) performed superior in terms of rooting and vegetative growth, compare to other treatments, the disease incidence was reported highest in T_1. Mostly bacterial disease causing leaf spot was observed. The disease first appears as small water-soaked areas on leaves and enlarges up to 0.60 cm in diameter with black centers and yellow halos.

CONCLUSION

The T_1 (top cutting) with mature leaves outperformed all other treatments both in terms of rooting and vegetative growth. In terms of rooting, T_1 produced maximum roots (21.4/plant) with longer (8.45 cm), thicker (0.29 cm) and heavier fresh rhizome (50.00g) whereas least was recorded in T_5 (bit cutting) with which was at par with T_4 (one node cutting). Similarly, in terms of vegetative growth, T_1 (top cutting) had maximum shoot length (33.50 cm), leaves per shoot (5.12), leaf petiole length (30.40 cm), leaf lamina length (20.86 cm) and leaf lamina breadth (13.00 cm) respectively after 3 months of planting. Likewise, T_1 (top cutting) produced largest number of propagules (12.30-22.70). It was also noticed that T_1 (top cutting) became ready to transplant within a month whereas in other treatments, it took more than two and half months. Therefore, considering the overall performance shown by different cutting methods, it can be concluded that T_1 (top cutting), had best rooting and vegetative growth compare to all other treatments. The top cutting method can be recommended as convenient vegetative propagation method for *Homalomena aromatica*.

REFERENCES

Ahmed M (2005) Hand book on medicinal and aromatic plants. *(NEDFi publishing house*, Guwahati) pp 33—38.

Ara R, Ratna M, Sarker R, Ahmed MM, Rahman MM (2019)Effect of rhizome cut on the yield of ginger. *Int J App Res* 5 (11) : 242—246.

Deb D (1983) The flora of Tripura state (*Today and Tomor row's Printers and Publishers*, New Delhi). pp 399—400.

Dattagupta S, Gupta A (2014) Traditional processing of non-timber forest products in Cachar, Assam, India. *Ind J Tradit Knowle* 13 (2) : 427—433.

Hartmann HT (2018) Plant propagation: principles and practices, (9th edition, New Jersey: Prentice-Hall). pp. 1024.

Jamir SL, Jamir NS, Deb CR (2015) Production of clonal planting material and propagation of Paris polyphylla Smith var. polyphylla through rhizome splitting. *European J Biotech Biosci* 3 (9) : 43—46.

Kar K, Borthakur SK (2008) Wild vegetables of Karbi-an glong district, Assam. *Natural Prod Rad* 7 (5) : 448—460.

Khan TU, Hore DK, Borthakur SK (2010) Sugandhmantri (*Homalomena aromatica* Schott): A potential aromatic and medicinal plant of North East India. *Pleione* 4(1): 1— 3.

Khumukcham R, Gajurel PR, Singh B (2019) Assessment of eco-diversity status of *Homalomena aromatica* (Spreng.) Schott and its habitat in tropical forest of Indian Eastern Himalaya. *Pl Sci* 6 (2) : 71—83.

Policegoudra RS, Goswami S, Aradhya SM, Chatterjee S, Datta S, Sivaswamy R, Chattopadhyay P, Singh L (2012). Bioactive constituents of *Homalomena aromatica* essential oil and its antifungal activity against dermatophytes and yeast. *J Med Myc* 22(1):83—87.

Ramatsobane MM, Afolayan AJ (2020) Effects of rhizome length and planting depth on the emergence and growth of *Alepidea amatymbica Eckl* and Zeyh. *Plants* 9(6):732.

Shukla AC, Lalsangluaii F, Singh B, Kumar A, Lalramnghing lova H, Dikshit A (2015) *Homalomena aromatica*: An ethno medicinal plant, can be a potential source of antimicrobial drug development. *European J Env Eco* 2(2): 96—104.

Singh G, Kapoor IPS, Singh OP, Rao GP, Prasad YR, Le clercq PA, Klinkby N (2000) Studies on essential oils, part 28: Chemical composition, antifungal and insecticidal activities of rhizome volatile oil of *Homalomena aromatica* Schott. *Flavour Fragnance J* 15 (4):279—280.

Tchoundjeu Z, Leakey RRB (1996) Vegetative propagation of African mahogany: Effect of auxin, nodes position, leaf area and cutting length, *New Forest* 11:125—136.

Umesha K, Murthy G, Smitha GR (2011) Environmental conditions and type of cuttings on rooting and growth of vanilla (*Vanilla planifolia* Andrews). *J Trop Agric* 49(1-2) 121—123.