Plants and Environment (2020) 2(1): 31-33
https://doi.org/10.22271/2582-3744.2020.mar.31

Research article

Development of propagation techniques of rare occurrence shrub *Catamixis baccharoides* Thoms.

Anita Tomar[1]* and Dinesh Kumar[2]

[1]Forest Research Centre for Eco-rehabilitation, Prayagraj, Uttar Pradesh, India
[2]Forest Research Institute, Dehradun, Uttarakhand, India

*Corresponding Author: anitatomar@icfre.org

Abstract: *Catamixis baccharoides* (Family: Asteraceae), is a chasmophyte shrub and is endemic to Garhwal and Nepal only. Indole-3-Butyric Acid (IBA) concentration treatments were tested around 5000 ppm concentration *i.e.* 4000 ppm, 5000 ppm, 6000 ppm and 7000 ppm concentrations to enhance rooting and plant percentage. Twenty cuttings of each germplasm were planted in four replications. The rooting among the two germplasm collections in *Catamixis baccharoides* fluctuated between 43.8% and 57.5% for IBA concentration of 4000 ppm to 7000 ppm. The plant percentage ranged from minimum 41.3% to maximum 48.8%. The performance of 4000 ppm was significantly lower than 6000 ppm for both germplasm collections. Thus, 6000 ppm can be effectively used for propagating this species for future conservation.

Keywords: Germplasm, Propogation, Percentage, Conservation.

INTRODUCTION

In India, many plants are fast moving towards the threat of rare, endangered and threatened (RET) categories. The loss of habitat, over-exploitation, difficult propagation, damage by biotic and abiotic agencies, etc. are the major reasons for the decline. From the biodiversity conservation point of view, twenty-six "hot spot" have been identified in India where there are high rates of deforestation and endemicity,which need priority attention.One of these is the Himalayan belt as a whole.At present, several of the Himalayan species are under ecological threat due to geological evolution, global climatic changes and human interference. These factors have adversely affected the floral wealth in the Himalayas. According to IUCN criteria, about 121 species have been recorded in Red Data Book of Indian plants from Himalayan region (Nayar & Sastry 1990). There are many rare and endangered species whose populations are fast decreasing indicating them as threatened for the future. The need of the hour is to take some effectual steps to tutelage the vanishing phytodiversity coupled with the preparation of "Green Data Book" instead of increasing the list of threatened and endangered plant species in "Red data Book"continuously (Chopra *et al.*, 2007). The current cultivation practices of identified rare,endangered and threatened plants in the country are still in primitive stage due to lack of suitable cultivation technology and poor marketing facilities. Most of the areas, which are suitable for commercial cultivation of plants and even those where they grow naturally, are deep in the interior.

By merely confining species in their natural habitats and imposing a ban on their exploitation cannot serve the purpose. There must be a scientific approach towards large scale cultivation as well as *in-situ* and *ex-situ* conservation of the species in question. This may help a lot to the conservationists engaged in such tasks, researchers for developing cultivation technologies for those who are interested to commercially cultivate them in their farms, etc.

A number of neglected species at present are on the verge of becoming endangered and many have even reached the point of extinction. Cultivation of such neglected plants has great scope in the mountain areas. But the bottleneck in this context is the unavailability of germplasm of such neglected species. No organised agencies or research organisations produce or supply sufficient planting material required for the purpose. Hence the present study was conducted for the development of propagation techniques of *Catamixis baccharoides* Thoms. True-to-type germplasm can be obtained through vegetative propagation. Hence, the major challenge in this task was to develop a vegetative propagation protocol that can be reliably used for the multiplication of germplasm of divergent sources as no literature is available on its conservation or propagation aspects. This issue was addressed in the present study.

MATERIALS AND METHODS

Selected plant

Catamixis baccharoides Thoms., family Asteraceae, is a chasmophyte shrub and is endemic to Garhwal and Nepal only. It is 3-5 ft. high and its branches are silky to tomentose. It is restricted to sandy cliffs in Siwalik (Kanjilal & Gupta, 1969). This species is a rare occurrence (Hosetti, 2006). It hangs from steep rocky slopes and cliffs. It flowers in June-July and is sparsely distributed throughout the Shivaliks. The only threat to this species is the gradual crumbling of the Shivalik cliffs on which this plant grows (Uttarakhand Forest Department, 2013). Thomson first reported this

Submitted: 11 October 2019 Accepted: 14 March 2020 Published Online: 31 March 2020

species in 1866 and later Kanjilal (1901) reported the plant from rocky and sandy cliffs of Siwaliks *e.g.* Timli Pass, Baribata etc. Perusal of herbarium specimens housed in Botanical Survey of India (North Circle, Dehradun) and in the oldest herbarium of Forest Research Institute (Dehradun) show that the species was quite common in Siwaliks in the past and formed an important component of the lime-stone vegetation in its's localities. Slowly its population declines due to continuous disturbance in its habitat and environmental conditions caused by human's interferences. Thus in 1987 on the guidelines proposed by IUCN, it was placed under Vulnerable category in "Red Data Book of India Plants" (Nayar & Sastry, 1987) .It is noteworthy that the taxa placed under Vulnerable category are believed likely to move into endangered category in near future if the casual factors continue.

Figure 1. Plants of *Catamixis baccharoides* Thoms.

Plant collection

Survey of species under the project *viz. Catamixis baccharoides*, was carried out in Garhwal Himalaya on the basis of information about the distribution of different species available in the literature. Sites, where the plants were found, were recorded. There was a problem in identification of plants of *C. baccharoides*. Plant specimens and photographs of the plants were brought and shown to specialists in Systematic Botany Discipline. Reference collections of Forest Research Institute (FRI), Dehradun Herbarium were also compared to establish the identity of the plants.

Cuttings of *C. baccharoides* were collected from Mohand, Dehradun (Latitude :23° 19′ N , Longitude : 69° 52′ E) and Mansa Devi hills, Hardwar (Latitude 29° 95′ N, Longitude 78° 16′ E) districts during month of March due to more favorable response during this season in comparison with other seasons (Bhatt & Todaria, 1991; Hartmann *et al.*, 1997).

Experiment designing

The study was carried out in Lesser Known Tree Species (LKTS) nursery of Forest Research Institute, Dehradun located at 30º 19′ N latitude and 78º 03′ E longitude. Germplasm were harvested with the help of sharp secateurs and were kept in a wet gunny bag, to avoid desiccation during transportation, from collection site to experimental site. Twenty cuttings were planted in four replications. Four indol-3-butyric acid (IBA) treatments *viz.* 4000 ppm, 5000 ppm, 6000 ppm and 7000 ppm and control were applied according to the method using 70% ethanol as a solvent (Hartmann & Kester, 1983). After twelve weeks of planting data on rooting and plant per cent were recorded

RESULTS AND DISCUSSION

Table 1. Effect of IBA concentrations on rooting of cuttings of *Catamixis baccharoides* Thoms. collected from different sites.

Rooting (%) characteristics	4000 ppm	5000 ppm	6000 ppm	7000 ppm	Control
Mohand, Dehradun					
Callus formation	48.8	56.3	**60.0**	57.5	3.8
Rooting (%)	45.0	52.5	**57.5**	56.3	1.3
Plant percent (%)	45.0	43.8	**48.8**	47.5	1.3
Mansa Devi hill, Haridwar					
Callus formation	52.5	53.8	**55.0**	53.8	2.5
Rooting (%)	43.8	50.0	**51.3**	**51.3**	1.3
Plant percent (%)	41.3	42.5	**47.5**	43.8	0.0

CD 5% for callus formation: 6.9

CD 5% for Rooting (%): 5.4

CD 5% for plant percent: 7.5

The growth behaviour of cuttings of *Catamixis baccharoides* from different places in relation to the various treatments has been observed and the results were recorded. Observations on rooting percentage and plant per cent were recorded for each treatment and the results of rooting behaviour of cuttings of *Catamixis baccharoides* collected from Mohand, Dehradun and Mansa Devi hills, Hardwar are presented in table 1. The rooting among the two germplasm collections in *Catamixis baccharoides* fluctuated between 43.8% and 57.5% for IBA concentration of 4000 ppm to 7000 ppm (Table 1). The plant percentage ranged from minimum 41.3% to maximum 48.8%. The performance of 4000 ppm was significantly lower than 6000 ppm for both germplasm collections. Thus, 6000 ppm can be effectively used for propagating this species.

CONCLUSION

An efficient protocol for macro propagation of rare occurrence shrub *Catamixis baccharoides* was developed in this study by testing various IBA concentrations. IBA is considered the best synthetic auxin because it is nontoxic to plants over a wide concentration range. This method produces a large number of true to the type, uniform, disease free, elite, plantlets right through the year, which will make things easier for large scale cultivation of this endangered plant . In this study treatment of cuttings with 6000 ppm IBA was found effective for propagating *Catamixis baccharoides.*

ACKNOWLEDGEMENTS

This work was financially supported by Indian Council of Forestry Research and Education (ICFRE), Dehradun, India

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