

**STUDIES ON THE VEGETATIVE AND MICROPROPAGATION OF  
SOME MEDICINAL AND ENDANGERED PLANTS OF ASSAM**

**ABSTRACT**

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## **ABSTRACT**

Plants are a major group among the living organisms, which support and help the life line of the human beings as well as other living organisms. Medicinal plants are one of the important groups of bio-resources, which are the base line for the life of human beings as well as for other animals. Any plant or part of the plants which contain active medicinal chemical constituents with a definite physiological response in the treatments of the diseases in human and other animals are called medicinal plants. It is also one of the most important elements of bio-diversity that usually grows in all kinds of eco-systems and possesses high pharmaceutical, economic and ecological values. Most of the medicinal plants are found in the wild habitat and they help in the progress of human civilization in different aspects, i.e. Pharmaceutical, economical, commercial, social etc.

Aromatic plants also constitute a large group among the plants which belong to about 60 families. These plants are very important for multifarious purposes such as uses in perfumes, flavors, antiseptics, deodorants, pharmaceutical preparations, and cosmetics and as fungicidal, insecticidal and antibacterial agents etc. On the other hand, different industries are based on the essential oils which are extracted from different aromatic plants.

Medicinal plants and aromatic plants constitute the life line of the pharmaceutical industry as well as perfume industry. Therefore, cultivation of medicinal and aromatic plants is of great importance due to their demand in the industrial purposes. One of the interesting things is that the raw materials of resources of such industries are mainly found as natural resources.

The population of these groups of plants (i.e. medicinal plant and aromatic) is gradually decreasing. The main cause is habitat loss due to the anthropogenic activities. Due to the degradation of their habitat and decline of population, perhaps this important of group plants will be gone forever from the nature as well as some of them may have already become endangered.

Endangered plants may be defined as a taxa in danger of extinction or the taxa where the numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they deemed to be in immediate danger of extinction.

Southern Assam is one of the important phytogeographic regions for different types of medicinal as well as endangered plants. It is situated between 92°15' and 90°16' East longitude and 24° 8' and 25° 8' North latitude and 26-27m above MSL. It is surrounded in North by Cachar Hills and Jaintia Hills, in the south by the State of Mizoram, in the East by Manipur and the West is the Sylhet District of Bangladesh and the state of Tripura. It covers an area of 6922 sq km. The ethnic communities of this region use the different parts of the medicinal plants in their traditional health care system. But due to the lack of proper utilization and awareness among them, these plants are over exploited. *Homalomena aromatica* (Roxb.) Schott. and *Smilax glabra* Roxb. are two of such important medicinal as well aromatic plants of this region. The fresh and dry rhizomes of *Homalomena aromatica* (Roxb.) Schott. are used as a raw material by the different industries. About 400 MT of dry rhizomes is exported from Southern Assam to different places of India. But the wild population of these species is declining gradually due to the illegal extraction and over exploitation of its rhizome.

Keeping the above in view the present research work was taken up on the vegetative propagation of the selected medicinal and the endangered plants of Southern Assam *in vivo*. Subsequently and attempt for *in vitro* propagation through micropropagation technique was also taken up three the plant species (i.e. *Smilax glabra* Roxb., *Bulbophyllum careyanum* (Hook.) Spreng. and *Paphiopedilum spicerianum* (Rchb.f.) Pfitz. respectively).

In the present study four medicinal as well as endangered plant species were taken into consideration, i.e. *Homalomena aromatica* (Roxb.) Schott., *Smilax glabra* Roxb., *Bulbophyllum careyanum* (Hook.) Spreng. and *Paphiopedilum spicerianum* (Rchb.f.) Pfitz. Among these four plants, *Homalomena aromatica* (Roxb.) Schott. is an aromatic plant and *Bulbophyllum careyanum* (Hook.) Spreng. and *Paphiopedilum spicerianum* (Rchb.f.) Pfitz. are two very important orchid species of Southern Assam. The fourth plant species *Smilax glabra* Roxb. is a woody climber. First three plant species are

considered as medicinal plant for their use into curing of different ailments and *Paphiopedilum spicerianum* (Rchb.f.) Pfitz. is used as a highly demanded cut flower due to its unique beauty of the flowers and also for their aesthetic value. On the other hand the target plant species are considered and identified under the different categories of threatened plants (RET plants).

Vegetative propagation is one of the potential and useful methods of asexual reproduction of those plant species, which are economically important but their population is very less in the natural habitat as well as they are difficult to propagate through seeds. This method of propagation is also considered as ideal for rapid multiplication of a species under threat.

Rhizome is one of the important vegetative parts of the rhizome producing plants. . The rhizome is used as propagating materials in the vegetative propagation of some important plant species. In the present work, rhizomes of *Homalomena aromatica* (Roxb.) Schott. and *Smilax glabra* Roxb. were used as a planting material in the different experiment with different treatments (i.e. different cuttings, into different seasons, with different natural substrate, organic and inorganic amendments, growth substances and cultivation etc.)

The target plant species, i.e. *Homalomena aromatica* (Roxb.) Schott., *Smilax glabra* Roxb. and *Bulbophyllum careyanum* (Hook.) Spreng. were successfully propagated vegetatively under the green house and nursery in pot culture ( *in vivo* conditions) under varied conditions. Mainly the rhizome of the experimental plant species were used as an experimental planting material. From the results, it was observed that these plant species could be propagated from the rhizome.

The three different cuttings of the rhizomes of *Homalomena aromatica* (Roxb.) Schott., i.e Cutting 1 (C1, upper portion), Cutting 2 (C2, middle portion) and the Cutting 3 (C3, lower portion) have shown good potential source of planting material for vegetative propagation of the said species. The cutting 2 (C2), i.e. in the present experiment, the middle portion of rhizome has shown to be the best propagating unit.

An epiphytic orchid *Bulbophyllum careyanum* (Hook.) Spreng. was considered for the vegetative propagation *in vivo* under green house condition. Three different growing conditions, i.e. 1) Growing Condition Number 1: Brick + charcoal + wood ( 1:2:1) with soil in pot culture, 2) Growing Condition Number 2: Brick + coconut husk + charcoal ( 1:2:1) with leaf mould in pot culture, 3) Growing Condition Number 3 : Trunk of tree *Bauhinia variegata* L.) were used for the vegetative propagation of this orchid species. In this experiment, the method of division of the orchid vegetative was applied.

The target plant species, *Homalomena aromatica* (Roxb.) Schott. and *Smilax glabra* Roxb. were attempted to propagate during the four different seasons (i.e. Spring, summer, autumn and winter). But both the plant species could not be propagated during the winter season.

Medium or substrate is one of the important factors in the vegetative propagation. Three types of natural substrata or medium i.e. Soil, sand and leaf mould, were used in the present work. It was observed that the three natural substrata, i.e. soil, sand and leaf mould have affected the vegetative propagation of *Homalomena aromatica* (Roxb.) Schott. and *Smilax glabra* Roxb. both positively and negatively. The percentage of propagation and survival percentage of *Homalomena aromatica* (Roxb.) Schott. were found to be 100%. The three natural substrate were favourable for the vegetative propagation of this species, while soil was found to be the best medium for the vegetative propagation of *Smilax glabra* Roxb. The other two substrate sand and leaf mould were found to be significantly poor in the vegetative propagation of *Smilax glabra* Roxb.

Organic amendments always supply the nutrients to soil and improve the soil fertility. Two types of organic amendments, (i.e. cow dung and vermicompost) were used in different dosages, (i.e. 100gm, 250gm and 500gm per 2kg of soil) for the vegetative propagation of the targeted two plant species (i.e. *Homalomena aromatica* (Roxb.) Schott. and *Smilax glabra* Roxb.). Due to the application of these two organic amendments, it was observed that the growth of the vegetative propagation of the target species was better than the control, i.e. without the application of organic amendments.

Plant growth regulators play an important role in the rooting of the plants. Three types of plant growth substances (plant growth regulators) were used in the vegetative

propagation of *Homalomena aromatica* (Roxb.) Schott. and *Smilax glabra* Roxb. IBA, IAA, GA<sub>3</sub> were used at different concentrations, i.e. 10, 20, 30, 50, 70, 90, 100, 250, 500 ppm. However, there was no positive response in the vegetative propagation of the targeted above mentioned plant species. Only it was observed that the rhizomes got rotten due to the growth substances treatments as compared to control, i.e. without the application of growth substances.

Cultivation is one of the best conservation measures for the endangered medicinal plants, which helps in the increase of their natural stock in the wild habitat. The target plant species *Homalomena aromatica* (Roxb.) Schott. was tried to cultivated under the agroclimatic conditions of Southern Assam. The rhizomes have been used as a planting material with the treatment of the above mentioned organic amendments, i.e. Cow dung and vermicompost. Three types of cutting of rhizomes, i.e. C1 (upper portion), C2 (Middle portion), C3 (lower portion) were successfully propagated with the treatment of the two organic amendments. A tremendous scope is available for the commercial and economic growth of this economically important plant species, which will help the progress of the life style of the people of this region, who are involved in the trade of this plant species.

Micropropagation is one of the important conservation initiatives which help to increase the population of a particular plant species within a particular period of time. In the present study one endangered medicinal plant, i.e. *Smilax glabra* Roxb. and two endangered orchid species i.e. *Bulbophyllum careyanum* (Hook.) Spreng. and *Paphiopedilum spicerianum* (Rchb.f.) Pfitz. were successfully propagated by micropropagation. *Smilax glabra* Roxb. is a highly demanded endangered medicinal plant of Southern Assam. In this plant seed germination is very less. Therefore, an attempt was made to establish a protocol for the micropropagation of this species. Different parts of the plant body were used as explant source in the present work. Interestingly only nodal explant showed good response in the MS and MS modified media But MS modified medium showed negative response in case of rooting. A successful micropropagation protocol was developed. The seeds of *Bulbophyllum careyanum* (Hook.) Spreng. were germinated into Vacin and Went medium *in vitro* from

the three month old mature capsules. Subsequently the plantlet of this orchid species was grown into three solid culture media, i.e. MS, MSM and OMM, and they were also successfully transferred from the lab to land condition. *Paphiopedilum spicerianum* (Rchb.f) Pfitz. was successfully grown in MS medium. The callus formation was observed from the young leaf and shoot tip of *Paphiopedilum spicerianum* (Rchb.f.) Pfitz. But shoot tip has shown better response compared to young leaf. Therefore, after callus formation the shoot tip was considered to be the best explant for the production of plantlets of this orchid species. A protocol was successfully developed for the micropropagation of the endangered orchid species.

Therefore, in the present scenario, vegetative and micropropagation of endangered and medicinal as well as aromatic plants is a must so that they can be sustainability utilized without any possible threat of their extinction in the near future.