CHAPTER 6

To study the vegetative propagation of Bulbophyllum careyanum (Hook.) Spreng.

6.1. Introduction:

Orchids are economically important cut and highly enveloped fascinating flowers as well as are in demand in horticulture. Due to their reproductive and distinct morphology as well as flower structure, it is taxonomically different from the other plants groups of monocotyledons. It belongs to the family Orchidaceae, popularly considered as “Gems or Blooming gold” among the cut flowers as well as in floriculture industry (Hedge, 2012). They are perennial herbs either epiphytic or saprophytic (Summerhays, 1951; Holitum, 1953; Campbell, 1964). They select their habitat in the tropical and sub tropical forests preferably in an undisturbed condition.

Orchids are known for the diversity of their habitat and habit. Globally about 200,000 species in 760 genera are distributed everywhere except in Polar and dry Deserts (Hedge, 2012). It is estimated that in India it is represented by nearly 1300 species in 167 genera representing 6 sub families, 17 tribes and 30 sub tribes (Krishna et al., 2004; Rani et al., 1993; Vij et al., 1992; Hedge, 2012). From Assam about 185 species (Talukdar, 2010) and from Southern Assam 59 orchid species have been reported so far (Bhattacharjee and Dutta, 2009).

6.2. TYPES OF ORCHIDS:

6.2.1. Based on the growth condition:

Two types of orchids are found:

a) Monopodial Orchid (Single footed): these types of orchids have a main stem which continuous to grow year after year. e.g. Phalaenopsis sp., Vanda sp. etc

b) Sympodial Orchids (Many footed): these types of orchids produce a series of pseudobulbs which grow to a certain size, bloom, then stop growing and are replaced by the next growth. e.g. Dendrobium sp., Cymbidium sp. etc.
6.2.2. Based on the growing condition:

Depending upon the growing condition in natural habitat, orchids can be further divided into four groups, viz, Epiphytes, Lithophytes, Terrestrials and saprophytic orchids.

6.3. PROPAGATION OF ORCHID:

Orchids are propagated by sexually and asexually. But the natural sexual propagation is rare as they lack endosperm. The seeds of orchids are poorly organized and have undifferentiated embryos. The seeds are only germinated if there is a fungal association/infection occurred in natural condition (Sagawa, 1963).

Therefore vegetative propagation is the best and suitable techniques for the propagation of orchid.

6.3.1. Vegetative propagation of Orchids:

Vegetative propagation of orchids gives true to type plants. Some conventional methods of vegetative propagation are as follows:

6.3.1.1. Division: This is a common simple propagation method. Division of the monopodial and sympodial orchids is different. In monopodial orchids, the division is done in such a way that the plants are separated into two or more plants. The each separated plants can be repotted into appropriate potting medium separately. e.g. *Paphiopedilum* sp. On the other hand in the division of sympodial orchid, each separated plants contain at least 3-5 bulbs with leaves. e.g. *Bulbophyllum* sp.

6.3.1.2. Propagation from daughter plants:

Sometimes some daughter plants are developed on the stalk of the flowers. The daughter plants are removed with rootlets from the mother plants and then fixed on the surface of the growing compost medium.

6.3.1.3. Cuttings:

The method of cutting of monopodial and sympodial orchids is different. In monopodial orchids, the uppermost part of the stem is cut just under the aerial roots and then planted
into coarse bark compost. On the other hand the cutting is done on the stalk of sympodial orchids in such a way that every cutting should be 10-15 cm in size and have 4-5 segments.

6.3.1.4. Back bulb:

Back bulbs are previously flowered or unflowered back pseudobulbs. It can give rise to a novel form of propagation, but it may take up three years to obtain a flowering size plant.

6.3.1.5. Keikis:

Keikis are young plantlets which develop either on a stem or on an old inflorescence. It is simple and satisfying method. In this method the young plantlets are cut from the parent plants and then potted into the orchid compost.

6.3.1.6. Aerial shots:

Some of the orchids produce aerial shoots or bulbs on old back bulbs. They usually arise on the upper part of the back bulbs and grow out slowly. These aerial shoots take 90-120 days to develop roots. At this stage, they are detached along with the portion of back bulb and potted as independent plant.

6.3.1.7. Tissue culture:

It is a special type of vegetative propagation in which the plantlets are produced from a small tissue or organ in an aseptic laboratory condition (i.e. in vitro).

6.4. Bulbophyllum careyanum (Hook.) Spreng.

*Bulbophyllum* is the second largest genus of the family Orchidaceae. *Bulbophyllum careyanum* (Hook.) Spreng. is one of the most important epiphytic orchid species among the 1803 species of *Bulbophyllum*. It is popularly known as “Carey's Bulbophyllum” with the special characters of single noded pseudobulb, basal inflorescence, and mobile lip. The plant has remote, spherical to oblong, lightly grooved pseudobulbs with a single apical, oblong to linear oblong, leaf. The flowering season is observed to be both winter and summer. It has hanging many flowered inflorescence with lance-shaped floral bracts.
Plants are found to be growing in evergreen lowland forests of Himalayas, Assam, Nepal, Bhutan, Sikkim, Myanmar, Thailand, and Vietnam at the elevations of 200 to 2100 meters.

The local name of the *Bulbophyllum careyanum* (Hook.) Spreng in Southern Assam is ‘Ishwarimul’. The habitat of this plant species is mainly in wild condition, i.e. in different reserve forests of southern Assam. Some of the host plants are *Magnifera indica* L., *Artocarpus heterophyllus* Lam., *Lagerstroemia speciosa* (L.) Pers., *Albazzia species*, *Ficus benghalensis* L., *Lagerstroemia reginae* Roxb., *Anthocephalus chinensis* (Lam.) Risch. ex. Walp. (Bhattacharjee and Dutta, 2009). The plant is very important in Floriculture as well as in traditional medicinal system. Due to their believed medicinal properties the ethnic communities of this region use the pseudobulbs of this orchid species for curing of different ailments mainly hormonal deficiency. The present status of this orchid species is rare according to the earlier reports (Das *et al.*., 2004; Bhattacharjee, 2009).

Now a days, population of this orchid species is depleting due to over exploitation, habitat destruction and some anthropogenic activities. One of the interesting characters of this orchid species is that in it the natural seed germination is very rare. Due to the lack of endosperm and undifferentiated embryos, the small seeds of this orchid species cannot germinate (Sagawa, 1963). It can be only germinated in artificial media *in vitro*, i.e. micropropagation. Otherwise vegetative propagation is the only solution for the conservation of this orchid species. Therefore, in the present work, some initiatives were taken for the *ex situ* multiplication and conservation of this orchid species. i.e. *Bulbophyllum careyanum* (Hook.) Spreng.

**6.4.1. Experimental site:**

The experiment was conducted in the nursery under natural environmental condition and in the green house of the Department of Ecolgy and Environmental Science, Assam University, Silchar.
6.4.2. METHODOLOGY:

Sample collection: The orchid species samples were collected from the wild habitat during the month of June 2012.

The whole experiment was conducted under three growing conditions. The first two conditions were made in the earthen pots and the third one was done in the branch of a tree species, i.e. Bauhinia variegata L. The details of these conditions are as follows:

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 mold in pot culture.


In the present work, division of the orchid plant parts were taken mainly as follows: first the rhizome of the collected samples were divided, having two pseudobulbs and two leaves. Then one divided part was put in condition no 1 and 2. On the other hand in the condition no 3, the divided samples were tied in the branches of the tree species Bauhinia variegata L. with the coconut husk and fibre. The experiment was conducted for one year. Regular watering and weed control (for Growth Condition Number 1 and Growth Condition Number 2) were maintained. The first two Growing Conditions (i.e. Number 1 and 2) were kept under greenhouse condition.

Growth parameters: Percentage of survival, days required for flowering, duration of remaining of the flowering, numbers of capsule formation, were recorded.

6.4.3. Data analysis:

The collected data were analyzed with the help of Microsoft Excel 2007 and Origin. t test was done for the test of significance of the different growth parameters.
6.5. RESULT:

All the three growing conditions were found to be successful. At the end of the experiment it has been observed that the percentage of survival (%) in the three different growing conditions were 100 %. While the other growth parameters differ from one to another. Maximum time required for the flowering was in the Growing Condition Number 3 and the minimum days required was in Condition Number 1. The flower is the most important part among the orchids. The experiment shows that Growing Condition Number 1 is the best for the flowering of *Bulbophyllum careyanum* (Hook.) Spreng. But the number of capsules were found to be the highest in Growing Condition Number 3 (Table 6.1) (Plate No. 5).

The numbers of leaves produced among the three different Growing Conditions were found to be varying. The maximum number of leaves was observed in Growing Condition Number 1 and the minimum number was observed in Growing Condition Number 3, by the end of one year (Table 6.2) (Plate No. 5).

**Table 6.1:** Percentage of survival, Days required for the flowering, Duration of remaining of the flower (days), Number of capsule formed in *Bulbophyllum careyanum* (Hook.) Spreng, in different growing conditions, after one year

<table>
<thead>
<tr>
<th>Growing Condition</th>
<th>Percentage of survival (%)</th>
<th>Days required for flowering (Days)</th>
<th>Duration of remaining of the flower (days)</th>
<th>Number of capsule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition 1</td>
<td>100±0</td>
<td>181.00±4.94*</td>
<td>10.33±0.58**</td>
<td>0.33±0***</td>
</tr>
<tr>
<td>Condition 2</td>
<td>100±0</td>
<td>188.33±2.12*</td>
<td>7.33±6.35**</td>
<td>0.33±0***</td>
</tr>
<tr>
<td>Condition 3</td>
<td>100±0</td>
<td>206.00±4.94*</td>
<td>3.00±5.20**</td>
<td>0.67±0***</td>
</tr>
</tbody>
</table>

Average, ±= SD

*The average values of days required for flowering are significantly different at 0.01 level, t=3.98068, p=0.00406

* *The average values of remaining days of flowering are significantly different at 0.01 level, t=3.96914, p=0.00412
** The average values of number of capsules are significantly different at 0.01 level, $t=2.52982$, $p=0.003524$

**Table 6.2:** Number of leaves produced by *Bulbophyllum careyanum* (Hook.) Spreng. Under different growing conditions (one year observation)

<table>
<thead>
<tr>
<th>Month of observation</th>
<th>Growing Condition Number 1</th>
<th>Growing Condition Number 2</th>
<th>Growing Condition Number 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>2.00±0.00</td>
<td>2.00±0.00</td>
<td>2.00±0.00</td>
</tr>
<tr>
<td>July</td>
<td>2.00±0.00</td>
<td>2.00±0.00</td>
<td>2.00±0.00</td>
</tr>
<tr>
<td>August</td>
<td>2.00±0.00</td>
<td>2.00±0.00</td>
<td>2.00±0.00</td>
</tr>
<tr>
<td>September</td>
<td>2.33±0.58</td>
<td>2.00±0.00</td>
<td>2.00±0.00</td>
</tr>
<tr>
<td>October</td>
<td>2.67±0.58</td>
<td>2.00±0.00</td>
<td>2.33±0.58</td>
</tr>
<tr>
<td>November</td>
<td>3.00±0.00</td>
<td>2.00±0.00</td>
<td>2.67±0.58</td>
</tr>
<tr>
<td>December</td>
<td>3.33±0.58</td>
<td>2.67±0.58</td>
<td>2.33±2.08</td>
</tr>
<tr>
<td>January</td>
<td>3.33±0.58</td>
<td>2.67±0.58</td>
<td>2.67±0.58</td>
</tr>
<tr>
<td>February</td>
<td>3.67±0.58</td>
<td>3.00±0.58</td>
<td>2.33±1.15</td>
</tr>
<tr>
<td>March</td>
<td>4.00±1.00</td>
<td>3.00±0.00</td>
<td>2.33±2.08</td>
</tr>
<tr>
<td>April</td>
<td>4.00±1.00</td>
<td>3.3±0.58</td>
<td>2.33±2.08</td>
</tr>
<tr>
<td>May</td>
<td>5.33±1.53</td>
<td>4.00±1.00</td>
<td>3.00±2.65</td>
</tr>
</tbody>
</table>

Average,±=SD

The average value of the number of leaves are significantly different at 0.01 level, where $t=3.85714$, $p=1.91309\times10^{-50}$. 

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6.6. DISCUSSION:

The orchid flower is the most beautiful among the flowering plants on the earth. Due to their distinct floral structure, now a days it has the highest demand as cut flowers in floriculture as well as for commercial purposes. *Bulbophyllum careyanum* (Hook.) Spreng. is one of the medicinally important orchid species among the genus *Bulbophyllum*. But the population of this orchid species has declined due to the over exploitation and due to other anthropogenic activities. Although *Bulbophyllum careyanum* (Hook.) Spreng. is an epiphytic orchid, but it can also be cultivated in pot culture with appropriate culture media. Similar results were also reported from the cultivation and conservation of some selected orchid species of Southern Assam (Bhattacharjee, 2009). From the present work it can be suggested that this orchid species grows in all the three growing conditions. However, Growth Condition Number 1 i.e. Brick + charcoal + wood (1:2:1) with soil has been observed to be the best among the three Growth Conditions taken into consideration in the present study.