

## **PROPAGATION AND CONSERVATION OF ENDANGERED ORCHID MICROSTYLIS WALLICHII SYN MALAXIS ACUMINATA (JEEVAK) IN ITS NATURAL HABITATS OF UTTARAKHAND HIMALAYAS**

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**Abstract:** The orchid is depleting fast in its natural occurrence areas due to over-extraction to meet the demand of Ayurveda industry. Neither commercial cultivation techniques nor replenishment procedures are available for this important terrestrial orchid. Pseudobulbs have been recorded as the best material for its propagation and multiplication. The present study was carried out in natural oak forest areas of Chakrata and Mussoorie Forest Divisions of Garhwal Himalaya, India for enrichment depleted natural areas. The performance of different type of pseudo-bulbs was observed at different selected sites. The performance of the orchid at different locations and its sustainable conservation is discussed in the paper.

**Keywords:** Endangered, orchid, Pseudobulbs, Vegetative Propagation and in-situ conservation.

### **Introduction**

*Jeevak (Microstylis wallichii syn Malaxis acuminata)* is a highly exploited medicinal terrestrial orchid. The orchid naturally grows in humus rich moist forest floor of temperate and sub-tropical region of the Himalayas between 1800 to 2300 masl.

The orchid is a critically endangered species (Bentham 1997). Murti et. al. (2000) have enumerated medicinal orchids of Himalayan region. It is disturbed in temperate to subalpine areas of the Himalayan region. 237 species of orchids are recorded from the state of Uttarakhand, of which 127 are terrestrial, 99 epiphytic and 11 saprophytic (Jalal et. al. 2008). Uttarakhand is the richest hub of *Jeevak*. *Jeevak* show the highest density in the Banj-oak, mixed oak, and Oak pine forests. This species grow in colonies and one colony may contain 5-25 individuals. *M. acuminata* forms colonies in shady places, moist ground and in the area that are wet & mossy (Jalal et. al. 2009).

The orchid is a critically endangered species because of its extensive use in *Ayurvedic* preparations like *Astawarga*, *Jivinya verga*, *Madura verga* and also in *Chyvanprash* as a health tonic, blood purifier, and aphrodisiac and also as an antioxidant. It is one of the

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ingredient of **Ashtverga** (combination of eight drugs) which is one of the core parts of the Ayurveda (Sharma *et. al* 2011).

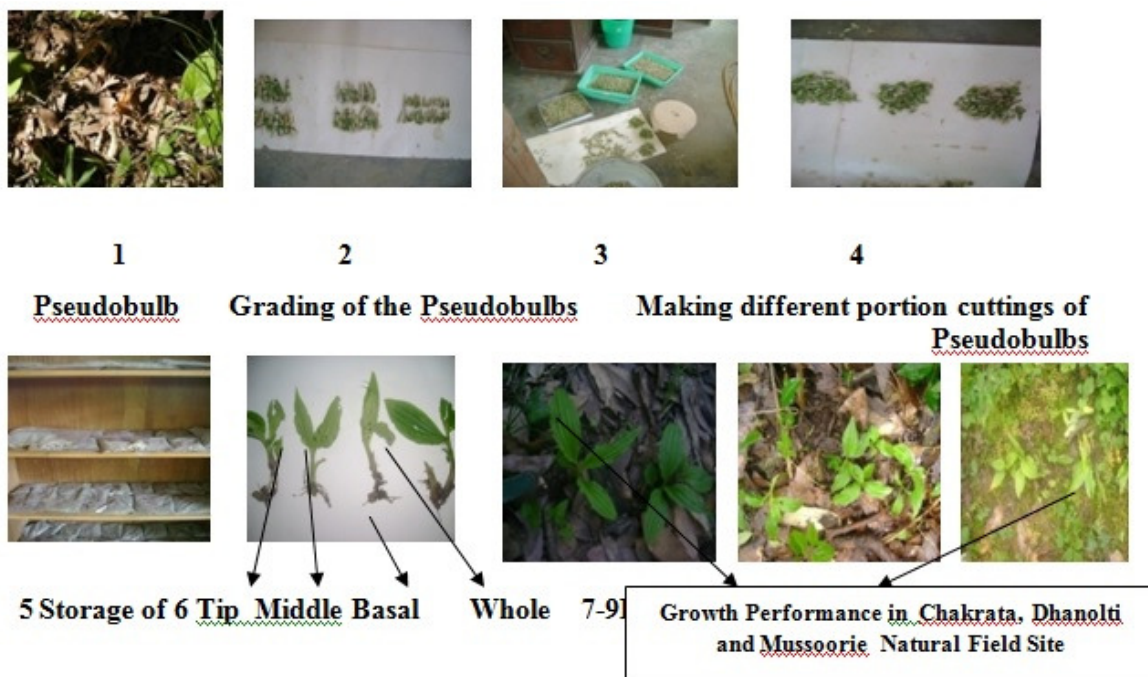
In Uttarakhand, its collection from the wild has been banned because of its dwindling presence (Singh *et al* 2005). However illegal exploitation of the orchid continues and the resource may vanish unless concrete steps are taken up immediately. As per a study, 70% of the medicinal plant collections involve destructive harvesting practices, leading to useful plant species becoming endangered or threatened (Anon, 2000).

The rapid socioeconomic changes in recent years and unscientific collection of the plant without focused conservation lead to the depletion of the plant density in natural habitats of the Himalayan region. There is requirement to develop techniques for *in-situ* conservation and replenishment in natural habitats for its sustainable management and availability. The present paper describes the experiences gained by the authors at selected sites in Garhwal Himalayas.

### **Material and Methods**

Pseudo-bulbs of Jeevak (*Microstylis wallichii*) were collected from Chakrata forest area as well as, from market during February-March 2009 and initial experiments involving vegetative multiplication through nodal cuttings were carried out at Non Wood Forest Products Nursery Dehradun. They were then planted at high altitude nursery at Chakrata and different selected forest areas allotted by State Forest Department for research work in Mussoorie and Chakrata Forest Divisions. These forest areas were managed and maintained by the Non Wood Forest Products Division, Forest Research Institute, Dehradun.

The Pseudo-bulbs of sizes 3 to 4 cm in length (0.8 -1.0 cm diameter) were selected and three type of nodal cuttings viz., Tip part, Middle Part and Bottom part of pseudobulbs were prepared. In the fourth types no cuts was made and whole pseudo-bulbs were sown. The bigger bulbs were not used since these should be reserved for the commercial market. Seeds Propagation was also tried however poor germination ability was noticed and thus, is not the best propagation method. The experimental bulbs after proper shoot development were planted in selected plots in Deodar and Oak Forests at Chakrata, Dhanolti and Mussoorie Forest areas during May end of 2009 in Randomized Block Design. All three sites were divided into three plots of size 10x10 m. and have total 1200 propagules with equal number (300) in each treatment with three replicates. Thus a total of 3600 number of propagules of Jeevak were planted at each location and evaluated for their field performance. The methodology described above is depicted in figure 1-9.



Pseudobulbs of *Microstylis wallichii* (Jeevak) collected from natural habitat Chakrata were graded in NWFP Nursery Forest Research Institute Dehradun and further propagated in NWFP Nursery Chakrata and selected field sites. Table-1 indicate that 1 kg Pseudobulbs of Jeevak harvested from forest site when categorised in to small, middle and big size. Small size contained 1880 number having average length and diameter was 2.89 cm and 0.48 cm. Middle size pseudobulbs contained 940 number having average length and diameter of 3.59 cm and 0.79 cm. Big size contained 350 number having average length and diameter was 5.00 cm and 1.17 cm.

The harvestable percentage of pseudobulb were recorded at different natural habitat surveyed in Uttarakhand (Table-1). The results indicated that only 11.04 % pseudobulbs from one kg harvested pseudobulbs can be used for commercial /market purpose, 26.65 % of pseudobulbs can be used for vegetative multiplication whereas 59.31 % of pseudobulbs should be left for regeneration purposes for future crop. Puni & Singh (2007) have also recommended the retention of the 80 percent pseudo-bulbs in its habitat, the yield of the bulbs after 1 or 2 years could be 3 to 4 folds and therefore, suggested to take up sustainable management study for this important plant.

**Table -1.** Grading of different type of Pseudobulbs

Categories	Av. Number of Pseudobulbs kg	Harvestable Percentage	Size of Pseudobulbs	
			Length of Pseudobulb (cm)	Dia. of Pseudobulb (cm)
Small size	1880	59.31	2.89	0.48
Middle size	940	29.65	3.59	0.79
Big size	350	11.04	5.00	1.17

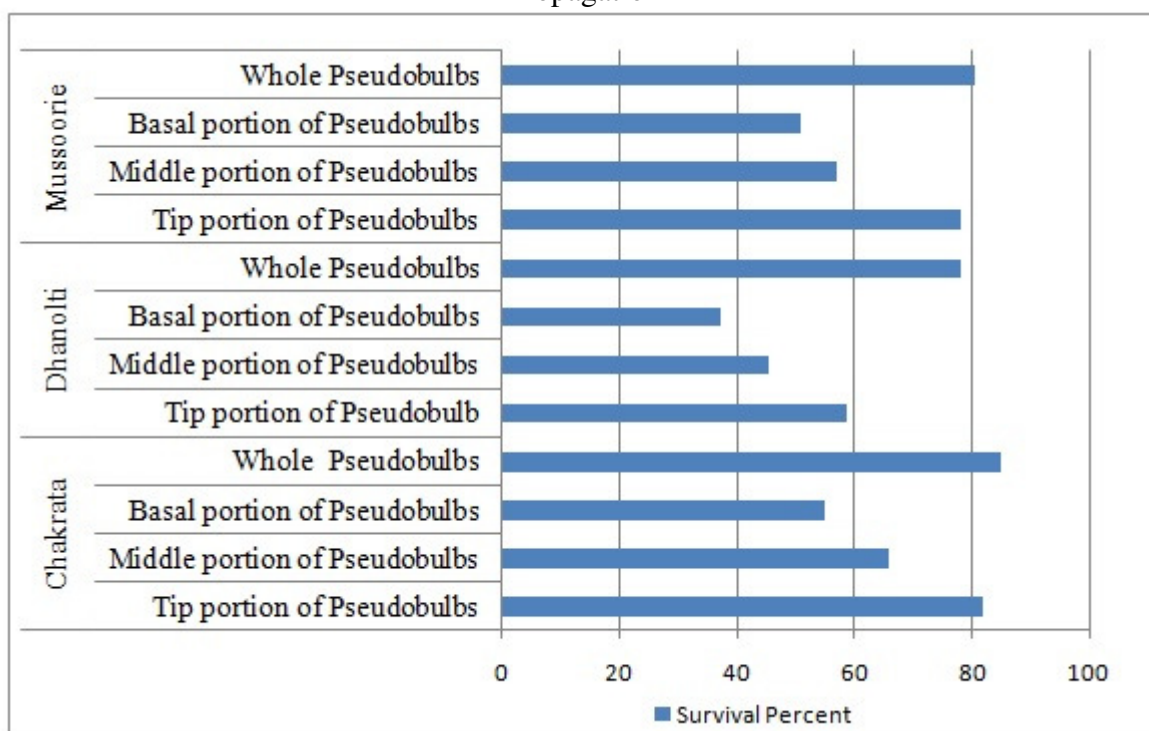
### Performance in Natural selected field sites

#### Survival percent

The maximum survival percent was found in Whole pseudobulbs in all selected sites (85% Chakrata 78% Dhanolti and 80.45% in Mussoorie) and minimum survival percentage was found Basal portion of cuttings of pseudobulbs in all sites (55% Chakrata 37.33 % Dhanolti and 51% in Mussoorie). Overall survival was higher in Chakrata as compared to other field sites. (Fig-1) The survival percent of all type pseudobulbs cuttings and whole bulbs was found better in Chakrata and Mussoorie, whereas it was less in Dhanolti site. It may be due to with altitude variations of site.

#### Growth Performance

The growth performance plantlets raised from pseudobulb cuttings was evaluated at three natural habitats (Table-2). Growth performance trend of stock raised from different sizes cuttings planted at three selected sites was observed. The overall performance of target species was found better at Chakrata site as compared to Dhanolti and Mussoorie. The growth was lowest at Dhanolti site, which may due to higher altitude of site. The Growth performance of whole pseudobulbs was found better in all three sites. The Chakrata site was near the NWFP Nursery Chakrata and it was supervised time to time and found less disturb by any type of interference. The site Mussoorie and Dhanolti was not supervised time to time and were visited to record growth data. There was human and wild life interference which might have resulted in less growth. The protection and supervision necessary when establish the enrichment plot in natural habitat.

**Fig-1** Survival Percent of Different type of Cuttings of Pseudobulb used in Vegetative Propagation**Table-2:** Growth performance of Different type of pseudobulbs at different locations

Type of Pseudobulbs Cuttings	Locations					
	Chakrata		Dhanolti		Mussoorie	
	Av. Length (mm)	Av. Dia. (mm)	Av. Length (mm)	Av. Dia. (mm)	Av. Length (mm)	Av. Dia. (mm)
Tip portion	17.72	5.66	18.01	4.64	16.67	4.67
Middle portion	25.27	5.58	18.00	4.90	22.70	4.80
Basal portion	19.85	5.67	20.06	5.34	21.75	5.15
Whole Pseudobulbs	23.84	6.79	21.15	5.50	22.84	6.00

### Regeneration of Pseudobulbs

The regeneration status of *Jeevak* in different sites under different types of pseudobulbs cuttings in 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> year of growth was recorded and showed variations from year to year. Maximum regeneration was recorded in all type of propagation materials in Chakrata site and minimum in Dhanolti site. The whole pseudobulbs showed upto 20% regeneration in 4<sup>th</sup> year in Chakrata site, while 17 and 11 % regeneration was recorded in Mussoorie and Dhanolti site respectively.

**Table-3** Regeneration Status of planted pseudobulb in selected Locations

Location	Type of Pseudobulb cuttings	Regeneration % II <sup>nd</sup> year	Regeneration % III <sup>rd</sup> year	Regeneration % IV <sup>th</sup> year
Chakrata	Tip portion	3	8	15
	Middle portion	4	8	14
	Basal portion	5	12	16
	Whole Pseudobulbs	7	14	20
Dhanolti	Tip portion	0	3	5
	Middle portion	2	6	8
	Basal portion	1	4	9
	Whole Pseudobulb	3	7	11
Mussoorie	Tip portion	2	6	12
	Middle portion	3	7	14
	Basal portion	3	8	16
	Whole Pseudobulb	5	10	17

### Harvesting and Management

The pseudobulbs big size / marketable (length more than 5 cm and diameter more than 1 cm) were harvested in month of October every year during the study period. The results reveal that the harvestable pseudobulbs varied every year. Table-4 shows that maximum pseudobulbs were harvestable from all type vegetative propagation materials, at Chakrata site (319) followed by Mussoorie (284) and Dhanolti site (225). In our study the harvested data shows that if the pseudobulbs were collected properly it can maintain the continue sustainability from the natural enrichment area. The middle size pseudobulbs can be harvested for vegetative propagation purpose and small pseudobulbs can be retained in forest area for regeneration purpose. The average time taken for collection of Jeevak in cultivated area/nursery area, identified natural forest area (selected area in 10m<sup>2</sup>) and identified natural forest site were found to be 15 minute, 30 minute and 60 minute respectively (Table-5).

**Table-4** Year wise Harvestable pseudobulbs in three selected Locations

Location	Type of Pseudobulb cuttings	No. of Pseudobulb Planted in May 2009	No. of Harvesting of Big size Pseudobulb October 2010	No. of Harvesting of Big size Pseudobulb October 2011	No. of Harvesting of Big size Pseudobulb October 2012	Total No. of Harvesting of Big size Pseudobulb
<b>Chakrata</b>	Tip portion	300	6	20	50	76
	Middle portion	300	5	10	30	45
	Basal portion	300	8	25	40	73
	Whole Pseudobulb	300	15	35	75	125
		<b>1200</b>	<b>34</b>	<b>90</b>	<b>195</b>	<b>319</b>
<b>Dhanolti</b>	Tip portion	300	3	15	25	43
	Middle portion	300	5	12	20	37
	Basal portion	300	7	18	35	70
	Whole Pseudobulb	300	10	25	50	85
	<b>1200</b>	<b>25</b>	<b>70</b>	<b>130</b>	<b>225</b>	
<b>Mussoorie</b>	Tip portion	300	4	18	40	62
	Middle portion	300	5	12	30	47
	Basal portion	300	7	20	35	62
	Whole Pseudobulb	300	11	32	70	113
	<b>1200</b>	<b>27</b>	<b>82</b>	<b>175</b>	<b>284</b>	

**Table-5** Collection time of Jeevak in different harvesting condition

Average number of Pseudobulbs collected	Condition /Nature of Propagation	Average Time Taken
100	Nursery bed in 10m <sup>2</sup>	15 minute
100	Identified Natural Forest selected area in 10m <sup>2</sup>	30 minute
100	Identified Natural Forest area	60 minute

## Conclusion

The pseudo-bulbs of Jeevak are important ingredients of several Ayurvedic preparations like Chyawanprash, therefore it is well known for its medicinal properties. It belongs to **Ashtverga group** of plants which is one of the core parts of the Ayurveda and have huge economic potential for industrial use in India and abroad. Presently the raw material is collected from natural forest areas located in the Temperate Forest area. However sufficient quantity is not available to meet the ever increasing industry need and for export. The local people know very little about the scientific production and processing of the product resulting in low productivity.

The results of the study undertaken on vegetative propagation technique will give a new knowledge and direction about planting of the species to the rural and concerned stakeholders for sustained production and management, conservation of the species. Information on scientific cultivation or domestication of *Microstylis wallichii* an important NTFP species is so far, not available and therefore, the present field trial an out planning was planned and established at different selected locations. Cultivation of species should be encouraged the better management and also to reduce the pressure in natural occurrence area. Prove that the products are derived from a sustainable growing environment & from a clearly defined area.

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