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Good Cultivation Practices of *Sweta Musli* (*Chlorophytum borivillianum* Santapau & R. R. Fern.)

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ABSTRACT

Sweta Musli is now the most demandable drug and has been frequently used by medical fraternity as vitalizer, health tonic, aphrodisiac, and vigor enhancer. In the 17th century *Rajanihantu* has introduced the first time and now it gained a most demanded drug worldwide. In India, *Sweta Musli* is known by the name of *Chlorophytum* species and *Asparagus adscendense*. *Chlorophytum borivillianum* is superior among them and due to high demand and overexploitation it entered the critically endangered species category. The global demand of *Sweta Musli* is 35000 tons per year, which is higher than supply from the wild as 5000 tons per year. In order to fill the market demand, farmers have started cultivating *Chlorophytum borivillianum*, a fast-growing and high active potential species. There is lack systematic information about the cultivation practices of the plant and farmers have been planting improperly and uprooted before maturing, resulting in less weighted tubers and economic loss. The study is an attempt to present the systematic information of cultivation practices of the plant.

KEYWORDS

Sweta Musli, Good cultivation practices, *Chlorophytum borivillianum*, Ayurveda



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INTRODUCTION

Sweta Musli is an indigenous drug in India and has been practicing for a long time in tribals and folklore medicine. The appreciation of the medicinal potential of *Sweta Musli* has been right from the 14th century AD in Ayurvedic pharmacopeia *Raja-nighantu*¹. In Ayurveda, it has been used as potential power against general debility and many lifestyle disorders and used as vitalizer, health tonics. Presently it is a famous drug around the world used for aphrodisiac and vigor enhancement and has got great trade value in the global market. Limited and some restricted wild reserve of the drug created demand and supply gap, and lead to the supply of substandard drugs or mixed with substitute or adulteration in the market. This is the biggest drawback for global acceptance of Ayurvedic drugs². The problem can be ruled out only by the commercial cultivation of high trade drugs.

Why *Chlorophytum borivilianum*?:

Botanical sources of *Sweta Musli* in India belong to species of genera *Chlorophytum* and *Asparagus*. *Chlorophytum borivilianum*, *C. arundinacium*, *C. tuberosum* and *Asparagus adsendense* are the most prominent sources in the country. *Chlorophytum tuberosum* is taken as an official source of *Sweta Musli* in India, which is indicated in the Ayurvedic

Formulary of India. The species in the country may be under threatened category due to overharvesting of the tubers. Further overharvesting will lead to a significant loss of genetic diversity, to stop the overexploitation of the species some restrictions have been given by the government on the procurement and trade of forest products (Indian Forest Act 1927). Gradually increasing demand creates a pressure on the supply of the species. A closely related species, *Chlorophytum borivilianum*, is now being cultivated to fulfil the demands and also to take the pressure off the wild *Chlorophytum tuberosum*. *C. borivilianum* was first described from India in 1954 and gained popularity as *Sweta Musli* due to superior in quality, highest yield and saponin content. Within very less time overexploitation of this species also, fall into rare status in the wild². The condition has been not changed as required and now it entered in the critically endangered (CR status) in the Red data species list category. Due to its fastest-growing nature, the species has been selected for cultivation and conservation of biodiversity³⁻⁴.

***Chlorophytum borivilianum* Santapau & R.R.Fern.:**

Chlorophytum borivilianum belongs to family *Liliaceae*. The roots of the plant



contain carbohydrates (42%), protein (9%), fiber (34%), saponins (1-2%) and alkaloids (2-5%). The saponins and alkaloids present in the plant are the main active potential. Small amounts of vitamins, minerals, steroids, and polysaccharides are also present in the roots. The tubers contain saponins and have aphrodisiac, adaptogenic, anti-aging, health restorative and health-promoting potential. It is also used as a curative for natal and postnatal problems, aphrodisiac and vitalizer, immunity improving drug, the remedy for diabetes and remedy for arthritis. Now it has been frequently used by medical fraternity in many lifestyle disorders⁵.

Current Scenario:

The global market demand of *Sweta Musli* has been gradually increasing due to highly used by pharmaceutical companies. 'Nai Chetna' a novel potential drug from *Chlorophytum borivilianum* has launched by Government of Gujarat. Due to great economic value and increasing demand, the species has created a demand-supply gap. The demand for tubers (35000 tons/A per year) is much higher than supply from the wild (5000 tons/ per year). The less supply from the natural resources and increasing demand in national and international markets requires prompt domestication and cultivation⁶. Presently the plant is cultivated in different parts of

India on a small scale. Due to lack of cultivation practices for *Sweta Musli*, it has been planting improperly and uprooted before maturing, resulting in less weighted tubers and less saponin amount. This causes low yield and economic loss and the demand-supply gap is remaining present all the time⁷. Hence, there is a strong need to understand the good cultivation practices of *Sweta Musli* to meet the market demand.

Cultivation status:

Sweta Musli is cultivated in most part of the country, mainly in Madhya Pradesh, Chhattisgarh, Maharashtra, Punjab, Andhra Pradesh and Tamilnadu. Due to agro-climatic suitability, it can be cultivated in Eastern, Western, Central and Southern Plateau, East and West Coast Plains and Hill regions comprising the states of Bihar, Orissa, Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka, Kerala, Tamilnadu and Gujarat⁸.

Need for cultivation:

The prime aim to promote the cultivation of *Sweta Musli* is for the conservation of biodiversity to protect it from CR status. The useful part of the plant is tuber and mainly propagated through the roots. When the roots are harvested from a particular place then reseedling of the plant never occurs. Due to lack of good cultivation knowledge, farmers have uprooted all



tubers and also before maturity and dehiscence of seed. This leads to loss of germinating material of the plant the plant for next season. So over-exploitation of the plant has decreased the wild reserve and forced them to a critically endangered species of red data book. Some year ago the plant was in the rare category. The second important factor is that dormancy period of the plant is 7-8 months⁹. Due to long dormancy period, demand cannot be fulfilled by the wild reserve. So organized cultivation is the only one way to conserve wild reserve of the plant and fulfills the global demand¹⁰.

Climate and Soil:

The plant grows well in tropical and subtropical climate with altitude 1500 meters. Agro-climatic conditions for the growing of the plant ranges from the central part to the southern part of India. Warm and humid climatic condition and soil moisture are ideal for high production. The cold climate and northern India is not suitable for its cultivation. Growing of the tubers depends on the nature of the soil but can be grown in different soils but potency has changed. Well-drained sandy- loamy soil with rich mineral content is considered best for the cultivation. The soil pH ranges from 5.5 to 7.0 as well as rich organic and humus content is ideal for the growth of the tubers.

Black, hard and clay soils are not suitable for growth.

Land preparation and Manuring:

Land preparation may be started from March to April with plowing. Deep plowing followed by Harrow cultivator has been used for cultivation. Pulverization of the soil can be done by trillers. Decomposed green Farm Yard Manure (FYM) and vermicompost are the major sources of organic manure and have been used for high production. FYM has better water holding capacity and fertility. In the mid of May, a deep plowing is done with decomposed FYM in 30-50 ton/acres. Neem cake in 500kg/hectare is also used for more fleshy tubers. Chemical fertilizer can be used for tuber growth. The recommended dose of 20kg N, 40kg P₂O₂, and 20 kg K₂O per acres should be used at the time of planting. After 45 days, a second treatment should be applied. Multi micronutrient fertilizer can be mixed as 50kg/acres. In the deficiency of Zinc, ZnSO₄ 10kg per acres should be used. The agronomical study suggested that organic manure enhanced steroidal saponin content in tubers and especially.

Vermicompost enhanced more than others. Chlorosis should be checked by the spray of ferrous sulfate once in 2 months. Two times application of herbicide with the interval of 14 days then leave the ground for one month. Then at the final land preparation



stage DAP (Diammonium phosphate) 120kg/hectare and MOP (Muriate of Potash) 100kg/hectare should be mixed with the soil uniformly (figure A)¹¹.

Preparation of bed-raising in the land:

Preparation of beds in the land is necessary for proper irrigation and drainage. The beds

should be raised to the height of 45cm and two beds separated with 45 cm intervals. Before preparation of beds, DAP, MOP and bone fertilizers should be mixed in the soil. All the raised beds should be well irrigated before sowing. Beds preparation should be done before starting of rainfall (figure B-C).



Figure: A: Land preparation with deep ploughing, B: Manual mixing of manures, C: Preparation of ridges, D: Seeds for propagation, E: Preparation of plantlet for propagation, F: Method of planting of plantlets, G: Arrangement of irrigation, H: Young plant, I: Harvested tubers, J: Peeling machine, K: Peeled tubers, L: Dried tubers.

Propagation:

Tubers and seeds are commonly used as planting material. For better production and easy cultivation, tubers are preferred. Seeds are collected from mature plants during dehiscence of seeds. For the preparation of planting material, tubers are separated from bunches of the fresh plant by the sharp blade carefully in such a way that each finger has a portion of stem disc remain

attached with tubers. Stem disc is the most important part which is responsible for germination and vegetative propagation.

a) Through seeds:

Seeds of Sweta Musli are black and look likes onion seed. Up to the month of June seeds are dormant and in July seeds become germinated within 12-16 days. Then seedlings are transplanted in the field. Development of plant tubers by the seeds is



not enough than vegetative propagation (figure D).

b) **Through tubers:**

Tubers having stem disc initiate sprouts at the mid of May when stored in preserved condition. In wild conditions, seedlings are arising within 4-6 days of rain. Productions of tubers are rapid and vigorous through vegetative propagation due to the presence of previously stored food material in the tubers. Vegetative propagation produces three times more tubers than seedlings (figure E)¹².

Planting:

It is a Kharif crop and sowing starts with the onset of monsoon. Planting of tubers is done in raised beds with adequate slope and drainage of the soil. Generally, tubers are planted at a distance of 30 to 35 cm between rows and 15-20 cm between plants. For adequate production, seedlings are planted at the rate of 400-500kg/hectares. About 30000-35000 tubers are required for planting in one hectare. Sowing of the tubers/seedlings should be done after 3-4 days of deep irrigation of the field. Tubers should be planted 5cm deep and covered above with the soil. After sowing tubers irrigation should be given on the same day (figure F).

Irrigation:

Irrigation is an important factor to enhance productivity. Until germination of planting

materials soil should be kept moist. Irrigation should be given at 8 to 10 days intervals. Sprinkler or drip method of irrigation should be used for a better result. Light irrigation should be used until and after drying and shedding of leaves. Proper water draining and avoiding stagnation of water should be kept in mind (figure G).

Plant Protection:

Regular weeding is essential for proper and healthy growth of the tubers. Weeding should be done at least 2-3 times at the intervals of 40-45 days. Diseases like leaf spot, anthracnose and wilt affect the crop. Some fungi like *Rhizoetonia*, *Fusarium* species affect the plant and fungicide should be used. Plant extracts and biological agents are also used for pest control. Spraying of neem or chrysanthemum or tobacco extracts (up to permitted levels) or application of *Trichoderma* should be used for herbal treatment. Bavistin or Benomyl (0.15%) can be used as a synthetic agent¹³⁻¹⁴.

Harvesting:

Three to four months after planting, the leaves start yellowing. Subsequently, they become dry and fall off and get detached from the tuber/ disc. After leaf fall tubers should be left in the soil to enhance secondary metabolite in both qualitatively and quantitatively. Moisture level in the soil should be maintained for another two to



three months. During this period, the skin of tubers mature and turns dark brown and it is the stage of the dugout. Soil should be properly irrigated before harvesting for easy dig out of the tubers.

Yield:

The yield of tubers mainly depends on proper manuring, weeding, and irrigation. On an average, the crop gives a yield of 4000-5000kg of wet tubers per hectares. After peeling and drying nearly 20% (800-1000kg) dry tubers are finally obtained¹⁵.

Processing:

After digging out tubers from the soil, they should be thoroughly washed in fresh water. The large and healthy tubers are separated from the tubers bunches and the small ones are kept aside for the use as planting material for the next season. The large tubers have been taken for processing. The outer brown skin is peeled off with a stainless steel knife and sun-dried for three to four days. Dried tubers are packed in polythene bags and sent to the market (figure J)¹⁶.

Intercropping:

Some crops greatly influence the growth and production of the *Musli*. Pigeon pea, pea, radish, cabbage, cauliflower, potato and tomato have proved for better rotation. These plants have been used for maintaining the sufficient residual fertility in the soil. *Chlorophytum* can be well

grown in partial shades, so it can be better intercropping with pigeon pea, cowpea, green gram, black gram, lentils and mustard. These plants offer better compatibility and growth of tubers. Intercropping with winter crops and some medicinal plants like *Ashwagandha* and *Isabgol* have improved the land efficiency and economic cultivation. Improvement of land fertility and efficiency with intercropping farming has been well studied in Rajasthan¹⁷.

Storage:

Storage rooms are specially made with ventilated racks. Tubers are stored in a controlled temperature of 25-31⁰C and relative humidity of 50-65%. Tubers should be stored after pretreatment with antifungal liquid in wooden powder or sand. Treatment with Thiram and Captan at 4 g per kg of roots can reduce rotting during storage.

High yield varieties:

RC-2, RC-16, RC-36, RC-20, RC-23, RC-37, and CT-1 are the varieties, maintained and collected by RAU, Udaipur. They are found to give a good yield and high saponin content¹⁸. MDB-13 and MDB-14 has been developed by Maa Danteshwari herbal research center, Chikalputi. These varieties contain high yield, disease and fungal resistance, maximum saponin, and alkaloid content¹⁹. Jawahar Safed Musli 405 and



Rajvijay Safed Musli 414, released by Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Mandsaur, Madhya Pradesh are good for cultivation²⁰. Birsa Agricultural University, Ranchi has also developed an improved variety²¹.

medicinal plants. This practice makes sure the physical, medicinal as well as economic values.

CONCLUSION

Good agricultural and cultivation practices have been adopted for the Ayurvedic medicinal plant, to improve the disease-free and developed plants as well as the yield of the plant. Cultivation is the way of conservation of biodiversity and improves yield. Due to overexploitation, *C. borivillianum* has been reported as critically endangered species in wild. So cultivation is the right way to conservation and improved the yield to fulfill the market demand. Due to lack of information on cultivation farmers are trying to early harvesting to fill the market supply but at the same time, the premature plant has less saponin and comparatively thin tubers. So the total outcome of the unorganized cultivation becomes meaningless. At the same time these immature plant materials if used as single or in formulation medicine then it will show less therapeutic potential. So, there is an urgent need to aware about and adaptation of the good cultivation practices for *C. borivillianum* and even all



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