

Good Agricultural Practices for Safed musli



**ICAR – DIRECTORATE OF MEDICINAL AND AROMATIC PLANTS RESEARCH
BORIABI, ANAND – 387 310, GUJARAT**

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Safed musli plant



Safed musli roots

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CONTENT

FOREWORD.....	v
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Safed musli

Name of the plant.....	01
Plant parts used for medicinal purpose	01
Uses	01
Characteristics of the plant.....	02
Major production areas.....	02
Cultivation methods	03
Post harvest processing.....	07
Documentation of activities.....	07
Yield and economics.....	08
Marketing	08
Market demand	08
Crop calendar for safed musli cultivation	09-10

FOREWORD

*Medicinal plants are integral part of human healthcare since ancient time which are used as medicine, cosmetics, health hygiene and food supplements. These plants are primarily sourced from their natural habitats and used. The increasing human population, climate change and changes in food habits and life style leads to frequent occurrence of many old and new age diseases. Medicinal plants playing major role in combating these diseases throughout the world. Due to increasing demand, these plants were over exploited, as a result, many of them are in short supply and some are getting status of rare, endangered and threatened. Hence, some of such medicinal plants are already brought under cultivation, safed musli (*Chlorophytum borivilianum*) is one among them.*

Safed musli renowned as 'Divya Aushad' is distributed in tropical and sub tropical climate of the world. Safed musli is a traditional Ayurvedic medicine since ancient times with enormous importance in the preparation of more than hundred different medicines. It is used to cure general physical illness and weakness, as aphrodisiac agent and revitalizer, as general sex tonic, remedy for diabetes and arthritis and increase body immunity. Compliance of good agricultural practices (GAP) for cultivation of medicinal crops is necessary to produce good quality raw drugs.

I am happy that ICAR- DMAPR, Anand has taken an initiative in compiling and publishing this extension bulletin that would serve as useful guide to the safed musli cultivators for the production of better yield and quality raw material.


(Jitendra Kumar)

Anand

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Good Agricultural Practices for Safed musli



1. Name of the plant

1.1 **Scientific name:** *Chlorophytum borivillianum* Sant. & Fernand.

1.2 **Local name:**

Hindi: Swetha musli, Safed moosli

Gujarati: Dholi musli

English: India spider plant

2. Plant parts used for medicinal purpose

Plant roots are used for medicinal uses in Ayurveda.

3. Uses

Safed musli is a traditional Ayurvedic medicine since ancient times and renowned as 'Divya Aushad' with enormous importance

in the preparation of more than one hundred different medicines. According to Bhavprakash (Ayurvedic Text) the drug is sweet, cooling, mucilaginous, increases Kapha and reduces Pitta and acts as stimulant. Safed musli is used to cure general physical illness and weakness, as aphrodisiac agent and revitalizer, as general sex tonic, remedy for diabetes and arthritis, increase body immunity, cure to natal and postnatal problems, as antimicrobial, anti-inflammatory and antitumor agent, also used in diarrhea, dysentery, gonorrhea, leucorrhea etc. Safed musli has spermatogenic property and found useful in curing impotency, now it is considered as an alternative 'Viagra'.

4. Characteristics of the plant

Ayurvedic texts have recommended *C. borivillianum* as the source of 'safed musli' raw drug. Its growth season is limited to middle of May to October, after that the aerial parts of the plant dry up and plant undergoes in dormancy. Roots of safed musli are fasciculate, sessile, cylindrical or ellipsoidal, 1-9 in number, number and size increases with the age of the plant. Leaves are radical up to 8 in number, narrow and spreading horizontally. Flowers are white born in clusters of three flowers. The seed are orbicular to coffee-bean-shaped.



5. Major production areas

Safed musli is distributed in tropical and sub tropical climate of the world. It is found mainly in India, America and Australia. In India, it is naturally distributed in the forest areas of Maharashtra, Gujarat, Rajasthan and Madhya Pradesh. It is inhabitant in wide range of habitats from the open, rocky places to shady and highly humus rich soil of the forest. Commercial cultivation has been started in Central India and has spread up to South India in recent past. Safed musli cultivation has become popular among the farmers of Maharashtra, Madhya Pradesh, Rajasthan, Gujarat, Uttar Pradesh, Bihar, West Bengal, Andhra Pradesh, Kerala and Tamil Nadu.

6. Cultivation methods

6.1 Climate

Safed musli prefer warm and humid climate during its crop growth period. Temperatures more than 35°C and less than 15°C are not suitable for its growth and yield. Areas receiving 50 to 150 cm rainfall between June end to October end are considered to be suitable for its successful cultivation.

6.2 Soil

Safed musli can be cultivated on various types of soils from sandy loam, sandy clay, low in organic matter and acidic soils of Bihar, West Bengal to heavy black cotton soils of Maharashtra, Madhya Pradesh, Andhra Pradesh to red lateritic soils of Karnataka to calcareous soils of Gujarat and Rajasthan. However, crop prefers well drained loamy soils rich in organic matter for good fasciculated root development and high productivity. Soils having high pH and high calcium carbonate content are not suitable for the crop and show severe micro-nutrients deficiency symptoms especially for iron and cause chlorosis.

6.3 Land preparation

Land is prepared well by ploughing and harrowing to make soil pulverised and porous. Since water stagnation is harmful for the crop, therefore, proper drainage is to be created by providing proper slope during land preparation. At the time of land preparation care must be taken to make the field free from perennial weeds like *Cynodon dactylon* and *Cyprus rotundus* as the roots and stems of these weeds penetrate the fleshy roots of safed musli causing physical damage as well as invite fungal infection. Apply 15-30 tonne farm yard manure or 5 tonne vermicompost or poultry manure per hectare at the time of last ploughing.

6.4 Planting time

Planting is done during the month of June-July depending on the onset of monsoon. The best time for planting based on sprouting percentage of the dormant buds is during 25th June to 5th July.

6.5 Propagating material

Safed musli is propagated both by seedling raised from true seeds as well as vegetatively using fleshy roots having condensed stem disc and shoot buds. Under commercial cultivation, the dormant plants of the previous year are generally used as vegetative propagules which sprout as early as in the last week of April to second week of May. Planting material weighing 3-4 g root is ideal for highest root yield. The higher price of the vegetative planting material has forced to raise the crop through true seeds. However, due to low seed germination percentage, farmers use roots as propagating material.

6.6 Raising nursery

Raised nursery beds are prepared of 1.2 m width and suitable length depending upon the number of seedlings to be raised and land slope. Soil of the nursery bed is well prepared to make it loose and porous as well as stones and gravels are removed. A sufficient quantity of fine and fully decomposed farmyard manure or compost is well mixed in the nursery bed a week before seed sowing. About 8.5 kg seed is required for raising seedlings to transplant one hectare of land. Seeds are sown by broadcasting and covered with light soil layer. Leaf mulching is advisable for better germination as well as its initial healthy growth. Seeds germinate in the nursery within 5-6 days. Seedlings of about one month old are ready for transplanting in the main field.

6.7 Method of planting

Planting is usually done on raised beds or ridges or flat beds depending upon the soil texture and amount of rainfall. The places where soils are heavy, rainfall is more and drainage system is poor, the crop is grown on raised beds or ridges. While in low rainfall areas and in light textured soils, planting on gentle-slopped flat bed is advisable. Planting should be done preferably in rainy days when high humidity prevails in atmosphere for high survival rate. Single or double row planting is followed in ridges. Planting should be done at 30 cm row to row and 10 cm plant to plant spacing to accommodate 3.33 lakh plants per hectare.

6.8 Rate of planting material

Requirement of vegetative planting material and true seeds of safed musli per hectare is given below.

Seed requirement	True seed	Vegetative seed (roots)
Plant population (Recommended)	3,33,000	3,33,000
Planting material required per ha (kg)	8.5	1,000
Seed price (₹/kg)	6,000	300.00
Seed price (₹/ha)	51,000	3,00,000

6.9 Recommended varieties

There are not much varieties available in safed musli, however, two varieties ‘Jawahar Safed Musli 405’ and ‘Rajvijay Safed Musli 414’ were released from AICRP on MAP unit, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Mandsaur, Madhya Pradesh are available for cultivation.

6.10 Crop nutrition:

Use of organic manures (farm yard manure, compost, vermi-compost, poultry manure and green manure) is preferred for growing of medicinal plants. However, mineral nutrition may also be supplemented through inorganic sources considering the requirement of the crop. Application of 15 tonne farm yard manure along with 50:40:40 kg NPK per hectare found optimum for obtaining good yield of safed musli. Higher doses of fertilizers have deleterious effect on roots. Among micronutrients, iron deficiency is most prevalent in safed musli. Green manuring with cowpea in summer may help in minimizing iron deficiency and improving crop productivity.

6.11 Irrigation

The crop is grown during monsoon season thus, irrigation is needed when monsoon fails or delay in setting after first few showers. When monsoon is over or erratic, the crop needs irrigation at about 15-20 days interval depending upon the soil moisture retention capacity and weather conditions.

6.12 Mulching

Mulching is advisable with organic matter such as dried leaves, straw etc., in the nursery as well as in the main field after planting of vegetative propagules. It helps in conserving the soil moisture as well as to protect the sprouts from direct sun burn at initial stage and increase the root yield.

6.13 Intercultural operations and weeding

Two to three weeding-cum-hoeing are required during the crop growth. In the rainy season, earthing-up is also required to avoid exposure of fleshy roots which often occur when crop is grown on raised beds or ridges. Inflorescence should be removed when it appears. Removal of inflorescence increases about 35% fleshy root yield. Chemical weed control is not recommended due to residue problem.

6.14 Crop rotation and Intercropping

The above ground vegetative parts of safed musli dries up by October end and roots are allowed to remain in soil till next February, if it is to be used for planting purpose in the next season. During this period suitable crops can be grown to utilize the space and time. Bengal gram or chickpea is ideal to follow as winter crop and can be harvested in the month of early February as green harvest. It enriches the soil by fixing atmospheric nitrogen and improves soil properties also. The crop respond well to partial shade, therefore, grow the crop with certain shade giving plants such as guar, pigeon pea, castor etc. as intercrops. Late maturing pigeon pea when grown with safed musli produces yield equal to its sole crop. It fits well within the pigeon pea crop and gives additional income to the farmers.

6.15 Insect pests and disease management

6.15.1 Diseases

No serious diseases have so far been reported in safed musli. However, diseases like leaf spot from Gujarat and Madhya Pradesh, and leaf blight from Lucknow, Pantnagar and adjoining areas in Uttar Pradesh were reported several times. In case of severe infection of leaf blight the leaves dry prematurely and plants fail to produce healthy fleshy roots and causes loss up to 30%. The incidence of root-knot disease caused by nematode *Meloidogyne incognita* has also been reported. The infested fleshy roots are generally deformed and large numbers of eggs and larvae are detected inside the fleshy roots. These diseases can be managed by application of *Trichoderma* spp. at the time of sowing or at the time of intercultural operations.

6.15.2 Insect pests

Among the insects, orange banded blister beetle is reported on safed musli. So far the insect pests have not been reported as a limiting factor for successful production of safed musli from any part of the country.

6.16 Harvesting

The crop is ready for harvest after four months of planting in October, if it is cultivated for use as raw drug material. When plant approaches maturity, aerial parts turn yellow and become dry and fall down on soil surface. Plants can be harvested at this stage if the planting material is not required for next season. The crop goes in dormancy on the onset of winter in the month of October-November. However, for the planting material production, fleshy root bunches are allowed to remain in soil till January-February and harvested in March-April. Harvesting is done by digging the roots carefully. Before harvesting, a light irrigation should be given for the easier digging of the fasciculated roots.

7. Post harvest processing

The harvested material is washed in running water to remove the soil particles. For the preparation of raw drug, individual fleshy roots are separated from the bunch and the outer cover of the root is removed by peeling. Peeling is easier in the freshly harvested roots. Once peeled, the fleshy roots are dried under partial shade in uniform thin layer with occasional stirring so that they retain the white colour and can fetch premium price. These roots can be grinded to make powder of safed musli. The roots harvested for use as planting material are kept under shade in single layer for about one week to reduce the moisture content and then stored in gunny bags or cartons in the soil or sawdust till the next planting season. Care should be taken to keep the material at moisture proof place.



Peeled roots



Powder

8. Documentation of activities

The documentation of all the activities starting from nursery to post harvest processing should be in continuation and maintained

properly. Records should be kept for each activity of cultivation such as nursery raising, land preparation, sowing, weeding, irrigation, harvesting and of post-harvest processing after harvest to sorting, drying, grading, packing and storage, with details of time and type of activities. It refers to a complete history and ensures traceability of the final product.

9. Yield and economics

Fleshy root yield varied significantly according to growing conditions. However, an average of 2 to 3 tonne fresh root yield of safed musli can be obtained from one hectare crop under favourable growing conditions. This yield gives about 0.4 to 0.6 tonne marketable dry root yield.

Gross and net return from safed musli are highly variable. Several factors such as cost of planting material, yield level, labour wages and selling price of processed roots affect the profit margins. However, the cost of planting material and peeling-off cost of roots are the major cost of production and greatly affect the economics of production. On an average ₹50,000-80,000 net profits can be obtained from one hectare crop.

10. Marketing

Safed musli is regularly traded in medicinal raw drug markets of Delhi, Neemach, Jabalpur, Indore and other local markets. However, Delhi market is more responsive and farmers from adjoining states prefer to sale their produce in the Delhi market at high price compared to local markets. Estimated annual trade of safed musli in India is about 100-200 MT.

11. Market demand

The global markets for safed musli are; U.S.A. Britain, European countries, Australia, Japan and China. Safed musli have annual demand over 50,000 tonnes world-wide which is much higher than present production (<5,000 tonnes). Safed musli root's powder is in great demand for power and sexual energy capsules and recorded growth 8-10 percent per year.

12. Crop calendar

Major activity	Month	Activity details
Nursery	May-June	Prepare nursery beds of 1.2 m width. Broadcast 8.5 kg seed and cover with light soil layer or leaf mulch. Apply light irrigation.
Land preparation	June	Prepare land by ploughing and harrowing till soil become pulverised and porous. Apply 10-15 tonne farm yard manure or 5 tonne vermicompost or poultry manure per hectare at the time of last ploughing.
Planting	25 th June-5 th July	Planting is done on raised beds or ridges or flat beds from seedlings raised in nursery or from the root cuttings weighing 3-4 g and having condensed stem disc and shoot buds. Planting should be done at 30 × 10 cm row to row and plant to plant spacing.
Irrigation	July-October	When monsoon is over or erratic apply irrigation at 15-20 days interval. Give one light irrigation before harvesting.
Intercultural operations	July-September	2-3 weeding-cum-hoeing are required during the crop period. Cover the sun exposed fleshy roots by earthing-up and remove inflorescence when it appears.
Spraying	July and September	As per the occurrence of disease and insect pest
Harvesting: Commercial crop Seed crop	October March-April	The crop is harvested in the month of October when aerial parts turn yellow and become dry and fall down on soil surface for commercial crop. For seed crop the fleshy root are allowed to remain in soil and harvest in March-April to raise the seedlings for the next crop. Harvesting is done by digging after giving a light irrigation.

Post harvest operations	April-May	The harvested roots are washed, separated and peeled. Then dry under partial shade in uniform thin layer with occasional stirring. The roots harvested for planting of next crop are kept under shade in single layer for one week and then store in gunny bags or cartons under the soil or sawdust.
Documentation	Through out the season	All the activities from sowing to harvesting and post harvest processing should be documented



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