

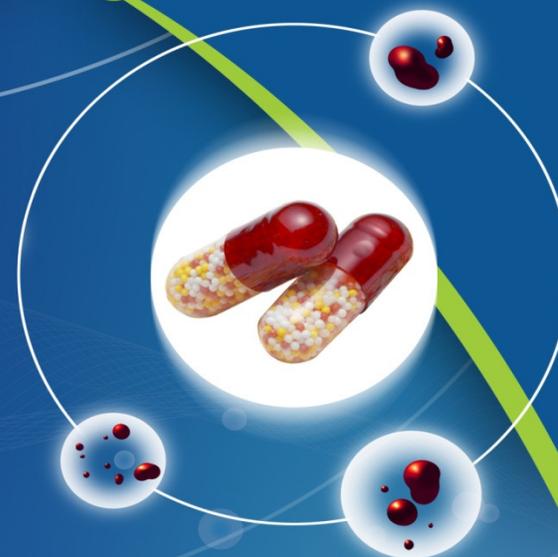


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**Review Article**


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## SAFED MUSLI (*CHLOROPHYTUMBORIVILIANUM*) A UNIQUE GIFT OF AYURVEDA AS DIVYA AUSHADHI

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### ABSTRACT

*Chlorophytumborivilianum* family Liliaceae is a traditional rare Indian medicinal herb widely used in the treatment of many clinical conditions in India. It is an important drug commonly known as 'SafedMusli'. It has many therapeutic applications in Ayurvedic, Unani, Homeopathic and Allopathic system of medicine. Though it is widely used as an aphrodisiac, but it can be used in many others. In the Ayurvedic literature, SafedMusli is celebrated as a Divya Aushadi with unparalleled medicinal properties. It is a chief ingredient in the preparation of over a hundred Ayurvedic formulations. *Chlorophytumborivilianum* is widely cultivated throughout India. Major phytochemical components reported from the roots of *C. Borivilianum* include mainly steroidal saponins, fructans and fructoligosaccharides (FOS), acetylated mannans, phenolic compounds and proteins.

**Key words:** *Chlorophytumborivilianum*, Safedmusli, Ayurvedic Medicine.

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### INTRODUCTION

The plant SafedMusli (*Chlorophytumborivilianum*) is a medicinal plant belonging to the family Liliaceae. The name Chlorophytum is derived from Greek word, Chloros means green and Phytum means plant. It grows well in tropical and sub-tropical climates at an altitude of 1500 m.

There are around 256 varieties of Chlorophytum in the world, which are yet to be known. In India, there are 17 of them, of which, *C. borivilianum* has a good market demand. Chlorophytum is a medicinal plant, with small, usually white flowers, produced on sparse panicles up to 120 cm long. SafedMusli holds an important place in the traditional medicinal system. Safedmusli (*Chlorophytum*) has unparalleled therapeutic and medicinal properties which have made safedmusli a key ingredient in the preparation of a number of Ayurvedic formulations. The chemical composition consists of carbohydrates, proteins, fibers, steroids, minerals and alkaloids. The saponins and alkaloids present in the plant are

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the primary source of its significant medicinal properties. Besides its extensive use in ayurveda and other conventional medical system in asia , safedmusli is also gaining increasing acceptance as a vitalizer and health gaining tonic, a curative for pre-natal and post-natal problems, a restorative for immunity-improvement and as a remedy for diabetes and arthritis. Though it is a very popular aphrodisiac agent, with no side effects. It is often prescribed for enhancing male potency and overcoming signs of fatigue. SafedMusli is particularly used for individuals with low sperm count and low libido. SafedMusli is also regarded as an energy booster in asthmatic conditions. Safedmusli is also

regarded as an energy booster in asthmatic conditions. The roots of safedmusli are also used to strengthen the general immune system of the body. It proves useful as a nutritive tonic for both the mother and the fetus during pregnancy and is also used to replenish the body fluids during the post partum stage. It also improves the quality and flow of breast milk, in feeding mothers. It is also used to control and prevent obesity and its side effects. It also enhances the activities of vitamin C and antioxidant enzymes. Regular use of safedmusli causes increase in the level of high density lipid protein (HDL) and decrease in the plasma and hepatic lipid profiles. [1, 2]

|                         |  |
|-------------------------|--|
| <b>Binomial Name(s)</b> | : <i>Chlorophytumborivilianum</i>                          |
| <b>Kingdom</b>          | : Plantae  |
| <b>Class</b>            | : Monocotyledons   |
| <b>Series</b>           | : Coronarieae  |
| <b>Family</b>           | : Liliaceae  |
| <b>Genus</b>            | : Chlorophytum   |
| <b>Species</b>          | : borivilianum   |
| <b>Popular Name(s)</b>  | : SafedMoosli, Shaqaqale, DholiMusli, Khiruva, Shedheveli, |
| <b>Parts Used</b>       | : Seeds and roots  |
| <b>Habitat</b>          | : Northern and western India                               |

#### **History:**

Safedmusli (*Chlorophytumborivilianum*) is a traditional Ayurvedic medicine since ancient times. According to Bhavprakash (The Ayurvedic Text) the drug is sweet, cooling, mucilaginous increases Kapha and reduces `Pitta daha and acts as stimulant, it gives strength. Mush prepared as a paste with goats milk or honey and applied locally over the face, brightens the complexion of the face. It is extensively used by the Ayurvedic practitioners for a wide variety of ailments and

particularly an ingredient of aphrodisiac preparations.

Safedmusali is a traditional rare Indian medicinal herb. Its roots (tubers) are widely used for various therapeutic applications. SafedMusli is used to cure physical illness and weakness, as an aphrodisiac agent and revitalizer, as general sex tonic, remedy for diabetes, arthritis and increasing body immunity, curative for natal and postnatal problems, for rheumatism and joint pains, increase lactation in feeding mothers, as antimicrobial, anti-inflammatory, antitumor

agent, also used in diarrhea, dysentery, gonorrhoea, leucorrhoea etc.

Safedmusli (*Chlorophytum borivillanum*) has spermatogenic property and is found useful in curing impotency, now it is also considered as an alternative 'Viagra'. Its root contains steroidal and triterpenoidal saponins, sapogenins and fructans which act as therapeutic agents and play vital role in many therapeutic applications [3, 4]

### **Description:**

The herb grows naturally in the central zones of India, as the temperature and climatic conditions prevailing there are suitable for its growth. Sandy loam soil, with suitable drainage system, is perfect for the growth of SafedMusli. Due to its diverse medicinal benefits, the plant has been recognized as the sixth most important herb by the Medicinal Plants Board, to be preserved and protected. Roots are hard, tapering at both the ends, fascicled, sessile, cylindrical, 1-8 in number, brown to black skinned. The tubers are 3-10 cm long at maturity with slight characteristic odour. Leaves are radical, 6-13 in number, 13-23 cm X 1-1.75 cm in size, spirally imbricate at the base, sessile, linear ovate, acute apex and slightly narrowed at the base. Margins are wavy with parallel venation. Scape is solitary, 15-30 cm long, terminal, unbranched. It bears flowers over upper  $\frac{3}{4}$  of its length. The flowers are white, bracteate, pedicellate, racemose, usually arranged in alternate clusters (each consisting of three flowers) [5, 6]. The flower clusters are closer on the upper part of the scape. The bracts are linear, papery, purplish, 1-1.5 cm long; the pedicle is whitish, jointed and kneed at the joint, 6-10 cm long. Perianth is petaloid, persistent, rarely deciduous, number of tepals are 6, linear, acute, 3-5 nerved. Stamens are 6, hypogynous, free or the 3 inner adnate to the perianth segment, as long as perianth. The filaments are glabrous and inserted in a small pit on the back of the connective. The anther is

yellow, linear or oblong. Style is slightly longer than the stamen; filiform; swollen at the apex. Stigma is small. Ovary is tri-lobed; reduced angles obtuse; green; 3 celled; ovules four or more in each cell; globose and sessile. Fruit is loculicidal capsule; green to yellow; triquetrous. Seeds are black in appearance with angular edges like onion seeds. [2, 7]

### **Chemical Constituents:**

SafedMusli contains carbohydrates (35-45%), fiber (25-35%), alkaloids (15-25%), saponins (2-20%), and proteins (5-10%). It is a rich source of over 25 alkaloids, vitamins, proteins, carbohydrates, steroids, saponins, potassium, calcium, magnesium, phenol, resins, mucilage, and polysaccharides and also contains high quantity of simple sugars, mainly sucrose, glucose, fructose, galactose, mannose and xylose.

Here saponin and alkaloids are the components that give safedmusli its medicinal activity. Two of the key saponins are hecogenin and stigmasterol. Stigmasterol is very similar in structure to testosterone. Hecogenin has steroidal-like effects that help to synthesize anabolic hormones. Anabolic hormones allow men to retain nitrogen more readily, which helps to form large more bulging muscles. Besides this Spirostanol glycosides (asparanin A and asparanin B) and two furostanol glycosides (asparoside A and B) have been isolated from the methanol extract of the fruits of *Asparagus adscendens*. Sarsasapogenin and diosgenin have also been reported and some other are: 4-hydroxy-8, 11-oxidoheneicosanol, Pentacosyldecosanate, Nonacosone, Tetra cosanic acid, Tri-acontanoic acid, Trigogenin, Nigogitogemin, Tokorogenin, Benzyl glucoside etc. [3, 4, 8]

**Analysis of active constituents:****a. Physico-chemical constants**

|                             |                      |
|-----------------------------|----------------------|
| 1. Total Ash                | - 3.02%              |
| 2. Acid Insoluble Ash       | - 0.25%              |
| 3. Water soluble ash        | - 50.7% of total ash |
| 4. Hot extraction           | - 20.48%             |
| 5. Cold Maceration          | - 0.35%              |
| 6. Water & Volatile matter  | - 7.60%              |
| 7. Foaming Index            | - 166.67%            |
| 8. Swelling Index           | - 4.60 ml            |
| 9. Mass fraction of Tannins | - 1.20%              |

**b. Microbial contamination tests**

|  |                       |
|--|-----------------------|
| 1. Aerobic microbial plate count-37 <sup>0</sup> C | - <10 <sup>5</sup> /g |
| 2. Yeasts and Molds Count                          | - <10 <sup>3</sup> /g |
| 3. Escherichia coli in 1 g                         | - <10/g               |
| 4. Salmonella in 25 gms                            | - Absent              |
| 5. Enterobacteriaceae                              | - <10 <sup>3</sup> /g |

**c. Heavy metal residues**

|                  |             |
|------------------|-------------|
| 1. Lead as Pb    | - <10mg/kg  |
| 2. Arsenic as As | - <3mg/kg   |
| 3. Cadmium as Cd | - <0.3mg/kg |
| 4. Mercury as Hg | - <0.1ppm   |

**d. Thin Layer Chromatography**

| Extract                | Solvent System                                | Spray Treatment   | No. of Spot(s) | Rf. Value (s)                          |
|------------------------|---|---|----------------|--|
| Pet. Ether<br>(60-80%) | Benzene:<br>Chloroform :: 4:1                 | Exposed to Iodine Vapours   | 3              | 0.13, 0.46, 0.58                       |
| Acetone                | Toluene:Ethylformate<br>:Formic acid :: 5:4:1 | 2% H <sub>2</sub> SO <sub>4</sub> , heated at 105 <sup>0</sup> C for five minutes | 7              | 0.1, 0.24, 0.33, 0.4, 0.54, 0.88, 0.92 |
| Ethyl alcohol          | Chloroform:<br>Methanol :: 95:5               | 2% H <sub>2</sub> SO <sub>4</sub> , heated at 105 <sup>0</sup> C for five minutes | 4              | 0.2, 0.28, 0.84, 0.87                  |

**Pharmacological activity of Chlorophytumborivilianum****1. Aphrodisiac activity:**

The aqueous extract of dried roots of *C. borivilianum* is reported to have a potent aphrodisiac and spermatogenic potential. To evaluate this effect, male wistar albino rats were orally treated with the dose of 125 and 250 mg/kg/day, their sexual behaviour was monitored 3 hr later using a receptive female. Their sexual behaviour was evaluated on days 1, 7, 14, 21 and 28 of treatment by pairing with a pro-oestrous female rat. For sperm count the treatment was continued further in all groups (control group-dist. water and treated group except group with sildenafil citrate 4 mg/kg/day) for 60 days. At 125 mg/kg, *C. Borivilianum* group had a marked aphrodisiac action, increased libido, sexual vigor and sexual arousal as compared with other groups. Similarly, at the higher dose (250 mg/kg) all the parameters of sexual behaviour were enhanced, but showed a saturation effect after day 14. On day 60 the sperm count increased significantly in both the *C. borivilianum* groups, 125 mg/kg and 250 mg/kg, in a dose dependent manner [1]

**2. Immunomodulatory activity:**

Polysaccharide fraction (CBP) of *C. borivilianum* has immunostimulating properties. CBP is derived from hot water extraction of *C. borivilianum* (Cb), comprising of ~31% inulin-type fructans and ~25% acetylated mannans (of hot water-soluble extract), was evaluated for its effect on natural killer (NK) cell activity (*in vitro*). Human peripheral blood mononuclear cells, isolated from whole blood were tested in the presence or absence of varying concentrations of each *C. borivilianum* fraction for modulation of NK cell cytotoxic activity toward K562 cells. Preliminary cytotoxicity evaluation against P388 cells was performed to establish non cytotoxic concentrations of the different fractions. Testing showed the observed significant stimulation of NK cell activity to be due to the CBP of *C. borivilianum*. Furthermore, *in vivo* evaluation carried out on Wistar strain albino rats for humoral response to sheep red blood cells and immunoglobulin level determination using enzyme-linked immunosorbent assay (ELISA), exhibited an effectiveness of *C. borivilianum* aqueous extract in improving immune function.

Thus results provide useful information for understanding the role of CBP in modulating immune function. [1]

### 3. Anthelmintic activity:

Saponin extract of *C. borivilianum* has Anthelmintic property when checked against *Pheretima posthuma* and *Ascaris galli*. Heused methanolic extract, crude saponin extract and purified saponin extract, Piperazine as standard drug and distil Water as control. Parameters used were time of paralysis and time of death of the worm. All extracts showed significant anthelmintic activity on selected worms. Purified saponin extract was found more active than other extracts. [9]

### 4. Antioxidant activity:

Antioiidant activity of aqueous extract of *C. borivilianum* (250 mg/kg for 7 days) was studied by 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging assay and lipid peroxidation assay. The aqueous extract of *C. borivilianum* (250 mg/kg for 7 days) inhibits significantly the levels of DPPH free radicals and thiobarbituric acid reactive substances, respectively in a dose-dependent manner. Antioxidant activity of *C. borivilianum* root extract was again proved using chemicals/metals-mediated oxidation. Aqueous extract, when used in graded-dose (25 to 1000 µg/ml), exhibits a very good antioxidant potency as evidenced by powerful nitric oxide, superoxide, hydroxyl, DPPH and ABTS [2, 20-azinobis (3-ethylbenzothiazoline-6- sulfonic acid)] radicals scavenging activity along with reducing capacity (ferricyanide couple assays), metal chelating ability, as well as markedly suppressed the lipid peroxidation in mitochondrial fractions. Further, aqueous extract significantly decreased ( $P < 0.05$ ) copper-mediated human serum and kinetics of LDL oxidation. Significant increase ( $p < 0.05$  to  $p < 0.001$ ) in the activity of reduced glutathione, catalase and superoxide dismutase and a

significant decrease in the hepatic malondialdehyde level has been observed at 100, 400, and 800 mg/kg body weight of *C. borivilianum* root extract when compared with the control value. [10]

### Antiulcer activity:

Alcoholic extract of *C. borivilianum* show ulcer healing property. Here cold stress induced gastric ulceration model was selected to evaluate antiulcer activity. The effect of single oral dose of the alcoholic extracts at the dose of 200 mg/ kg reduces the ulcer index significantly ( $p < 0.001$ ) compared to that of control group. [10 -12]

### 5. Antistress activity:

This activity was carried out using chronic cold restraint stress rat model. Chronic stress resulted in significant increase in plasma glucose level, plasma cholesterol, triglycerides level, serum corticosterone level and adrenal gland weight as compare to control. Pretreatment with aqueous extract of *C. borivilianum* at both dose levels (125 and 250mg/kg) reverted significantly the rise in plasma glucose levels indicating adaptogenic potential, plasma cholesterol level, triglyceride level, serum corticosterone level and also adrenal gland hypertrophy. [12]

### 6. Anti-tumour anti-mutagenic activity:

The roots of *C. borivilianum* contain cytotoxic steroidal glycoside saponin chloromaloside-A and spirostanol pentaglycosides embracing beta-Dapiofuranose which are responsible chemicals for anticancer property. Antitumour and anti-mutagenic property of aqueous extract of roots of *C. borivilianum* were also established when he reported that skin papillomagenesis studies demonstrated a significant ( $p < 0.001$ ) decrease in cumulative numbers of papilloma, tumour incidence, tumour burden, tumour size and tumour weight and significant ( $p < 0.01$ ) increase

in average latent period when the animals received *C. borivilianum* root extract at a dose level of 800 mg/kg body weight/day orally in double distilled water at pre, and post initiation stages of carcinogenesis. A significant reduction in the frequency of chromosomal aberration and micronuclei was observed in the treated animals as compared to carcinogen controls. The present investigation suggests that *C. borivilianum* has anti-tumour, anti-mutagenic and chemomodulatory effects. In another study four new spirostane-type saponins named borivilianosides, isolated from an ethanol extract of the roots of *C. borivilianum*, shows cytotoxic effect on two human colon cancer cell lines (HT-29 and HCT 116).[11-14]

### 7. Antidiabetic activity:

A fructo-oligosaccharide, isolated from *C. borivilianum* extract were found to have significant antidiabetic activity with the blood sugar levels being 118.32 +/- 3.56 and 110.21 +/- 4.22, respectively, as compared to the control value of 231.25 +/- 3.03 along with moderate antioxidant activity in streptozotocin induced diabetic animals.[13]

### 8. Antimicrobial activity:

The antimicrobial potential of *C. Borivilianum* was screened against eight bacteria and four pathogenic fungi, using microbroth dilution assay. Lowest concentration of the extract, which inhibits any visible microbial growth after treatment with p-iodo-nitrotetrazolium violet, was considered to be minimum inhibitory concentration. Water extracts of *Chlorophytum borivilianum* showed antimicrobial activity in a range of 75-1200 µg/ml.[12-15]

### 9. Larvicidal activity:

The larvicidal properties of *C. Borivilianum* saponin extracts (Methanolic

extract, crude saponin extract, purified saponin extracts) was examined for the mosquito species *Anopheles stephensi*, *Culex quinquefasciatus* and *Aedes aegypti* on the basis of LC50 and EC50 values. All extracts found to be larvicidal activity and among them purified saponin fraction was found more effective. Recently some other activity reported includes antiviral activity of *C. borivilianum* extract which shows a potent antiviral activity against BHV-1 virus. Antibacterial property of different extracts of *C. borivilianum* was carried out against bacteria, *Staphylococcus aureus*, *E. coli*, *Pseudomonas aeruginosa* and *Bacillus subtilis*, using cup diffusion method. Acetic acid extract shows antibacterial activity against all these 4 bacteria in the order of sensitivity as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *E. coli*, *Bacillus subtilis*. [15]

### CONCLUSION

It would not be an exaggeration to call Safed Musli a unique gift of nature to mankind since the time immemorial. Under the Indian system of medicine, it has emerged out to be an extremely valuable gift of nature to mankind. Safed Musli is celebrated as a Divya Aushadi with unparalleled medicinal properties as the preparation of *C. borivilianum* is a very popular herb in traditional Indian medicine, chief ingredient in over a hundred Ayurvedic formulations and used as a potent "Rasayana" drug in "Ayurveda" as a rejuvenator, a Vitalizer and health-giving tonic, a curative for pre-natal and post-natal problems, a restorative for immunity-improvement and as a remedy for diabetes and arthritis and as a potent aphrodisiac. As it has tremendous properties which can be utilised for health improvement of human beings, a special care should be taken in cultivation of *Chlorophytum borivilianum*, isolation of different phytoconstituents specially saponin, so true medicinal value of our indigenous medicinal plant can be explored.

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