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Genus *Chlorophytum* Ker Gawl.: Medicinally important plant from Ancient Indian literature (Ayurveda)

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Abstract

India is known for its tradition, culture, and Traditional medicine system. Ayurveda has long history in India where the plants are used as medicine. Ayurveda is an offshoot of Atharva veda written over 3000 thousand years ago. Charak and Sushruta described a large number of crude drugs and a large part of them had originated from plants. Ayurvedic medicines are based on herbs, either single herb or in combination posses one or more therapeutic principles. The ayurvedic preparation entirely is considered as the active substance and the constituents are either of known therapeutic activity or are chemically defined substance generally accepted to contribute substantially to the therapeutic activity of the drug. According to Bhavprakash the drug is sweet, cooling, and mucilaginous, increases Kapha, reduces Pitta, daha, acts as stimulant, it gives strength. (Mishra 2012., Bhise and Salunkhe 2009**)**

In the present study we have discussed the medicinal properties of a genus *Chlorophytum* Ker Gawl, which is commonly known as" safed musli". It was found that it is extensively used by the ayurvedic practitioners for a wide variety of ailments and particularly an ingredient of aphrodisiac preparations. It is also employed as ayurvedic rasayana because safed musli is a constituent of Chyawanprash, an outstanding rejuvenator. It is important constitution of Jeevaneeyagan (vitalisers). Total eight herbs constitute the Jeevaneeyagan (vitalisers). These herbs are aphrodisiac, strengthening, blood purifier, conception plus and galactogogue. Collectively these herbs are also named as Astavarga. *Chlorophytum* Ker Gawl (safed musli) is one of the important constituent as it contain properties like antidiabetic, antistress, immunomodulatory, anti-inflammatory, antioxidant, antimicrobial, aphrodisiac, anti-ageing, and increases immunity.(Haque *et al*., 2011. Mishra, 2012., Deore and Khadabadi 2008, Sing, 2007)

The genus *Chlorophytum* Ker. Gawl. (Asparagaceae) contain 198 species, six subspecies and eight varieties is distributed in the old world tropics especially in Africa and India. It is now represented by 17 species in India of which 15 occur in the Western Ghats. Most of the *Chlorophytum* Ker Gawl. species are usually forest dwellers and ephemerals making it difficult. This reviews is focused on various aspects of plant saponins and high medicinal properties of *Chlorophytum* species and its uses in Auruveda (Govaerts *et al.* 2012, Chandore *et al* 2012, Kaushik 2005, Bhatnagar, 2003. Gaikwad, et al 2012).

Chlorophytum borovilianum Santapau & R. R. Fern.

Fist time reported from Salsette island near Mumbai. The trebles from Maharashtra, Madhya Pradesh, Rajasthan, Gujarat, and Chhattisgarh uses the tubers and leaves as a medicine for arphodisic, anti rheumatic and sexual tonic. It is reach a source of alkaloids vitamins, minerals, proteins, carbohydrates, steroids the important phytochemical constituents is saponins, which is present upto 2-20 percent. Saponins chemically consist of sugar moiety usually glucose, galactose, hlucouronic acid, xylose, rhamnose or methylpentose glycosidically linked to a hydrophobic aglycogen (sapogenin). In Ayurveda it is essential part of traditional diet of mother (pregnancy), also its tubers are used in preparation of nutritional tonic to overcome problem of male impotency or low sperm counts. *C. borovilianum* also known as herbal Viagra as it is useful for people suffering from erectile dysfunction (Haque *et a.*,2011, Kaushik *2005.*,Acharya *et al*., 2009, Sundaram *et al* 2011, Bhattacharlee, and De, 2005 *).* Other traditional uses of *Chlorophytum borovilianum* Santapau & R. R. Fern are mention in table 1.

Chlorophytum tuberosum Baker.

The plant generally grow along the forest margin, grassy slopes rocky places and valleys. *C. tuberosum* is famous as safed musali in korku, Gond , Gavai, tribal in Maharashtra and Madhya Pradesh state of India. *C. tuberosum* is used as potent "Rasayan" drug in Ayurveda as an rejuvenator and tonic. Traditionally, Rasayana drugs are used against a plethora of seemingly diverse disorders with no pathophysiological connections according to modern medicine. Though, this group of plants generally possesses strong antioxidant activity, only a few have been investigated in detail. Over about 100 disorders like rheumatoid arthritis, hemorrhagic shock, CVS disorders, cystic fibrosis, metabolic disorders, neurodegenerative diseases, gastrointestinal ulcerogenesis are cured by using "Rasayan" (Patil and Deokule 2012, Choudhary *et al* 2008 ., Chaudhari, 2007, Govindarajan *et al.*,2005., Haque *et al*., 2011). Other traditional uses of *Chlorophytum tuberosum* Baker are describe in table 1 medicinal properties of *Chlorophytum* species.

***Chlorophytum laxum* R.Br.**

Chlorophytum laxum R.Br. is one of the important plant medicinal plant for tribal in Karnataka , Maharashtra and Madhya Pradesh state. It is commonly called as "Bhoomi shakkar'. The plant is basically use for treatment of piles and as astringent. The tuberous roots are being used as a well-known tonic and an aphrodisiac. Roots are used for the treatment of diarrhea, dysentery, also used as demulcent and galactogogue. The tuber pest of *Chlorophytum laxum* is use for treatment of insect bite and snake bites (Padal et al 2012., Dabur et al 2007., Panda et al., vijayan et al 2007., Niranjan 2011). (table1)

Chlorophytum arudinaceum Baker

Chlorophytum arundinaceum Baker is an important medicinal plant and its tuberous roots are used for various health ailment treatments. *C. arundinaceum* has became an endangered species in the Eastern Ghats, and a rare medicinal herb in India. (Singh et al., 2012**)** Plant distributed in the Eastern Himalayas, Assam,

Bihar and Maharashtra, Madhya Pradesh, Chhattisgarh and Andhra Pradesh. *C. arundinaceum* is also popular as "safed musali" in tribal, *C. arundinaceum* is used in the Indian traditional system of medicine for improving the general state of health and for stress-related immune disorders. The roots (tubers) are rich in alkaloids, vitamins, minerals, proteins, carbohydrates, saponins, polysaccharides and steroids, four sapogenins – stigmasterol, tigogenin, neogitogenin, and tokorogenin identified on the basis of mass spectral fragmentation. *C. arundinaceum* has various therapeutic values as total rejuvenator, antioxidant and Immunomodulator and is being used as an anti arthritic and anticancer drug. Because of its aphrodisial properties, *C. arundinaceum* is mainly identified as 'Herbal viagra'. *C. arundinaceum* a plant of repute as its fasciculated roots are reported to be used as a tonic and constitute an important ingredient of more than 20 Ayuervedic and Unani preparations. There are many other reports elucidating its use in the treatment of wounds, ulcers and also as a vegetable. **(**Lattoo et al 2006., Kumar *et al* 2007., Chopra, R.N. 1956, Trivedi, 2009, Samantaray et al 2009.,valya et al 2009). Other traditional uses of *Chlorophytum arudinaceum Baker* are describe in table 1 medicinal properties of *Chlorophytum* species

***Chlorophytum comosum* Jacp. J. de. La Soc**

The species is native to South Africa and is commonly known as spider plant, there is no reference of any medicinal use of *Chlorophytum comosum* in Ayurveda. *Chlorophytum comosum* is garden plant and mainly cultivated as ornamental plant not for medicinal used. In China *Chlorophytum comosum* is used for the treatment of bronchitis, fracture, and burns as part of traditional medicine. Three saponins are isolated from *Chlorophytum comosum* (Gitogenin Hecogenin ,Tigogenin) which show anti tumor activity.(Haque *et al*., 2011., Kaushik *2005.*, Mimaki et al 1996., Gudadhe et al 2012). Other traditional uses of *Chlorophytum comosum* Jacp. J. de. La Soc are mention in table 1.

Chlorophytum nimonii (Grah) Dalz

Chlorophytum nimonii (syns *Chlorophytum orchidastrum Lindl)* is found in tropical and subtropical forest. There is no any report of traditional used in ayurveda and uniani medicine. *C. nimonii* contain six steroidal saponins (Orchidastroside A, Orchidastroside B, Orchidastroside C, Orchidastroside D, Orchidastroside E, Orchidastroside F). Plant shows Antihyperglycaemic activity in streptozotocin induced antidiabetic rat mode land antidyslipidaemic activity. (Lakshmi *et al*.,2009., Acharya *et al*.2010.,Lekhak et al 2012, lekhak and yadav 2012). More use of *Chlorophytum nimonii (Grah) Dalz* are mention in table 1 medicinal properties of *Chlorophytum* species.

***Chlorophytum glaucum* Dalz.**

C. glaucum is used for indigenous system of medicine as galactogogue and aphrodisiac. It is also used in nourishing, antioxidant, general tonic and strength enhancer . used to cure general debility and impotency.

(Naike and Nirgude 1980, Patil *et al.* 2011, Lehkak and yadav 2012). ***Chlorophytum nepalense* (Lindl.) Baker**

Chlorophytum nepalense (Lindley) Baker, (syns *Chlorophytum khasianum* Hook.), local name "Khiranglo" or "Nigalisak". *Chlorophytum nepalense* used as wild vegetables by local communities like Chhetri, Tamang Bankaria and khasi. of Nepal and North- Easterner India, *Chlorophytum nepalense* root fibrous, cylindric, nearly clustered. Rhizome often short, inconspicuous. Leaves uniform, sessile, flat, convolute, often distichous, acute-acuminate, linear-lanceolate, entire, margin laxly crisped, glabrous, green. Inflorescence an irregular terminal raceme, scape solid, simple or shortly branched, terete or slightly compressed, green. Other medicinal use of *Chlorophytum nepalese* is still unknown to the science.(Basu et al 2002, Afroz *et al*, 2008, Joshi and Siwakoti 2012, Hooker 1892)

***Chlorophytum malabaricum,* Baker In j Linn. Soc.xv. 331;**

Chlorophytum malbaricum is small herb with short stem clothed with the bases of the leaves, and thick white root. Leaves all from the ground, lanceolate, acute, usually folded along the meddle line, but without midrib, many-nerved, glabrous, and bluish. Flowers usually in pairs, one opening much before the other. In the axils of the bract, raceme in shorts spike, which rises without leaves from the center of the plant. Bract, acuminate three nerved, thin longer than pedicel. Pedicel shorter than the bract not jointed. Flower star-shaped, across sepal broadest above the middle with midrib greenish and raised into a slight keel at the end. There is no medicinal uses of *Chlorophytum malabaricum* is reported. (Hooker 1892)

***Chlorophytum bharauchae* Ansari, Raghavan and Hemadri**

Perennial herbs root thick , cylindrical, leaves ,radical, acute to acuminate at the apex , wavy and hyaline on the margin ,glaocous green below. Flowers numerous usually in terminal lax branched racemes. Perianth white with green blotch at apex,3-nerved . stamens 6 , filaments glabrous . capsules 3- lobed obcordate. Seeds black, suborbicular. There is no medicinal use of *Chlorophytum bharuchae* is reported. (Yadav et al 2002)

***Chlorophytum attunatum* Baker.**

Roots flushy, leaves membranous, linear, acute, slightly narrowed at the base, with 15 to 20 distinc immersed veins. Scape glaburous naked erect, as long as leaves. Flower are white in simple racemes, dense in upper part, bract ovate lanceolated, aenminate.pedicel erect ,jointed about the meddle , stamens longer than anthers. Anthers narrowly linear. Still day there is no evidence of medicinal use of *Chlorophytum attunatum.* (sheriff and Chennaveeraiaha 1975, Cook 1908)

***Chlorophytum kolhapurens* sardesi and yadav**

Robust perennial herbs ; tubers fleshy, cylindrical . Leaves radical ,membranous , linear , acute.Flowers numerous on a naked scapes perianth linear lanceolate ,greenish white . stamens 6; filament longer than anthers , papillose. Capsules globose,emarginated , acutely 3-angled . seeds orbicular, compressed , dull black. Rare in srub forests . the specimens could not been assigned satisfactorily to any Indian species of the genus. Resembles to *C. bharuchii* Ansari, Raghavan and Hemadri, grows in sandy soil. (Sardesai et al 2006, Lekhak et al 2010,)

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***Chlorophytum belgaumense* , Chandore and yadav**

Chlorophytum belgaumense Perennial herb. Roots 5 – 10 per plant, bearing vegetative buds growing into new plants; swollen and tuberous in middle, terminating in fibrous roots; root tubers narrowly fusiform to turbinate. Leaves radical, 5 – 9 per plant, sessile, imbricating at base, broadly lanceolate, glabrous, subcoriaceaous, channelled, apex acute, margins hyaline, undulate. Scape usually solitary, unbranched, naked, to 22 cm long. Flower white, bracteate, pedicellate, usually in alternate or subopposite, 3-flowered clusters. Bracts large, persistent until fruit formation, apex acute, margin hyaline, whitish, jointed above the middle, pedicel portion below the joint cylindric to triangular in cross-section, 0.8 – 1.0 cm long; pedicel portion above the joint 0.4 – 0.5 cmlong, cylindric to triangular in cross-section. Perianth segments 6, in two whorls of 3 each, *Chlorophytum belgaumense* reported in 2012 and many people are working on its medicinal properties.(Chandore *et al* 2012)

***Chorophytum breviscapum* Dalz.**

Root fibres with oblong tubers, pendulous from them.leaves 6-9 membranous, linear oblong or oblong lanceolate, acuminate, flat, with undulate margins, shining above, pale beneath attenuated towards the base in a broad petiole. Flowers white, usually in simple racemes, long, bracts membranous, ovate-lancrolate, with long acumination pedicel long jointed near the top. Perianth more than 3/8 in. long, segments linear, acute. Medicinal properties of *Chorophytum breviscapum* are not reported.(Haque *et al*., 2011, Cook, 1908).

***Clorophytum glaucoides* Blatt.**

Slender perennial tuberaous herbs ; roots cylendric as well as with pendulous elliptic tubers , leaves Linear –lanceolate acuminate at apex ,glaoucus whote below . Flowers numerous , white on simple or branched racemes. Stamen 6 capsules globose, emarginate, triquetrous, black. No medicinal used is reported (Lekhak et al 2012, Yadav et al 2002).

Table 1– medicinal properties of *Chlorophytum* species *(*safed musali)

Sr. No	Species Name	Biochemical contain	Medicinal use
1	*C. borivilianum* Santapau & Fernandez	- **Saponins** (2-17%), Alkaloids (15-25%),**Carbohydrates (42%),Protein (80-90%), Fibers (3-4%).** Borivilianoside E, Borivilianoside F,Borivilianoside G, Borivilianoside H.	• **Aphrodisiac activity & Spermatogenic activity** • **Anti-oxidant activity** • Herbal-Drug interactions • Safed Musli has anti-ageing properties. It rejuvenates the "whole" body and mind without any side effects. • The roots are widely used as a natural "sex tonic" and are integral part of more than 100 herbal drug formulations. • The dried tubers of Safed Musli are used for pre-natal and post-natal illness. Its powder increases lactation in feeding mothers and lactating cows. • It cures physical weakness and improves immunity. • It is also used as an herbal remedy for diabetes and arthritis.
2	*C. arundinaceum* Baker	27 alkaloids, saponins, steroids, carbohydrates, sugars, proteins, minerals, glycosides, vitamins. tigoginin, stigmasterol, Neo-giogenin, Tokorogenin	• Its roots are eaten or dried and made into powder taken as a general health and strength tonic, and specifically to help impotency. • Associated male sexual problems. • Some users report an aphrodisiac effect. • It has various therapeutic values as total rejuvenator, antioxidant and Immunomodulator • the treatment of wounds, ulcers and also as a vegetable.
3	*C. tuberosum* Baker	protein, tannins, saponins, steroids, anthroquinone, sugars, fats**,** alkaloids.	• A precious ayurvedic drug widely used as a potent ‘Rasayana’ drug in ‘Ayurveda’ as a rejuvenator. • Plant specifies vitiated vata, pitta, diabetes, spermaturia, leucorrhea, and is a potent aphrodisiac. • Roots are used to treat diarrhea and dysentery and also used as demulcent and galactogogue.
4	*C. kolhapurensis* Yadav and Sardesai	Not studied	
5	*C. comosum* Jacp. J. de. La Soc	**27** alkaloids, saponins, steroids, carbohydrates, sugars, proteins, minerals, glycosides, vitamins. Gitogenin, Hectogenin, Tigogenin	• **Steroidal Saponins / Antitumor-Promoter Activity**: Study isolated three new spirostanol pentaglycosides and four known saponins. The saponins were examined for inhibitory activity on tumor promoter-induced phospholipids metabolism of HeLa cells. • **Antiproliferative**: The antiproliferative effects of n-butanol

			extract from *C. comosum* was tested in vitro against four human cell lines. Results showed the extract to have antiproliferative effects and apoptosis in human cell lines. • **Indoor Air Purifier**: According to a NASA study, spider plants absorb 96 percent of carbon monoxide in a controlled environment within a 24-hour period, making it one of the most effective air purifier in its research. • A traditional folk medicine used to treat bronchitis, fractures and burns.
6	*C. laxum* R. Brown	- 27 alkaloids, saponins, steroids, carbohydrates, sugars, proteins, minerals, glycosides, vitamins	• An important drug of the Ayurvedic and Unani System of Medicine • Ethonobotanically the species tubers has been used for treatment of Piles and as well as an Astringent by Soliga tribes extensively even today • The tuberous roots are being used as a well-known tonic and an aphrodisiac. • Roots are used to treat diarrhoea and dysentery and also used as demulcent and galactogogue.
7	*C.breviscapum* Dalz	27 alkaloids, saponins, steroids, carbohydrates, sugars, proteins, minerals, glycosides, vitamins.	• Root powder fried in the ghee, chewed in case of mouth and throat allergy. • Curative of Natal and post Natal problems. • Found very effective in increasing male potency. • It is considered as alternative to Viagra. • Herbal products : jeevan-anand kesar chyawanprash, jeevan-anand narayana oil, • jeevan anan
8	*C. attenatum* Baker	Not studied	Not in medicinal used
9	*C. glaucum* Dalz.	Mainly saponins & herbal steroids	• Aphrodisiac • Nourishing • Strength promoting actions • Antioxidant • General tonic and • Strength enhancer • Used to cure general debility and impotency
10	*C. malbaricum*	Not studied	Not in medicinal used
11	*C. nepalense* Baker	Not studied	Not in medicinal used
12	*C. nimmoni* Dalz.	alkaloids, saponins, steroids, carbohydrates, sugars, proteins, minerals, glycosides and vitamins.	• Antifungal activity. • Antihyperglycaemic. • Antidyslipidaemic activity

		Chloragin .Orchidastroside A, Orchidastroside B, Orchidastroside C, Orchidastroside D, Orchidastroside E, Orchidastroside F(steroidal saponins)	
13	*C. bharuchii* Ansari, Raghavan and Hemadri	Not studied	Not in medicinal used
14	*C. belgaumense chandure and yadav*	Not studied	Not in medicinal used
15	*C.glaucoides* Blatt	Not Studied	Not in medicinal used
16	*C.gothanese* Yadav and Malpure	Not studied	Not in medicinal used

In Indian systems of medicine *Chlorophytum* species are treated as medicinal plant. It is widely used as natural sex tonic. This is the reason that it is an integral part of more than100 Ayurvedic formulations. The white tuberous roots of this plant are the medicinally useful parts. The tuberous roots of other species Asparagus, Bombax and Orchids are also sometimes called safed musali leading to confusion. Total 17 species of *Chlorophytum* have been reported in India. Most of the *Chlorophytum* species are usually forest dwellers and ephemerals making it difficult to find them in flower, some of the taxonomically important morphological characters have been neglected in the past. The roots, filament and anther length and filament surface are the characters found to be more consistent and species specific. Critical field survey, observations and analysis of *Chlorophytum* populations from North Western Ghats has resulted in the of novelties, indicating the need for further careful field exploration and critical analysis (Sardesai et al. 2006; Malpure & Yadav 2009.Chandore et al 2012). All these species are totally different in medicinal properties but due to lack of correct information all species are known as Safed Moosli in Indian drug market. Indian forests are rich in Safed Moosli. Due to its unique medicinal properties, demand of *Chlorophytum* species is increasing very fastly in Indian and international drug markets. This increasing demand has created a pressure on Indian forests and if steps for timely conservation will not be taken, the Indian forest will loose this valuable plant.

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