

A REVIEW ON KRISHNA MUSALI (CURCULIGO ORCHIOIDES GAERTN) AND ITS CULTIVATION AND PROPAGATION-AN ENDANGERED MEDICINAL PLANT

Mahadevi Bhangi¹, I. B. Kotturshetty², Prakash Meti³

¹Assistant Professor, Dept. of Dravyaguna, Shri J.G.C.H.S AMC, Ghataprabha, Karnataka, India

²Principal & Professor, Dept. of Panchakarma, RGES AMC, Ron, Karnataka, India

³Associate Professor & PhD Scholar, RGES AMC, Ron, Karnataka, India

Email: bhangimahadevi5@gmail.com

ABSTRACT

Since immemorial time, the plants drugs have been in use for treatment of disease. But due to over exploitation, destructive mode of collection, and other biotic and abiotic factors several medicinal plants are facing genetic erosion and are under the threat of extinction. *Krishna Musali (CurculigoorchioidesGaertn)* is an endangered medicinal plant and as such required to be conserved and domesticated. *Krishna Musali* has been widely described in the Ayurvedic classical texts. It plays significant role in the treatment of different diseases It is extensively used in *Rasayana, Vajikarana* (rejuvenation), as nutritive tonic. Many pronounced biological activities such as anti cancerous, anti-hepatictoxic and immune modulator activities have been reported from the *Krishna Musali* plant. The plants can be cultivated by rhizomes and plants are naturally propagated through seeds and underground bulbils. The seeds of *Curculigo Ochioides* were cultured on MS basal medium. Explants produced a single shoot and well-established roots. Multiple shoots were obtained by culturing the explants on a medium containing cytokine. Either of BAP, Zeatin, IAA, a kinetic produced 5 to 15 shoots per explant without any root formation. Roots were readily induced by transferring the multiple shoots to a medium free of cytokinin. The present paper highlights medicinal values, chemical constituents, and biological activities along with cultivation strategies of the species in India.

Keywords: *Krishna Musali*, endangered, cultivation.

INTRODUCTION

The drug *Krishna Musali* is obtained from the bitter mucilaginous part from the tuberous roots of *Curculigoorchioides Gaertn*, it is one of the important drugs of choice for *Vajikarana* and *Rasayan* therapy in Ayurveda and reputed for its various medicinal properties. The drug *Krishna Musali (Curculigo orhioides)* is *Vata, Pittahara* having *Guru, Snigdha, Picchila Gunas; Madhur, Tikta Rasas; Madhur Vipak; Ushna Virya* and does *Brumhana*(nourishment), *Rasayana*

karmas& also *Sthairya* (stability) & *Mardhavakar* (softness).

History: *Krishna Musali* has been widely described in the Ayurvedic classical texts. It plays significant role in the treatment of different diseases. The references regarding *Krishna Musali* are available in *Samhita* period and *Nighantu* period etc.

Samhita Period: -

1. Charaka Samhita –In Charaka Samhita references regarding *Krishna Musali* is available in *Chikitsa Sthana*, in *Kasa Chikitsa*, *Dhoomapana yoga*¹.

2. Sushruta Samhita – In Sushruta Samhita, *Krishna Musali* is mentioned in *Sutra Sthana* and *Chikitsa Sthana*, while describing *KsharaPaka* in Sushruta Sutra *Sthana* 11th chapter, *Krishna Musali* is mentioned in 15th shloka, as one of the ingredient in *Prativapa Ksharavidhi*.² In Sushruta *ChikitsaSthana* 18/5, in the *chikitsa* of *vatajaGranti*, as *Pralepa yoga*. In Sushruta *Uttaratantra Talapatrya* has been mentioned in *Karna Palirogachikitsa*, as one of the in ingredient in *Taila Yoga*.

3. Astanga Hrudaya –In Astanga Hrudaya, *Krishna Musali* has been explained in *Sutra Sthana*, *Chikitsa Sthana* and *Uttara Sthana*. In Astanga Hrudaya *Sutra Sthana* 30/22, in the context of *Kshara –Agni karma Vidhi Adhyaya*. In *chikitsa sthana* the drug *Krishna Musali* explained in *Shvayathuchikitsa*, mainly in *Ekangashopha*. In *Uttara Sthana* 18/45, *Krishna Musali* is mentioned in the context of *Karna Roga Pratishedha Adhyaya*, in *Taila Yoga*³. Vagbhata for the first time introduced the term *Musali* in the context of *Vyanga Chikita* as *lepa* ingredient in *Uttara Sthana*, 32/21.

Nighantu Period

- **Madhava Dravyaguna**⁴: It is explained in *vividhoushadi varga*.
- **Hrudayadeepika Nighantu**⁵: *Krishna Musali* is mentioned in *vatagnaVarga*.
- **Madanapala Nighantu**⁶: In this *Nighantu* it has been explained in *Abhayadivarga* and told to be *Rasayana* and *Brumhan*. It is also *tikta*, *madhura*, *guru*, *ushna veerya*, *vrushya*, Etc.
- **Raja Nighantu**⁷: It has explained in *Moolakadi varga*. Different synonyms of *Krishna Musali*, like *musali*, *talamuli*, *hemapushapi* etc. are highlighted. It is *madhura*, *sheeta*, *picchila*; *pit-tashamaka*.

- **Kaiyadeva Nighantu**⁸: *Krishna Musali* has been mentioned in *Oushadivarga*, & it is *guru*, *madhur* and *tiktarasatmaka*, *Usnhaveerya*. And is also told to be *rasayana*, *vrushya* and *Brumhan*.
- **Bhavaprakasha Nighantu**⁹: *Krishna musali* is mentioned in *Guduchadivarga*. The properties of *Krishnamusali* are mentioned in detail. It is told that *Krishna Musali* is *guru*, *madhura*, *tikta rasatmaka*, *ushna veerya*, does *rasayana* and *brumhana karma* etc.
- **Shaligrama Nighantu**¹⁰: Here a detailed description regarding the properties and actions of *Krishna Musali* are available. The *rasa* is *Madhur*; *vi-rya* is *sheeta*. It is *Vrushya*, *vatapittahara*.
- **Nighantu Adarsha**¹¹: It has been explained under *Musalikandadi varga*.
- **Priya Nighantu**¹²: It is explained under *Shatapushpadi varga*.

Nomenclature of *Curculigo Orchioides Gaertn*¹³

- Kingdom -Plantae
- Division -Spermatophyte
- Subdivision -Angiospermae
- Class -Monocotyledon
- Order -Asparagales
- Family -Hypoxidaceae
- Genus -Curculigo
- Species -Orchioides Gaertn
- Scientific name -*Curculigo Orchioides Gaertn*

Gana And Varga

Different Acharyas have mentioned the *Krishna Musali* in different *Gana* or *Varga* as follows. *Kakolyadi Gana*, *Vividhoushadhivarga*, *Abhayadivarga*, *Moolakadivarga*, *Musalikandadi*, *Guduchyad*, *Oshadadi*, *Shatapushpadivarga*, *Vataghnava*

Synonyms (*Paryaya*)^{14,15}

Taalamuli, *Mushali*, *Suvaha*, *Krushnamusali*, *Talapatri*, *Khalani*, *Kharjoori*, *Bhootali*, *Godhaadi*, *Hemapushpi*, *Deerghakandika*, *Taalamuli* are some of the synonyms that are there for *Musali*.

Table 1: Showing Gunas Of Krishnamusali According to Different Authors ^{16,17}

S.No	Rasapanchaka		M.N	R.N	K.N	Bp.N	N.A	P.N
1	RASA	Madhura	+	+	+	+	+	+
		Tikta	+	-	+	+	+	+
2	GUNA	Guru	+	-	+	+	+	—
		Snigdha	+	-	-	-	+	-
		Picchila		+	+	-	+	-
		Sheeta	-	+	-	-	+	-
3	VEERYA	Sheeta	-	+	-	-	-	-
		Ushna	+	-	+	+	+	+
4	VIPAK	Madhur	+	+	+	+	+	+

M.N – Madanapala Nighantu, R.N – Raja Nighantu, K.N – Kaiyadeva Nighantu

Bp.N – Bhavaprakasha Nighantu, N.A – Nighantu Adarsha, P.N – Priya Nighantu

Karmas (Actions): Vrushya, Rasayana, Brumhana, Shukrala, Pushtikara, Balya, Agnivardhaka, Sthairya-karaka,

Prayoga (Therapeuticuses): Kasa, Unmatha, Swayathu, Granthi, Gudajanyavata, Arsha, VyangaMootraghata, Leucorrhoea

Prayojyaanga (Useful part): Moola kanda

Matra (Dose): Root powder-3-6gms, Juice-10-20ml

Classical Uses of Krishna Musali: ¹⁸

- Kashaya of Krishna Musali should be used in Mutakruchra.
- Used as Rasayana- satavari, mundi, hastikarna-palaasha and taalamooli- all are taken in equal parts, mixed with ghrita (ghee) and Madhu (Honey) and taken.
- Regular use of Krishna Musalichoorna mixed with Ghrita as act as Vrushya (aphrodisiac)

Folk Uses: ¹⁹

- Bulbs of kali Musali used in scorpion bites, roots are prescribed usually combined with bitters and aromatics in the form of electuary, the dose being one teaspoon twice a day.
- In gonorrhoea, menorrhagia, leucorrhoea, and menstrual derangements the Kala Musali is given with warm milk and sugar in dose of drachms.
- In Piles, Asthma, Jaundice, Diarrhea and colic, the tubers are administered with sugar and one glass of milk in the form of thick mucilage. (Unani)

- Roots are used as demulcent, alterative, and tonic during convalescence after acute illness, in the dose of 1 to 2 ounces of the root in warm milk and sugar.
- The powdered rhizome is put into cuts is said to stop bleeding and dry up the wounds (Carter)

Morphology ²⁰

Habitat: It is found in sub-tropical Himalayas from Kumaun, Manipur, Bihar, Konkan and Nilgiri hills. Occurring wild in sandy situations of hot regions of India and Ceylon.

General Characters of Species Curculigo Orchioies Gaerten:

Root stock: stout, short or elongate with copious fleshy root fibers.

Leaves: Sessile or petiolate 15-45 by 1.3 to 2.5 cms, linear or linear-lanceolate, membranous, plicate, glabrous or sparsely soft hairs, the tips sometimes rooting and reaching the ground, base sheathing.

Flowers: Bright yellow, distichous, the lower lowest in the raceme -2 sexual, the upper male; Bracts lanceolate, membranous. Perianth-segments 13 to 17 cms, long, elliptic, oblong, hairy on the back, testipes very slender, 1.3 to 2.5 cms long. Ovary lanceolate, the cells 6-8 ovulate stigma 3 cleft.

Fruit: Capsule 13 cms long, hypogaeous, 1-4 seeded with a slender break, septa spongy

Seed: Oblong, testa deeply grooved in wavy lines, black, shining.

Actions and Uses

The rootstocks are emollient, demulcent, diuretic, aphrodisiac, depurative, alterative, appetizing, carminative, antipyretic and tonic. They are use full in retention of urine, leucorrhoea, menorrhagia, menstrual, derangements, hemorrhoids, pruritis, skin diseases, asthma, bronchitis, jaundice, diarrhea, dyspepsia, colic, vomiting, ophthalmic, lumbago, gonorrhoea and cut wounds.

Pharmacognosy

1) Macroscopic

Drug occurs in transversely cut pieces of 2.5 to 5cm long, straight to slightly curved, cut surface 1.0 to 4.5 cm in diameter; external surface blackish-brown, cut surface cream coloured; surface with numerous shallow wrinkles and transvers cracks; with a few rootlets and root scars; nodes and internodes prominent; taste mucilaginous and slightly bitter.

2) Microscopic

Shows a narrow strip of cork, consisting of 5 to 7 rows of light brown cubical to rectangular cells; secondary cortex consists of thin-walled, parenchymatous cells, densely filled with starch grains and acicular crystals of calcium oxalate, either isolated or in bundles, in a few small, round to tangentially elongated, lysigenous cavities also found scattered in this region; a few vascular bundles found embedded in cortical region with phloem towards outer side, and consisting of a few xylem elements; ground tissue consisting of parenchymatous cells, some of which contain acicular crystals of calcium oxalate; numerous fibro-vascular bundles found scattered throughout the region, mostly towards peripheral region having phloem, almost encircled by xylem vessels having annular and spiral thickening; starch grains simple, rounded to oval and also compound of 2 to 4 components, measuring 4 to 21 μ in India, present in cortical and central region, a number of deep red, resin canals found throughout the region, mucilage in the form of colourless mass found in a few cortical parenchymatous cells.

Powder-Grayish; vessels with annular and spiral thickenings; simple, round to oval, starch grains measuring 4 to 21 μ in diameter, and compound starch

grains having 2 to 4 components and a few acicular crystals of calcium oxalate; mucilage in the form of colourless mass found in a few cortical parenchymatous cells.

3) Major chemical constituents

Flavone, glycoside-5, 7 dhydromyricetin-3-0-L xylopyranosyl(4-1), Tannins, Resins, Sapogenins-sterol, stigmaterol, and alkaloid, Mucilage, Fat, Starch, and ash containing oxalate of calcium etc. Root contains a good deal of mucilage.

4) Pharmacological activity

Hypoglycemic activity, Anti cancerous activity, Hepato protective, Anti-inflammatory, Flavone, glycosides showed power full uterine stimulation in guinea pigs, rats and rabbits.

5) Identity, Purity, Strength.

Foreign matter- Not more than 2%, Total Ash-Not more than 9%, Acid-insoluble ash-Not more than 2%, Alcohol-soluble extract-Not less than 3%, Water-soluble extract -Not less than 17% these all factors are indicative of an ideal *Krishna Musali*.

Shelf Life or Stability or Expire Date

Churna: 2 months-1 year

Propagation and Cultivation:²¹

Krishna Musali is naturally growing in sandy areas, with good amount of moisture, on grassy slopes of hills. Soil mixture consisting of equal parts of loamy soil, well decayed manure and sand is favorable for its growth. Moderate watering and moist atmosphere are preferable. The species is propagated by suckers. A warm humid tropical climate is better site for growth, development, yield and quality of *Krishna Musali*. Growth, development, yield and quality of two biotypes of *Curculigo Ochioides*, observed for 12 months, revealed that it had an active growth phase of seven months, after which it could be harvested for the highest rhizome yield. The two biotypes are differed in growth, quality, and yield parameter. The plant is slow growing, less competitive and poor yielding, fail to withstand weed competition and rodent attack.

The plants can be cultivated by rhizomes and plants are naturally propagated through seeds and underground bulbils. The seeds of *Curculigo Ochioides* were cultured on MS basal medium. Explants pro-

duced a single shoot and well-established roots. Multiple shoots were obtained by culturing the explants on a medium containing cytokine. Either of BAP, Zeatin, IAA, a kinetic produced 5 to 15 shoots per explant without any root formation. Roots were readily induced by transferring the multiple shoots to a medium free of cytokinin. The explants when cultured on MS medium supplemented with coconut milk produced shoot promotion and root formation, as well as additional shoot bud initiation.

Technique for large scale multiplication of *Curculigo Ochioides* through direct bulbil formation from leaf explants in shake flask cultures has been developed. Leaf segments (7x10 mm) were cultured in B5 liquid containing KNO₃ (200 mg N/l) 2 SO₄ (50 mgN/l), benzyl adenosine (2.2 micro M) and polyvinyl pyrrolidone (250mg/l). About explants produced maximum number of bulbils(546/flask at 6 weeks growth) in medium. Shake flask cultures yields 624 bulbils/1 medium. Germination of bulbils was maximum (90.62%) On agar - gelled B5 medium containing benzyl adenosine (2.2 micro M) and gibberlic acid (3.5 micro M). Plants developed in vitro were successfully transferred to soil with a high rate of survivability (90%).

DISCUSSION

The drug *Krishna Musali* is one of the best Drug of choice for *Rasayan*. Acharya Vagbhata mentioned it in the treatment of *Vyanga* (Melasma) for the first time. Reference regarding the *Krishna Musali* is available in all the *Samhita* as well as in all *nighantus*. As it is *Rasayan dravya*, *Varna prasadan* is one of the qualities that *rasayan Dravyas* possess, when given internally. *Krishna Musali* does the *Varna Prasadana* by external application also.

The standards for purity and identity of the trial drug are mentioned in the Ayurvedic Pharmacopeia of India. The standard methods mentioned in Ayurvedic Pharmacopeia of India were followed under strict supervision. The preliminary phytochemical study shows that this drug has shown positive in alkaloids, Tannins, steroids, carbohydrates, saponins, reducing sugar & amino acids.

Qualitative analysis for Inorganic Element shows presence of Iron, Chloride, Sulphates, Carbonates and Phosphate. By this we can draw a conclusion that the drug used for study was genuine and standard.

CONCLUSION

Krishna musali is used in *Rasayana*, *Vajikarana*, as nutritive tonic. Many pronounced biological activities such as anti-cancerous, hepatic toxic and immune modulator activities have been reported from the *Krishna Musali* plant. Many of the *Acharyas* have mentioned about importance of this drug. But due to the over exploitation, destructive mode of collection, and other biotic and abiotic factors several medicinal plants are facing genetic erosion and are under the threat of extinction. So, propagation and cultivation of the *Krishna musali* is really needed to have enough benefits. The explants when cultured on MS medium supplemented with coconut milk can produce shoot promotion and root formation, as well as additional shoot bud initiation. Direct bulbil formation from leaf explants is very useful in case of large-scale multiplication.

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