

# *Curculigo orchioides* Gaertn. (Kali Musali)

## An endangered medicinal plant of commercial value

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### Abstract

Plant drugs have been in use for the treatment of diseases since times immemorial. Due to over exploitation, destructive mode of collection, and other biotic and abiotic factors, a number of medicinal plants are facing genetic erosion and are under the threat of extinction. *Curculigo orchioides* Gaertn. commonly known as *Kali Musali* is an endangered medicinal plant and as such required to be conserved and domesticated. It is extensively utilized as nutritive tonic for strength, vigour and vitality. In the recent times, many novel chemical constituents have been isolated and characterized and many pronounced biological activities such as anticancer, antihepatotoxic and immunomodulator activities have been reported from the plant. The present article highlights medicinal values, chemical constituents and biological activities along with cultivation strategies of the species in India.

**Keywords:** *Kali Musali*, *Shyah-Musali*, *Curculigo orchioides*, Curculigosides, Anticancer, Hepatoprotective, Immunomodulator, Cultivation, Endangered.

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### Introduction

The drug *Kali* or *Shyah-Musali* of Ayurvedic system of medicine is derived from the bitter mucilaginous tuberous roots of *Curculigo orchioides* Gaertn. (Family-Hypoxidaceae). It is one of the important *Rasayana* drug of Ayurvedic Materia Medica for vigour and vitality and also reputed for its various medicinal properties. It is known by various vernacular names such as: *Talmuli*, *Talusa* (Bengali); *Nelatigade* (Kannada); *Nelappana* (Malayalam); *Nilappanai* (Tamil); *Nelatadi* (Telgue); *Talmuli*, *Musikaparni*, *Talpatrika* (Sanskrit); and Golden Eye Grass (English)<sup>1-3</sup>. It is a geophilous plant with tuberous roots and rhizome and found throughout India, eastward to southwards particularly subtropical areas of Central

Himalaya and Western ghats<sup>2,4</sup>. The tuberous roots are credited with same medicinal properties as that of *Safed Musali*, derived from various species of the genus *Chlorophytum* Ker-Gawl. particularly *C. borivilianum* Sant. & Fernandez<sup>5</sup>. It has tonic, aphrodisiac, demulcent, diuretic properties and used in asthma, impotency, jaundice, skin, urinary and venereal diseases<sup>6</sup>. It is used in many Ayurvedic and Unani compound formulations as an important ingredient<sup>5,7</sup>. In present times, the drug has been extensively studied for its phytochemicals and pharmacological activities<sup>8-14</sup>. Anticancer, hepatoprotective, antioxidant and immuno-modulator properties have been found in experimental models<sup>11, 14</sup>. The roots of *Kali Musli* are extensively utilized in

pharmaceutical industries for manufacturing medicines and considerable amount of roots are extracted by the local inhabitants and tribal people from forests. It fetches good price in the market<sup>7</sup>. Due to ruthless commercial exploitation and habitat destruction coupled with poor seed set and germination the wild populations of plant have been considerably depleted<sup>7,15</sup>. The plant is no where under large scale cultivation in the country; however, some sporadic cultivation and tissue culture techniques are available for *in vitro* culture and its rapid multiplication<sup>15-16</sup>. In view of therapeutic values for the treatment of many diseases and novel pharmacological activities, an attempt has been made to report the recent development in areas of pharmacology and phytochemistry along with cultivation practices of *Kali Musali*.

It is a perennial herb about 30cm in height with a short or elongated root-stock bearing several fleshy lateral roots which are black in colour. Leaves are simple 15-45 cm long, crowded on the short stem (rhizome), sessile or short petiolate, with sheathing leaf base and often produce adventitious buds at the tip when in contact with soil. Flowers are bright yellow; distichously the upper few are male flowers which are smaller in size, while the lower ones are bigger

and may be hermaphrodite or female, 1-4 seeded. Fruits are 1-2 cm long with short slender beak.

The plant is found in Khasi hills, subtropical areas of Central Himalayas up to 2250 m altitudes and Western ghats and mainly occurs in sandy region of hotter part of India. It is also found in Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Uttar Pradesh, Karnataka, Kerala, Tamil Nadu, West Bengal and in some other states<sup>2, 4, 7</sup>.



Plant of *Curculigo orchioides*



Plant with tuberous rootstock of *Curculigo orchioides*

### Cultivation

*Kali Musali* is naturally grown in sandy areas, with good amount of moisture, on the grassy slopes of hill sides<sup>7</sup>. Soil mixture consisting of equal part of loamy soil, well decayed manure and sand is favourable for the growth of the plant. Moderate watering and a moist atmosphere are preferable. It is propagated by suckers. The better site for growth, development, yield and quality of *Kali Musali* is a warm humid tropical climate. Growth, development, yield and quality of two biotypes ('Panamkuzhi' and 'Vellnikkara') of *C. orchioides*, 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 differ in growth, yield and quality parameters. The plant is slow growing, less competitive and poor yielding, fail to withstand weed competition and rodent attack<sup>15</sup>. Plants are naturally propagated through seeds and underground bulbils. The plant can be cultivated by the rhizome<sup>17</sup>.

In present times, tissue culture methods have become a powerful tool to develop micropropagation method for such plants. Bulbils formation has gained



Crude drug (dried roots)

considerable attention as a novel method for micropropagation due to easy in transportation, better survivability of germinated bulbils. Large scale propagation through direct bulbils formation from leaf explants in shake flask culture is a method to overcome the problem of population depletion<sup>16</sup>. Shake flask culture produces 2737 bulbils per litre medium where as static culture produces only 624 bulbils per litre medium at 6 weeks. This clearly indicates the superiority of shake flask culture over static flask culture in producing high number of bulbils by accommodation of higher number of explants per litre of the medium<sup>18</sup>. Yield can be increased further by manipulating the size of the leaf explants. Multiple shoots can also be obtained from the meristem tip culture on MS medium supplemented with BA (2.21  $\mu\text{M}$ ). The shoots rooted on half strength of MS basal medium or on the medium supplemented with NAA (0.53  $\mu\text{M}$ ), and then *in vitro* plantlets transferred to pots containing a mixture of vermiculite and soil (1:1) for acclimation for a period of two - three weeks. At the end of a three-month period, an average of 125 plants could be obtained from a single meristem<sup>19</sup>.

### Utilization and Chemical Composition

The major chemical constituents present in the root stock of *Kali Musali* are glycosides, polysaccharides (hemicelluloses, starch, tannins, resin, mucilage), fat and calcium oxalate. The fresh rhizome contains both yuccagenin, a sapogenin and alkaloid lycorin. The presence of these two types of chemical constituents appears to be the transition

point between the alkaloid bearing species and saponin bearing species and both type of biogenetic mechanism are probably operating in this plant<sup>10</sup>. A phenolic glycoside, named curculigoside was isolated from the rhizome and its structure was elucidated as 5-hydroxy-2-O- $\beta$ -D-glucopyranosylbenzyl 2,6-dimethoxybenzoate having high phagocytic activity<sup>8</sup>. Four esters: *n*-decan-3-olyl-pent-3'-en-1'-oate, *n*-hexadec-9,11-dienyl cinnamate, *n*-tridecanyl-hex-2'4'-dien-1'-oate, and *n*-heneictriacont-13-en-5,10-diol-hex-2'-en-1'-oate are also present in the rhizome, the fourth one is new phyto-constituents isolated for the first time from synthetic or natural source<sup>9</sup>. The chloroform extract of the rhizome contains hentriacontanol, sitosterol, stigmasterol, cycloartanol, sucrose and from methanolic extract a new phenolic glycoside named corchioside-A (Orcinol-3- $\beta$ -D-Xylopyranosyl-(1 $\rightarrow$ 6)- $\beta$ -d-glucopyranoside) has been isolated<sup>20</sup>. Two types of aliphatic hydroxy ketone have been isolated from the rhizome are named as 27-hydroxytriacontan-6-one and 23-hydroxytriacontan-2-one<sup>21</sup>. Two crystalline compounds 21-hydroxytetracontan-20-one and 4-methylheptadecanoic acid have been isolated from the acetone soluble fraction of the *n*-hexane extract of the rhizome<sup>22</sup>. A large variation has been reported in the phenolic glycoside of *C. orchioides* which can be utilized in the crop improvement of this plant<sup>23</sup>.

### Medicinal uses

Rootstocks are sweet, cooling, bitter, emollient, diuretic, aphrodisiac, depurative alternant, appetizer, carminative, virilogenic, antipyretic and useful in vitiated condition of gall bladder,

skin diseases, asthma, bronchitis, jaundice, diarrhoea, cuts, wounds, dyspepsia, colic, vomiting, ophthalmia, lumbago and gonorrhoea<sup>6,24-25</sup>. The dried rhizome has been used as a tonic in the treatment of decline in physical strength<sup>8</sup>. It is used along with other drugs for the treatment of general and sexual weakness, leucorrhoea, menstrual disorders, etc. The root powder is mixed with sugar, stirred in milk and taken in the form of thick mucilaginous fluid in case of diarrhoea. It is the ingredient of many Unani formulations, viz. *Majun Mochras* used for leucorrhoea, *Majun Samagah* and *Majun Pumb Dana* used as an aphrodisiac and *Hab-Asgand* prescribed in lumbago, rheumatism and gout<sup>7,21</sup>.

### Biological activity

The screening for the biological activities of the plant showed, hypoglycemic and anticancer activity in the alcoholic extract of rhizome<sup>14</sup>. Tuberos roots are used as tonic for strength vigour and vitality due to the presence of flavanone, glycoside-I, steroid, saponins, triterpenoids and other secondary metabolite. Flavones glycoside isolated from the plant, has been found to be powerful uterine stimulant in guinea pigs, rats and rabbits<sup>13-14</sup>. The methanolic extract of rhizome against paracetamol and powdered rhizome, against rifampicin induced hepatotoxicities exhibited significant hepatoprotective activity ( $P < 0.01$ ) like that of Silymarin, a known hepatoprotective agent. The methanolic extract of rhizome elevated the level of some of the antioxidant enzymes like Glutathione transferase in hepatotoxic rat which showed its antioxidant activity<sup>12</sup>.

Curculigo saponin-G extracted from the rhizome, increases the weight of Thymus in mice<sup>26</sup>. The methanolic extract of its rhizome has been shown to enhance phagocytic activity of macrophages. The pure glycoside fraction of the methanolic extract has been found to stimulate immune response by acting both on macrophages and the lymphocytes<sup>27</sup>.

### Conclusion

The drug *Kali Musali*, is an important drug of Indian Systems of Medicine. It is under the threat of extinction and as such requires *ex-situ* and *in-situ* conservation. Its cultivation is also required to meet the industry demand. In view of its diverse biological activities, in depth phytochemical, pre-clinical and clinical studies are required to develop new drugs for hepatoprotection, immunomodulation, cancer, etc.

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