## ABSTRACT

Kalihari (Gloriosa Superba) is included in Sthavar upavisha by Rasatarangini and Kanda Visha by Sushruta. It is described in Guduchyadi Varga in Bhavprakash Nighantu. This elegant climbing plant is common in Bengal and in low jungle throughout India. It is a climber with very attractive or glorious flower hence the name as such. The entire plant is poisonous; especially the tubers (Kanda) are extremely poisonous. The toxic properties of the plant are essentially due to highly active alkaloid Colchicines. The poisoning is mostly accidental. Kalihari also having therapeutic use The tuber possess abortifcient stimulant and anthelmintic properties it is used to treat leprosy. Hence in this article various toxicological aspect of Kalihari along with these therapeutic uses, fatal dose, fatal period and medicolegal importance is described.

**KEYWORDS:** kanda visha, upavisha, Kalihari, Gloriosa superba.

## INTRODUCTION

To maintain the health of healthy person and to cure the disease is the intention of Ayurveda.[1] Agadatantra is the branch of Ayurveda which deals with the diagnosis and treatment of various poisonous like snake bites, insect, spider bites etc. and by other poisonous substances like plant and minerals.[2]

Toxicology is the term used in modern science for Agadatantra. Forensic toxicology deals with medical and legal aspect of harmful effects of poisonous substances on human body. A poison is a substance which when administered, inhaled or ingested is capable of acting deleteriously on human body.[3] According to Acharya Charaka if we used poisonous drugs after shodhana they act as good medicine. Even medicine may act as a poison if do not use in proper dose.[4] Entire plant of Kalihari (Gloriosa superba) is a toxic, specially the tubers are extremely poisonous. The toxic properties of plant are essentially due to highly active alkaloid ‘Colchicine’. Another important alkaloid called Gloriosine.[5] In Bruhatrayi many therapeutic uses of Kalihari are mentioned. It is an abortifcent used for the expulsion of foetus, kanda lepa applied on palm and sole it gets labourless delivery.[6] It is used in the treatment of Vatrakta Kashtha,[7] Arsha,[8] Bhagandar, Asadhya Gandamala can be treated by Pana, Abhyanga and Nasya of Gunyadya Taila.[9] As the Kalihari is the Sthavar Vanaspatic upavisha,[10] it should be purified before using in medicinal preparation. Hence the shodhana sanskara process is carried out to avoid its toxic effect on the body. Toxicological views of Kalihari (Gloriosa superba) are highlighted in this review article as per Ayurveda as well as modern toxicology.

## REVIEW OF KALIHARI IN AYURVEDA

Kalihari (Gloriosa Superba) is included in sthavara upavisha by Rasatarangini and kanda visha by Sushruta. It is described in Guduchyadi varga in Bhavprakasha Nighantu. This elegant climbing plant is common in Bengal and in low Jungle throughout India.

**Synonyms of Kalihari**


**Guna Karma**

Rasa- Tikta, katu kashaya
Guna Tikshna, Laghu
Virya- Katu
Vipaka- Ushna

**Varga**

Bhavprakash Nighantu- Guduchyadi varga
Kai dev Nighantu-Aushadhi Varga
Priya Nighantu- Shatpushpadi Varga
Dhanvantari Nighantu-Karviradi varga
Shodhal Nighantu- Karviradi varga
Madapal Nighantu-Pabala Varga
Sushruta – Katukavarga

Kali hari (gloriosa superb Linn) is a plant bearing beautiful flowers like fire’s flame or tongue at the tip (Agnishikha, Agnijtvha). The plough shaped rhizomes (langali, halini) is used as drugs.

Medicinal use
It is katu rasam, tikshnoshnam, katu vipakam. It is abortifacient (garbhvanat), useful in surgical emergencies (Kali hari, visgalya) and wound healing (vranach). It also destroy lice (yakari).[16] For the labourless delivery kanda lepa applied on umbilical groin region. Kali hari use externally to cure the disease like shotha, vrana, kushtha, krumi.[17] It is also used in krumikarnak and unmath.[18]

Kali hari in Bruhatrayi
The rhizomes of costus specious (Koen) recognized as Kevuka are also sometimes sold for use in the name of Langali. Its action on uterus has also been found to be nearly similar but powerful to that of Langali. In Cha. Su. 27-106 Langulaki has also been used as vegetable. It is not clear whether Gloriosa leaves or costus rhizomes are intended to be used as such. It might be noted that costus is used as a pot-herb by the tribule people. It is also possible that Langula (-Ka), Cha. Chi. 9(55) and V. 57(11) may also demand the use of Costus.

Kali hari (Gloriosa Superba) is included in Sthavar Mulavisha by Charak,[19] and Kanda Visha included in Katukaverga by Sushruta. It used as prativrav darwapa while preparation of Tikshnakshar.[20] Kali hari kanda is an abortifacient used for the expulsion of foetus, Kanda lepa applied on palm and sole it gets labourless delivery. Kali hari has many medicinal uses it used in the treatment of Vatrakta, [21] Kushtha, [22] Arsha,[23,24] Bhagandar, [25,26] Switra, [27] Unmath (by abhyanga and nasya) indralupta (by applying lepa of this kalpa after Raktamokshana on the affected site), Asadhyya Gandamala can be treated by pana, Abhyanga and Nasya of Gunjyadya, [28] Apachi can also be treated by the Abhyanga of Kali hari Siddha Taila,[29]

Kali hari also included in vranashodhankaraka yoga.[30] In the treatment of Apakwa Ajagadlikha and Kaphaj Arbud Kali hari used.[31,32]

While the preparation of Samshodhana Varti Kali hari is used as a Samshodhana dravya.[33] Kali hari do the Samshodhana dravya. Kali hari do the Samshaman.[34] and Samshodhana of Kapha.[35] There is a reference of use of Kali hari in Uttarasti dravya by Shushrut. Uncurable disease can also be cure by the use of Kali hari as a Rasayan Yoga. Patient can live upto 500 years by taking this rasayan yoga. Kali hari is used as Virechaka also.[36]

Shodhana process of Kali hari kanda in Laghu trayi
Before using Kali hari Kanda as medicine or to prepared kalpa Shodhana (purification) of Kali hari is advised in Samhita.

Methods of Shodhana sanskara of Kali hari kanda in different Ayurvedic texts are as follows,
1. By Yogratnakar with Gomutra sthapitanam.[37] Quantity sufficient Gomutra taken in earthen pot and pieces ashuddha Kali hari Kanda immersed in it. After 24 hrs kali hari kanda pieces were drown out from the earthen pot and dried.
2. By Bhavprakash with Takra sthapitanam.[38] Quantity sufficient takra mix with sindhav taken in earthen pot and asuddha Kali hari kanda pieces suspended in it and on next day Kali hari kanda were drown out and wash with hot water. After this it again mix with fresh Takra with sindhav and repeat the same procedure for next 6 days. Lastly wash with hot water it dried.

Modern Review of Kali hari (Gloriosa superba)[39]
Latin name-Gloriosa superba
Family-Liliaceae
Common name- Glory lily, Climbing lily, superb lily

Characteristics
- Large herbaceous, climbing annual
- It is a slender vine with a thick tuberous root, resembling a sweet potato.
- Leaves terminates in tendril-like, long, curling tips.
- Flowers are large, solitary and very striking in appearance. They may be yellow or red, crinkled and long-stalked. They appear to be ‘upside-down’ with the stamens and pistils pointing downward.

Other Features
- Poisonous part
All parts of the plant, specially the tubers, are extremely poisonous

Main toxins
Colchicine, an alkaloid, is responsible for the toxic effect of Gloriosa superba. The species also contains another alkaloid ‘Gloriosine’.

Colchicine
CAS number: 64-86-8
Molecular formula: C_22H_35NO_6
Structural name: Colchicine

Colchicine occurs as pale yellow to greenish yellow, odorless crystals or amorphous scales or powder. It darkens on exposure to light. Melting point is 157°C.
Route of exposure
Oral- Ingestion of tubers or other parts either intentionally or accidentally. No data about exposure with any other route is found.

Main risk and target organs
The toxins in ‘Gloriosa superb’ have an inhibitory action on cellular division resulting in diarrhea, depressant action on the bone marrow and alopecia.

Uses
Different parts of the plant have a wide variety of uses especially within traditional medicine practiced in tropical Africa and Asia. The tuber is used traditionally for the treatment of bruises and sprains, colic, chronic ulcers, hemorrhoids, cancer, impotence, nocturnal seminal emissions, leprosy and also for inducing labour pains and abortion. Because of its similar pharmacological action, the plant is sometimes used as an adulterant of aconite. The juice of the leaves is used to kill head lice and also as an ingredient in arrow poisons. The flowers are used in religious ceremonies. The tuber has commonly been used as suicidal agent among women in rural areas and it has also been used for homicide.

Clinical effects
Initial symptoms develop within two to six hours after ingestion of tubers of Gloriosa superb. They are characterized by numbness and tingling around the mouth. Burning and rawness of the throat, nausea, intense vomiting, abdominal pain and bloody diarrhea leading to dehydration. The other important complications that follow may include; respiratory depression, dyspnoea, shock, hypotension, marked leucopenia, thrombocytopenia, coagulation disorder, oliguria, hematuria, confusion, seizures, coma and ascending polyneuropathy. Alopecia and dermatitis are the late manifestations that develop about one to two weeks after poisoning.

Diagnosis
Bio-medical analysis: daily full blood counts, coagulation tests, serum electrolyte levels and urinalysis are the important investigations to assess the clinical condition.

First aid measures
If the patient is conscious and alert, induce vomiting by tickling the back of the throat or by giving syrup of ipecac. If not responded can be carried out stomach wash. The patient should be admitted to a hospital immediately with, if available vomit and any remaining plant material.

Management principles
Carefully monitor the respiration. Ensure adequate airway, perform gastric lavage immediately. Anticipate and treat hypotension with adequate intravenous fluids and vaspressors. Blood transfusion is also helpful to support the circulation. Continuous cardiac monitoring is useful. Correct dehydration and electrolyte imbalance. Monitor renal function. Initial forced diuresis enhances elimination of colchicines and should be performed once dehydration and shock is corrected. Keep the patient under observation.

Treatment[39]
Decontamination- Activated charcoal therapy may be effective. Colchicine is belived to undergo enterohepatic recirculation. Multiple dose activated charcoal may interrupt enterohepatic recirculation, though there is no clinical evidence that this decreases toxicity or improves outcome.

Symptomatic and supportive measures-
- Fluid and electrolyte status, especially potassium levels, should be followed closely, with administration of appropriate IV fluids.
- A complete blood count should be done daily, monitoring for bone marrow depression. Patient suffering from bone marrow depression should be isolated to protect the patient from infection.
- Analgesics or opiates (with an ant cholinergic drug if necessary) may be used to control severe abdominal pain.
- Respiratory failure requires aggressive supportive care including mechanical ventilation.

Fatal dose-uncertain (more than 750mg).[41]

Fatal period- Uncertain.[41]

Autopsy findings- No specific findings are seen.[41]

Medicolegal importance-The poisoning due to ‘gloriosa superb’ is mostly accidental. The kanda lepa is applied on the skin on umbilicus, perineum and inguinal region for the purpose of labourless delivery and abortion. For the criminal abortion it is introduced in vagina. This may lead to accidental poisoning.[41]

DISCUSSION
Kalihari is found in many parts of India. This Kalihari is used therapeutically described in Indian system of medicine also having poisonous properties. As per Ayurveda toxicological classification Kalihari included in Shhavar mula visha and irritant organic vegetable poison as per modern toxicology. Kalihari included in Upavisha described in Rashatrastra text. Upavisha are low in toxic potency than visha. In many diseased condition Kalihari is used therapeutically externally as well as internally. It possesses strong abortifacent action so named as Garbhhanut, Garbhapatini etc. Kalihari also useful combat various disease condition such as various skin disease ,piles, worm infestation and inducing labour etc. Because of its similar pharmacological action, the plant is sometimes used as an adulterant of aconite. The
juice of the leaves is used to kill head lice and also as an ingredient in arrow poisons.

CONCLUSION

Kalihari (Gloriosa superba) is categorized under sthavara visha (plant origin). Acharya Charak have clearly mentioned even a strong poison can become an excellent medicine if administered properly, on the other hand even the most useful medicine act as a poison if not handled correctly. Kalihari is an abortifacient plant, accidental poisoning is very common, cases involve children for whom plants are accessible and attractive and consumed mistakenly as a sweet potato. The tuber has commonly been used as suicidal agent among women in rural areas and it has also been used for homicide. Active constituents of Kalihari may exert toxic effect at high concentration. The purification (shodhana sanskara) processes are basically intended to reduce the toxicity for medicinal use.

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