



A TOXICOLOGICAL REVIEW ON UPAVISHA 'KALIHARI' (*GLORIOSA SUPERBA*)

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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, belongs to family *Liliaceae*. 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 abortifacient stimulant and anthelmintic properties it is used to treat leprosy. Hence in this article various toxicological aspect of *Kalihari* along with these therapeutic usages, 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] *Agadtantra* is the branch of *Ayurveda* which deals with the diagnosis and treatment of various poisoning 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 *Agadtantra*. 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 abortifacient 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 Kushtha*,^[8] *Arsha*,^[9] *Bhagandar*, *Asadhya Gandamala* can be treated by *Pana*, *Abhyanga* and *Nasya* of *Gunjyadya Taila*.^[10] As the *Kalihari* is the *Sthavar Vanaspathic upavisha*.^[11] 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 *Bhavprakash Nighantu*. This elegant climbing plant is common in Bengal and in low Jungle throughout India.

Synonyms of Kalihari

Kalihari Halini, Langali, Shakrapushpi, Vishalya, Agnishikha, Ananta, Wanhivaktra, Garbhanut,^[12] *Siri, Kaliharika, Agnijivha, Swarnapushpa, Dipta, Naktendapushpika, Vidyujwala, Vanhishikha, Garbhapatini, Hali, Langlini*,^[13] *Agnimukhi*,^[14] *Indrapushpi. vanhijivha. vanhimukhi*.^[15]

Guna Karma

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

Varga

Bhavprakash Nighantu- Guduchyadi varga

Kaidev Nighantu-Aushadhi Varga
Priya Nighantu-Shatpushpadi Varga
Dhanvantari Nighantu-Karviradi varga
Shodhal Nighantu- Karviradi varga
Madanpal Nighantu-Pahala Varga
Sushruta – Katukavarga

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

Medicinal use

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

Kalihari in Bruhatrayi

The rhizomes of *costus speciosus* (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*.

Kalihari (Gloriosa Superba) is included in *Sthavar Mulavisha* by *Charak*,^[19] and *Kanda Visha* included in *Katukaverga* by *Sushruta*. It used as *pratiwap dravya* while preparation of *Tikshnakshar*.^[20] *Kalihari kanda* is an abortifacient used for the expulsion of foetus, *Kanda lepa* applied on palm and sole it gets labourless delivery. *Kalihari* 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), *Asadhya Gandamala* can be treated by *pana, Abhyanga* and *Nasya* of *Gunjadya*,^[28] *Apachi* can also be treated by the *Abhyanga* of *Kalihari Siddha Taila*,^[29]

Kalihari also included in *vranashodhankaraka yoga*.^[30] In the treatment of *Apakwa Ajagallika* and *Kaphaj Arbud Kalihari* used.^[31,32]

While the preparation of *Samshodhana Varti Kalihari* is used as a *Samshodhana dravya*.^[33] *Kalihari* do the *Samshodhana dravya*. *Kalihari* do the *Samshaman*.^[34] and *Samshodhana* of *Kapha*.^[35] There is a reference of use of *Kalihari* in *Uttarbasti dravya* by *Shushrut*. *Uncurable disease* can also be cure by the use of *Kalihari* as a *Rasayan Yoga*. Patient can live upto 500 years by

taking this *rasayan yoga*. *Kalihari* is used as *Virechaka* also.^[36]

Shodhana process of Kalihari kanda in Laghutrayi

Before using *Kalihari Kanda* as medicine or to prepared *kalpa Shodhana* (purification) of *Kalihari* is advised in *Samhita*.

Methods of *Shodhana sanskara* of *Kalihari kanda* in different *Ayurvedic* texts are as follows.

1. By *Yogratnakar* with *Gomutra sthapitam*.^[37]

Quantity sufficient *Gomutra* taken in earthen pot and pieces *ashuddha Kalihari Kanda* immersed in it. After 24 hrs *kalihari kanda* pieces were drown out from the earthen pot and dried.

2. By *Bhavprakash* with *Takra sthapitam*.^[38]

Quantity sufficient *takra* mix with *saindhav* taken in earthen pot and *ashuddha Kalihari kanda* pieces suspended in it and on next day *Kalihari kanda* were drown out and wash with hot water. After this it again mix with fresh *Takra* with *saindhav* and repeat the same procedure for next 6 days. Lastly wash with hot water it dried.

Modern Review of Kalihari (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^[40]

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: C₂₂H₂₅NO₆

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 157⁰C.

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 superba*' 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 a 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 superba*. 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 vasopressors. 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 believed 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 superba*' 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 *Sthavar mula visha* and irritant organic vegetable poison as per modern toxicology. *Kalihari* included in *Upavisha* described in *Rashastra* 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 abortifacient action so named as *Garbhanut*, *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 a 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.

REFERENCES

1. Bramhanand Tripathi; *Charak Samhita*, third edition, *Chaukhamba Surbharti Prakashan* Varanasi; *sutrasthan* 30/26 *Dashmahamuliya Adhyaya*, 1994; 565.
2. Kaviraj Ambikadatta Shshtri; *Sushruta Samhita of maharshi sushruta*; part-1, 14th edition, *chaukhamba sanskrita sansthan*, Varanasi; *sutrasthana* 1/14. *vedotpatti adhyaya*, 2003; 4.
3. Dr.C.K. Parikh; Parikh's textbook of medical jurisprudence forensic medicine and toxicology; reprint edition. CBS publishers and distributors, Daryaganj, New Delhi-110002, section 8, clinical and forensic toxicology, Q.8.01, 2002; 8.1.
4. Bramhananda Tripathi; *Charak Samhita*, third edition, *chaukhamba surbharti Prakashan* Varanasi; *sutrasthan* 1/27, *Dirghajivitiya adhyaya*, 1994; 47.
5. Dr. K.M.Nadkarnis; *Indian material medica with Ayurvedic, Unani and home remedies vol-1*; reprint, Bombay; *Gloriosa superba*, 1993; 579.
6. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *sharir sthan* 10/23, *Garbhini Vyakaran sharir adhyaya*, 1989; 77.
7. Shri Lalchandra Vaidya; *Ashtang Hrudayam*, first edition, Motilal banarasida Prakashan Delhi; *Chikitsasthan* 22/7, *vatrakta chikitsa Adhyaya*; (reprint 1977), 1963; 532.
8. Shri Lalchandra Vaidya; *Ashtang Hrudayam*, first edition, Motilal banarasida Prakashan Delhi; *Chikitsasthan* 19/45, *kushtha chikitsa Adhyaya*; (reprint 1977), 1963; 512.
9. Shri Lalchandra Vaidya; *Ashtang Hrudayam*, first edition, Motilal banarasida Prakashan Delhi; *Chikitsasthan* 8/7160, *Atisar chikitsa Adhyaya*; (reprint 1977), 1963; 442.
10. Shri Lalchandra Vaidya; *Ashtang Hrudayam*, first edition, Motilal banarasidas Prakashan Delhi; *Uttarsthan* 30/18-20, *Granthyarbud pratished adhyaya*; (reprint 1977), 1963; 748.
11. Pandit Kashinath shastri, *Rasatarangini of sadanand Sharma*, reprint edition, Motilal Banarasidas prakashak, Delhi; *chapter* 24/6, *Vishopvishavidnyaniyam*, 1944; 648.
12. Shri Bramhashankar shastri; *Bhavprakash-1*, fifth edition, *chaukhamba Sanskrit series office*, Prakashan, Varanasi; *Guduchyadi varga adhyaya*, 1969; 312.
13. Pandit Kashinath shastri, *Rasatarangini of Sadanand Sharma*, 11th edition, Banarasidas prakashak, Delhi; *Chatusarvishtarang adhyaya*, 496-497: 739.
14. Dr. Zarkhande Oza and Dr. Umapati Mishra, *Dhanvantari Nighantu*, reprint edition, *Chaukhamba surbharti prakashak*, Varanasi; *Karviradi varga* 4/ 8, 2004; 164.
15. Acharya Priyavat Sharma and Dr. Guruprasad Sharma, *Kaidev Nighantu*, first edition, *Chaukhamba oriyantaliya Prakashan*, Varanasi; *Aushadhi varga slok* 1075, 1979; 198-199.
16. Shri Bramhashankar shastri; *Bhavprakash-1*, fifth edition, *chaukhamba Sanskrit series office*, Prakashan, Varanasi; *Guduchyadi varga adhyaya*, 1969; 312.
17. Pandit Kashinath shastri, *Rasatarangini of Sadanand Sharma*, 11th edition, Banarasidas prakashak, Delhi; *Chatusarvishtarang adhyaya*, 501-503: 741.
18. Pandit Kashinath shastri *Rasatarangini of Sadanand Sharma*, 11th edition, Banarasidas prakashak, Delhi; *Chatusarvishtarang adhyaya*, 504-509: 741.
19. Pandit Kashinath shastri and Dr. Gorakhnath chaturvedi, *Charak Samhita*, sixteenth edition, *Chaukhamba Bharti Academy publishers and distributors* Varanasi; *Chikitsasthan-Vishachikitsitam adhyaya*, 1989; 23/11-13: 625.
20. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Ksharagnikarmavidhimadhyay*, 1963; 30/19-21: 213.
21. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Vatrakta chikitsa Adhyaya*, 1963; 22/17: 532.
22. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Kushtachikitsa adhyaya*, 1963; 19/45: 512.
23. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Atisar chikitsa adhyaya*, 1963; 8/160: 442.
24. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Arshachikitsa adhyaya*, 12/6: 38.
25. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Bhagandar chikitsitam adhyaya*, 8/39: 47.

26. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Bhagandar chikitsitam adhyaya*, 8/45: 48.
27. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Switrakrimi chikitsa adhyaya*, 1963; 20/16-17: 520.
28. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Granthya arbud pratished Adhyaya*, 1963; 30/18-20: 748
29. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Granthya arbud pratished Adhyaya*, 1963; 30/21:748.
30. Shri Lalchand Vaidya, *Ashtang Hrudayam*, First edition, Motilal Banarasidas Prakashan, Delhi; *Vranapratished Adhyaya*, 1963; 25/44: 724.
31. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Kshudra roga chikitsitam adhyaya*, 20/3-4: 93.
32. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Granthapacharbudganda chikitsitam adhyaya*, 18/36: 86.
33. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Mishrakam adhyaya*, 36/13: 138.
34. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Sanshodhan Sanshamaniya adhyaya*, 39/9: 149.
35. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Chikitsasthan*, *Sadyovrana chikitsitam adhyaya*, 2/90: 20.
36. Kaviraj dr Ambikadatta shashtri, *Sushrut Samhita*, seventh edition, *Chaukhamba Sanskrit sansthan*, Varanasi, *Sharirasthan*, *Garbhiniyakaran shariram adhyaya*, 10/23: 77.
37. Shri Lakshmpatishastri Ayurvedacharya; Yogratanakar, seventh edition, *Chaukhamba Sanskrit Sansthan*, Varanasi publication; *purvardha 1, Upavishaparakarnam*, 1999: 167.
38. Shri Bramhashankar shastri; *Bhavprakash 1*, fifth edition, *Chaukhamba Sanskrit series office*, Prakashan, Varanasi; *Guduchyadi Varga Adhyaya*, 1969; 314.
39. V V Pillay, Textbook of forensic medicine and toxicology, 18th edition, Paras medical publisher, Hyderabad, chapter 30, Irritant plant, 2017; 585.
40. <http://www.inchem.org/documents/pims/plant/pim245.htm#SectionTitle>.
41. Professor Dr.S.G.Huparikar, Textbook of Agadtantra, 1st edition june, published by Rashtriya shikshan mandal Pune; lecture, 2008; 22: 158.