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Karavira (*Nerium oleander* / *Thevetia neriifolia*): A Comprehensive Review of Its Botanical Identity, Ayurvedic Significance, Toxicological Profile, and Therapeutic Potential-*A Review Article*

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Abstract:

Karavira is one of the most well-recognised medicinal and toxic plants documented across classical texts of Ayurveda. Classified under the Upavisha (sub-poisonous) category, Karavira has occupied a dual role — as a potent cardiotoxin on one hand, and as a valuable therapeutic agent on the other. The plant corresponds botanically to two major species: *Nerium oleander* Linn. (White/Red Oleander) and *Thevetia neriifolia* Juss. (Yellow Oleander or Pita Karavira). Both species contain cardiac glycosides that produce digitalis-like effects on the heart.

Keywords: Karavira, Upavisha, *Nerium oleander*, *Thevetia neriifolia*, Cardiac Glycosides, Shodhana, Agadtantra, Ayurveda.

1. Introduction

Karavira, commonly known as Oleander, stands as one of the most prominent toxic plants described in Ayurvedic pharmacopoeia. The genus *Nerium* (White and Red Oleander) and *Thevetia* (Yellow Oleander)

both belong to the family Apocynaceae and are collectively identified under the Ayurvedic term Karavira. These are large evergreen ornamental shrubs grown widely throughout India, particularly in gardens, hedges, roadsides, and near temples. From the earliest Vedic literature through the classical Samhitas and medieval Nighantus, Karavira has been acknowledged for its dual character. On one side, it is a Sthavara Visha (vegetable poison), classified under Mula Visha Varga (root poisons) by Charaka and Sushruta. On the other, it has been employed in treating a wide range of disorders including Kushtha (skin diseases), Vrana (wounds), Netraroga (eye disorders), Jvara (fever), and as an antidote in snake bite management. The medicinal significance of Karavira derives from its cardiac glycosides — primarily Oleandrin in *Nerium* and Thevetin/Peruvoside in *Thevetia*. These compounds exert a digitalis-like action on the heart, making the plant both therapeutically promising and dangerously toxic. Poisoning incidents are particularly common in southern India and Sri Lanka, where the plant grows abundantly and is easily accessible. In the context of Agadtantra (Ayurvedic toxicology), Karavira holds special importance. This review systematically compiles the available classical and contemporary literature to present a holistic understanding of this familiar yet complex plant.

2. Botanical Identity and Classification

2.1 Nomenclature and Botanical Description

Karavira is represented by two primary botanical species:

a) *Nerium oleander* Linn. / *Nerium indicum* Mill. — White and Red varieties (Shveta and Rakta Karavira)

b) *Thevetia neriifolia* Juss. ex Steud. / *Thevetia peruviana* (Pers.) K. Schum. — Yellow variety (Pita Karavira)

Both species are large, profusely branched, evergreen shrubs with milky latex present throughout all parts. Nerium indicum grows up to 3 metres in height, with linear-lanceolate, thickly coriaceous leaves arranged in whorls of three. Flowers are red or white, fragrant, appearing in terminal polychasial cymes. Thevetia neriifolia is taller, reaching up to 12 feet, with alternate, longitudinal leaves and bell-shaped yellow flowers. Fruits of the yellow variety are round, approximately 5 cm in diameter, containing a triangular light-brown seed with two compartments. The plant is native to South America and West Indies but is now widely cultivated in tropical and subtropical India.

2.2 Varieties:

Ayurvedic Nighantus describe between two and five varieties of Karavira based on flower colour:

Reference / Text	Number of Varieties	Names
Shodhala Nighantu, Madana Pala Nighantu, Dhanvantari Nighantu	2	Shveta (White), Rakta (Red)
Kaideva Nighantu, Bhavaprakasha Nighantu, Modern classification	3	Shveta, Rakta, Pita (Yellow)
Raja Nighantu, Nighantu Adarsha	4	Shveta, Rakta, Pita, Krishna (Black)

Shaligrama Nighantu	5	Shveta, Rakta, Gulabi (Pink), Pita, Krishna
Grierson's Apocyanaceae classification	6	Alba, Rubra, Cornea, Florepleno Alba, Florepleno Corneo, Florepleno Rubra

Botanically, the White and Red varieties correspond to Nerium indicum, while Pita Karavira is Thevetia peruviana. The identity of the Krishna (Black) variety remains uncertain; it may represent a purplish-tinged variant of Thevetia.

3. Names in Different Languages and Synonyms

3.1 Regional and Vernacular Names

Language / Region	Name
Sanskrit	Karavira, Ashvamar, Hayamar
Hindi	Safed Kaner, Lal Kaner, Pila Kaner
Marathi	Karavir, Kanher, Kalhher, Patari
Bengali	Shveta Karavira, Karabi
Tamil	Kanel Chettu, Aral
Kannada	Vakana Linge, Kanagilu
Telugu	Ganneru, Kasturi Patte
Malayalam	Arali, Panchaarali, Kanaviram
Gujarati	Pila Kanir
English	Oleander, Yellow Oleander, Lucky Nut
Arabic	Sumul-himar (Donkey poison)
Pharasi / Persian	Kharajahar (Donkey poison)
Latin	Nerium oleander, Nerium odorum

The Arabic name 'Sammulmar' means snake venom, highlighting how ancient cultures equated this plant's toxicity with that of venomous creatures.

3.2 Sanskrit Synonyms

A total of 75 synonyms have been attributed to Karavira across various Nighantus, grouped by the character they describe: • Based on toxicity / potency: Kanavira, Canda, Chandaka, Chandataka, Pratihasa, Vira, Viraka, Mahavira, Pracanda. • Based on action on horses (accidental poisoning): Ashvaghna, Ashvamara, Ashvamarak, Ashvanashak, Hayamara, Hayaghna, Hayari, Hayaripu. • Based on morphology (many leaves / flowers): Shataprasa, Shatkunda, Shatkumbha. • Specific to Pita (Yellow) variety: Gaurpushpa, Ravipriya, Peeta Karavira, Sugandhikusuma, Patalika. • Specific to Rakta (Red) variety: Canda, Laguda, Raktapushpa, Bhutadravi. • Specific to Shveta (White) variety: Ashvamaraka, Prathihasa, Shatapushpa, Shvetapushpa

4. Classical Categorisation in Ayurvedic Texts

4.1 Varga Classification

Classical Text	Varga (Classification Group)
Charaka Samhita	Kushthaghna Mahakashaya; Tikta Skandha; Mula Visha Varga; Tikta Varga
Sushruta Samhita	Laksadi Gana; Shiro Virechana Varga; Mula Visha Varga; Daha Shamanardha Dharagraha Shayan
Ashtanga Hridaya / Vagbhata	Laksadi Gana
Bhavaprakasha Nighantu	Guduchyadi Varga; Visopavisha Varga
Dhanvantari Nighantu	Karaviradi Chaturdasha Varga; Upavisha Gana of Misrakadi Varga
Raja Nighantu	Karaviradi Varga
Kaideva Nighantu	Sthaavara Visha; Aushadha Varga; Dhatu Varga
Shaligrama Nighantu	Guduchyadi Varga

4.2 Historical References

The historical footprint of Karavira extends from the Vedic era to the present. The Rigveda refers to it as 'Hrudya Vanaspati' (heart-beneficial plant). The Mahabharata (Aaranyakparva) mentions Karaviravan. Kautilya's Arthashastra listed Karavira among ingredients for Madanayoga (intoxicating preparation). Ancient texts Mritchhakatik and Mahabhasya describe garlands of Karavira flowers given to those condemned to death — an early acknowledgment of its lethal nature.

Charaka Samhita (Cha.Chi. 7/104-105) references Shveta Karavira in the treatment of Kushtha. Sushruta Samhita refers to it as 'Karavira Soma' among varieties of Soma and indicates Karavira Kshara in Ashmari (urinary calculi) treatment. Ashtanga Hridaya (A.H.Sha.1/61) recommends Karavira leaf-processed oil for treating itching and stretch marks (Kikwis) in pregnant women — a remarkably modern cosmetic indication.

5. Pharmacological Properties (Rasa Panchaka)

Property	Value
Rasa (Taste)	Katu (Pungent), Tikta (Bitter), Kashaya (Astringent)
Guna (Quality)	Teekshna (Sharp/Penetrating), Laghu (Light)
Virya (Potency)	Ushna (Hot)
Vipaka (Post-digestive effect)	Katu (Pungent)
Dosha Karma	Kaphavata Hara (Reduces Kapha and Vata)
Prabhava	Not attributed in Nighantus

Based on these pharmacodynamic properties, Karavira has been used both externally and internally. Externally it is most effective in skin disorders (Kushtha, Kandu), wound management (Vrana Shodhana, Ropana), eye conditions, and as a Shirovirechana (nasal purgative) herb. Internally, it is classified as poisonous unless properly purified, after which its cardiotonic, diuretic, antipyretic, and aphrodisiac properties may be utilised.

6. Phytochemical Composition

6.1 Nerium oleander / Nerium indicum

The principal active constituents of Nerium oleander include the cardiac glycosides Oleandrin (C32H48O9), Neriin, Folinerin, and Rosagenin. Additional phytochemicals include Neriodorin, Neriodorein, Scopoletin, Scopolin (from bark), Tannin, Rutin, Glycosides, Aromatic oil, Potassium salts, Fenolinic acid, and the red colouring agent Nerifolin. The root bark contains alpha-amyrin, beta-sitosterol, kaempferol, betulinic acid, and oleanolic acid. The leaves and stem contain Dombonitol, while root bark contains 2,4-dihydroxy acetophenone.

6.2 Thevetia neriifolia (Pita Karavira)

Thevetia seeds contain Thevetin A (C42H64O19, Mol. Wt. 872.93) and Thevetin B / Cerberoside (C42H66O18, Mol. Wt. 858.95) as the major triosides. Other important glycosides include Peruvoside (C42H44O9, Mol. Wt. 548.65), Neriifolin, Cerberin (2'-O-acetylneriifolin), Theveneriin (Ruvoside), Peruvosidic acid, Theveside, Viridoside, and Thevefolin. Thevetin is present in seeds at 3.6 to 4 per cent as determined by physiological assay.

6.3 Peruvoside — The Most Important Glycoside

Among all Thevetia glycosides, Peruvoside is considered the most clinically significant. Pharmacological studies demonstrate that Peruvoside exerts a quick and powerful positive inotropic effect in experimental animals. Using dog heart-lung preparations, Peruvoside proved nearly as quick-acting and potent as the standard drug Ouabain in treating failing hearts. In therapeutic doses, it reduces right atrial pressure and increases cardiac output. Clinical trials confirm quick action when administered intravenously, dependable oral absorption, and low acute and cumulative toxicity. Peruvoside is reported to be superior to both Digoxin (oral) and Ouabain (intravenous), producing comparatively smaller ECG alterations.

7. Pharmacognostic Profile of Karavira Root

7.1 Macroscopic Characters

The root of Karavira (Nerium indicum) is elongated and thick with a dark-brown surface. It is less branched, with brownish bark showing small longitudinal fissures. The cut surface reveals a nearly circular or oval cross-section with a dark-brown outer cork region and a greenish-brown cortex. The central xylem is large and woody with unevenly distributed small pores of varying size.

7.2 Microscopic Characters

Transverse section reveals a highly lignified outer cork layer with linear arrangement. The inner cortex comprises 20 to 25 layered parenchymatous cells forming a compact zone, with numerous small secretory canals. Xylem occupies the centre, surrounded by distinct phloem bundles. Narrow medullary rays connect the pith to the cortex. In powder microscopy, the light-brown root powder shows cork cells, calcium oxalate crystals, fibre fragments with tapering ends (approximately 200 microns), pitted vessels, reticulate vessel fragments, sclereids, and stone cells.

7.3 Physicochemical Parameters

Parameter	Value
Loss on drying (w/w %)	4%
Foreign matter	Nil
Total Ash value (%)	3.3%
Acid insoluble Ash value (%)	1.0%
Water soluble Ash value (%)	2.3%
Extractive value — Ashodhita (unpurified)	14.96% (13.47 g per 90 g crude drug)
Extractive value — Shodhita (purified)	14.66% (13.66 g per 90 g crude drug)
Total Polyphenolic content — Ashodhita	4.14% w/w
Total Polyphenolic content — Shodhita	2.59% w/w
Total Cardiac glycoside content — Ashodhita	3.27% w/w
Total Cardiac glycoside content — Shodhita	3.05% w/w

The qualitative phytochemical analysis of both Ashodhita and Shodhita extracts shows the presence of Carbohydrates, Alkaloids, Flavonoids, and Saponins. Tannins, Starch, and Steroids tested negative in both. The quantitative reduction in polyphenolic content after Shodhana (from 4.14% to 2.59%) is significant, while cardiac glycosides showed a smaller decrease (3.27% to 3.05%), indicating that the purification process primarily targets polyphenolic toxins rather than glycosides.

8. Shodhana (Purification) of Karavira

Karavira is classified under Upavisha (semi-poison) in Bhavaprakasha Nighantu and Rasatarangini. Shodhana is mandatory before internal therapeutic use. The classical method described in Yogaratnakara and Sharangadhara Samhita involves:

Standard method (Samanya Shodhana): Steam the coarsely powdered Karavira root bark in cow's milk (Godugdha) using Dola Yantra (swinging vessel apparatus) for one Prahara (approximately three hours) continuously on medium flame. The milk gradually turns woody-brown in colour during the process. Vishesh (Special) Shodhana: Processing with Godugdha and Gomutra (cow urine). Further Shodhana of the Upavisha group can also be done through Pancagavya. The Shodhana process primarily reduces the total polyphenolic content, which is associated with the irritant/toxic effects of the plant, while the cardiac glycoside content undergoes only modest reduction. This explains why Shodhita Karavira still retains cardiotonic activity while exhibiting reduced toxicity.

9. Therapeutic Uses in Ayurvedic Classics

According to the comprehensive review of classical texts, Karavira appears as an ingredient in 472 formulations, of which 222 are unique after removing duplicates. Among these, 154 have external uses, 61 have internal uses, and 7 have both. The formulations address 62 disease conditions.

Maximum formulations address Kushtha (58), followed by Shvitra / leukoderma (15), Vrana / wounds (13), Jvara / fever (11), Upadamsha / syphilis (10), Vajikarana / aphrodisiac use (10), Arsha / piles (9), Bhagandara / fistula-in-ano (9), and Visha Chikitsa / poison management (9).

The dominant dosage form is Taila (medicated oil) accounting for approximately 29% of all formulations, followed by Lepa (topical paste) at 24.3%, Rasa Kalpana (mercurial preparations), Kvatha (decoctions), Ghrita (medicated ghee), and Churna (powder). External applications dominate due to the plant's toxic nature when ingested.

9.1 Selected Classical Formulations

Formulation	Reference	Indication	Part Used
Karaviraadi Taila	Multiple Samhitas	Kushtha, Bhagandara, Pita, Shtriroga	Mula, Patra (Shveta), Moolatvaka, Pushpa
Karaviraadi Agada	A.H.U. 36/70	Sarpa Dansha (Snake Bite)	Pushpa, Mula
Shvetakaravira Taila	Charaka Chi. 7/104	Kushtha	Moolatvaka
Karavira Patra Siddha Taila	A.H.Sha. 1/61	Garbhini Kandu and Kikwis (Stretch Marks)	Patra
Cirbilvadi Lepa	Chakradatta	Vrana Shotha (Wound Inflammation)	Mula
Karaviraadi Kwatha (Lepa)	A.H.Chi. 19/61	Kushthaghna	Multiple parts
Trifaladi Lepa	Charaka Chi. 21/87	Kaphaja Visarpa	Mula
Sarvesvara Rasa	Multiple Rasa Granthas	Vatarakt, Sparshavata, Kushtha	Moolatvaka (Shveta)

10. Toxicological Profile

10.1 Active Toxic Principles

- Nerium oleander: Oleandrin, Neriin, Folinerin, Rosagenin
- Thevetia neriifolia: Thevetin A, Thevetin B (Cerberoside), Peruvoside, Thevotoxin, Cerberin

10.2 Fatal Dose and Period

Species / Part	Fatal Dose	Fatal Period
Thevetia — Seeds	8 to 10 whole seeds (adults); 1 seed kernel (children)	Up to 24 hours
Thevetia — Root	15 to 20 grams	Up to 24 hours
Thevetia — Leaves	5 to 10 leaves	Up to 24 hours
Nerium — Leaves	5 to 15 leaves	Usually within 24 hours
Nerium — Root	15 grams	Usually within 24 hours

10.3 Signs and Symptoms

Toxicity presents in three stages — mild, moderate, and severe. Key manifestations include: • Gastrointestinal: Burning sensation in mouth, nausea, profuse vomiting (90% in mild toxicity), abdominal cramps, diarrhoea, excessive frothy salivation, tingling/numbness of tongue. • Cardiovascular (predominant): Bradycardia (56-63%), cardiac arrhythmia (35-55%), hypotension (23-77%), heart block, tachycardia. • Neurological: Drowsiness, dizziness, headache, restlessness (40-75%), convulsions, semi-consciousness, coma. • Terminal: Ventricular fibrillation leading to cardiac arrest; peripheral vascular failure is the most common cause of death

10.4 ECG Changes

Characteristic ECG changes include: absent or distorted P-waves; P-R interval prolongation; ST segment depression; sinus arrhythmia; various degrees of heart block including first-degree heart block, Wenckebach's phenomenon, bundle branch block, and complete heart block with Stokes-Adams syndrome; and supraventricular or ventricular tachycardia.

11. Treatment of Karavira Poisoning

11.1 Modern Medical Management

- Immediate gastric lavage / emesis. • ECG monitoring and cardiac rhythm management throughout
- Antiarrhythmics: Lignocaine and Phenytoin 100-200 mg QID for arrhythmias. • Atropine injection for AV block. • Propranolol (1-3 mg OD) for blood pressure management. • Sodium molar lactate infusion with glucose, Adrenaline (2 ml of 1:1000), and Noradrenaline (2 mg) for cardiovascular correction. • Correction of fluid and electrolyte imbalance; monitoring of serum potassium and renal function. • Anti-digoxin Fab fragments — proven effective in clinical trials for Thevetia-induced cardiotoxicity. • Fructose-1,6-diphosphate (FDP) — a novel antidote proven in randomised double-blind study

11.2 Ayurvedic Treatment

According to Ayurvedic classics, the following are recommended as antidotes for Karavira poisoning:

- Buffalo curd mixed with sugar (Mahisha Dadhi with Sharkara)
- Buffalo milk (Mahisha Dugdha) consumed orally
- Powder of Arkatvaka (Calotropis bark) mixed with water
- Emetics followed by clarified butter (Goghruta) — for yellow oleander
- Terminalia chebula (Haritaki) fruit has shown antidote potential in preliminary studies

12. Medicolegal Aspects

Karavira holds important medicolegal significance given its widespread availability and potent toxicity: • Suicide: The most common medicolegal use, especially among rural women facing dowry or marital difficulties. Decoction of root or leaves, or seed pulp, is commonly ingested. • Criminal Abortion: The root is used both locally and internally for procuring abortion — a use documented across ancient texts and modern forensic reports. • Accidental Poisoning: Occurs when plant parts are used therapeutically without proper preparation — e.g., leaf decoction applied externally for inflammation, root paste used for cancer, or plant used for hypnotism. • Homicide: Rare but documented cases exist. • Cattle Poisoning: Powdered seeds mixed with cattle feed, or juice applied on cloth introduced rectally. • Post-mortem Features: Congestion of organs, inflamed gastrointestinal tract, dilated body veins, petechial haemorrhages on pericardium. The plant's

glycosides resist heat and decomposition, allowing detection in decomposed or burnt bodies. Differential diagnosis of Karavira poisoning includes Digitalis poisoning and Tetanus (due to convulsive symptoms).

13. Modern Pharmacological Activities

Research on both species has demonstrated a wide spectrum of biological activities:

Activity	Species / Extract
Cardiotonic / Digitalis-like action	Both species — cardiac glycosides
Hepatoprotective	Nerium indicum methanolic flower extract
Antidiabetic	Nerium indicum chloroform/ethanolic leaf extract
Antioxidant	Methanolic extracts of leaves and flowers
Antimicrobial / Antibacterial	Ethanol extract of both species
Antifungal	Nerium indicum 50% ethanol fraction; Thevetia hexane extract
Anti-inflammatory	Fresh flowers of Thevetia neriifolia
Anticancer / Antileukemic	Anvirzel (Nerium indicum extract); Oleandrin
Antiviral	Methanolic extracts (herpes simplex, influenza)
Antimalarial / Larvicidal	Ethanolic and acetone extracts
Antidiarrheal	Ethanol-extracted leaves of yellow oleander
Antitermite	Thevetia neriifolia seed oil
Antispermatogenic	Methanolic extract of Thevetia stem bark
Antiangiogenesis	Oligosaccharides from Nerium indicum leaves
Diuretic	Potable extract of Nerium indicum
Neuroprotective	Flower polysaccharides of Nerium indicum

14. Discussion:

The dual identity of Karavira — as both a potent cardiac poison and a therapeutic medicinal plant — makes it uniquely fascinating from an Ayurvedic and modern pharmacological perspective. The plant's documented presence from the Rigveda through to current forensic toxicology reports testifies to its enduring importance in Indian medicine and public health. The Ayurvedic approach to Karavira is sophisticated. Rather than simply declaring it toxic, classical texts developed nuanced strategies: Shodhana to reduce toxicity while preserving therapeutic activity; careful specification of parts used, dosage forms, and indications; and the distinction between external and internal administration based on disease requirement and patient condition. The predominance of external formulations (particularly Taila and Lepa) in the 222 identified preparations reflects this careful approach. The pharmacognostic standardisation work on Karavira root represents an important step toward validating and integrating this traditional plant into evidence-based medicine. The finding that Shodhana significantly reduces polyphenolic content (from 4.14% to 2.59%) while producing only modest reduction in cardiac glycoside content (3.27% to 3.05%) provides phytochemical evidence supporting the Ayurvedic claim that purification reduces toxicity while preserving medicinal potency. From a public health perspective, Karavira poisoning remains a serious concern, particularly in South India and Sri Lanka. The lack of a universally available specific antidote makes prevention and early recognition critical. The identification

of Anti-Digoxin Fab fragments and Fructose-1,6-diphosphate as effective modern antidotes represents significant progress, while further clinical evaluation of Terminalia chebula (Haritaki) as an Ayurvedic antidote merits research attention. Future research opportunities include: standardisation of Shodhana methods using high-performance liquid chromatography; clinical trials evaluating Peruvoside against established cardiac glycosides; investigation of Karavira's cosmetic applications (particularly for stretch marks as indicated in Ashtanga Hridaya); and development of safe external formulations leveraging the plant's established antimicrobial, anti-inflammatory, and wound-healing properties.

15. Conclusion:

Karavira, encompassing both Nerium oleander and Thevetia neriifolia, is a familiar yet profoundly complex medicinal plant with deep roots in Ayurvedic tradition and modern toxicology. This review demonstrates: • The plant is described by 75 synonyms across Ayurvedic Nighantus, reflecting detailed ancient knowledge of its morphology, pharmacological properties, and toxicity. • Karavira appears in 222 unique formulations addressing 62 disease conditions, with Kushtha (skin diseases) receiving the greatest therapeutic attention. • Taila (medicated oil) and Lepa (topical paste) are the dominant dosage forms, reflecting the primacy of external use due to the plant's toxic nature. • Shodhana with cow milk for three hours is the classical purification method, validated by modern phytochemical analysis showing reduction of polyphenolic content. • The cardiac glycosides — particularly Peruvoside from Thevetia — hold genuine therapeutic promise as cardiotonic agents with a relatively favourable therapeutic index. • Toxicological awareness is essential: 8-10 Thevetia seeds can be fatal to adults; 1 seed kernel to children. The fatal period is within 24 hours. • The plant's medicolegal significance — particularly in suicide, criminal abortion, and cattle poisoning — demands vigilance in clinical and forensic practice.

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