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Nerium Oleander

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ABSTRACT:

Nerium oleander is a medical plant, used for the treatment of cancer.

Nerium oleander is an important medical plant in Indian folk medicine. It is a potentially lethal plant in many cases and poisoning is reported in tropical and subtropical parts of the world as well a number of suicidal cases are also common in south Asian nations, particularly in Sri Lanka and India. All parts of the plant are toxic and contain variety of cardiac glycosides which includes Neriine, Oleander, cardenolides, gentiobiosyl and odoroside. The plant species also produce secondary metabolites such as alkaloids, flavonoids and steroids which have pharmacological applications. Antibacterial, anthelmintic, anti-inflammatory, hepatoprotective, immunopotential, anti-pyretic, antioxidant, antifungal, anticancer, and anti-HIV properties are among the significant pharmacological activities. This review describes the evidence – based information regarding pharmacological activity as well as phytochemical of this plant.

KEY WORDS: Nerium oleander, Toxicity, Anti -bacterial, Antioxidant, Anthelmintic.

INTRODUCTION:

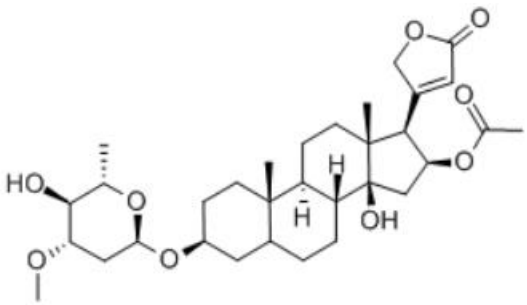
The name actually derives from the ancient Greek “naros” that means flowing, running with reference to its natural habitat representation by river bank: followed by the addition of the Latin word “olea” that underlines the resemblance of its leaves to the ones of the oliver tree. Oleander contain, in each of its parts (leaves, flower, fruits, branches, and the stem) several cardiotoxic glycosides, called cardenolides.

The Nerium toxic plant

HISTORY: Oleander was employed as poison in dart and arrow by prehistoric people. Radford 1986 despite its well-recognized toxic potential oleander has been used for centuries in traditional medicine for diverse ailments such as cardiac illness, asthma, comas, cancer, and epilepsy in ethnobotanical literature, Nerium oleander has been described as effective for these indications. Duke 2023 jamal,2012 a number of other Oleander uses have been reported although in most cases, evidence supporting use is lacking.

OLEANDRIN: Oleandrin is a cardiac glycoside found in the poisonous plant (Nerium oleander L.). It is located throughout the plant Digoxin-like qualities are shared by oleandrin, a primary phytochemical found in oleander, which is linked to the toxicity of oleander sap. Recent research has demonstrated that it may have anticancer effects.

STRUCTURE OF OLEANDRIN:



- Oleandrin chemical formula $C_{32}H_{48}O_9$
- The structure of oleandrin contain a central steroid nucleus with an unsaturated lactone ring structure on C17 and a dideoxy arabinose group on C3. In addition, the steroid has a substitute of an acetyloxy group on C16.
- The glucose that constitutes the glycoside is L-oleandrose.

MECHANISM OF ACTION OF OLEANDRIN:

Oleandrin

↓

Inhibits Na+/K+-ATPase

↓

Increases Na+

↓

Increases Ca2+

↓

Cardiac Toxicity.

OLEANDRIN AND ANTI CANCER ACTIVITY:

- Oleandrin has anti -tumor activities in various tumours such as ovarian cancer, glioma colon cancer.
- Osteosarcoma bladder cancer, breast cancer and leukaemia. The working mechanism involves the suppression of akt phosphorylation and the inhibition of mTOR.In vitro, oleandrin causes tumor cells to undergo apoptosis and suppresses proliferation.

OTHER ACTVIITIES:

- ✓ Cardiac glycoside activity
- ✓ Neuroprotective activity
- ✓ Hepatoprotective activity
- ✓ Anti diabetic activity
- ✓ Anti -oxidant activity
- ✓ Anti- inflammatory activity
- ✓ Anti -microbial activity
- ✓ Larvicidal activity
- ✓ Antinoclceptive activity
- ✓ CNSdepressant activity
- ✓ Locomotar activity
- ✓ Diuretic activity
- ✓ Immuno modulating activity
- ✓ Anti leukemic effects.

ETIOLOGY OF OLEANDER:

- ➢ Nerium Oleander is a plant species that has been widely cultivated and naturalized in many of the world.
- ➢ The etiology of Nerium Oleander refers to its origin, Evolution, and dispersal.

ORIGIN:

- ➢ Nerium Oleander is native to the mediterranean region, specifically in the areas surrounding the mediterranean sea.
- ➢ It is believed to have originated from the genus Nerium which includes several species of oleander.

EVOLUTION:

- ▪ Nerium oleander has evolved over time through a process of natural selection, adapting to various environmental conditions.
- ▪ It has developed unique characteristics such as its toxic compounds, to protect itself from herbivores and competing plants.

DISPERSAL:

- ✓ Nerium Oleander has been widely dispersed through human activity, including cultivation and trade.
- ✓ It has been in traduced to many regions including Asia, Africa, American where has becomes invasive in some area.

IMPORTANCE:

- ❖ **BOTANICAL NAME:** Nerium oleander
- ❖ **PRONOUNCIATION:** NEER-ee-um oh-lee-AN-der
- ❖ **FAMILY:** Apocynacea
- ❖ **SYNONYM:** Nerium indicum mill
- ❖ **COMMON NAME:** Arali, kanaveeram, suprasum, Indian oleander, common oleander, rosebay.

- **HINDI NAME:** Kaner
- **DISTRIBUTION:** From mediterranean through Persia, Afghanistan, to west Himalayas, cultivated elemental plant.

SIDE EFFECTS:

Cardiovascular Activity:

- cardiac arrhythmias (abnormal heart rhythms)
- Bradycardia (slow heart rate)
- Tachycardia (fast heart rate)
- Hypotension (low blood pressure)
- Cardiac arrest

Neurological Activity:

- Seizures
- Confusion
- Disorientation
- Dizziness
- Numbness

Gastrointestinal Activity:

- Nausea,
- Vomiting,
- Diarrhea,
- Gastrointestinal bleeding
- abdominal pain.

Respiratory System Activity:

- Coughing
- Wheezing
- Shortness of breathing

Others:

- Headache
- Fatigue
- Weakness
- Muscle cramps
- Renal failure (in severe case)
- Taking the oleander leaf, oleander leaf tea, or oleander seeds has lead to deadly poisoning.

PRECAUTIONS:

It's probably dangerous for anyone to consume oleander orally. However, oleander poses a particular risk to those who suffer from the following ailments.

Children: Oral oleander consumption in children is probably dangerous. Taking the oleander leaf, oleander leaf tea or seeds has led to deadly poisonings. There isn't enough information to know whether or not it is safe for pregnant or breast -feeding women to apply oleander to the skin. Stay on the safe.

Pregnancy and breast-feeding: Taking Oleander by mouth is **unsafe likely** as it might cause an abortion or cause birth defects. Ingestion of this plant affect the gastrointestinal system, the heart and the central nervous system. Positive inotropy is the primary impact of cardiotoxic glycosides.

PLANT DISCRIPTION:

Nerium oleander, also referred to as oleander rosebay, is a tiny tree or shrub that is grown as an ornamental and landscaping plant throughout the world in tropical and subtropical climates. It grows to heights between 6.5feel and 19.5 feet tall and 6 feet 10 feet wide.Nerium grows to 2-6 meters {7-20feet} tall. mosttsmost commonly grown in its natural shrub form, but can be trained into a small tree with a single trunk. Late spring to late summer is when this plant blooms.

"THIS PLANT'S ENTIRE RANGE OF TOXICITY MAY BE DEATHLY."

Nerium has long been thought to be a hazardous plant since it contains a number of harmful chemicals.

- However, its bitterness renders it unpalatable to humans and most animals .so, poisoning cases are rare and the general risk for human mortality is low Extended contact with sap can result in dermatitis, eye inflammation, and skin irritation.
- It is containing leaves, flowers, fruits, branches, stem, roots

LEAVES: The leaves are thick and lustrous, with a noticeable mid-rib that is lanceolate and grouped in whorls of three or pairs along the woody stem

- Pairs or whorls of three
- Thick and leathery, darks green in color
- **Leaf arrangement**: Opposite\subopposite; whorled
- **Leaf type**: Simple
- **Leaf Margin:** Entire
- **Leaf shape:** Lanceolate, linear
- **Leaf venation:** Pinnate
- **Leaf type and persistence:** Evergreen
- **Leaf blade length:** 4to 8 inches ;2to 4inches

- **Leaf color:** Green

The leaves of Nerium oleander plant

- The oleander leaves are used to treat patients with advanced malignancy.

FLOWERS:

- Clusters at end of each branch
- Deeply 5-lobed corolla
- Sweety scented
- **Flower color:** orange, pink, red, white, yellow.
- **Flower characteristics:** Pleasant fragrance; very showy; year - round flowering

During the summer months large clusters of white, pink, red, or yellow {for yellow oleander] flowers appear at the branches.All parts of the plant contain cardiac glycosides.Large clusters of white, pink, red, or yellow blooms (for yellow oleanders) occur at the extremities of branches during the summer. Every portion of the plant has

All parts of the plant contain glycosides 2.5-5cm {1-2in} diameter.

Nerium oleander flower

Mainly the plant is 4 colors of flowers are seen i.e.

- Red,
- White,
- Yellow,
- Pink.

Different types of Nerium oleander flowers.

FRUITS:

- Long narrow capsule 5-20 cm
- Fruit shape: Elongated
- Fruit length:3to6 inches
- Fruit covering: dry or hard

Greeny fruits of Nerium oleander

- Fruit characteristics: does not attract wild life, in conspicuous and not showy, no significant
- Litter problem.
- Split open at maturity to release numerous downy seed.
- The fruit a long narrow pair of follicles, when splits open at maturity to release numerous downy seeds
- The young unripe small fruit is green, but it turns red when fully grown but still unripe.
- Fruit {5-15cm long and 6-10 mm in diameter} consists of two follicles.
- The Nerium Oleander plant is likely bitter in taste.

BRANCHES:

- This fast-growing tropical shrub produces clusters of reddish 5- petalled flowers at the end of branches and are sweetly scented.

  Trunk bark branches: trees that are regularly developed with multiple trunks or that can be trained to grow multiple trunks grow mostly erect and do not droop; they are not very showy trees that like to produce numerous trunks.

- but can be trained to grow with a single trunk, no thorns.

DRUGS USED IN NERIUM OLEANDER:

1.Digoxin immune fab {Digibind}: Anti dote for severe cardiac toxicity

2.Atropine: For bradycardia [slow heart rate]

3.**Lidocaine:** For ventricular arrhythmia's

4.**Phenoborbital:** For seizures

5.**Activated charcoal:** decontamination {if ingested}

6.**Sodium lactate:** To manage hyperkalemia

7.**Calcium gluconate:** To manage hypocalcemia {low calcium levels}

8.**Magnesium sulfate:** To manage cardiac arrhythmias

9.**Potassium chloride:** To manage Hypokalemia {low potassium levels.

MEDICINAL PROPERTIES AND USES:

Oleandrin is of medical and toxicological interest, often used in folk medicine to treat various diseases, including congestive heart failure, abscess, asthma, dysmenorrhea, sores, eczema, epilepsy, herpes, leprosy, malaria, ringworm, scabies, indigestion, strokes and neurodegenerative diseases

Nerium Oleander has been used in traditional medicine for centuries, and its medical properties include:

1.Cardiac effect: Oleander contains cardiac glycosides, which can help to treat heart conditions like congestive heart failure.

2.Anti- cancer property: Some studies suggest that oleander extract may have anti-tumor and anti-cancer effect.

3.Anti-viral and Anti- microbial properties: Oleander has been shown to inhibit the growth of certain viruses and bacteria.

4.Anti -inflammatory properties: Oleander extracts may help reduce inflammation and pain.

5.Anti-oxidant properties: Oleander contains anti -oxidants which can help to protect against cell damage and oxidative stress.

6.Skin conditions: Nerium oleander extracts have been used to treat skin conditions like eczema, acne, and psoriasis.

7.Pain relief: Oleandrin has been used as a pain reliever, particularly for treating arthritis and other inflammatory conditions.

8. Neurological disorder Nerium oleander extracts have been used to treat anxiety, depression, and epilepsy.

9.Infections: Oleandrin has been used to treat bacterial and viral infections, including HIV.

PRODUCTION TECHNOLOGY:

oleander is a plant used in medicine in traditional medicine, and its production involves several steps

1.Cultivation: Nerium oleander is grown in well-drained soil and full sun.

2.Harvesting: Leaves and flowers are collected, usually during the flowering season.

3.Drying: the plant material is dried to remove excess moisture.

4.Extraction: Active compounds like oleandrin and marine are extracted using solvents or steam distillation.

5.Purification: The extraction is purified to remove impurities and enhance potency

6.Formulation: The purified extract is formulated into desired products like capsules, tinctures or topical creams.

7.Quality control: Products are tested for quality, safety, and efficacy.

SOME IMPORTANT CONSIDERATIONS:

Handling Nerium oleander requires caution, as its toxic if ingested.

Ensure proper identification and authentication of the plant material.

Follow good agricultural and manufacturing practices {GAMP] and regulatory guidelines.

IDENTIFYING FEATURES OF OLEANDRIN:

Oleandrin is a cardiac glycoside found, and its identification features include:

1.Chemical formula: $C_{32}H_{48}O_9$

2.Molecular formula :576.65g/mol

3.Melting point :248-250^{0}C

4.Solubility: Soluble in ethanol, methanol and chloroform and insoluble in water.

5.UVspectrum: Absorption maxima at 215-220 and 280-285 nm.

6.IRspectrum: characteristic peaks at

3400-3500cm^{-1} [Hydroxyl group}

1700-1750cm [Lactone ring}

7.NMRspectrum: characteristic signals for the aglycon and sugar moieties.

8.Mass spectrum: Molecular ion peak at m/z 576, fragment ions at m/z 45 and 458,440 and 324.

9.Chromatographic properties: values in TLC and HPLC, retention times in GC-MS.

10.Biological activities: Inhibits sodium {NA^+}/K^+-ATPase increases cardiac contractility, and exhibits cytotoxicity

PLANT PROFILE:

The Nerium oleander plan

METHODOLOGY:

PLANT MATERIAL:

1.Mediterranean region: Country such as Greece, Italy, turkey, Spain, Portugal, France.

2.Middle east, including Israel, Palestine.

3. North Africa: Including Egypt.

4. south Asia: including India, Pakistan and srilanka.

5.Southeast Asia: which including chaina, Japan.

Flowers blooming

EXTRACTION AND ISOLATION OF NERIUM OLEANDER:

PROCEDURE:

- Dried and ground Nerium oleander leaves [500gm] were extracted with methanol [2.51] using a Soxhlet apparatus for 24 hrs.
- The extract was filter and concentrated using rotary evaporation to yield a crude extract.
- The semi pure extract was further purified preparative HPLC on a C_{18} column with a gradient of water and acetonitrile oleandrin was isolated as a white crystalline powder with a purity of >95%.

PHYSICOCEMICAL TESTS:

- ❖ Ash value,
- ❖ Moisture content,
- ❖ PH value,
- ❖ Solubility test,
- ❖ Melting point, and
- ❖ Boiling point.

TEST	OBSERVATION	INFERENCE
Ash value	5.6%	Presence of inorganic matter
Moisture content	8.2%	Presence of water
PH value	6.5%	Slightly acidic
Solubility test	Soluble in methanol, ethanol and water	Presence of polar compounds
Melting point	200-202^{0}C	Presence of oleandrin
Boiling point	350-360^{0}C	Presence of volatile compound

TABLE3: preliminary phytochemical analysis of Nerium oleander

PHYTOCOSTITUENTS	TEST	OBSERVATION
Alkaloids	-Dragendorff's test -Mayers test -HCL test	positive
Glycoside test	-Keller kiliani test -Segals test -Sodium nitroprusside test	positive
Flavonoid test	-Shinoda test -Alcl3 test -HCL-mg test	positive
Phenolic test	-Ferric chloride test -Lead acetate test Gelatine test	positive
Terpenoid test	Salkowski test Liebermann Burchard test Hcl-Zn test	positive
Saponins test	Froth test Hemolysis test Borntragers test	positive
Tannin test	Gelatin test Lead acetate test	positive

	Ferric chloride test	
Anthraquinone test	Born Tragers test Modified born Tragers test	Negative

POWDER CHARACTERISTICS:

CHARATERISTICS	**PROPERTIES**
Color	greenish brown to brown
Odor	bitter, unpleasant
Particle Size	50-150µm
Particle Shape	Irregular, angular
Surface Area	1.5- 2.5m^2/g
Density	0.5-0.7 g/cm^3
Flow ability	poor to fair
Cohesiveness	high
Angle of repose	$30\text{-}40^0$
Bulk density	0.3 -0.5 g/cm^3
Tapped density	O.5 -0.7g/cm
Moisture content	5-10%
Ph	6.5-7.5
Solubility	Insoluble in ware and soluble in ethanol and methanol.
Dispersibility	poor in water fair in ethanol, methanol.

TREATMENT:

Oleandrin is a toxic compound found in Nerium Oleander and poisoning can occur through ingestion, inhalation or skin contact. Here treatment plan for oleandrin poisoning.

1.Mild poisoning:

1.Activated charcoal

2.Supportive care

3.Observation

2.Moderate poisoning:

1.Gasrtic lavage

2.Activated charcoal

3.Supportive care

4.Cardiac monitoring

3.Severe poisoning:

1.Hospitalization

2.Gastric lavage

3.Activated charcoal

4.Supportive care

5.Cardiac monitoring

6.Anti- arrhythmic medications

7.Digoxin immune fab

CONCLUSION:

cardiac glycosides, specifically oleandrin, are present in the extremely toxic plant Nerium oleander. If treatment is not received, ingestion or exposure to the plant can result in deadly cardiac, neurological, and gastrointestinal problems.Timely medical intervention is required for an appropriate diagnosis and treatment plan. Digoxin immune fab medication, decontamination, and supportive care are all part of the treatment. It's imperative to handle the plant carefully and keep plant pieces away from consumption or contact. Seek quick medical attention if you think you may have poisoned yourself with Nerium oleander.

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