



## A Review on Phytochemistry and Pharmacology of *Nerium indicum* Mill. Plant

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### ABSTRACT

*Nerium indicum* is an important medicinal material in Chinese folk medicine. All parts of the plant are reputed as therapeutic agent and have been used in folklore in a variety of ailments. The leaves and bark are used as heart tonic, diuretic, expectorant, diaphoretic and emetic. Its main active constituents are polysaccharides, cardenolides, glycosides, and triterpenoids. The important pharmacological activities are antiulcer, immunomodulating, antioxidant, molluscicidal, analgesic, anticancer and antidiabetic activity. This paper explains the evidence-based information regarding the phytochemistry and pharmacological activity of this plant.

**Keywords:** *Nerium indicum*, pharmacological screening, medicinal importance.

### INTRODUCTION

*Nerium indicum* Linn (Syn. *N. odorum soland*) commonly known as "kaner", belonging to family Apocynaceae. It is widely distributed in Mediterranean region and subtropical Asia but is native of Indian subcontinent and cultivated elsewhere.

All parts of the plant are reputed as therapeutic agent and have been used in folklore in a variety of ailments. The leaves and bark are used as heart tonic, diuretic, expectorant, diaphoretic and emetic.<sup>1</sup> Roots boiled in water are considered helpful when applied externally in skin complaints, herpes and ringworm infection. Leaf juice in very small doses is given in snake and other venomous bites. Juice of young leaves is effective in ophthalmia with lacrimation. Infusion of the leaves is abortive. Root paste is used in hemorrhoids, various type of cancer, Ulceration and leprosy.<sup>2-5</sup>

The plant in folk remedies to include the use as cardiogenic, diaphoretic, diuretic (promotes excretion), emetic and expectorant. Decoction of leaves has been applied externally in the treatment of scabies and to reduce swellings. The root is a powerful resolvent (power to disperse inflammatory). The oil prepared from the root bark is used in the treatment of leprosy and skin diseases of scaly nature. The whole plant is believed to have anti-cancer properties.

*Nerium oleander* L. is a small evergreen tree of 2–5 m in height with a wide geographical and ecological distribution, and its certain parts are used as medicinal materials in Chinese folk medicine.

It is widely grown as an ornamental plant in warm temperate and subtropical regions, due to its abundant and long lasting flowering and moderate hardiness. It is used for screens, hedging along highways, planting along beaches and in urban areas by removing suckers and leaving just a few stems. It can also be formed into very attractive small trees. In Northern regions it may be

grown as an indoor or patio plant. Oleander has flexible branches with green, smooth bark eventually turning to dark grey.

Cut or broken branches exude a thick, white sap. The leaves are 5 to 20 cm long, narrow, acuminate or acute in the apex, shortly petiolate, with a coriaceous dark-green blade. Some cultivars have white or yellow variegated leaves. Flowers are produced in terminal heads and their colors vary from deep to pale pink, lilac, carmine, purple, salmon, apricot, copper, orange, yellow and white.

Each flower is about 5 cm in diameter with five petals, although some cultivators have double flowers. The fruit consists of a narrow follicle 7.5 to 17.5 cm long which opens to disperse fluffy seeds. Oleander can be propagated by seed but, being allogamous and highly heterozygous, it shows great variability in seedling populations.

### PLANT PROFILE

Kingdom	: Plantae
Division	: Angiosperms
Class	: Dicotyledonous
Subclass	: Asteridae
Order	: Gentianales
Family	: Apocyanaceae
Genus	: <i>Nerium</i>
Species	: <i>indicum</i>



Figure 1: *Nerium indicum* plant

**Common Names**

English: Indian Oleander, oleander

Hindi, Gujrathi, Marathi: Kanher

French: Laurier Rose

Tamil, malyalam: Arali

Bengali: Karabi kaner

Telagu: Gannferu

**Habitat**

Africa: Algeria; Libya; Morocco; Tunisia Ethiopia Niger

Asia-Temperate: Oman; United Arab Emirates Afghanistan; Cyprus; Iran; Iraq; Israel; Jordan; Lebanon; Syria; Turkey; China - Yunnan

Asia-Tropical: India - Jammu and Kashmir, Punjab; Nepal; Pakistan

Europe: Albania; Former Yugoslavia; Greece Italy; Malta France; Portugal; Spain.

**ECONOMIC IMPORTANCE**

The plant is used as a rat poison and an insecticide. The pounded leaves and bark are used as an insecticide. A green dye is obtained from the flowers. The plant is commonly used for informal hedging in the Mediterranean. The leaves contain small amounts of latex that can be used to make rubber, though the amount is too small for commercial utilization. The plants have an extensive root system and are often used to stabilize soil in warmer areas.<sup>6-8</sup>

**MEDICINAL IMPORTANCE**

The leaves and the flowers are cardiogenic, diaphoretic, diuretic, anticancer, antibacterial, anti Fungal and expectorant. A decoction of the leaves has been applied externally in the treatment of scabies and to reduce swellings. This is a very poisonous plant, containing a powerful cardiac toxin and should only be used with extreme caution. The root is powerfully resolvent, is used in the form of plasters and is applied to tumors because of its poisonous nature it is only used externally. It is beaten into a paste with water and applied to lesion and ulcers on the penis. Bark is bitter and is used as cathartic, febrifuge and intermittent fever. Plants have an extensive root system and are often used to stabilize soil in warmer areas. Oil prepared from the root bark is used in the treatment of leprosy and skin diseases of a scaly nature. Seeds are Poisonous.

Abortifacient and alternative: They used as purgative in dropsy and rheumatism. The whole plant is said to have anticancer properties.

*Nerium indicum* has also been used in the treatment of cancer the flowers, leaves, leaf juice or latex, bark and roots have been used against corns, warts, cancerous ulcers, carcinoma, ulcerating or hard tumors.

**CHEMICAL CONSTITUENTS**

The root of *Nerium indicum* contains glycosides, neriodorin, neriodorein and karabin. The bark contains scopoletin, scopolin. Besides this it contains tannins, red colouring matter, a aromatic oil, wax and flobefin and a yellow coloured stable oil. It also contains oleandrin. The roots contain bitter glycosides fenolinic acid and aromatic oil. It also possesses potassium salts in excess.

**PHARMACOLOGICAL ACTIVITIES****Antioxidant Activity**

The Methanolic extract of leaves (LE) and Methanolic extract of flowers (FE) of *Nerium indicum* (Arali) was analysed for Antioxidant activity (AOA) in terms of DPPH free radicals, Total Phenolic Content (TPC) was measured in terms of Gallic acid equivalent and Flavonoid content was analysed in terms of Quercetin equivalent. The antioxidant activities of (LE & FE) were found to be 72.8% and 67 %. TPC of study extracts (LE & FE) were found to be 227 mg/100g and 449 mg/100g. The Total Flavonoid content of (LE & FE) were found to be 125 mg/100g and 199 mg/100g respectively. Superoxide anion radical scavenging activity of flowers was 66 % compared to leaves 25 %. Similarly Lipid Peroxidation showed higher activity in flowers than leaves. Enzymatic antioxidant activity such as Superoxide Dismutase, Glutathione peroxidase and Catalase of *Nerium indicum* flowers were around 10% to 30% higher than that of leaves. The results clearly indicate that the methanol extracts of *Nerium indicum* flowers have more potent antioxidant activity than leaves<sup>1</sup>.

**Analgesic Activity**

In acetic acid induced writhing model, the flower extract of *Nerium indicum* showed 89.14% ( $p < 0.001$ ) and 93.20% ( $p < 0.001$ ) inhibition of writhing response at oral doses of 250 mg/kg and 500 mg/kg body weight of mice, respectively. The root extract showed prominent analgesic activity with 59.18% ( $p < 0.001$ ) and 95.92% ( $p < 0.001$ ) writhing inhibition at oral doses of 125 mg/kg and 250 mg/kg body weight of mice, respectively. The results were found to be highly promising ( $p < 0.001$ ) in comparison to the control and accompanied with dose dependence. The stem extract showed only 6.78% and 27.89% inhibition of writhing response at oral doses of 125 mg/kg and 250 mg/kg body weight of mice, respectively. The analgesic activity of stem extract was less significant as compared to that of crude flower and root extracts.

All the fractions of crude leaf extract of *Nerium indicum* showed 100% inhibition of writhing reflex. This indicates that administration of the fractions of crude leaf extract inhibited the pain sensation produced by acetic acid since the mice did not show any writhing reflex during this investigation<sup>2</sup>.

### Antiulcer activity

Antiulcer activity of flowers extract of *Nerium indicum* was studied in rats in which gastric ulcers are induced by oral administration of Indomethacin and pylorus ligation<sup>3</sup>.

### Cell Proliferation disease

The Methanolic extract of the plant *Nerium* is used for the treatment of cell Proliferation disease in animals and humans. (G Patel, S Nayak, S Shrivastava (2010).

### Antimicrobial activity

All the extracts displayed broad spectrum of activity against gram +ve bacteria and fungus. The *Nerium indicum* extracts decrease the microbial growth, this suggests that it is, having microbiostatic effects. The results obtained are encouraging as the methanolic, chloroform, hexane extracts have shown considerable antimicrobial activity. The activity of the plant is appreciable considering the importance of micro-organisms<sup>4</sup>.

### Anti diabetic activity

In this study alloxan-induced rat model was used. As expected, in the diabetic control, there was severe hyperglycemia as compared to the normal animals. It was observed that the standard drug glibenclamide lowered the blood glucose level significantly bringing it nearly back to normal. The single dose of ethanolic extract (300 mg/kg b.w.) of *Nerium indicum* has more significantly ( $P < 0.01$ ) reduced the blood glucose level as compare to diabetic control at 7<sup>th</sup> day of the study. Chloroform extract (500 mg/kg b.w shown significant reduction of blood glucose after one hour whereas ethanolic extract showed significant reduction at three hours. Aqueous extract of the same plant could not reduce glucose level at sub acute level, though it did showed reduction of glucose level at seven hours as compared to diabetic control. The effects of different extracts on glucose tolerance test in normal rats were evaluated. At 30 min after glucose administration the peak of blood glucose level increased rapidly from the fasting value and then subsequently decreased. Glibenclamide treated group (600ig/kg) prevented glucose induced hyperglycemia significantly at 30 min and 90min ( $171.83 \pm 4.214$  and  $106.16 \pm 4.316$ ) as compare to normal control ( $167.83 \pm 2.301$  and  $146.83 \pm 2.960$ ) respectively. Maximum glucose tolerance in *Nerium indicum* extracts was observed in chloroform extract ( $121.00 \pm 2.966$ ) and minimum glucose tolerance was observed in aqueous extract ( $155.33 \pm 3.018$ ) in 90 minutes compared with the normal control<sup>5</sup>.

### Molluscicidal Activity

The molluscicidal activity of *Nerium indicum* bark against *Lymnaea acuminata* snails was studied. The toxicity of different bark preparations was both time and dose dependent. The 24-h LC50 of the lyophilized aqueous extract of bark was 34.5 mg/l whereas that of lyophilized boiled water extract was 42.5 mg/l. Low concentrations

of vacuum-dried ethanolic extract (24-h LC50: 4.9 mg/l) and purified bark (24-h LC50: 0.87 mg/l) were effective in killing the test snails<sup>6</sup>.

### Hepatoprotective Activity

Methanolic flowers extract of *Nerium indicum* was evaluated for hepatoprotective in rats. The rats treated with methanolic extract of *Nerium indicum* at a dose of 500 and 1000 mg/kg prevented carbon tetrachloride induced reduction in ascorbic acid<sup>7</sup>.

### Antiviral Activity

An ethnopharmacological screening, plants used in Nepalese traditional medicine were evaluated for antiviral activity. Methanolic and methanolic-aqueous extracts derived of 23 species were assayed in two in vitro viral systems, influenza virus/MDCK cells and herpes simplex virus/Vero cells. Two species, *Bergenia ligulata* and *Nerium indicum* showed the highest antiinfluenzaviral activity with 50% inhibitory dose of 10 microg/ml. *Holoptelia integrifolia* and *N. indicum* exhibited considerable antiviral activity against herpes simplex virus. None of these extracts showed cytotoxic effects<sup>8</sup>.

### Cell Proliferation disease

The Methanolic extract of the plant *Nerium* is used for the treatment of cell Proliferation disease in animals and humans.<sup>1</sup>

### CONCLUSION

Natural Products, especially plants, have been used for the treatment of various diseases for thousands of years. Terrestrial plants have been used as medicines in Egypt, China, India and Greece from ancient time and an impressive number of modern drugs have been developed from them. Thus the plant kingdom is really a potential source of medicinal properties. In recent years, traditional system of medicine has become a topic of global importance. Plant have their own chemical compounds, some of those chemical compounds also have therapeutic value for human.

In recent years, ethno-botanical and traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use.

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