REVIEW OF PHARMACOLOGICAL ACTIVITY OF *NERIUM* INDICUM MILL

Shrinivas K. Sarje*, Snehal Rasale, Aparna Suryavanshi, Shagufta Bano Farooqui, Nitin B. Ghiware

Department of Pharmacology, Nanded Pharmacy College, Nanded, Maharashtra.

ABSTRACT

Nerium indicum Mill is an important Chinese folk medicine. It is a vegetatively propagated ornamental plant, valued for its evergreen foliage and showy terminal flower clusters that are available in different colors. Indicum is cultivated recently as a flowering pot plant and therefore abundant propagation of plant material for commercial use is of great importance. This species also produces secondary metabolites, some of which are pharmacological interests. The important pharmacological activities are anti-inflamatory, antibacterial, anticaner, antinociceptive, and CNS depressant activity. This paper explains the evidence-based information regarding the phytochemistry and pharmacological activity of this plant.

KEYWORDS: Nerium indicum, Phytochemistry, Pharmacological activity, Taxanocological classification.

INTRODUCTION

In recent years, traditional system of medicine has become a topic of global importance. Many of the plant species that provide medicinal herbs have been scientifically evaluated for their possible medicinal applications. It has been mentioned that natural habitats for medicinal plants are disappearing at a faster rate and together with environmental and geopolitical instabilities; it is increasingly difficult to acquire plant derived compounds. Nerium indicum mill.is an evergreen shrub reaching up to four meters in height and belongs to the family – Apocynaceae, is a shrub or occasionally tree distributed in tropical Asia. Nerium indicum mill. is cultivated worldwide as an ornamental plant. It is native to the
Mediterranean region and is also found in Southern Europe and Southwest Asia, but is naturalize very easily and in many areas the plant is sub-spontaneous.

The plant Nerium indicum mill. Inflorescence of Nerium indicum Immature pods-Seeds Leaves are 10 to 22 cm. long, narrow, acute in the apex, shortly petiolate, with a coriaceous dark green blade narrow, untoothed, short-stalked and dark or grey-green in color. Some cultivars have leaves variegated with white or yellow patches. All leaves have a prominent mid rib, are "leathery" in texture and usually arise in groups of three from the stem. The plant produces terminal flower heads, usually pink or white. Each flower is about 5 cm in diameter and five petalled although some cultivators have double flowers. Indicum has flexible branches with green, smooth bark eventually turning to dark grey on maturity. Cut or broken branches exude a thick, white sap. The fruit consists of a narrow follicle 7.5 to 17.5 cm long which opens to disperse fluffy seeds. Indicum can be propagated by seeds but, being allogamous and highly heterozygous, it shows great variability in seedling population.

**Classical names**


**Taxonomic classification**

Phylum-Plantae  
Class/ Subphylum- Angiosperms  
Series – Eudicots  
Order-entianales  
Family – Apocyanaceae  
Genus – Nerium  
Species- Oleander
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.

Medicinal Importance
The leaves and the flowers are cardiotonic, 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.

Neriumindicum 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, (Abe, F.and T. Yamauchi. (1992)).

Chemical constituents
The most well known effects of indicum are due to two glycosides, neriin and, and an alkaloid, oleandrin which have a cardiotimulatory action and to the glycosides, gentiobiosyloleandrin, gentiobiosyl-nerigoside and gentiobiosyl-beaumontoside extracted from the leaves. Indicum is also diuretic and lentive on dermatosis and contusion.In addition, its lymph is rich of minerals and α-tocopherol, an important antioxidant. Adyregenin is a compound with no cardiac effect. There are also weakly active cardenolides (heterosides of uzarigenine) and inactive cardenolides (heteroside of adynergenine, of digitalose), triterpenoids, a resin, tannins, glucose, a paraffin, ursolic acid, vitamin C and an essential oil. The seeds contain glucosides (oleandrine, odorosides, adigoside). The bark also contains glucosides (rosaginoside, nerosiside, cortenerside). The roots contain steroids.
Pharmacological activity
Oleandrine is anti inflammatory, anti tumoral and emollient and potentialises apoptosis. The hydro alcoholic and aqueous extract of the flowers is antinociceptive and cardiotonic. The leaves and seeds provoke poisoning with nausea, vomiting, mental confusis ventricular hyperkalaemia that can quickly end in death.

Antinociceptive activity
The aqueous and ethanol extracts of oleander leaves possess significant antinociceptive activity, but ethanolic extract was more pronounced. However extract were shown to induce gastric, ulcerogenicity with mice. Flowers either dried or fresh also exhibit potent antinociceptive activity. (Zia, A., B. S. Siddiqui, 1995).

Analgesic activity
In acetic acid induced writhing model, the flower extract of Nerium indicum showed 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 The response is thought to be mediated by the prostaglandin pathways. The promising antinociceptive activity of the methanolic extract of flower and root of Nerium indicum might be due to Analgesic Activity of Methanolic Extracts of N.indicum (S.Ahmed 2006).

Anti diabetic activity
The activity Nerium indicum observed in chloroform extract diabetic rats had lower body weights, high blood glucose level as compared to normal rats. However, orally administered NIEE and NICE significantly increased the body weight and decreased blood glucose level in diabetic rats. This may be due to improving the glycemic control mechanisms and insulin secretions from remnant pancreatic - cells in diabetic rats. The exact biologically active constituents responsible for the said effect have not been reported nor was the exact mode of action of the ant diabetic activity reported earlier, with the lone observation that it is used in folklore diabetic treatments. (MS Sikarwar 2009).

Anti ulcer activity Pylorus ligation induced ulcer was used to study effect on gastric secretion. Ligation of pyloric end of stomach causes accumulation of gastric acid in the stomach that produces ulcers. Agents that reduce secretion of gastric aggressive factor such
as acid and pepsin and/or increase secretion mucin are effective in reduction in ulcer index when compared to control. (Patel Govind 2010).

**Anti bacterial activity**

The antimicrobial activity of methanol extract of Nerium indicum, Tagetuserecta, Chrysanthemum leucanthemum, Rosa centrifolia, Jasminumangustifolium, Toreniafournieri against Gram negative and Gram positive bacteria were studied invitro. The objective of this research was to confirm the antibacterial activity and perform HPTLC analysis of methanolic extracts of various flower extracts. The methanolic extracts of Nerium indicum, Tagetuserecta, Rosa centrifolia, Toreniafournieri exhibited growth inhibition on selected bacterial strains viz., Bacillus sp., Escherichia coli., Klebsiella sp., Yersinia sp., Enterococcus sp. Based on the results, the methanol extract of Rosa centrifolia was considered to be the most effective and also indicated that all the flower extracts exhibited inhibitory action against the growth of Lactobacillus (V.Ramya 2010).

**Anti-inflammatory activity**

Anti inflammatory activity assessment experiment has also the components of flowers may have the activity, since only the ethanol extract were found active even then that of reference drug indomethacin. (RA Nagourney et.al 2001).

**Antimicrobial activity**

The presence of antifungal and antibacterial substance in the higher plant is well established. Plant has provided a source of inspiration for novel drug compounds, as plants derived medicines have made significant contributions towards human wealth. The antimicrobial activity of leaves and roots of Nerium oleander against Bacillus pumilus, B.subtilis, Staphylocooccus aureus, Escherichia coli and Aspergillusniger (Hussain and Gorsi (2004)).

**Locomotor activity**

Purified fractions obtained from the methanol extract of fresh oleander leaves possess a CNS depressant activity i.e., produced reduction in locomotor activity. They also showed significant analgesic activity as indicated by inhibitory effects on acetic acid- induced and increased reaction time to thermal test.(Zia et.al(1995)).
Anticancer activity
The aqueous extract of Nerium oleander L. has been undergoing clinical investigations as an anticancerous agent. Oleandrin and its aglyconeoleandrigenin are the active compounds that are isolated from this plant which shown to have anticancerous properties. Anvirzel has also revealed cytotoxicity in human tumor cell lines with evidence of apoptosis as a principal mode of cell death. (Judith A (2001)).

Diuretic Effect
The chief active principle oleandrin was found to stimulate the heart function and also had a diuretic effect. The effect of odorin on the heart of rabbits and dogs is identical with that of digitalis group whereas neriodin is twice as active as digitoxin in digitalis like action similar to that of oleandrin. (Pathak, Sen. (2000)).

Neuroprotective activity
Nerium indicum exert partial protection in cortical neurons stressed by beta-amyloid (Aβ) peptides or deprivation of nutrition from serum. In this study, we have isolated and characterized a new polysaccharide from the flowers of N. indicum (named as J6) and aimed to investigate its neuroprotective effects against Aβ-induced apoptosis. Pretreatment of the polysaccharide J6 significantly decreased the activity of caspase-3 as well as the cytotoxicity triggered by Aβ peptides in a dose-dependent manner. In contrast to the activation of survival signaling such as Akt found in J2, J3 and J4 fractions, neuroprotective effects of J6 markedly inhibited Aβ peptide-stimulated phosphorylation of c-Jun N-terminal kinas (JNK-1) as determined by Western blot analysis. Taken together, the polysaccharide J6 isolated from the flowers of N. indicum can serve as potential neuroprotective agent against neuronal death in Alzheimer's disease.(Man-shanya 2007).

Hepatoprotective activity
Methanolic flowers extract of Nerium indicum evaluated for hepatoprotective in rats. The plant extract showed a remarkable hepatoprotective activity against carbon tetrachloride induced hepatotoxicity in liver tissues. Carbon tetrachloride induced a significant rise in Serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT) and alkaline phosphatase (ALP). Treatment of rats with different doses of plant extract significantly altered serum marker enzymes levels to against carbon tetrachloride treated rats. The activity of the extract at dose comparable to the standard drug, silymarin.Histopathological changes of liver sample were compared with respective control.
The hepatoprotective properties of Neriumindicum against carbon tetrachloride induced hepatotoxicity in rats. (Govind Patel.2010).

**Antileukemic effects**

Antitumor activity of this novel plant extract, the relative abilities of oleandrin and oleandrigenin to inhibit FGF-2 export from two human prostate cancer cell lines, DU145 and PC3, were examined. Anvirzel and Oleandrin are extracts of oleander induce cell death in human cancer cells. Toxicity of Nerium oleander and Calotropisprocera have an activity in the antitumor human cell line test with ED50 varied in the range of 0.008 to 2.13 µg/ml, depending upon the cell line. Used in chancre and ulcers on the penis, reduce swellings, powerful cardiac toxin.(Shaw D and Pearn J. (1979)).

**Immunomodulating activity**

CNS depressant activity: After the isolation of oleandrin a number of new chemical constituents have been isolated from this plant and their pharmacological properties have also been evaluated. Experiments have been demonstrated that the crude alcoholic extract from the leaves has CNS depressant activity. Nerium oleander contains at least 2% cardiac glycosides. Rosagenin may be extracted from the bark and has a strychnine-like action. Several flavones (0.5%) and volatile oils (unimportant amount), as well as rubber, fats, sugars and hydrocyanic acid, can be isolated from its leaves.(Pearn J.(1987)).

**CONCLUSION**

Today, our understanding of the interactions between drugs and herbs & food is still in its infancy. People are using herbal medicines from centuries for safety, efficacy, cultural acceptability and lesser side effects. Plant and plant products have utilized with varying success to cure and prevent diseases throughout history. Major plunge by the pharmaceuticals.

industry is focused towards design and development of new innovative/indigenous plant based drugs through investigation leads from traditional system of medicine. It is a best classical approach in the search of new molecules for management of various diseases. Though screening of literature is available on Nerium oleander depicted the fact that it is a popular therapy among the various racial groups, Ayurvedic and traditional practitioners for treatment of ailments. Researchers have been exploring the curative potential of this plant as it has more therapeutic properties which are still not known.
BIBLIOGRAPHY

34. V.Ramya In vitro studies on antibacterial activity and separation of active compound of selected flower extract by HPTLC. Jchem pharma, 2010; 86-91.