

A PHYTOCHEMICAL STUDY OF KARVĪRA (*NERIUM INDICUM*): AN IMPORTANT ĀYURVĒDIKA HERB

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ABSTRACT

In *Āyurvēdika* text more than 500 medicinal plants have been mentioned with their therapeutical uses, *Karvīra* i.e. *Nerium indicum* is one of them. It is a very useful plant with various medicinal properties such as anti microbial, anti-pruritus, wound healer, antileprotic, cardiac tonic etc. Since long, it is being used by *Āyurvēdika* physicians in various diseases, especially the skin diseases. Scientific studies now also support its use in a variety of conditions as wound infections, inflammation, cancer, diabetes and CNS depression. Various active constituents as glycosides, terpenoids and flavonoids are responsible for its therapeutic effects. The objective of present study was to investigate important phyto-chemical constituents, present in the leaf,

root, and stem bark of *Nerium indicum* (*Karvīra*) in different solvents like Ethanol, Acetone, Hexane, Ether, and Aqueous. The dried leaf, root, and stem bark samples are extracted with solvents by cold maceration. This work strongly proves that leaves, stem bark and root of *Nerium indicum* are rich in Alkaloids, Flavonoids, Terpenoids, Saponins, Tannins, Carbohydrates and glycosides in all the solvents.

KEYWORDS: Baṛhatatrayī, Karvīra, kṛmighna, *Nerium indicum*, Nighaṅṭu, phytochemical.

1. INTRODUCTION

India is known as the “Emporium of medicinal plants”. The use of plants to treat various diseases in India dates back to the times of Ṛigvēda even being practices more anterior to it

as a folk medicine. Thousands of plants and their therapeutical uses are documented in *Āyurvēdika* literature, one such plant being *Karvīra* i.e. *Nerium indicum*.

1.1 Habitate

Nerium indicum is an evergreen shrub or small tree in the Dogbane family Apocynaceae. It has synonyms like *Nerium oleander* and *Nerium odorum*. It is also known as oleander from its superficial resemblance to the unrelated plant *Olive olea*.^[1] The white and red flowered variety both are equated with *Nerium indicum*. It is commonly found as an ornamental shrub in the gardens throughout India. It is cultivated all over the world, especially in south-west Asia. *N. indicum* is exclusively native to India, Bangladesh, Nepal, Myanmar and China. It is about 5 meter tall, large glabrous erect shrub with milky juice. It has linear- lanceolate, dark green shiny and thickened leaves. Flowers are fragrant, red, white and rose-colored. Whole plant of *N. indicum*, especially roots are highly toxic. Generally, the parts used for medicine are roots and leaves.

1.2. *N. indicum* in Āyurvēda

The chief resources of the traditional *Āyurvēdika* knowledge of medicinal plants, the *Saṃhitās* and *Nighaṅṭus* described the two main varieties of *Karvīra*, the white and red ones, which have been botanically identified as *Nerium indicum*. *Ācharya* Caraka and *Suśruta* both have classified *Karvīra* under the group of *Mūla Viśa*, and as one of the *kuṣṭhaghna* (alleviates leprosy including different types of skin disorders) *Dravya*.^{[2][3]} (c.ci 23-10) (su. Su 38-64,65). Many *Nighaṅṭus* mentioned therapeutic uses of *Karvīra*. *Nighaṅṭus* are the *Ayurvedic* texts, which give detail accounts of the medicinal plants. According to *Priya Nighaṅṭu*, *Karvīra* is described as *hṛdya* (cardiac tonic) and useful in skin diseases and *śvāsa roga* (respiratory problems)^[4] (*P.N.* 177,178,179). *Bhāvaprākāśa* has described *Karvīra* as a *viśa* (poison) and indicated it in treatment of *Vraṇa* (infected wounds), *Kuṣṭha* (skin diseases including leprosy), *kṛmi* (microbes and parasites), *Kaṇḍu* (itching), etc.^[6] (B.N 3-83).

Ethno medicinal uses of *N. indicum* is also very popular for its ethno medicinal uses, such as in cardiac disease, asthma, corns, cancer, epilepsy, wound healing and inflammation.^[7] (Priyankar dey and tapas kumar chaudhuri 2016).

The aim of this study is to reorient our ancient knowledge in a scientific way. As we know that phytochemicals present in a plant are mainly responsible for its pharmacological

properties. Thus, phytochemical screening of *N. indicum* has been done to re-establish ancient knowledge.

2. MATERIAL AND METHOD

2.1. Plant material collection and Identification

The leaves, stem barks, and roots of *Karvīra* (*Nerium indicum*) were collected during the months of October from Rajeshwari nursery, Dehradun. The plant samples were identified from BSI, Dehradun as *Nerium indicum* Mill synonym *Nerium oleander* L. Accession number is 116589.

2.2 Sample preparation

The fresh sample of leaves, stem barks, and roots of *Karvīra* (*Nerium indicum*) were cleaned thoroughly with water and dried at room temperature for 10 days in shade. The dried samples were powdered separately using an electrical grinder. The powdered samples were stored in screw cap bottles until further analysis. 10 grams powder of each leaves, roots and stem barks was taken separately, and mixed with 50ml of each solvent (ethanol, acetone, aqueous, hexane, ether) separately and kept for four days. All contents were periodically shaken using an electric shaker. After four days, all the contents were filtered through Buchner funnel in separate conical flasks and these were further concentrated through evaporation by keeping the filtrate in a round bottomed flask, till the solvents completely evaporated and the extract settled down to the bottom. Now, there 15 extracted samples have prepared. Each crude extract mixed with dimethyl sulphoxide (DMSO) and preserved at 20⁰C in freezer for further use for evaluation of phytochemical analysis.

2.3. Phytochemical analysis

The individual extract was subjected to the qualitative phytochemical screening for the finding of some chemical constituents. Phytochemical test were carried out adopting standards procedure (Trease et.al 1983^[8], Kokate et.al 1997^[9], Hegde et.al 2010^[10]).

Table-1: List of investigated phyto-chemicals.

| S.N. | Phytochemicals | Test | Method |
|------|----------------|----------------|--|
| 1 | Quinone | Hcl test | 2ml extract + few drops of conc. HCL=yellow precipitate |
| 2 | Protein | Ninhydrin test | 2 ml extract + few ninhydrin molecules = deep blue colour |
| 3 | Carbohydrate | Molisch's test | 2ml extract + few drop molisch's reagent + 2ml conc. H ₂ SO ₄ = after 2-3 minute red or dull violet colour |

| | | | |
|----|-------------------|---------------------------------|---|
| 4 | Phlobatannins | precipitate test | 2 ml extract + 10 ml aqueous solution boiled at 100 ⁰ c with few drop of 1% HCL = red precipitate |
| 5 | Cardiac glycoside | Keller kiliani test | 5 ml extract + 2 ml glacial acetic acid + 1 drop of FeCl ₃ + 1ml of conc. H ₂ SO ₄ = Present Pale yellow colour in upper layer |
| 6 | Phenol | Ferric chloride test | 2 ml extract dissolve in distilled water + alcoholic FeCl ₃ = bluish black colour |
| 7 | Tannins | FeCl ₃ solution test | 2 ml extract + 2 drop of 5% FeCl ₃ = brown colour |
| 8 | Saponins | Foam test | 2 ml extract + 20 ml distilled water + shaken vigorously = persistent froth |
| 9 | Terpenoids | Salkowski test | 2 ml extract + 1ml chloroform + few drops of conc. sulphuric acid = reddish brown precipitate |
| 10 | Alkaloid | Wagner's test | 2 ml extract + Wagner's reagent = brown colour |
| 11 | Flavonoids | Alkaline reagent test | 2 ml extract + few drop NaOH = yellow colour |

RESULTS AND OBSERVATIONS

Findings of the phytochemical constituents in the different extracts of leaf, stem-bark, and root of *Nerium indicum* reported in Table 2, 3 and 4.

Table-2: Phytochemical analysis of leaves of *N. indicum*.

| Phytochemical | Aqueous ext.* | Ethanol ext. | Acetone ext. | Hexane ext. | Ether ext. |
|---------------|---------------|--------------|--------------|-------------|------------|
| Alkaloids | + | + | | - | + |
| Glycosides | + | + | + | + | + |
| Phenol | + | - | - | - | - |
| Saponins | + | + | - | - | - |
| Terpenoids | + | + | + | + | + |
| Quinones | + | - | - | - | + |
| Amino acid | - | - | - | - | + |
| Tannins | + | + | + | - | - |
| Phlobatannins | - | - | + | - | - |
| Carbohydrates | - | + | + | + | + |
| Flavonoids | + | + | + | + | + |

[(+) = presence of compound, (-) = absence of compound, * extract]

Preliminary phytochemical analysis of different leaf extracts of *N. indicum* presented in Table 2. Results revealed the presence of Glycosides, Terpenoids, and Flavonoids in all extracts. Most of the constituent's glycosides, alkaloids, tannins, terpenoids, Flavonoids, saponins, phenols and quinones are present in aqueous extract. Whereas, least of the constituent's are present in Hexane extract. Phenols and quinines are present in aqueous extract only. While Phlobatannins, Carbohydrate and Amino acids are absent in Aqueous extract. Saponins and tannins are found in aqueous and ethanolic extract. Amino acids are found in ether extract only and Phlobatannins in Acetone extract only. Carbohydrate found in all extracts except aqueous.

Table-3: Phytochemical analysis of stem bark of *N.indicum*.

| Phytochemical | Aqueous ext.* | Ethanol ext. | Acetone ext. | Hexane ext. | Ether ext. |
|----------------------|---------------|--------------|--------------|-------------|------------|
| Alkaloids | + | + | - | - | + |
| Glycosides | + | + | + | + | + |
| Phenol | + | + | + | + | + |
| Saponins | + | + | - | - | - |
| Terpenoids | + | + | + | + | - |
| Quinones | + | - | + | - | - |
| Amino acid | - | - | + | - | + |
| Tannins | - | + | + | - | - |
| Phlobatannins | - | - | - | - | + |
| Carbohydrates | + | + | + | + | + |
| Flavonoids | + | + | + | + | + |

Phytochemical analysis of different extracts (aqueous, ethanol, acetone, hexane, ether) in stem-bark of *N. indicum* presented in table 3. The data showed the presence of glycosides, phenols, carbohydrates, and Flavonoids in all extracts (aqueous, ethanol, acetone, hexane, ether). It has also observed that maximum numbers of phyto-chemicals are found in Aqueous, Ethanol, and Acetone extract while minimum in Hexane extract.

Table-4: Phytochemical analysis of root of *N.indicum*.

| Phytochemical | Aqueous ext.* | Ethanol ext. | Acetone ext. | Hexane ext. | Ether ext. |
|----------------------|---------------|--------------|--------------|-------------|------------|
| Alkaloids | + | + | - | - | + |
| Glycosides | + | + | + | + | + |
| Phenol | + | - | - | - | - |
| Saponins | + | + | - | - | - |
| Terpenoids | + | + | + | + | - |
| Quinones | + | - | - | - | - |
| Amino acid | - | - | + | - | + |
| Tannins | + | + | + | - | - |
| Phlobatannins | - | - | + | - | + |
| Carbohydrates | - | + | + | + | + |
| Flavonoids | + | + | + | + | - |

Table no-4 shows the results of phyto-chemical analysis of different extract (water, ethanol, acetone, hexane, ether) of root of *N.indicum*. Results have revealed that all the extract show the presence of Glycosides, Flavonoids and Terpenoids except the ether solvent which lacks Flavonoids and terpenoids. It was also observed that aqueous extract have maximum number of Phytochemical while hexane extract have minimum no of Phytochemical. Phenols and quinines are present in aqueous extract only. While Phlobatannins, Carbohydrate and Amino acids are absent in Aqueous extract.

DISCUSSION AND CONCLUSION

L. Bhuvaneshwari, et.al (2007)^[11] isolated six phytochemicals (terpenoids, alkaloids, glycosides, saponins, tannin and carbohydrates) from the leaf extracts (benzene, chloroform and ethanol) of *N. indicum*. Negative results were obtained for phenolic compounds, Flavonoids and Phlobatannins.

The present investigation revealed that *Nerium Indicum* (*Karvīra*) exhibits positive results for some medicinally important phytochemicals i.e. Flavonoids, Alkaloids, Tannins, Saponins, Terpenoids, Glycosides, Carbohydrate, Amino acid, Phlobatannins, Quinone and Phenol. During this work it was observed that water extract of leaves, stem bark and root of *N.indicum* contains maximum number of phytochemicals and shows negative results for Carbohydrate, Amino acids and Phlobatannins. This study also showed that all the extracts show the presence of glycosides, Flavonoids and terpenoids except the ether solvent of root which lacks Flavonoids and terpenoids. These phytochemical compounds detected for various pharmacological activities. Flavonoids have high antioxidant property and play an important role to reduce inflammation, cardiovascular disease, atherosclerosis, tumor, carcinogenesis and thrombosis.^[12] (Robert et al 2001) Saponin acts as anti-carcinogenic, immunostimulant and antioxidant.^[13] It has been found that terpenoids have many pharmacological activities such as antibacterial, antimicrobial, antifungal, antiparasitic, antiviral, anti-allergenic, antitumor, anti-inflammatory immunomodulatory etc.^[14] (roslin et al 2011) Phenolic acid is known as a wide range of therapeutic effect against disease like diabetics, cancer and cardiovascular disease.^[15] Kumar Ganesan and Baojun Xu 2017) *N.indicum* also possesses tannin which helps to manage the glucose level in blood.^[13] These results show that *N.indicum* is a potential source of useful compounds which can be used as leads to synthesize new drugs. The presence of certain phyto-chemicals in *N. indicum* justify it's therapeutical uses described in *Āyurvēda* as well.

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