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A Review on Phytochemistry, Traditional uses and Pharmacological activities of *Nyctanthes arbor-tristis* L.

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Abstract

In India, *Nyctanthes arbor-tristis* L. (Oleaceae), also referred to as "Parijat," is a very significant plant. It is a common ingredient in Ayurvedic medications. This plant has some medical use in all of its parts. It has a wide range of therapeutic applications, including as an expectorant, laxative, anthelmintic, antipyretic, anti-inflammatory and arthritis. Plants are capable of all these functions because they contain a variety of phytochemicals that can serve as a source of potent pharmacological substances. The present review focused on Phytochemistry and Medicinal Uses of Nyctanthes arbor-tristis.

Key words : *Parijat,* Medicinal uses, Chemical constituents.

Nyctanthes arbor-tristis L. (Oleaceae) are little trees or shrubs with young, sharply quadrangular branches and soft white hairs. The leaves are oblong, opposite, sharp or acuminate at the apex, rough, and covered with short, stiff hairs. The base is rounded or slightly cuneate, and the major nerves are clearly visible beneath. The edge is whole or has a few big, prominent teeth. Axillary, single, or in terminal short trichotomous cymes, inflorescences occur. The blooms, which are produced in clusters of two to seven, have a nice aroma and a white corolla with five to eight lobes and an orange-red core. Individual flowers open at dark and close at dawn. Fruits are compressed, orbicular, and encapsulated. Seeds have a flattened, orbicular shape[5,13].

Phytochemistry :

N. arbor-tristis showed the presence of phytosterols, phenolics, tannins, flavonoids, glycosides and saponins with glycosides and alkaloids. Iridoid glycoside. The root part of the plant is composed of alkaloids, tannins, glycosides, beta-sitosterol and oleanolic acid. The stems contain the glycoside naringenin, sitosterol. Arborside-A, Arborside-B, C and D, nyctanthine, amyrin, hentriacontane D-sitosterol, astragalin, oleanolic acid, nyctanthic acid, tannic acid, ascorbic acid, methyl salicylate, lupeol, volatile oil, glucose, fructose, carotene and benzoic acid are present in leaves. Cyclohexylethanoid, rengyolone, 6-O-transcinnamoyl-7-O-acetyl-6-beta- hydroxylogan,

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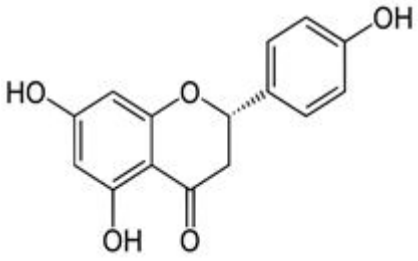
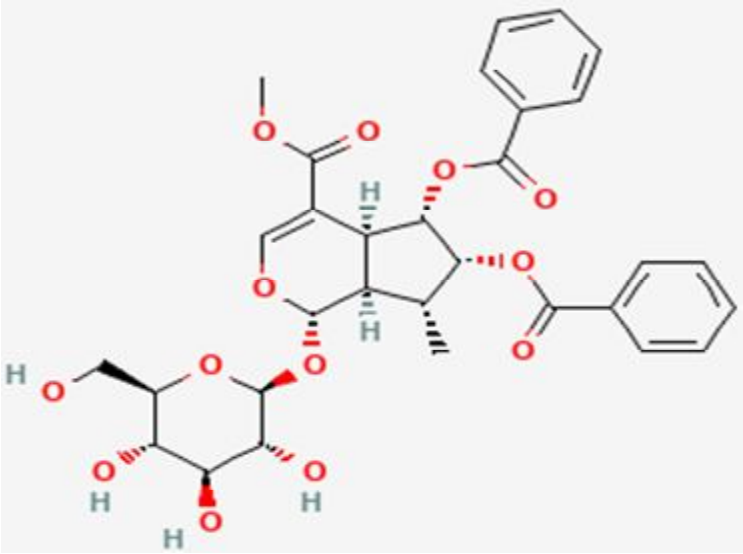
Fig. 1. *Nyctanthes arbor-tristis* L.: Various parts

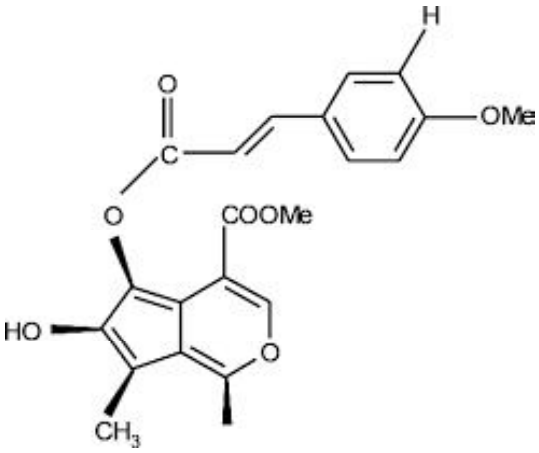
essential oils, nyctanthin, D-mannitol, tannins, glucose, carotenoids, -monogentiobioside—D-digentiobioside are present . D-Glucose & D-Mannose, Arbortistoside- A, B, D and E, Nyctanthoside, Nyctoside.glycerides of linoleic, oleic, lignoceric, stearic, palmitic, myristic, nyctanthic acid and 3,4-secotriterpene acid are present in seeds[3,10,14,15,16,18,19].



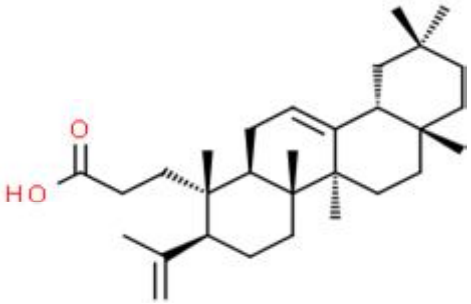
Naringenin



Arborside-A



Nyctanthine



Nyctanthic acid

Fig. 2. Major Phytochemical of *Nyctanthes arbor-tristis* L

Traditional uses :

The flowers of *Nyctanthes arbor-tristis* are used in India, Indonesia (Java) and Malaysia to provoke menstruation while the bitter leaves are used as cholagogue, laxative, diaphoretic and diuretic (Agroforestry tree database). The leaf juice is used to expel roundworms and threadworms in children. The leaf juice is also used to treat loss of appetite, piles, liver disorders, biliary disorders, chronic fever, malarial fever, obstinate sciatica, rheumatism, and as a diaphoretic. Fresh leaf juice has been suggested to be safe purgative for infants when given with honey mixed with common salt. In the form of infusion in doses of two ounces it is useful in fever and rheumatism as diaphoretic and diuretic. The seed powder is used for scalp scurvy, in alopecia and as anthelmintic. The bark is used for the treatment of bronchitis and snakebite. In central India, the tribal people use various parts of *Nyctanthes arbor-tristis* to relieve cough, hiccup, dysentery, snakebite and sores. The inflorescence is used to treat scabies and other skin diseases. Besides the activities mentioned above, *Nyctanthes arbor-tristis* is also known in Indian traditional medicine to possess immunotoxic, antiallergic, antihistaminic, purgative, antibacterial and ulcerogenic activities. Other uses are as an expectorant and for bilious fevers. The hot infusion of flowers is used by some elderly Sri Lankan Buddhist monks as a sedative. The Jayantia tribes (India) habiting regions close to Myanmar use the leaf juice orally as an anthelmintic and the flower along with honey as an anti-spasmodic. Traditionally, the flowers of the plant are known to be effective as stomachic, carminative, astringent, anti-bilious, expectorant, hair tonic and are used in the treatment of piles and various skin diseases. The bark is used to treat bronchitis and snake bite[8,17].

Pharmacological activities[1,2,4,6,7,9,11,12]

Anticancer activity :

The first study on *N. arbortristis'* anticancer efficacy was published in 2001, by researchers who discovered that petroleum ether, chloroform, and ethyl acetate extracts

of the flowers had substantial cytotoxic activity. In Swiss albino rats, a methanolic extract of stem bark was shown to have considerable anticancer efficacy when compared to 5-fluorouracil against Dalton's ascitic lymphoma. The cytotoxicity of the ethanolic, methanolic, and aqueous leaf extracts against the T-cell leukaemia cell increases with time and dosage. At all doses and time periods, the extracts showed a significant reduction in normal cell toxicity.

Antiparasitic activity :

A crude 50 percent ethanolic extract of leaves was found to exhibit trypanocidal activity at a concentration of 1000 mg/ml. In vivo experiments showed that at dosages of 300 and 1000 mg/kg, i.p., the extract had antitrypanosomal actions and substantially extended the life time of *Trypanosoma* evansi-infected mice. However, it has been observed that once the extract therapy is stopped, the parasitaemia rises, resulting in the death of the experimental animals.

Antimalarial activity :

A clinical study including 120 malaria patients was conducted. A fresh paste of medium-sized five leaves of *N. arbortristis* administered three times daily for seven days cured 92 (76.7 percent) of patients. The remaining 20 patients recovered within ten days, while the other eight did not respond to treatment. The paste was well-tolerated, and no severe side effects were seen.

Immunostimulant activity :

Oral administration of ethanolic extract of NAT at dosages of 50, 100, 150, and 200 mg/kg significantly enhanced circulating antibody titres when challenged with SRCs and heat-killed Salmonella antigens. Chronic therapy raised the overall WBC count and significantly enhanced the DTH response. The extract was found to include 21 immune-bioactive chemicals.

Hepatoprotective activity :

The antihepatotoxic efficacy of aqueous extracts of *Nyctanthes arbor-tristis* leaves and seeds against carbon tetrachloride (CCl_4) caused hepatotoxicity was discovered. Hepatic diseases have become significant roadblocks for medicine in the twenty-first century.Hepatic tissue has a high capacity for regeneration, and damage is typically substantial before it becomes apparent. Hepatic disorders develop itself when hepatocyte regeneration does not keep up with damage, resulting in hepatocellular failure.

CNS depressant action :

The leaves, flowers, seeds, and barks of NAT (600 mg/kg) were found to significantly and dose-dependently prolong sleep onset and duration and to cause a decrease in dopamine and an increase in serotonin levels, implying that the CNS depressant activity of the ethanol extracts of seeds, leaves, and flowers is due to a decrease in dopamine.

Anti-inflammatory activity :

A water soluble ethanolic extract of NAT leaves was used in a study to determine the presence of anti-inflammatory activity. NAT inhibited acute inflammatory edoema in

the hind paw of rats induced by several phlogistic agents, including carrageenin, formalin, histamine, 5-hydroxytryptamine, and hyaluronidase.Turpentine oil was shown to be effective in reducing acute inflammatory edoema in rats' knee joints.

Antiviral Activity :

The ethanolic extract, n-butanol fractions, and two pure compounds extracted from the NA show a strong inhibitory impact against encephalomyocarditis virus (EMCV) and Semliki forest virus (SFV).The in-vivo ethanolic extract and the n-butanol fraction protected EMCV-infected mice against SFV by 40% and 60%, respectively, at daily doses of 125mg/kg weight.

Anti-diabetic activity :

In comparison to diabetic controls, oral administration of chloroform and ethanolic leaf and flower extracts significantly increased superoxide dismutase (SOD) and catalase (CAT) levels and significantly decreased liver lacto peroxidase (LPO), serum SGPT, SGOT, and alkaline phosphatase, cholesterol, and triglyceride levels. When diabetic rats treated with streptozotocin-nicotinamide were given an ethanol extract of the stem bark, it demonstrated significant anti-diabetic activity. The extract lowers blood glucose levels dose-dependently.

Anti-Allergy activity :

Pretreatment with a water soluble portion of an alcoholic extract of NA leaves avoided suffocation in guinea pigs exposed to histamine aerosol. Arbortistoside A and arbortristoside C have been shown to have anti-allergic effects in *NA*.

Anti-Trypanosomal potential :

In vitro and in vivo antitrypanosomal activity of a crude 50% ethanolic extract of N. arbor-tristis leaves was investigated. At the highest concentration tested (1000 g/ml), the extract showed trypanocidal action.

Sedative effects :

The hot infusion of N. arbo-tristis flowers may have sedative properties. A variety of concentrations of hot floral infusion were prepared and given orally. Two hours after treatment, the sedative potential was determined. Male rats had a modest dose-dependent conscious sedation effect from the injection, while female rats did not. Even after subchronic therapy, the infusion was well tolerated in terms of overt toxic symptoms, liver or kidney function, and did not exhibit any overt indications of dependency.

Antianemic activity :

A haematological research using ethanolic extracts of the flowers, barks, seeds, and leaves of the plant showed a dose-dependent rise in the haemoglobin content and red blood cell count in rats. Additionally, the extracts prevent anaemic rats' hemogram profiles from degradation.

Anti-Histaminic and Anti-Tryptaminergic activity :

The aqueous soluble extract of *N. arbor-tristis* leaves (4.0 and 8.0g/kg oral)

successfully prevents guinea pigs from hypoxia caused by histamine aerosols (2 percent at 300 mm Hg). In N. arbor-tristis, arbortristosid A and arbortristosid C were shown to be anti-allergic.

Anti-Aggressive Activity :

Fresh juice derived from the leaves of the plant was shown to have antimalarial activity.

The plant's seeds, leaves, roots, flowers, and stem have been found to have antibacterial and antiallergic properties in a 50 percent ethanolic extract. The leaf extract of the plant was shown to have anti-inflammatory, analgesic, antipyretic, and allergenic effects. Immunostimulant effects have been discovered in the leaves, seeds, and flowers of the plant. Sedative, antihistamine, purgative, and tumour necrosis depletion activities have been shown for the water soluble part of the ethanolic extract. Arbortristoside, isolated from the seeds, showed anticancer properties.

Anti-Filarial activity :

Both the chloroform extract of the flowers and a purified constituent of the N. arbortristis plant are larvicidal against the common floral vector *Culex quinquefasciatus*.

Anti-Leishmanial activity :

The anti-leishmanial activity of N. arbortristis has been attributed to iridoid glucosides, arbortristosides A, B, and C, as well as 6-b-hydroxyloganin. Arbortristosides A, B, C, and 6-beta-hydroxy-loganin were shown to be anti-leishmanial in macrophage cultures and hamster test systems, respectively.

Anti-arthritic activity :

Arthritis is a progressive degenerative condition that starts with joint pain and proceeds to bone and joint deterioration. Cytokines have a major role in the pathogenesis of rheumatoid arthritis. Previously, it was shown that aberrant tumour necrosis factor (TNF-) expression resulted in debilitating arthritis in experimental animals. In the absence of interleukin-1 (IL-1), the development of arthritis was substantially decreased in collagen-induced arthritis (CIA). Mice missing the interleukin-6 (IL-6) gene were resistant to arthritis caused by antigens and collagen. These studies shown that pro-inflammatory cytokines (TNF-, IL-1, and IL-6) have a role in rheumatoid arthritis and may represent therapeutic targets.

Antioxidant activity :

In a living organism, free radicals are generated as a consequence of the body's normal metabolic activity. Antioxidants act as free radical scavengers, defending the body against pathological conditions such as ischemia, anaemia, asthma, rheumatoid arthritis, inflammation, neurodegeneration, Parkinson's disease, mongolism, the ageing process, and perhaps dementias. According to prior study, *NAT's* antioxidant activity was determined using the DPPH test, free radical scavenging activity, reducing power assay, and total antioxidant capacity. The plant was shown to have a significant degree of antioxidant activity.

In conclusion, the comprehensive review of *Nyctanthes arbor-tristis* reveals a

rich tapestry of phytochemical compounds, underscoring its potential as a valuable resource in traditional medicine and modern pharmacology. The diverse array of secondary metabolites, including flavonoids, alkaloids, and terpenoids, contribute to its medicinal properties. The plant has been traditionally used in various cultures for its therapeutic benefits, serving as a remedy for a spectrum of ailments.

The pharmacological activities attributed to Nyctanthes arbor-tristis, such as anti-inflammatory, antioxidant, antimicrobial, and analgesic effects, substantiate its traditional uses. Furthermore, emerging scientific evidence supports the plant's potential in addressing contemporary health challenges, thereby providing a scientific foundation for its inclusion in modern therapeutic interventions.

Despite the promising findings, it is essential to acknowledge the need for further research to elucidate the mechanisms of action, pharmacokinetics, and potential side effects associated with the use of *Nyctanthes arbor-tristis*. Additionally, standardization of extraction methods and dosage regimens is crucial for ensuring reproducibility and safety in clinical applications.

In conclusion, *Nyctanthes arbor-tristis* stands as a botanical treasure with a rich phytochemical profile and a history deeply rooted in traditional medicine. The integration of traditional knowledge with modern scientific exploration holds the promise of unlocking the full therapeutic potential of this plant, paving the way for the development of novel pharmaceuticals and health-promoting interventions.

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