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Nyctanthes arbor-tristis: a comprehensive review

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Abstract

The Indian medicinal herb *Nyctanthes arbor-tristis* Linn. (NAT) is well-known. It is often referred to as "Parijat" and is a critically endangered species in India. Crude extracts and refined chemicals from seeds, such as 4-hydroxy-hexahydrobenzofuran-7-one, 6-hydroxyloganin, and Arbortristoside A, a polysaccharide from the leaves, and Naringenin from the stem, may all be sources of active pharmacological agents. In Ayurveda, the plant is used for a variety of pharmacological effects, including anticancer, antiparasitic, antimalarial, immunostimulant, hepatoprotective, antiviral, anti-diabetic, and anti-allergy activity.



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Introduction

For a long period of time, ancient works of literature have recorded the use of plants for therapeutic purposes. As a result of this recording of essential traditional knowledge about medicinal plants, many significant medicines have been developed in the contemporary age. *Nyctanthes arbor-tristis* L. (Oleaceae) is a significant medicinal plant that has been utilised for a variety of purposes throughout history. Numerous plant components have been utilised medicinally in traditional and indigenous cultures. *Nyctanthes arbor-tristis* is used in Ayurveda, Siddha-Ayurveda, and Yunani medicine as a laxative, diuretic, anti-venom, digestive, mild bitter tonic, and expectorant. Also called as Harshingar and Night jasmine, *Nyctanthes arbor-tristis* Linn (Magnoliophyta division; Magnoliopsida class; Lamiales order; Oleaceae family) (Class: Magnoliopsida; Order: Lamiales; Family: Oleaceae) (Division: Magnoliophyta; Class: Magnoliopsida; Order: Lamiales; Family: Oleaceae) [1-2].

It is a tiny native tree with rough and peeling grey or greenish bark. The shrub may reach a maximum height of ten metres. The opposite leaves are 6–12 cm long and 2–6.5 cm broad with a full edge, and the plant lives for 5–20 years. The fragrant blooms are clustered in groups of two to seven and have a five-to-eight lobed corolla with an orange-red centre. The powder white petals are clinging to dew droplets. The fruit is a flat, brown, and heart-shaped to spherical capsule divided into two parts, each of which contains a single seed and is about 2 cm in diameter [3-4].

It is found in the outer Himalayas and parts of Jammu and Kashmir, Nepal, and Assam, Bengal, and Tripura, extending from the central area to the Godavari in the south [5]. The plant

is found across northern Pakistan and southern Nepal, as well as northern India and Thailand's east coast. Due to its great therapeutic efficacy, it is now being investigated in biomedical science in order to create a more accurate therapeutic index in terms of active principles that may be the plant's flag molecule. [6].

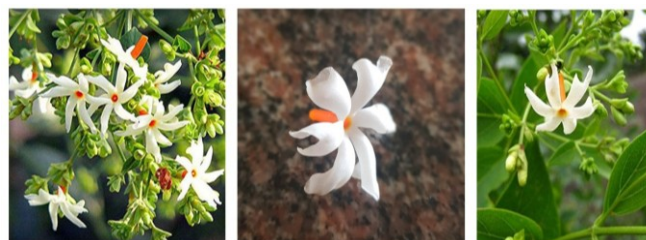


Fig 01: *Nyctanthes arbor-tristis* or Night jasmine

Vernacular Names [7-8]

English: Night jasmine, coral jasmine,

Hindi: Parja, Har, Siharu, Harsing har, saherwa, seoli, Nibari, Shefali.

Kannada: Parijata, harashingar

Odia: Shingadahar, harashingar, gangaseuli, jharasephali

Tamil: Pavilamalligai, manja-pu, pavazhamalligai

Telugu: Pagadammali, swetasarasa, paghada, karchia, karuchiya

Malayalam: Pavilamalli, parijatam, pavizhamalli, parijatakam

Marathi: Khurasli, Parijataka, Purijat

Classification of study drug [9]

Kingdom: Plant

Order: Lamiales

Family: Oleaceae

Genus: Nyctanthus
Species: Arbortristis

Etymology [10]

“Paarinaha Samudrath jaatho va parijatah” is the etymology of Parijata: It is known as Parijata because it originated in the Samudra (Ocean) as a consequence of (parinaha) thorough searching.

Synonyms of Parijata [11]

Parijata is referred to by a variety of names in many classics. Its many names alludes to physical features such as colour, fragrance, and flower and leaf use. Synonyms include parajataa, hara-singhara, sephali, raga-pushpi, kahrapatrak, sephalika, pushpaka, nala-kumkuma, prajakta, and rakta-kesara.

Traditional pharmacological properties

Parijata has traditionally been used for its pharmacological characteristics such as rasa (katu, tikta, guna-ruksha, virya-ushna), guna, virya, and vipaka. It is a component in many chemical compositions. Generally, the leaves, roots, flowers, and seeds of Parijata are used in a variety of dosage forms, including juice, powder, and decoction, to treat a variety of illnesses. It is particularly used to treat illnesses caused by vata and kapha vitiation [12-13].

Table 01: Chemical constituents of NYCTANTHES ARBORTRISTIS.

Plant parts	Chemical constituents
Leaves [14-15]	D-mannitol, -sitosterole, astragaline, nicotiflorin, oleanolic acid, nyctanthic acid, tannic acid, ascorbic acid, methyl salicylate, carotene, friedeline, lupeol, mannitol, glucose and fructose, iridoid glycosides, benzoic acid.
Flowers [16-17]	Essential oil, nyctanthin, d-mannitol, tannin and glucose, carotenoid, glycosides viz β -monogentiobioside ester of α -crocetin (or crocin-3), β -monogentiobioside- β -D monoglucoside ester of α -crocetin, β -digentiobioside ester of α -crocetin
Seeds [18]	Arbortristoside A&B, Glycerides of linoleic oleic, lignoceric, stearic, palmitic and myristic acids, nyctanthic acid, 3-4 secotriterpene acid.
Stem [19]	Glycoside-naringenin-4'-0- β -glucapyranosyl- α -xylopyranoside and β -sitosterol
Flower [20]	Oil α -pinene, p-cymene, 1- hexanol methyl heptanone, phenyl acetaldehyde, 1-deconol and anisaldehyde.
Bark [21]	Glycosides and alkaloids

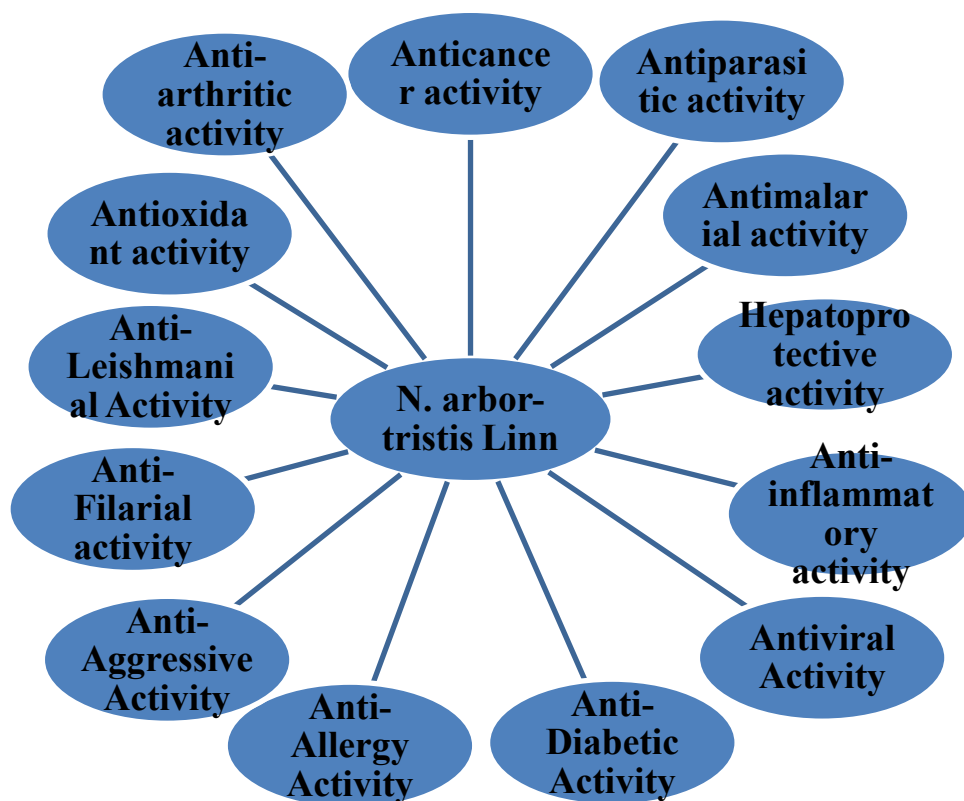


Fig 02: Pharmacological activities of Nyctanthes arbor-tristis Linn

Pharmacological Activities

Pharmacological activities are shown in figure 2 and discussed in details following are

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 [22].

Antiparasitic activity

A crude 50 percent ethanolic extract of leaves was found to exhibit trypanocidal activity at a concentration of 1000 Og/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 [23].

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. [24].

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. [25].

Hepatoprotective activity

The antihepatotoxic efficacy of aqueous extracts of *Nyctanthes arbor-tristis* leaves and seeds against carbon tetrachloride (CCl₄) caused hepatotoxicity was discovered [26]. 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 [27].

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. [28].

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. [29].

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. [30].

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. [31].

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. *Arbortristoside A* and *arbortristoside C* have been shown to have anti-allergic effects in NA [32].

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 [33].

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 [34].

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. [35, 5].

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. [36].

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. Arbortristoides, isolated from the seeds, showed anticancer properties [37].

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* [38].

Anti-Leishmanial Activity

The anti-leishmanial activity of *N. arbortristis* has been attributed to iridoid glucosides, arbortristoides A, B, and C, as well as 6-b-hydroxyloganin. Arbortristoides A, B, C, and 6-beta-hydroxy-loganin were shown to be anti-leishmanial in macrophage cultures and hamster test systems, respectively [39].

Anti-arthritis 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. [40]

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. [41].

Conclusion

Plants offer a wide range of pharmacological properties that may be therapeutically beneficial for population health and well-being; thus, further clinical research is urgently required. So far, all pharmacological research has been preliminary such as Anticancer activity, Antiparasitic activity, Antimalarial activity, Immunostimulant activity, Hepatoprotective activity, Anti-inflammatory activity: Antiviral Activity, Anti-Diabetic Activity, Anti-Allergy Activity, Anti-Histaminic and Anti-

Tryptaminergic activity, Anti-Aggressive Activity, Anti-Filarial activity, Anti-Leishmanial Activity, Antioxidant activity, Anti-arthritis activity. In these studies, the bioactive chemical must be discovered and described, as well as the molecular mechanism of action.

Disclosure Statement

There are no conflicts of interest.

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