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Nycatanthes Arbour-Tritis with Special Reference to their Anti-Arthritic Activity - A Review

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Abstract: India has been blessed with wide variety of flora having medicinal properties. *Nycatanthes arbor-tristis* commonly known as *Parijat* is the official flowers of West Bengal have significant health properties. Ayurveda has established *Nycatanthes arbor-tristis* as a very useful medicinal plant. The parts of this plant have been used since ages in treating various disorders like chronic fever, rheumatism, arthritis, joint pain etc. *Nycatanthes arbor-tristis* extracts were highly effective in preventing and suppressing arthritis which is a common disease seen in older generation. The present study aims to explore the significant compounds present in *Nycatanthes arbor-tristis* which makes this plant potentially suitable for the treatment of arthritis. It also presents the review of the work done in past in treatment of arthritis using different parts of *Nycatanthes arbor-tristis* plant extracts.

Keywords: Medicinal properties, chronic fever, rheumatism, arthritis

I. INTRODUCTION

Arthritis means the inflammation of the joint. It is a leading cause of pain, physical disability. Prolonged inactivity can result in much of the morbidity attributed to arthritis problems such as fatigue, lessens joint flexibility and muscle strength, loss of independence, poor endurance and overall fitness and depression. It is a severe chronic and disabling disease affecting many people. Arthritis appears in many forms with more than a hundred different types. Osteoarthritis is the most common type of arthritis affecting over 10% of the population, especially older people¹. It affects wide aspects of life including physical and social activities². Anti-inflammatory drugs and analgesics used against arthritis is costly and also had an adverse side toxic effects^{3,4}. Presently, researchers focused on use of traditional medicinal plants for treatment of arthritis especially in developing countries where resources are meager^{5,6}. These medicinal plants act as long acting anti-inflammatory agents displaying minimum side effects⁷. *Nycatanthes arbor-tristis* Linn. (NAT) is a small divine ornamental tree has long been medicinally used in traditional systems of medicine⁸. It is commonly known as night flowering Jasmine or *Parijata* or *Harsingar*^{9,10}. This plant of Oleaceae family is small ornamental tree with fragrant white flowers. The leaves are given for treating chronic fever, rheumatism, arthritis, joint pain¹¹. Different parts of NAT are known to own for treatment of various ailments. The aim of the present study involves the detail description of arthritis and to prove the therapeutic potential of the plant as an anti-arthritic agent.

II. DETAILED DESCRIPTION OF ARTHRITIS

A. Symptoms of Arthritis

Symptoms of arthritis are typically characterized by joint pain, swelling, aching, stiffness, tenderness and fatigue. The symptoms can develop gradually or suddenly. These symptoms can be mild, moderate or severe. Major sign and symptom of arthritis is inflammation of joints. It can also involve the immune system and various internal organs of the body. The symptoms may includes pain with stiffness, redness and swelling often occurring in the hip, spine, knee or other weight-bearing joints, but can also affect the fingers and other non-weight bearing joints. In severe conditions it causes chronic pain, limping, loss of range of motion of joint and makes it difficult to walk. It can cause permanent joint changes¹².

B. Most common types of arthritis

The classification of arthritis is based on the joints affected by the damage caused by it. The two main types of arthritis are osteoarthritis and rheumatoid arthritis¹³.

- 1) *Osteoarthritis*: It is a type of degenerative arthritis. It involves wear-and-tear damage to joint's cartilage the hard, slick coating on the ends of bones. This is the most common type of arthritis. It primarily affects cartilage. It can cause joint pain and stiffness. Enough damage can result in bone grinding directly on bone, which causes pain and restricted movement
- 2) *Rheumatoid arthritis*: It is a type of inflammatory arthritis¹⁴. In this type of arthritis the body's immune system attacks the lining of the joint capsule, a tough membrane that encloses all the joint parts. This lining, known as the synovial membrane, becomes inflamed and swollen¹⁵. The disease process can eventually destroy cartilage and bone within the joint. This results in pain, stiffness, swelling, joint damage and loss of function of the joints. Inflammation most often affects the hands and feet.

C. Treatment of arthritis

The conventional method of treatment of arthritis is the use of non-steroidal anti-inflammatory drugs (NSAIDs) or disease modifying ant rheumatic drugs (DMARDs). For the treatment of chronic patients immunosuppressive and cytotoxic drugs are used. These therapeutic agents reduce the inflammation and joint destruction but their long term usage may leads to side effects like gastrointestinal ulcers, cardiovascular complications, toxicity, hepatic fibrosis, cirrhosis, diarrhea, immune reactions and local injection-site reactions. Moreover, these pharmacological treatments cause economical exploitation¹⁶.

Since, plant has got wide range of pharmacological actions and play efficient role for betterment of the treatment. The plants provide essential compounds with active principles, having minimal side effects and may be useful for arthritis control. Also, herbal medicines synthesize from plants showing anti arthritic activity are cheap and safe. The present study focused on the use of traditional medicinal plants *Nyctanthes arbor-tristis* Linn. (NAT) for treatment of arthritis.

III. DESCRIPTION OF PLANT

A. Anatomy

Nyctanthes arbor-tristis Linn.(NAT) is a large shrub with flaky grey bark and height up to 10 m tall , stiff whitish hair^{17, 18, 19}. It has fragrant flowers with five to eight lobes which are white in color, and corolla is orange colored centrally they are produced in clusters of two to seven together, with individual flowers opening at dusk and finishing at dawn¹⁸. The leaves are opposite, simple, 6–12 cm long and 2–6.5 cm broad, with an entire margin. The fruit is a flat brown heart-shaped to round capsule 2 cm diameter, with two sections each containing a single seed¹⁸. These are long and broad, nearly orbicular, compressed, 2-celled. Seeds are exalbuminous, testae are thick and outer layer of large transparent cells is heavily vascularised¹⁹.

B. Medicinal value

NAT is a divine tree with numerous medicinal uses. Different parts of NAT are known to own for treatment of various ailments by tribal people of India. The parts of the plant used for different purposes are summarized in Table 1.

Table 1. Medicinal applications of different parts of NAT

Part of the Plant	Chemical constituents	Medicinal application	Reference
Leaves	tannic acid, methyl salicylate, amorphous glucosides, mannitol, resin, ascorbic acid, carotene, and traces of a volatile oil	For treating chronic fever, rheumatism, arthritis, joint pain, obstinate sciatica, treat anorexia, hemorrhoid, liver disorders, biliary disorders, intestinal worms, chronic pyrexia, malaria and as a tonic, cholagogue and laxative.	^{20,21}
Seeds	Glycerides of linoleic, oleic, stearic, palmitic and myristic acids	Used as anthelmintic and in alopecia, Cure infections of scalp, piles and skin diseases, rheumatic joint pain, in treatment of malaria and also used as an expectorant.	^{22, 19, 23}
Bark	Glycosides and alkaloids	Treatment of snakebite and bronchitis	^{24 25}
Root	Alkaloids, tannins and glucosides	Pyrexia, sciatica, anorexia	^{26 27}
Flower	Essential oils, coloring matter (nyctanthin), mannitol, tannin and glucose	Antibacterial, larvicidal, Antimalarial	²⁸

IV. REVIEW ON ANTI-ARTHRITIC ACTIVITY OF NAT

The anti-arthritis activity of NAT may be due to presence of active constituents like flavonoids and terpenes. So it can be used as a potential natural source of inflammation disorders by preventing or slowing the progress of symptoms of arthritis. The present study focused to analyze the work done in earlier studies and to identify the most active bioactive fractions & phyto constituents which are responsible for the observed significant anti-arthritis activity.

- A. Kannan et al., 2007, investigated the immune modulator potential of NAT²⁹. The study concludes that the leaf extracts of NAT is used to treat arthritis, lung injury and some painful conditions such as cancer, chronic fever and rheumatism. An ethanolic extract of NAT was screened in rats for humoral and cell-mediated immune responses. The chronic administration of NAT increased the total counts of white blood cells (WBC) and controls the delayed-type hypersensitivity (DTH) reactions. The study confirms the strong immuno-bioactivities in extracts of NAT.
- B. Bhalerao, 2011, studied NAT and Maharashtra extracts for arthritis using gouty arthritis and Freund's adjuvant Induced Polyarthritis³⁰. The plant extract was found to have low toxicities even at high doses. The study showed that in gouty arthritis a significant reduction in legged gait was observed as compared to control group whereas in poly arthritis model complete control was noticed. The results showed promising role in both chronic and acute arthritis models suggesting further histopathological studies in order to establish its anti-arthritis potential. The plant extracts are believed to possess many flavonoids which may have played a significant role in reducing inflammation thereby reducing legged gait. Further studies are recommended to establish the results.
- C. Srinivasan et al., 2011, investigated phytochemical constituents of NAT flowers³¹. Dried ethanolic extract of NAT flowers was further subjected to fractionation by using petroleum ether, diethyl ether and ethyl acetate solvents in the order of increasing polarity. Phytochemical screening of flower extract showed the presence of volatile oils, phenolic compounds and iridoid glycosides. Petroleum ether and diethyl ether fraction showed the significant antioxidant activity. Antibacterial activity revealed that petroleum ether and diethyl ether extracts were moderately active against both gram positive and gram negative species. None of the tested fraction showed significant antifungal activity.
- D. Jain et al., 2012, analysed phyto chemical screening of the ethanolic extract of the stem of NAT³². The ethanolic extract was fractionated with different solvents like petroleum ether, ethyl acetate and butanol. The ethylacetate fraction was chromatographed over Si-gel column, which resulted in the isolation of Naringenin which is a flavonone possessing antiviral, antioxidant, anticarcinogenic activities. Various spectroscopic techniques (IR, UV, NMR and Mass) were used to elucidate and confirm the structure of the isolated compound.
- B. Bansal et al., 2013, developed a protocol for callus induction from nodal explants of NAT³³. Phytochemical analysis of natural and in vitro raised plants showed the presence of bioactive substances like flavonoids, alkaloids, terpenoids in different types of extracts.
- C. Goyal et al., 2013, conducted studies to evaluate the antimicrobial properties of leaves of NAT³⁴. The different solvent extracts were prepared on the basis of polarity. Antimicrobial activities were evaluated using pathogenic microbes. Marked antimicrobial activity was noticed against pathogenic microorganism using different solvent extracts.
- D. Sarvani et al., 2014, studied the immunomodulatory effect of NAT flower³⁵. The aqueous and alcoholic extracts of flowers of NAT were prepared and standardized by preliminary phyto chemical tests. The studies were conducted on various in vitro antioxidant and free radical scavenging activities like DPPH, ABTS, superoxide anion scavenging and reducing power activity. The in vivo immunomodulatory activity on Swiss Albino mice of NAT extracts were found to be dose dependent and alcoholic extract exhibited better activity when compared to aqueous extract. The study reveals that aqueous and alcoholic extracts of NAT have shown potent antioxidant and free radical scavenging properties. The study reveals that extracts possess immunomodulatory activity and the activity may be due to antioxidant and free radical scavenging potential of NAT.
- E. Ramchandran et al., 2014, analyzed major bioactive compounds present in the ethanol extract from NAT by GC-MS³⁶. The study reported that phytochemical constituent of plant leaf ethanolic extract contains steroids, phenol, alkaloids, saponin, tannin and flavonoids. The observation reveals the presence of different compounds such as Arturmerone, Curlone, Dibutyl phthalate, Hexadecanoic acid, ethyl ester, 9-Octadecenoic acid, ethyl ester and 1, 2-Benzenedicarboxylic acid, diisooctyl ester. The ethanolic extract of NAT has shown the presence of potent bioactive compounds and is suitable for phytopharmaceutical applications.
- F. Bansal et al., 2015, reviewed NAT is an important traditionally used medicinal plant to provoke menstruation, for treatment of scabies and other skin infections, as hair tonic, diuretic, in treatment of arthritis, malaria, bronchitis and as anthelmintic³⁷. The

review compiles the traditional and scientific data of medicinal properties of NAT comprising pharmacognostic description, distribution, therapeutic uses, phytochemical constitution and chromatographic evaluation.

IV. CONCLUSION

The review explores the possibility of scope of NAT plant in treating various kinds of arthritis. The study compiles the work done by various researchers which consist of extraction of different plant parts using different solvents like diethyl ether, ethyl acetate, petroleum ether etc. The results successfully reveal that plant possesses wide range of pharmacological actions, which may be therapeutically beneficial for overall health and wellness of population. This can be attributed to the presence a large number of flavonoids which are beneficial to the human body in many ways. More studies are needed to establish the low side effect and toxicity of this plant.

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