

## A REVIEW OF THE MEDICINAL HERBAL PLANT OF *NYCTANTHES ARBOR-TRISTIS* AND ITS ACTIVITY

Kamlesh Kumar Yadav<sup>1\*</sup>, Ravindra B. Laware<sup>2</sup>

<sup>1</sup>Bhagwant University Sikar Road Ajmer Rajasthan 305004.

<sup>2</sup>Professor and Principal College of Pharmacy Pravara Institute of Medical Sciences (Deemed to be University) Loni, Ahmednagar, Maharashtra.



\*Corresponding Author: Kamlesh Kumar Yadav

Bhagwant University Sikar Road Ajmer Rajasthan 305004.

Article Received on 24/09/2023

Article Revised on 14/10/2023

Article Accepted on 03/11/2023

### ABSTRACT

The medicinal plant *Nyctanthes arbor tristis* (Parijata) has significant therapeutic potential in Ayurveda. Ayurveda, which employs herbs and their extracts to treat and manage a variety of ailments, is one of the oldest medical systems. It is recognized as one of India's traditional medicinal herbs with the greatest health benefits. It is regarded by way of a significant herbal that produces not only distinctive pharmaceutical items but also has manufacturing significance. In addition to being used as a laxative, rheumatism, skin conditions, and as a sedative, it has a number of medicinal properties including anti-helminthic, analgesic and anti-inflammatory, antioxidant, hepatoprotective, anti-viral, antifungal, anti-pyretic, anti-histaminic, antimalarial, and antibacterial. The possible phytochemicals and pharmacological action of the plant *Nyctanthes arbor tristis* are the main topics of the current review. The variety of plants Various components, including seeds, leaves, flowers, bark, and fruits, investigation indicated the presence of their primary pharmacological action and phytochemicals a substantial hair tonic composed of flavanoids, glycosides, oleanic acid, essential oils, tannic acid, carotene, glucose, and benzoic acid.

**KEYWORD:** *Nyctanthes arbor-tristis*, Parijata, pharmacological action.

### INTRODUCTION

The oldest informational source in this region, the Rigveda, contains the earliest references to traditional medicine. Later, Ayurveda, which was derived from the Vedic conception of life, served as the foundation for many different systems of therapeutic sciences. It gradually assimilated into the Indian subcontinental people's culture and heritage. phyto is the Greek word for a herbal, and phytochemicals or phyt-chemicals are the chemicals produced by plants.<sup>[1]</sup> Ancient literary works from a long time ago describe the use of plants as medicines. Many significant drugs of the fashionable era were made possible by such primary mental object documentation on medicinal plants.<sup>[2]</sup> The reproductive structure aids in the storage of these inhibitory phenolic compounds within the pericarp. Removing both covers or soaking seeds in an antioxidant solution like polyvinylpyrrolidone (PVP) or polyvinylpolypyrrolidone (PVPP) before planting both increase the rate of germination.<sup>[3]</sup> The plants that are utilized as medications are generally safe and have few hazardous side effects, or they were so poisonous that deadly effects were widely recognized. The protagonist has offered a wealth of treatments for all human ills.<sup>[4]</sup> Since ancient times, man

has been fascinated with *N. arbortristis* for treating a variety of physical ailments. Since the dawn of civilization, different portions of several plants have been used to relieve suffering, treat illness, and manage pain. The primary and oldest source of medicines for *N. arbortristis* was plants, which provided the majority of the medications used in prehistoric medicine. The history of all civilizations includes evidence of the use of medicinal flowers and plant parts to treat ailments and diseases. Everywhere the interest in medicinal and aromatic flowers has been shown. The history of all civilizations includes evidence of the use of medicinal flowers and plant parts to treat ailments and diseases. Due to their secure and efficient energy principles, medicinal and aromatic flowers have garnered interest around the globe. The orange heart is used to dye cotton and silk; this tradition was first carried out by Buddhist monks, whose orange robes were colored by this flower. Hindu mythology considers the Parijata to be one of the five Devaloka trees that grant wishes.<sup>[5,6]</sup> In addition to its usage in the Ayurvedic, Siddha, and Unani systems of medicine, various sections of *Nyctanthes arbor-tristis* are reported to be used intended for treating a variety of diseases by tribal people in India, particularly in Orissa and Bihar.<sup>[7,8]</sup> Utilization of medicinal herbs for treating

illness has been recorded throughout human history. Due to their safe and efficient active ingredients, medicinal and aromatic plants have garnered interest around the globe.<sup>[9]</sup> It may be found in sections of Jammu & Kashmir, Nepal to the east of Assam, Bengal, and Tripura, which extend from the central area to the Godavari in the south, as well as the outer Himalayas. It thrives in red and black soil with a pH of 5.6 to 7.5 and favors dry and semi-dry climatic conditions.<sup>[10]</sup> Anywhere above 1500 tops above sea level is a shrub, but at 3000 tops it is a well-formed tree known as a cow by the locals. The wooden is mostly utilized as firewood and for the handles of axes and koolharees.<sup>[11]</sup>

### PLANT EXPLANATION

Coral jasmine, regularly alluded to as night jasmine, is an innate modest tree with a harsh, peeled, gray or green bark. The plant may reach a tallness of ten meters. The contradicting basic takes off have a full edging that's between 2 and 6.5 cm wide and 6 to 12 cm long. The orange-red buds have a five to eight lobed corolla and are fragrant. They as often as possible develop in bunches of two to seven. Dew trickles are resting on the snow-white petals. The natural product has two parcels, each with a singular seed; it is level, brown, and heart-shaped to round, measuring around 2 cm in distance across.

**VERNACULAR NAMES:-** In different states of India plant is known by<sup>[11]</sup>

**Table 1: Name of the plant in various language.**

Language	Name
Sanskrit	Parijatha
Hindi	Harsingar
Gujarathi	Jayaparvati
Bengali	Sephalika
Malayalam	Parijatakam
Telugu	Pagadamalle
English	Night Jasmine
Marathi	Parijathak
Oriya	Gangasiuli

**Table 2: Taxonomical classification.**<sup>[12,13]</sup>

Kingdom	Plantae
Subkingdom	Viridiplantae
Infrakingdom	Streptophyta
Super division	Embryophyta
Division	Tracheophyta
Sub division	Spermatophytina
Class	Magnoliopsida
Order	Lamiales
Family	Oleaceae
Genus	Nyctanthes
Species	Nyctanthes arbortristis
Binomial Name	Nyctanthes arbortristis

### MORPHOLOGICAL CHARACTERS<sup>[14,15,16]</sup>

**Leaves:** The leaves of *Nyctanthes arbor-tristis* are widely used in Ayurvedic medication to treat a variety of ailments, including internal worm infections, rheumatism, chronic fever, and sciatica. They are also used as a laxative, diaphoretic, and diuretic drug. To lessen coughs, apply leaves. To cure a coughing, leaf extract is combined with sugar and administered three times a day. For the treatment of illness, high blood pressure, and diabetes, leaf paste is administered with honey. The leaves' juice is used as a laxative, diaphoretic, diuretic, mildly bitter tonic, and antidote against reptile venoms. Additionally, leaves are working in spleen enlargement. The leaf extract is used to treatment of rheumatism, piles, chronic fever, intractable sciatica, intestinal worms, liver problems, biliary disorders, loss of appetite, and fever. The opposite leaves are 5 to 10 cm long, 2.5 to 6.3 cm wide, oval, acute or acuminate, whole or with a few big, distant teeth, and short bulbous hairs that are rounded or slightly cuneate. The petiole is 6 cm long and hairy. Simple, petiolate, and stipulated leaves. The top side of the lamina is dark green with dotted glands, while the bottom surface is pale green and gently pubescent. The lamina is oblong with an acute or acuminate apex, an entire or serrated edge, and some undulation, especially at the base. The venation of *Nyctanthes arbor-tristis* is unicostate, reticulate, and averages 12 lateral veins per midrib. The petioles have an adaxial concavity 5- 7 and are around 7-10 mm long.

**Flowers:** The flowers are used for ophthalmic, gastrointestinal, bowel, expectorant, and hygiene applications as well as in the treatment of piles and a number of skin conditions. A coloring constituent found in the flowers' bright orange corolla tubes is identical to the colorant crocetin found in saffron. Previously, the corolla tubes were occasionally used with safflower to colour silk. The flowers are used for ophthalmic reasons as well as for stomachic, carminative, astringent to bowel, antibilious, expectorant, toiletry, and the treatment of piles and numerous skin disorders. Nyctanthin, a coloring agent found in the flowers' vivid orange corolla tubes, is the same as the crocetin found in saffron. Historically, the corolla tubes were used to colour silk, sometimes in conjunction with safflower or turmeric. In 3-5 fascicles of pendaculate bracteates, the flowers are tiny, fragrant, and sessile. In short terminal trichotomous chymes, the peduncles are four-angled, thin, hairy, auxiliary, and solitary. Bracts are oblong, 6 to 10 mm long, apiculate, and hairy on both sides. lobes are white, cuneate, and unevenly obcordate, and the tube is 6 to 8 millimeters long, orange in color, and approximately the same length as the limb. The calyx Carolla is 6 to 8 mm long and constricted.

**Fruits:** The *Nyctanthes arbor-tristis* fruit is a 1-2 cm in diameter, long, broad, compressed, obcordate orbicular, 2-celled capsule that splits into two flat, one-seeded carpels and is reticularly veined and glabrous. The fruit's macroscopic structure The fruit is brown, plane, and

heart-shaped to round, with two cells that open transversely from the apex and each contain one seed. It is about 2 cm in diameter. Fruit displays its normal characteristics under the microscope. The three layers of collenchymas are followed by the compactly packed polygonal cells with slightly anticlinal walls that make up the epidermal cells in the epicarp. Oil gland, sclerenchymatous fibers, and spongy parenchymatous tissue.

**Stem and Bark:** A major bush with quadrangular branches might grow up to 10 m in height. The bark of the NAT herbal is extreme and hard, with a dim dark or earthy colored tone. The bark surface is dimpled because of scaling off of roundabout barks and inconsistent because of dim earthy colored shading regions. The inward bark is smooth white, delicate, and imploded, with an obviously apparent non-fell phloem zone.

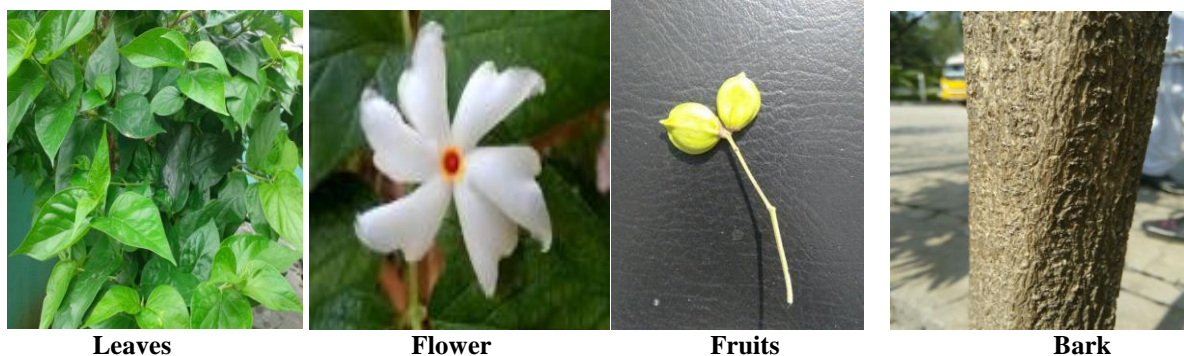
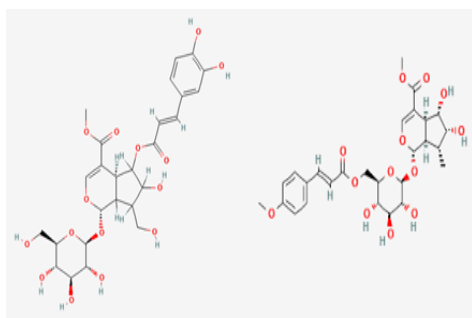


Fig 1: Morphology of different part of *Nyctanthes arbor-tristis*.

### CHEMICAL COMPONENTS

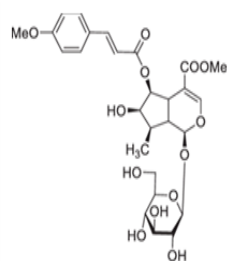
Table 3: Phytoconstituent and biological activity.

Phytoconstituent	Parts of Plant	Biological Activity
beta-amyrin, beta-sitosterol <sup>[17,18]</sup>	Leaves	Analgesic and antiinflammatory
Flavanol glycosides <sup>[19,20]</sup> - kempferol 3-glucoside (astragaline), kempferol 3-rhamnoglucoside (nicotiflorin), Iridoid glycosides <sup>[21]</sup> (arborsides A, B, C) and 6-O- trans-cinamoyl-6 β-hydroxy loganin 7-O-trans-cinnamoyl-6-β-hydroxy <sup>[22,23]</sup>	Leaves	Antiulcer, Antidiabetic Antioxidant, Anti-inflammatory, Cardioprotective, Antiobesity, properties
flavanoids (astraglin and nicotiflorin), Nyctanthin, nyctanthoside Arborside C, D-mannitol, 6-beta-hydroxyloganin <sup>[24,25,26,27]</sup>	Flower	Diuretic, Anti-inflammatory, Antidiabetic, Antibacterial, Antioxidant
Iridoid glycoside (Arbortristoside A) (I), nyctanthic acid, oleanic acid, friedelin, b-sitosterol glucoside and 6 b-hydroxyloganin, Arbortristoside A and B and Vitamin A, Nicosterol, Nyctanthic acid. <sup>[28,29]</sup>	Seed	Anticancer, Antileishmanial Antiinflammatory, Antiallergic, Antiulcer.
Glycosides and Alkaloids <sup>[30,31]</sup>	Bark	Antimicrobial, Antifungal, Antihelminthic, Antiallergic, CNS Modulatory
beta-sitosterol and naringenin-4'-O-beta-glucopyranosyl-xylopyranoside <sup>[32]</sup>	Stem	Antiamoebic, Antifungal, Antiallergic
a-pinene, p-cymene <sup>[33,34,35]</sup>	Flower oil	Modulation of antibiotic resistance, Anticoagulant, Antitumor

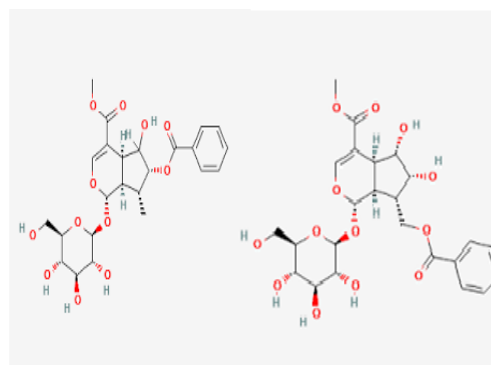


Arbortristoside B

Arbortristoside E

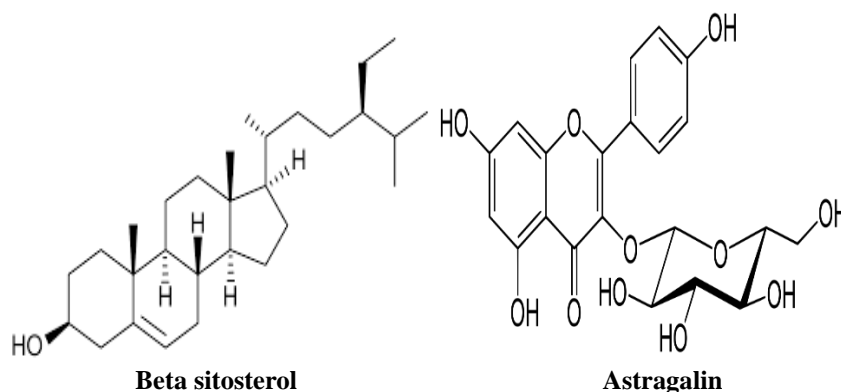


Arbortristoside A



Arborside C

Arborside D



**Fig 2: Chemical Structures of different phytochemicals of *Nyctanthes arbor-tristis*.**

### MEDICAL AND THERAPEUTICAL APPLICATIONS<sup>[36]</sup>

- ❖ Coral Jasmine has antibacterial, anti-inflammatory, expectorant, bitter tonic properties, and is a moderate purgative.
- ❖ Night Jasmine can help youngsters with constipation.
- ❖ The blooms are astringent, bitter, ophthalmic, stomachic, and carminative.
- ❖ The leaves are used to cure arthritis, fever, rheumatism, and other unpleasant conditions.
- ❖ condition.
- ❖ New leaves are cooked in mustard oil and apply topically to cure roundworm.
- ❖ To cure intestinal worms, the leaf juice is used with ordinary salt.
- ❖ Coral Jasmine is used to treat fungal skin infections, bronchitis, and dry cough.
- ❖ and as an antidote to snake bite.
- ❖ Seeds can be used to cure piles, baldness, and scurvy.
- ❖ Gout is treated using an infusion of Night Jasmine flowers.
- ❖ Restlessness, headache, gastritis, hepatitis, diarrhea, and vertigo are all treated with coral jasmine.
- ❖ The seed decoction is used as a hair tonic in the treatment of dandruff.

### PHARMACOLOGICAL ACTIVITY OF *NYCTANTHES ARBOR TRISTIS*<sup>[37,38,39,40,41,42,43,44]</sup>

**Table 4: pharmacological activity of NAT.**

Activity	Leaf	Flower	Fruit/seed	Stem/bark/root	Whole plant
Anti allergic	Alcoholic	-	-	-	-
Anti-anxiety	Extract	Ethanollic	-	-	Hydro alcoholic
Anti inflammatory& analgesic	Alcoholic Ethanollic Extract	-	Alcoholic	Stem alcoholic stem methanollic extract	Aqueous extract
Anti aggressive	Ethanollic Hydro alcoholic	Ethanollic	Ethanollic	Ethanollic	-
Anti filarial		Chloroform	-	-	-
Anti-bacterial	Methanollic Chcl & eth. Acetate Ethanol & Chcl ethanollic and aqueous extracts ethyl acetate &Chcl	-	Methanollic Chcl & eth.acetate	Bark Chcl & eth. acet Bark various Extract Ethanol & Chcl	Hot water, Ethanollic, Benzene, Petroleum Ether & Chlorof orm Extract
Anti cancer	Different solvent	Pet.ether, chcl, ethyl acetate	Methanollic	--	-
Anti diabetic	Hydroalcoholic Chcl	Hydroalcoholic Chcl	-	Root methanollic	--
Anti malarial	Ethanollic Paste	-	-	-	-
Anti parasitic	50% ethanollic	-	-	-	-
Anti trypanosomal	50% ethanollic ethanol extract	-	-	-	-
Anti viral	Ethanollic	-	-	-	-
Anti histaminic Antitryptaminergic	Alcoholic	-	-	-	-
Anti cholinesterase Antileishmanial		-	-	-	-



Anti nociceptive Antipyretic	Ethanollic	-	-	-	-
Anti anemic	Ethanollic Ethanollic	Ethanollic Ethanollic	Ethanollic Ethanollic	Ethanollic extract	-
CNS depressant	Ethanollic Ethanollic	Ethanollic Ethanollic	Ethanollic Ethanollic	Ethanollic	-
Hepato protective	Aqueous & Ethanollic	-	-	s. aqueous	-
Sedative	-	-	Aqueous	-	--
-Piles, gout, dry cough	Aqueous	Different solvent	Aqueous	-	-
Toxicity	Ethanollic	-	-	-	-
Constipation & intestinal worms	-	Different solvent	-	-	-
Anti proloferative		Different solvent	-	-	-
Diuretic	Ethanollic	Ethanollic	Ethanollic	Ethanollic	-
Anti plasmodial potency	Ethanollic	-	-	-	-
Branco dilatory effect	Ethanollic	-	B. pet.ether, chloroform, ethylacetate, aqueous & ethanollic	--	-
Immuno protective	-	-	-	-	Ethanollic

#### CNS depressant activity

The leaf, flowers, seeds and bark of *Nyctanthes arbortristis* were found to substantially and dose-dependently improve the beginning and duration of sleep, and also to reduce dopamine levels and elevate serotonin levels. From this, it may be assumed that the reductions may be what is responsible for the CNS depressive effect of the ethanol extracts of seeds, leaves, and flowers.

#### Anticancer activity

The in vitro anticancer potential of methanol extracts from the fruit, leaves, and stem of *Nyctanthes arbortristis* was investigated. At 30mg/ml cans, moderate action was seen. The dried *N. arbortristis* leaf methanol extract was 71% inhibited, and 10 mg/ml cans showed the least amount of inhibitory efficacy. With an 86% inhibition of pathogen-free breast malignancy cell lines. *Nyctanthes arbortristis* dried fruit methanol was shown to be highly effective against human breast cancer cell lines, and the IC50 values were determined to be 9.72 mg and 13.8 mg. Glycosides, tannins, phenols, and steroids are the phytochemicals that were identified from the dried fruit methanol of *Nyctanthes arbortristis* and are thought to be the cause of this anticancer effect.

#### Antimalarial activity

research conducted on 120 malaria patients. In 92 (76.7%) individuals, the condition was healed within 7 days after receiving a fresh paste made from medium-sized *Nyctanthes arbortristis* leaves administered three times daily for 7–10 days. While the remaining 8 patients did not respond to the medication, another 20 patients were healed within 10 days. There were no serious negative effects and the paste was well tolerated. *Anopheles stephensi* larvae were killed by methanol and

chloroform extracts of leaves when tested against three important mosquito vectors, *Aedes aegypti*, *Culex quinquefasciatus*, and *Anopheles stephensi*, with LC50 values of 244.4 and 747.7 ppm, respectively.

#### Anti-viral Activity

Arbortristoside A and Arbortristoside C, two pure substances derived from the *N. arbortristis*, all demonstrated strong inhibitory effect against the encephalomyocarditis virus (EMCV) and Semliki Forest Virus (SFV). Infected mice were protected from EMCV and SFV in vivo by the ethanollic extract and the n-butanol fraction by 40 and 60%, respectively.

#### Anti-allergy Activity

A water-soluble component of the alcoholic extract of *N. arbor-tristis* leaves provided considerable protection against the development of hypoxia in guinea pigs exposed to histamine aerosol. *N. arbor-tristis* contains the anti-allergic compounds arbortristoside A and arbortristoside C.

#### Hepatoprotective Activity

The water-based extracts of *Nyctanthes arbor-tristis*'s leaves and seeds were discovered to exhibit antihepatotoxic effect against carbon tetrachloride (CCl4)-induced hepatotoxicity. By lowering the amounts of SGPT (serum glutamic pyruvic transaminase), SGOT (serum glutamic oxaloacetic transaminase), and serum bilirubin (total and direct), it was additionally demonstrated that the alcoholic and water-based extracts had considerable hepatoprotective effect. Histopathological analyses of liver tissues demonstrated that the extracts can regenerate hepatocytes, supporting the findings.

### Anti-fungal activity

The three most common clinical pathogenic fungus, *Aspergillus niger*, *Penicillium*, and *Aspergillus flavus*, were tested for antifungal activity in different areas of the NAT plant. Fresh and mature leaves, seeds, stems, bark, and flowers were gathered, dried, and extracted using distilled water, methanol, and chloroform. By using the well diffusion method, the antifungal activity of the extracts was assessed in terms of the "zone of inhibition" of fungal growth. The findings showed that only distilled water extract of NAT's stem and bark exhibited antifungal activity against *A. niger*, but chloroform extract of NAT's leaves only proved effective against *A. flavus*. The research revealed that methanolic extract of NAT's leaves, stem, and bark demonstrated the most antifungal effectiveness against both *Aspergillus* and *Penicillium*.

### Anti-bacterial properties

The main factor contributing to early mortality worldwide is infectious illnesses. A wide range of pathogens have the ability to resist antimicrobial drugs, and multiple drug resistance is becoming increasingly prevalent in a variety of different species, including *Staphylococcus aureus*, *Staphylococcus epidermis*, *Salmonella typhi*, and *Salmonella paratyphi A*. According to a research, a methanolic extract of NAT leaves had MIC values between 1 and 8 mg/ml and shown strong antibacterial activity against *Staphylococcus aureus*, *Staphylococcus epidermis*, *Salmonella typhi*, and *Salmonella Para typhi A*. The extracts' minimum inhibitory concentration (MIC) and zone of inhibition were calculated, and the results were compared to those of the common medications fluconazole and ciprofloxacin. The chloroform extract was shown to have both antibacterial and antifungal properties, in contrast to the petroleum ether and ethanol extracts, which were demonstrated to only have antibacterial effects.

### Wound healing activity

The wound-healing ability of NAT on Wistar albino rats. For 16 days, the rats administered 2% weight/weight NAT methanolic extract treatment. Both incision and excision wounds were found to take near 16 days to fully heal and epithelize. It was found that NAT extract at a dosage of 300 mg per kilogram may be used to treat both types of wounds.

### Analgesic and anti-inflammatory activities

To test its analgesic and anti-inflammatory properties, methanol was extracted from the stem bark of *Nyctanthes Arbor tristis*. Using morphine sulphate as the reference medication at a dosage of 5 mg/kg of body weight, the analgesic action was assessed in Wister albino rats using the hot plate technique, tail flick test, and tail immersion method. The results were reported as the mean increase in latency after drug administration SEM. By employing diclofenac sodium as a reference medicine and inducing rat paw edema with carrageenan,

the antiinflammatory action was evaluated. The results were reported as a mean increase in paw volume SEM. Toxic doses of 250 mg/kg and 500 mg/kg of body weight of stem bark extract were administered. Animals were given oral doses of both extract and common medications. Orally administered as a control was distilled water. *Nyctanthes arbortristis* Linn was identified by the results. had strong painkilling and anti-inflammatory properties.

### Antispasmodic Activity

In a prior investigation, guinea pig ileum was used to assess the antispasmodic efficacy of an ethanolic extract of fresh flowers, dried leaves, stems, and bark of NAT. It was discovered to prevent acetylcholine's contractile reaction.

### Anti-Allergy Activity

In guinea pigs exposed to histamine aerosol, a water soluble component of the alcoholic extract of *N. arbor-tristis* leaves provided significant protection against the onset of hypoxia. The anti-allergic substances arbortristoside A and arbortristoside C are found in *N. arbor-tristis*.

### Immuno-stimulant activity

Both humoral and cell-mediated reactions have shown that NAT's aqueous leaf extract has potent immunomodulatory effects. Additionally, flower has shown immunostimulant activity that activates the cell-mediated immune system. Mice with systemic candidiasis were treated with ethanolic extracts of NAT's seed and root, which had immunomodulatory effects. Two iridoid glucosides called arbotristosides A and C were taken out of the plant's seeds.

### CONCLUSION

Different parts of *nyctanthus arbortritis* linn was used in traditional medicine by practioners for many ailments. The plant of sarrow has lot of medicinal uses, produced by its phytochemicals such as alkaloids, glycosides, steroids, flavonoids and terpenes. Many pharmacological activity of this plant has been proved by research work done for anti-allergic, anti-anxiety, anti-inflammatory, analgesic, anti-filial, anti-bacterial, antioxidant, anti-cancer, antidiabetic, antimalarial, anti-parasitic, anti-viral, anti-histaminic, anticholinesterase, antinociceptive, antipyretic, anti-anemic, CNS depressant, diuretic, anti-plasmodial brancodilator, immune protective, hepatoprotective, sedative and used for piles, gout, drycough, constipation and toxicity treatment.

### REFERENCES

1. Hetal Bhalakiya, Nainesh R Modi. Traditional uses, phytochemical profiles and Pharmacological Activities of *Nyctanthes arbot-tristis*. Life science Informatics Publications March-April RJLBPS, 5(2): 1003.
2. Smita Parekh, Anjali Soni *Nyctanthes arbor-tristis*, Comprehensive review on pharmacological,

- antioxidant and anti-cancer activities. *Journal of Applied Biology and Biotechnology*, Jan-Feb 2020; 8(01): 95-104.
3. D. Samsal, Sanjta Das and S. P. Basu Phytochemical and Therapeutics Potential of *Nyctanthes arbor-tristis* Linn. in *Pharmacognosy review*, volume Issue 2 Jul-Dec- 2007.
  4. Pushpendra Kumar Jain, Arti Pandey Wonder of Ayurvedic medicine *Nyctanthes arbor-tristis* International Journal of Herbal Medicine, 2016; 4(4): 09-17.
  5. Kirtikar KR & Basu BD, *Indian Medicinal Plants*, Vol. VII, (LM Basu Publishers, Allahabad, India), 2110-2113.
  6. Indu Mittal. A Review on Holy Improving Plant *Nyctanthes arbor-tristis* Linn (Night Jasmine) with monsther, therapeutic possibilities. In *International Journal of Modern Pharmaceutical Research*.
  7. Shinde PR, Sali VA, Patil PS and Bairagi VA Assessment of pharmacognostic, phytochemical and antibacterial potential of fruit of *Nyctanthes arbor-tristis* Linn. *Journal of Pharmacognosy and phytochemistry*, 2014; 2(6): 203-212.
  8. Suresh V. Arunachalam G Senthil KN. In vitro anthelmintic activity of *Nyctanthes arbor-tristis* Bark, *Journal of Pharmaceutical Research*, 2011; 4: 283-284.
  9. Champa Rani, Sunaina Chawla *Nyctanthes arbor-tristis*, Linn (Night jasmine) A sacred ornamental Plant with immense medicinal Potentials. *Indian Journal of Traditional Knowledge*, July 2012; 11(3): 427-433.
  10. Rohit Kumar Bijauliya, Pushpendra kannoja Pharmacognastical and Physiochemical study on the leave of *Nyctanthes arbor-tristis* Linn. In *Journal of Drug Delivery and Therapeutics*, 2021; 11(4): 30-34.
  11. Milind M. Meshram, Swatee B. Rangari, Shashank B. Kshirsagar, Suraj Galbhiye, *Nyctanthes arbor-tristis*. A Herbal Panacea in *International Journal of pharmaceutical Science Research UBSA* (2012) VOL 3 Issue 8 Suresh V, Jaikummar S, Arunachalam G "Antidiabetic activity of ethanolic extract of stem bark of *Nyctanthes arbor-tristis* Linn". *Research journal of pharmaceutical, biological and chemical sciences*, 2010; 1(4): 311- 317.
  12. Himanshi Rawat, Yashika Verma, Ayesha, Neha Saini, Neha Negi, Hem Chandra Pant, Aditi Mishra, Mayank Singhal, Arzoo Khan, Naveen Gaurav "*Nyctanthes arbor-tristis*: A traditional herbal plant with miraculous potential in medicine"
  13. Anuradha. S. N et al. "herbal review on *nyctanthes arbor-tristis* linn. " *Rapports De Pharmacie*, 2017; 3(1): 319-329.
  14. Preeti Mishra et al. Harsingar plant and its species: Review on medicinal uses, therapeutics effects and its importance, *Advance Pharmaceutical Journal*, 2022; 7(3): 67-72.
  15. Ria Chakraborty, Santa Datta, A Brief Overview on the Health Benefits of *Nyctanthes arbor-tristis* Linn. - A Wonder of Mother Nature, *Indo Global Journal of Pharmaceutical Sciences*, 2022; 12: 197-204.
  16. Sen, A. B., Singh, S. P., "Chemical examination of *Nyctanthes arbor-tristis*. *Journal of the Indian Chemical Society*", 1964; 41: 192-194.
  17. Nirmal, S. A., Pal, S. C., Mandal, S. C., Patil, A. N., "Analgesic and antiinflammatory activity of b-sitosterol isolated from *Nyctanthes arbor-tristis* leaves". *Inflammopharmacology*, 2012; 20: 219-224.
  18. Singh, S. P., Bhattacharji, S., Sen, A. B., "Flavonoids of *Nyctanthes arbor-tristis*. *Bulletin of the National Institute of Sciences of India*", 1965; 31: 41-43.
  19. Ammara Riaz et al. "Astragalins: A Bioactive Phytochemical with Potential Therapeutic Activities", 2018.
  20. Srivastava, V., Rathore, A., Ali, S. M., Tandon, J. S., "New benzoic esters of loganin and 6b-hydroxyloganin from *Nyctanthes arbor-tristis*. *Journal of Natural Products*", 1990; 53: 303-308.
  21. Stuppner, H., Mueller, E. P., Mathuram, V., Kundu, "Iridoidglycosides from *Nyctanthes arbor-tristis*. *Phytochemistry*", 1993; 32: 375-378.
  22. Mahida Y & Mohan JSS, "Screening of plants for their potential antibacterial activity against *Staphylococcus* and *Salmonella* spp"., *Nat Prod Rad*, 2007; 6(4): 301-305.
  23. Lal, J. B., "Constitution of the coloring matter of *Nyctanthes arbor-tristis*-identity of nyctanthin with a-crocoetin". In: *Proceedings of the National Institute of Sciences of India*, 1936; 2: 57-61.
  24. Gupta S. K., Bokadia M. M., "Flavonoids from the flowers of *Nyctanthes arbor-tristis* Linn." *Vijnana Parishad Anusandhan Patrika*, 1976; 377-380.
  25. Ratnasooriya WD, Jayakody, JRAC, Hettiarachchi, ADI & Dharmasiri, MG, "Sedative effects of hot flower infusion of *Nyctanthes arbor-tristis* on Rats", *Pharmaceut Biol*, 2005; 43(2): 140-146.
  26. Chatterjee A & Parkrashi S, "The Treatise on Indian Medicinal Plants", Vol. 3, (Publications and Information Directorate, New Delhi, India), 1994; 76.
  27. Rathore, A., Srivastava, V., Srivastava, K. C., Tandon, "Iridoidglucoside from *Nyctanthes arbor-tristis*". *Phytochemistry*", 1990; 29: 1917-1920.
  28. Purushothaman, K. K., Venkatanarasimhan, Mathuram, S. A., "Arbortristiside A and B, two iridoid glucosides from *Nyctanthes arbor-tristis*". *Phytochemistry*, 1985; 24: 773-776.
  29. Bandi, B., Venkatesan, K., Mannarapu, U. Keerthi M., "Isolation and partial characterization of alkaloids from stem bark of *Nyctanthes arbor-tristis*". *International Journal of Pharmaceutical and Biomedical Research*, 1998; 149-152.
  30. Vats M, Sharma N & Sardana S, "Antimicrobial Activity of Stem Bark Extracts of *Nyctanthes arbor-tristis* Linn. (Oleaceae)", *Int J Pharmacog Phytochem Res*, 2009; 1(1): 12-14.

31. Chauhan, J. S., Saraswat, M., "A new glycoside from the stem of *Nyctanthes arbor-tristis*". Journal of the Indian Chemical Society, 1978; 55: 1049–1051.
32. Kovac J., Simunovic K., Wu Z., Klancnik A., Bucar F., Zhang Q., Mozina S. S. "Antibiotic resistance modulation and modes of action of (-)-alpha-pinene in *Campylobacter jejuni*", 1995.
33. Bahare Salehi et al. "Therapeutic Potential of  $\alpha$ - and  $\beta$ -Pinene: A Miracle Gift of Nature", 1989.
34. Chandra G, "Chemical composition of the flower oil of *Nyctanthes arbor-tristis* Linn", Indian Perfumer, 1970; 14(1): 19.
35. Preeti Mishra, Deeksha Tiwari, Aman Tomar, Anoop Verma, Sagar Singhal, Jagrati Mittal, 2022; 7(3): 67-72, Harsingar plant and its species: Review on medicinal uses, therapeutics effects and its importance Advance Pharmaceutical Journal.
36. Amol K. Daund et al. "A review on *nyctanthes arbor-tristis* leaves: a potential medicinal herb" *wjpmr*, 2022; 8(4): 128–132.
37. Shivani S et al. "Quality Standards of Leaves of *Nyctanthes arbor-tristis* Linn." International Journal of Drug Development and Research, 2015; 7(3): 004-009 -005.
38. Nainesh R. Modi and Hetal Bhalakiya. "Traditional medicinal uses, phytochemical profile and pharmacological activities of *nyctanthes arbor-tristis*." 2019; *RJLBPCS* 5(2): 1004.
39. Subhash Kajla et al. "*Nyctanthes arbor-tristis* Linn. (Night Jasmine): A sacred ornamental plant with immense medicinal potentials" Indian Journal of Traditional Knowledge, July 2012; 11(3): 427-435.
40. Nisha Verma and Rajeev Kumar Yadav, 2020. *Nyctanthes arbor-tristis* – A Review, Journal of Emerging Technologies and Innovative Research, 7(5): 2349-5162.
41. Ganesh K Aurade. Et al. Ganesh K Aurade. "Medicinal uses of plant *Nyctanthes arbor-tristis* Linn(Parijat): A Review" International Journal of Pharmaceutical Research and Applications, Mar-Apr 2022; 7(2): 47-56.
42. Pankaj Srivastava et al. "*Nyctanthes arbor-tristis*: A Wonder Indian Herbal Drug Needs Healthcare Attention" Biomed J Sci & Tech Res, 2018; 5(3).
43. Sagar Madhukar Sawant et al. The Review on Medicinal Uses of *Nyctanthes Arbor-tristis* (Night Jasmine), International Journal for Multidisciplinary Research, September-October 2022; 4(5).