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REVIEW ARTICLE

Nyctanthes arbor-tristis L.–A Tropical Plant with Exquisite Ethno-medicinal and Therapeutic Potential

Archna Karel*, Gargi Saxena
Department of Home Science (Foods & Nutrition). IIS (deemed to be University), Jaipur

Abstract

A multifunctional and sacred ornamental tree *Nyctanthes arbor-tristis* L. (NAT), traditionally found in India is known popularly as Parijat or Night Jasmine. The tree has caught attention due to medicinal benefits derived from bark, seeds, leaves, flowers and fruits that were used in folklore. Considered to be most pious of flowers and leaves these are offered to deities and used for ornate and artistic purposes. Regionally, whole plant parts have been used as a therapeutic agent to cure ailments, such as arthritis, sciatica, malaria, enlargement of spleen and in purification of blood. In Ayurveda, this aromatic flower acts as healer. The present research deals with the important therapeutic properties and ethno-medicinal importance of *Nyctanthes*.

Keywords: Ayurveda,Ethno-medicinal, *Nyctanthes arbor-tristis* L., Ornamental, Parijat

Introduction

The taxonomic classification of *Nyctanthes arbor-tristis* L. was not well defined earlier. It belongs to the family Oleaceae (Bentham and Hooker, 1876). A study was conducted to designate it into the most suitable family (Vaishampayan and Sharma, 1983). *Nyctanthes arbor-tristis* L. has been used in traditional medicine for antibilious, gynaecological troubles, and hepatoprotective activity since remote times (Kumari *et al.,* 2012). Tribal people of Central India have used various parts of this plant to relieve cough, hiccups, dysentery, snakebite, and sores (Parekh and Soni, 2020). Two Greek words 'Nykhta'(Night) and 'anthos'(flower) make up the word *Nyctanthes* (Hamburger and Hostettmann, 1991), while the species '*arbor-tristis* 'referring to 'the sad tree' reportedly originated from the sombre appearance of the tree in the daytime (Upadhyay and Sharma, 2018). The flowering plant, *Nyctanthes arbor-tristis* L., belongs to family Oleaceae and has very high medicinal value (Geetha *et al*., 2014).

The genus *Nyctanthes* consists of two species, *Nyctanthes arbor-tristis* L. and *Nyctanthes aculeata* Craib. While the former is native to India and is utilised as a sacred plant in religious ceremonies, the latter is indigenous to Thailand (Dewi *et al.,* 2022). It is known by several other names in various states of India in their respective vernacular languages as depicted in Table 1.

Night Jasmine breeding is done through seeds or cuttings. From an oversized plant population, it is necessary to do cutting/grafting so as to produce captivating versions (Chakraborty and Datta, 2022). *Nyctanthes arbor-tristis* L. are small trees or shrubs with star shaped white flowers and young quadrangular branches. The leaves show opposite phyllotaxy, shape oval or acuminate, surface rough due to the presence of hairs, margin entire or serrate; base rounded or cuneate, major veins visible on the abaxial surface. The inflorescence is solitary terminal or axillary or terminally cymose (Ahirwar, 2023). Discrete blooms occurring in groups of two to seven open at dusk and close at dawn with orange-red core and five to eight white lobes. Fruits are flattened capsules. The seeds are flat and orbicular (Ahirwar, 2023). It is distributed wild in northern India and southwards to Godavari. Additionally, the Indian subcontinent, Pakistan and Bangladesh (Khatune, 2003), and tropical Southeast Asia are home to it (Dewi *et al*., 2022). Although endemic to South Asia and South East Asia such as Indonesia, Malaysia and Thailand, it is cultivated in gardens for ornamental purposes.

Herbs form the basis of conventional medicine in India since ages and in modern day have become popular throughout the world. Since primitive times, traditional and rural people depended on *Nyctanthes arbor-tristis* L. to cure various body diseases like cold, fever, dysentery,

*Corresponding Author Email: akarel3@gmail.com

diarrhoea, joint pain etc (Pandel *et al*., 2023). Each component of the tree has been used as traditional medication remedies for numerous human illnesses since ages. Although the serene white flowers have a bitter taste, they have usages as hair tonic, expectorant, stomachic, carminative, and anti-bilious, astringent to bowel and to treat various skin diseases (Patil *et al*., 2022). Flowers are also collected to make garlands as offerings to deities. The orange core of the flower is used for dyeing silk and cotton robes of Buddhist monks (Sandhar *et al*., 2011; Chakraborty and Datta, 2022). According to Hindu mythology, it is considered as one of the five trees of Heaven which may bestow whatever one wishes for. Different parts of *Nyctanthes arbor-tristis* L. are used by tribal people of the Indian subcontinent by virtue of their medicinal and healing properties. The Unani, Siddha and Ayurvedic systems of medicine have described its various applications (Bhalakiya and Modi, 2019). It is also found in gardens for ornamental purposes. Different plant parts, such as bark, stem, leaves, flowers, flower oil, fruits and seeds contain phytochemicals with significant medicinal activities (Jain and Pandey, 2016). It has bitter taste and is traditionally used in various diseases like spleen enlargement, round worm infestation, sciatica, fevers, bronchitis and rheumatism (Srivastava *et al*., 2018; Thokala, 2018).

Botanical Description

Nyctanthes arbor-tristis L. possesses grey to greenish-white tinted rough bark, with quadrangular stems. It is a large shrub that may reach to a height of 10 m. The leaves are ovate, slightly wedge-shaped, about 5 –10 cm long and 2 – 6.5 cm, acuminate, possessing tiny bulbous hairs (Fig.1). The flowers have a pleasing scent, corolla lobed into five to eight parts and a red-orange core, growing in bunches of two to seven, with discrete florets blooming after sunset and withering after sunrise (Fig. 1 and 2). Calyx campanulate, about 6-8mm long. The brown coloured, cordate to rotund and two lobed capsule is flat and 2 cm in diameter. The seeds are exalbuminous with thick testa (Verma and Yadav, 2020).

Table 1. Vernacular Names of *Nyctanthes arbor-tristis* L.

English	*Coral jasmine, Night jasmine*
Hindi	*Harsinghar, Parijat, Har, Siharu, Saherwa,Seoli, Nibari, Shefali*
Odia	*Shingadahar, harashingar, Gangaseuli,Jharasephali*
Tamil	*Pavazahamalligai , Pavilamalligai, Manja-pu*
Telagu	*Swetasarasa,Pagadammali, Paghada,Karchia, Karuchiya*
Malayalam	*Parijatam, Pavilamalli, Pavizhamalli, Parijatakam*
Kannada	*Harashingar, Parijata*
Marathi	*Parijataka, Purijat, Khurasli*

Source: Hiremath *et al.,* 2016

Fig. 1. *Nyctanthes arbor-tristis* L. plant

Fig. 2. Flowers of *Nyctanthes arbor-tristis* L.

Bioactive compounds present in vegetative parts (roots, stems, leaves) and reproductive parts (flowers) showed the presence of alkaloids, glycosides, saponins, phytosterols, phenolics, tannins, flavonoids and reducing sugars (Satyal *et al*., 2012; Rahman *et al*., 2013; Pandel *et al*., 2023).

The plant has a high value scientifically as well as therapeutically. It is widely accessible and does not require any special growing conditions. It has a wide range of medical benefits for general health and wellness of the population as expressed in Table 2. Traditional medicinal uses of *Nyctanthes arbor-tristis* L. are still in use.

Some uses of morphological parts of this mystical plant provide an opportunity for employment generation among farmers at local level in flower decorations, creation of garlands, bouquets and opening a plethora of economic possibilities for industries to apply processing techniques in various sectors such as food, health, cosmetics and agriculture related products. Aesthetically, it is used to make ornaments and necklaces among the natives. The serenity of *Nyctanthes* flowers with its natural saffron hue makes it unique to incorporate in sweets made from milk and milk products, desserts such as cakes and puddings as well as in breads. *Nyctanthes* flowers are connected to our ancient mythology and culture and have a rich culinary heritage in India.

Table 2. Chemical composition and medicinal uses of distinct parts of *Nyctanthes arbor – tristis* L.

Plant part	Chemical constituents	Medicinal Uses	References
Leaves	It consists of D -mannitol, β -sitosterol, flavanol glycosides, astragalin, nicotiflorin, oleanolic acid, nyctanthin acid, tannic acid, ascorbic acid, methyl salicylate, trace of vol atile oil, carotene, friedelin, lupeol, mannitol, glucose, fructose, and benzoic acid.	Juice from leaves works as a tonic. Additionally, 'kadha' prevents fever, cough, arthritis, worm infestation, constipation. Extract instantly helps to increase platelet count in dengue and chikungunya fever.	Venkataraman *et al*., 2019 Tripathi *et al*., 2021; Pandel *et al*., 2023
Flowers	Constitutes glycosides, like β-monogentiobioside ester of α-crocetin (or crocin-3), β-D monoglucoside ester of α-crocetin, β digentiobioside ester of α-crocetin (crocin-1) and nyctanthin, essential oils, glucose, tannins and carotenoids.	The miniature, white flowers with soothing fragrance work wonderfully in gastric disorders, respiratory complaints. Helps to lower high blood sugar levels and act as a potential anti-diabetic.	Rangika *et al*., 2015; Tripathi *et al*., 2021; Selvaraj and Shanmugam, 2022
Stem	Glycoside-naringenin-4'-O-β-glucapyranosyl-α-xylopyranoside and β-sitosterol are present.	Dried powder from the stem is beneficial for healing joint pain and malaria.	Tripathi *et al*., 2021; Rani *et al*., 2023
Seeds	Nyctanthic acid; 3,4-secotriterpene acid; and a polysaccharide of D-mannose and D-glucose. Arbortristosides A and B; glycerides of linoleic, oleic, lignoceric, stearic, palmitic, and myristic acids	Help in treating hair loss, alopecia.	Tripathi *et al*., 2021; Rani *et al*., 2023
Bark	Glycosides and alkaloids	Bark is consumed with betel leaves (paan) to cure cough and congestion.	Tripathi et al., 2021; Pandel *et al*., 2023
Flower Oil	Phenyl acetaldehyde, 1 - decenol, α - pinene, p - cymene, 1 - hexanol, and methyl heptanone.	Perfume	Jain and Pandey,2016; Pandel *et al*., 2023
Plant	2, 3, 4, 6 - tetra - O - methyl - D - glucose; arbortristosides A, B, and C; and iridoid glycosides.	Arthritis, sciatica, to cure malaria, enlargement of spleen and acts as blood purifier.	Bharti and Saxena, 2016; Tripathi *et al.* , 2021

Pharmacological Activity

Analgesic activity

The leaf and whole plant extract of petroleum ether, beta-sitosterol is responsible for analgesic activity (Verma and Yadav, 2020).Methanolic extract of stem bark of *Nyctanthes arbor-tristis* L. was evaluated to study the analgesic and anti-inflammatory activities on Wistar albino rats which showed that it had potent analgesic and anti-inflammatory activities (Kakoti *et al*., 2013). The ethanolic extract of *Nyctanthes arbor-tristis* L. showed greater sedative analgesic and cytotoxic potential than methanolic extract at all doses used in the investigation (Khan *et al*., 2017).

Anti-inflammatory activity

5 hydroxytrytamine, formaline, histamine, hyaluro-nidase are considered as aqueous and alcoholic extract of stem, leaves. These are prototype compounds of acute and sub-acute anti- inflammatory activity (Deshmukh *et al*., 2007). Anti-inflammatory activity was observed in the whole plant and leaves and stem extracts of

Nyctanthes arbor- tristis L. (Bhalakiya and Modi, 2019). The *in vitro* anti-inflammatory assay of methanolic and aqueous extract of *Nyctanthes arbor-tristis* L. flowers was carried out using egg albumin denaturation assay to study *in vitro* anti-inflammatory activity and it was revealed that the activity was dose- dependent (Venkadesh *et al*., 2021).

Antibacterial activity and Antifungal activity

Phenolic and tannin compounds obtained from leaves are used against anti-microbial activity (Gulshan *et al*., 2015). The common microbes we encounter are bacteria, fungi and viruses. Arbortristoside A and C from leaves and fresh plant parts show anti- bacterial activity (Geetha *et al*., 2014).It was observed that leaves of *Nyctanthes arbor-tristis* L. extracted in methanol indicated remarkable antibacterial activity against *Salmonella paratyphi A*, *Salmonella typhi*, *Staphylococcus epidermidis* and *Staphylococcus aureus*. The Minimum Inhibitory Concentration (MIC) and zone of inhibition of the extracts were calculated and comparison was done with the standard antibiotics ciprofloxacin and fluconazole. Chloroform extract showed both antibacterial and antifungal activities while ethyl alcohol and petroleum ether extracts were antibacterial (Kumari *et al*., 2012). In another study, Venkadesh *et al*. (2021) revealed that the methanolic extract of *Nyctanthes arbor-tristis* L. flowers were likely to suppress the growth of bacteria. The highest zone of inhibition was observed in *Pseudomonas* followed by *Escherichia coli* and *Klebsiella pneumoniae* showed zones of inhibition in the descending order. Stem bark extract show anti-fungal activity against *Aspergillus niger* (Verma *et al*., 2016). A water-based paste made of *Nyctanthes arbor-tristis* L. leaves is externally used in skin ailments, particularly in cure of ring worm. The fresh boiled leaves of *Nyctanthes arbor-tristis* L. with mustard oil can be used in treatment of ring worm. The leaves are crushed into a paste, which is applied externally for treatment of dermal ailments, such as in treatment of ring worm. Fresh leaves of *Nyctanthes arbor-tristis* L., boiled in mustard oil can also be used in treatment of ring worm as reported (Singh *et al*., 2020). Methanolic extract of leaves has been shown to cure influenza (Rajbhandari *et al*., 2001) while the water-based leaf paste was found to be effective in relieving oedema (Than *et al*., 1996).

Anticancer activity

Nyctanthes arbor-tristis L. flowers were tested for in-vitro anticancer activity (Singh *et al*., 2008). Stems, leaves and fruits of *Nyctanthes arbor-tristis* L. extracted in methanol were tested *in vitro* for anticancer activities. Moderate to high inhibitory activity was demonstrated against human breast cancer cell lines. Khatune *et al*. (2001) anticipated that the active phytochemicals isolated from methanolic extracts of *Nyctanthes arbor-tristis* L. dried fruits such as steroids, tannins, phenols and glycosides are responsible for this anticancer activity.

Anti-diabetic activity

Singh *et al*. (2008) studied the effect of ethanolic root extract of *Nyctanthes arbor-tristis* L. and observed that it is proficient in reducing blood sugar level.

Suresh *et al*. (2010) reported antidiabetic activity of ethanolic extract in stem and bark of *Nyctanthes arbor-tristis* L. Hypoglycaemic activity was assessed by Bharti *et al*. (2011) using dried roots of *Nyctanthes arbor-tristis* L. extracted in methanol. This extract was more effective in reducing the blood glucose level in comparison with the standard drug.

Anti-cholinesterase activity

Nyctanthes arbor-tristis L. leaves extracted in water stimulate acetylcholine esterase activity in mice (Jain and Pandey, 2016).Serum was seen to be stimulated more than the brain.

Antianxiety activity

Hydroalcoholic extract of leaves is used to reduce emotional stress (Singh *et al*., 2008). The study of Deshmukh and Juvekar (2006) and Deshmukh *et al*. (2007) showed that treatment with methanolic extract of leaves relieved the stress induced variations in the biochemical levels of neurotransmitters and hormones such as corticosterone, dopamine, 5-hydroxytryptamine and norepinephrine.

Significance of traditional uses of *Nyctanthes arbor tristis* L. (NAT)

Jadhav and Patil, (2016) reported that *Nyctanthes arbor tristis* L**.** signifies the advent of autumn as well as the arrival of Goddess Durga in West Bengal, where it is the state flower. According to the Hindu mythology, Parijata is regarded as sacred to Devaloka, being a wish-granting tree (Verma and Yadav, 2020). A study by Singh *et al*. (2022) reported that in Hindu mythology this plant was brought to earth by Lord Krishna as it was adorned by goddess Satyabhama and considered as a holy tree since Dwapar Yuga, therefore named as Harsingar. Traditionally for religious offerings flowers were gathered and garlands were made.

Diverse applications of *Nyctanthes arbor-tristis* L. represented in various literatures

Flowers

Therapeutically, flowers were used to cure stomachache, as carminative, astringent, expectorant and hair tonic, in dermatological issues and for eye ailments. (Kakoti *et al*., 2013).The flower powder was added to enhance color of sandal powder and as a paste for curing headache (Sahani and Mall, 2013). Fabrics were dyed with the orange pigment obtained from corolla tubes of flowers by locals in ancient times (Jain *et al*., 2016).

Stems

Since traditional times, the powder from bark has been used in rheumatic joint pain and internal injuries. Indigenous people used it to treat snakebite and bronchitis (Verma and Yadav, 2020).

Leaves

Ayurveda uses its leaves as a laxative and diuretic with a wide range of ailments including worm infections, persistent fever, and sciatica (Kakoti *et al*., 2013; Verma and Yadav, 2020). For cough reduction, in curing fever, regulating high blood pressure and diabetes the extract paste added with honey is consumed. As a remedy for intestinal ailments children were given a paste, added with sugar (Chovatiya *et al*., 2020; Pandel *et al*., 2023).

Seeds

The aromatic seed powder paste is applied to cure afflictions of scalp, alopecia and skin diseases (Jain and Pandey, 2016; Sharma *et al*., 2021).

Commercial Use

Perfume is made from the essential oil found in *Nyctanthes arbor-tristis* L flowers. The vivid orange corolla tubes contain a pigment called nyctanthin, which is similar to the pigment obtained from saffron known as, ά- Crocetin, which was earlier used to dye fabrics along with turmeric, safflower, and indigo (Sandhar *et al*., 2011). The bark of the plant may be used as an agent in tanning, and the leaves are occasionally used as a polishing agent for wood and ivory (Rani *et al*., 2012).

Conclusion

Since more than a century, *Nyctanthes* has been used for medicinal and household reasons. From northern Pakistan and southern Nepal, it is widely dispersed throughout northern India, Southeast Asia, and Thailand. Owing to its wide range of applications in healthcare, it is extensively documented in historical literature concerning identification, morphology, origins, availability, dosage, and therapeutic usage. The phytochemical analyses inferred that its high therapeutic efficacy may be due to the presence of many bioactive compounds such as, βeta-sitosterol, D-mannitol, nyctanthic acid, tannic acid, linoleic acid and oleic acids noticed in abundance in *Nyctanthes*. The medicinal and curative prospects were investigated by review of the present botanical and past literatures and comprehensive information was obtained about phytochemical composition, taxonomic position and morphological characteristics, habitat curative properties and other mercantile uses. In comparison with other parts of the plant, corolla was found to possess high commercial value. Considerably,Harsingar is a very important herbal medicine even after all this time.

Future Arenas

- Further research has been going on developing infusion teas incorporating herbs and fruit extracts free from steroids, saponins and tannins that will have a myriad of health benefits against seasonal ailments and chronic diseases.
- Extraction and utilization of these flowers in pharmaceutical industries in form of herbal cosmetics can emerge as a natural beauty enhancer.
- Employment generation among farmers, utilizing protected cultivation to increase shelf life, involvement of women to supplement their household income by processing and preparing innovative products like greeting cards, bookmarks, wall hangings, paperweights and dry-flower arrangements. This can all be done with support of Self-help groups and government run programmes.
- Awareness building is a great need to conserve this sacred tree and floral diversity through community participation.

Conflict of Interest

The Authors declare no conflict of interest.

References

Ahirwar, P., Rajput, D., Thakur, G.S., Yadav, D. 2023. Therapeutic potential and phytochemical profile of *Nyctanthes arbor-tristis* linn: A review. Int. J. Novel Res. Dev. 8 (1), a435-a458.

Bentham, G., Hooker, J. D. 1876. Genera Plantarum 2, 1026 –1053. L Reeve and Co., London, UK.

Bhalakiya, H., Modi, N.R. 2019. Traditional Medicinal

Uses, Phytochemical Profile and Pharmacological Activities of *Nyctanthes arbortristis*. Res. J. Life Sci. Bioinform. Pharm. Chem. Sci. 5, 1003–1023

Bharti, M., Saxena, R.C., Baghel, O.S., Saxena, R., Apte, K. G. 2011. Wound healing activity of leaf of *Nyctanthes arbor-tristis* (Linn). Int. J. Pharm. Sci. Res. 2(10), 2694–2698

Bharti, M., Saxena, R. 2016. *Nyctanthes arbor-tristis* Linn: A Review of Pharmacological Profile. Asian J. Sci. Technol. 7(7), 3200-3202.

Chakraborty, R., Datta (De), S. 2022. A brief overview on the health benefits of *Nyctanthes arbor-tristis* Linn. - A wonder of mother nature. Indo Global J. Pharm. Sci. 12, 197-204.

Chovatiya, N.V., Thumar, B.V., Butani, A.M., 2020. Effect of planting time and pinching on growth of chrysanthemum (*Dendranthema grandiflora*) Cv. Ratlam selection. J. Pharmacogn. Phytochem. 9(2), 411-413.

Deshmukh, R.D., Pokharkar, R.D., Takate, S.B., V.N. Gite, V.N. 2007. Amelioration of CCl4-Induced Hepatosuppression by *Nyctanthes arbor-tristis Linn* Leaves in Wistar Albino Rats. Journal of Pharmacologyonline 1, 203-208.

Deshmukh, V.K., Juvekar A.R. 2006. Antianxiety and nootropic activity of *Nyctanthes arbor tristis* leaves. Planta Medica. 72. doi:10.1055/S-2006-949752

Dewi, N. K. S. M., Fakhrudin, N., Wahyuono, S. 2022.A comprehensive review on the phytoconstituents and biological activities of *Nyctanthes arbor-tristis* L. J. Appl. Pharma. Sci. 12(8), 009–017

Geetha, D.H., Jayashree, I., Rajeswari, M. 2014. Antibacterial activity of leaf of *Nyctanthes arbor-tristis* linn. Int. Res. J. Pharma. Appl. Sci. 4(4), 4-6.

Gulshan, B., Suri, K.A., Grover, P. 2015. A Comprehensive review on *Nyctanthes arbortristis.* Int. J. Drug Dev. Res.7(1), 183-193.

Hamburger, M., Hostettmann, K. 1991. Biochemistry in plants: the link between phytochemistry and medicine. Phytochemistry. 30 (12), 3864 -3867.

Hiremath, V.V., Hiremath, B.S., Mohapatra, S., Das, A.K. 2016. Literary Review of Parijata (*Nyctanthes arbor-tristis* linn.). An Herbal Medicament with Special Reference to Ayurveda and Botanical Literatures. Biomed. Pharmacol. J. 9 (3) 1019-1025.

Jadhav, S., Patil, M. 2016. A review on: *Nyctanthes arbor-tristis* Linn. Rejuvenating herbs. Int. J. Res. Pharm. Pharm. Sci. 1(1), 54- 62.

Jain, P.K., Pandey, A. 2016. The wonder of Ayurvedic medicine — *Nyctanthes arbor-tristis*. Int. J. Herb. Med. 4(4), 9–17.

Jain, R., Shahani, R., Sharma, N. 2016. Eco Friendly Printing of Cotton and Silk Fabrics using Natural Dye from "*Nyctanthes arbor-tristis*'s(Parijat)". Period. Res. 4(3), 64-68.

Kakoti, B.B., Pradhan, P., Borah, S., Mahato, K., Kumar, M. 2013. Analgesic and anti-inflammatory activities of the methanolic stem bark extract of *Nyctanthes arbor-tristis* Linn. BioMed Res. Int.826295. doi:10.1155/2013/826295

Khatune, N., Haque, M.E., Mosaddik, M. A. 2001. Laboratory Evaluation of *Nyctanthes arbor-tristis* Linn. Flower Extract and its Isolated Compound Against Common Filarial Vector, Culex quinquefasciatus Say (Diptera: culicidae) Larvae. Pak. J. Biol. Sci. 10.3923/pjbs.2001.585.587.

Khatune, N.A., Islam, M.E., Rahman, M.A.A., Mosaddikm M.A., Haque, M.E. 2003. *In-vivo* cytotoxic evaluation of new benzofuran derivative isolated from *Nyctanthes arbortristis* L. on Ehrlich Ascite Carcinoma cells (EAC) in mice. J. Med. Sci. 3, 169-173.

Kumari, T.D.S., Madhuri, T.D.S., Charya, M.A.S., Rao, K.S. 2012. Antioxidant and anticancer activities of *Nyctanthes arbor-tristis*. Int. J. Pharm. Pharm. Sci. 4(4), 452–454.

Pandel, T.W., Gurunani, S.G., Kaikade, A.R. 2023. Comprehensive Review on Parijat (*Nyctanthes arbor-tristis*). Int. J. Pharm. Res. Appl. 8 (3), 1215-1224.

Parekh, S., Soni, A. 2020. *Nyctanthes arbor-tristis*: Comprehensive review on its pharmacological, antioxidant, and anticancer activities. J. Appl. Biol. Biotechnol. 8(01), 95-104.

Patil, C.D., Shelke, A.N., Bhandare, P.S. 2022. Phytochemical Screening & Anthelmintic Activity of Flower Extract of *Nyctanthes arbor-tristis*. Int. J. Trend Sci. Res. Dev. 6(4), 507-514.

Rahman, M.M., Rokeya, B., Shahjahan, M., Ahmed, T., Roy, S. R., Liaquat Ali, L. 2013. Hypoglycemic Effect of *Nyctanthes arbor-tristis* Linn Extracts in Normal and Streptozotocin-Induced Diabetic Rats. Malays. J. Pharma. Sci. 11(1), 21–31.

Rajbhandari, M., Wegner, U. Julich, M. Schopke, T., Mentel, R. 2001. Screening of Nepalese medicinal

plants for antiviral activity. J. Ethnopharmacol. 74, 251-255.

Rangika, B.S., Dayananda, P.D., Peiris, D.C. 2015. Hypoglycemic and hypolipidemic activities of aqueous extract of flowers from *Nyctanthes arbor-tristis* L. in male mice. BMC Complement Altern. Med. 15, 289. https://doi.org/10.1186/s12906-015-0807-0.

Rani, C., Chawala, S., Mangat, M., Mangal, A.K., Kajla, S., Dhawan, A.K. 2012. *Nyctanthes arbor-tristis* Linn (Night Jasmine): A Scared Ornament Plant with Immense Medicinal Potentials. Indian J. Tradit. Knowl. 11(3), 427-435.

Rani, S., Goud, M.P., Kumar, E.U., Nayak, R. L., Hiranmai, L., 2023. Extraction and Evaluation of In Vitro Anthelmintic Activity using *Nyctanthes Arbor-Tristis* Linn. Int. J. Res. Anal. Rev. 10(2), 485-496.

Srivastava, R., Trivedi, D., Shukla, G., Srivastava, P. 2018. *Nyctanthes arbor-tristis*: A Wonder Indian Herbal Drug Needs Healthcare Attention. Biomed. J. Sci. &Tech. Res. 5(3), 4527-4520.

Sahani, S., Mall, T.P. 2013.Diversity of potent ethnomedicinal plants from Bahraich UP, India. Res. Environ. Life Sci. 6(1), 27-34.

Selvaraj, S., Shanmugam, H., 2022.Extraction of crocin from the flowers of night jasmine (*Nyctanthes arbor-tristis* Linn.) Pharma Innovation. 11(8), 192-194

Satyal, P., Paudel, P., Poudel A., Setzer, W.N. 2012. Chemical composition and biological activities of essential Oil from leaf and bark of *Nyctanthes arbor-tristis* L. from Nepal. Oen Access J. Med. Aromat. Plants. 3(1): 1-4.

Sandhar, H. K., Kaur, M. Kumar, B., Prasher, S. 2011. An update on *Nyctanthes arbor-tristis* Linn. J. Int. Pharm. Sci. 1 (1), 77-86.

Sharma, L., Dhiman, M., Singh, A. 2021. *Nyctanthes arbor-tristis* L.: an unexplored plant of enormous possibilities for economic revenue. Proc. Nat. Acad. Sci. India Sec. B. 91(2), 241-255.

Singh, A., Malhotra, S., Subban, R. 2008. Anti-inflammatory and Analgesic agent from Indian medicinal plant. Int. J. Integr. Biol. 5, 150-58.

Singh, D.K., Pandey, R.K., Singh, R., Agnihotri, R.K. 2022. Parijat (*Nyctanthes arbor-tristis* L.): A Holy tree of India with special reference to medicinal importance. Acad. J. Med. Plants. 10(4), 049-052.

Singh R., Singh D. K., Agnihotri R. K. 2020. Ethnobotanical studies of Harsingar (*Nyctanthes arbor-tristis* L.) of Agra region: A traditional medicinal plant. Int. J. Botany Stud. 5 (4), 121-124.

Suresh V, Jaikumar S, Arunachalam G. 2010. Antidiabetic activity of ethanolic extract of stem bark of *Nyctanthes arbor-tristis* Linn. Res. J. Pharm. Biol. Chem. Sci. 1(4), 311-317.

Than, A., Myint, M.M.S., Myint T. and Myint, W., 1996. Anti-oedema activity of *Nyctanthes arbor- tristis* L, *Curcurma longa* L. and Plantago Major L. Myanmar Health Sci. Res. J. 8(1), 36-40.

Thokala, M., 2018. A Literary Review of *Nyctanthes arbor tristis linn* (Parijatha) Linn in Ayurvedic Classics. World J. Pharma. Res. 7(4), 410-419.

Tripathi, A., Kumar, S., Srivastava, S. K. 2021. Medicinal Properties of Harsingar (*Nyctanthes arbor-tristis* Linn.): A Review. Int. J. Creat. Res. Thoughts. 9 (1). 3406-3410.

Upadhyay, D., Sharma, V. 2018. *Nyctanthes arbor-tristis*: An Important Vulnerable Medicinal Plant. Int. J. Adv. Sci. Res. Manag. 1, 180-183.

Vaishampayan, N., Sharma, Y.N. 1983. On the taxonomic position of *Nyctanthes arbor-tristis* L. Curr. Sci. 52 (15), 723-725.

Venkadesh, B., Kumar K. D., V. P. R, M. P. P., Kumar, P.Y. 2021. Preliminary Pharmacological Studies on *Nyctanthes arbor-tristis* L. Flower Extract. Ann. Rom. Soc. Cell Biol. 25(6), 1759–1769.

Venkataraman, S., Harinya, S., Chidiuto, D.B., Raja, R.R. 2019. Phytochemical Constituents and Pharmacological activities of *Nyctanthes arbor-tristis*. Res. J. Pharm. Tech. 12(10), 4639-4643.

Verma, L., Tamrakar, V., Haque, N., Kumar, A. 2016.Antifungal activity of different extracts from different parts of *Nyctanthes arbor-tristis* Linn. (Parijat) against clinical pathogens. Shodh Darpan. 1 (4), 239- 250.

Verma, N., Yadav, R.K. 2020. *Nyctanthes arbor-tristis* – A Review. J. Emerg. Technol. Innov. Res. 7(5), 269-283.