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Indian Journal of Unani Medicine

Indian Journal of Unani Medicine Vol. XIV, Iss. 1, pp. 61-68, January-June, 2021
ISSN No.: 0974-6065
https://doi.org/10.53390/ijum.v14i1.10

REVIEW ON *NYCTANTHES ARBOR-TRISTIS* (*HARSINGHAR*) - A HERBAL MEDICAMENT WITH SPECIAL REFERENCE TO UNANI MEDICINE

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Review Paper

Received: **05.06.2021** Revised: **12.06.2021** Accepted: **22.06.2021**

ABSTRACT

Nyctanthes arbor-tristis Linn is one of the important herbal drugs used for therapeutic purpose in India. It is described with the name '*Harsinghar*' in Unani Medicine. Various parts of the plant are used medicinally to cure various diseases since centuries ago. These medicinal properties of the plant are due to the active phytochemicals present in the plant. Various chemicals have been isolated from this miracle plant having therapeutic potential possessing ethnomedical and pharmacological activities. It is a rich source of important phytochemicals like nycanthine, astringent principle, beta cortisol, coloring matter, tannins, flavonoids, cardiac glycosides, saponins and alkaloids etc. Pharmacological actions of *Harsinghar* include cholagogue, anthelmintic, laxative, antipyretic, diaphoretic, diuretic; for which the the plant is employed in the treatment of skin disorders, dandruff, malaria, different types of fever, hemorrhoids, palpitation, cough, excessive menstrual bleeding menstrual etc. Diverse pharmacological studies of the plant have been reported such as antimicrobial, anti-inflammatory, antidepressant, antipyretic, antioxidant activity proving the traditional claims scientifically. In this paper, an attempt has been made to summarize the information described in classical Unani texts and updated scientific research conducted on different parts of the *N. arbor-tristis* plant.

No. of Pages: 8 **References:** 49

Keywords: *Nyctanthes arbor-tristis, Unani medicine, Night jasmine, therapeutic uses.*

INTRODUCTION

Unani System of medicine is one of the ancient traditional system of medicine originated from Greece and based on the theoretical framework of Greek physician Hippocrates. It passed through many stages, countries, cultures and people. It is developed by Romans, Arab physicians and when it reached in India during Mughal period also enriched by Indian physicians. According to basic concepts of Unani medicine, there is a power of self-preservation and/or adjustment in an individual which is called defense constitution which gets affected in diseased conditions and needs restoration to normal by the use of various therapies prescribed in the system[1]. In Unani literature, four types of therapies are described for maintaining health and treating diseases. These four therapies are *Ilaj bil-Tadbeer* (Regimental therapy), *Ilaj bil-Ghiza*, (Dietotherapy), *Ilaj bil-Dawa* (Pharmacotherapy) *Ilaj bil-Yad* (Surgery)[2]. Pharmacotherapy involves administration of drugs to correct the disease. As per World Health Organization, 80% of the world population prefers or uses Herbal medicine for primary health care. In Unani medicine, the use of drugs employed are mainly derived from plants, for prevention and cure of

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ailments is based on the concept of holistic healing considering the individual's psycho-physical wellbeing. Drug identification, action, uses of *Mufradat* (single drugs) and preparation of *Murakkabat* (compound drugs) are selected according to the temperament of the patient and nature of the disease. Single drugs or their combinations in raw form are preferred over compound drugs[3]. Most of the naturally occurring drugs used in this system are safe for human use, while drugs that are toxic in crude form are first processed and purified in many ways before use to make them safer[4]. In Unani system of medicine, numerous plant origin drugs are mentioned for medicinal purpose[5] and it also has a unique feature of adding *Musleh* (corrective drug) to counter the *Muzzirrat* (harmful effect/toxicity) of main drugs. The plant *Nyctanthes arbor-tristis* Linn., commonly known as *Harsinghar*, is described in Unani medicine for its multi-potential pharmacological activities. It is also known for its traditional uses by the rural, mainly tribal people of India[6]. The generic name *Nyctanthes* derived from two Greek words- '*Nykhta*'-Night and '*anthos*'-flower, and specific name 'arbor-tristis' means sad tree is supposed to be derived from dull appearance of the plant during daytime[7]. It is native to India and found abundant in outer Himalayan ranges from the Chenab to Nepal, Assam, Bengal, southwards to the Godavari and also found in Kanchanaburi province in Thailand[8,9]. It is found wild in the forest of Central India[10,11] and also commonly planted in the gardens for beautif ul and fragrant flowers. Flower resemble with the jasmine flower[12]. *Nyctanthes arbor-tristis plant* has multi- purpose uses. It is used for therapeutic purpose. An essential oil is present in the flower which is used in perfumery. Garland of flower is worn around the neck and pinned in hair as gajra by women to enhance for beautification so called *Harsinghar*[12]. Juice is obtained from the flower and stalk, and preserved in a concentrated form as a purple dye[12]. Besides, it has revealed strong prospective as a safe and natural coloring agent due to the manifestation of natural pigment 'nyctanthin' which can supplementary be applied in food and textile industries[13].

Description of the plant

N. arbor-tristis Linn. (NAT) is a small tree or shrub growing upto 15-20 feet tall with a grey flaky bark. It is a very popular flowering plant in warm, humid regions. It has somewhat square shaped stem and shoots. Stem bark is brown, rough and white spots are found on it[14]. Leaves are 4-sided, opposite, short petioled, quadrate or oblong, moderately thick, rough, pointed or coarsely serrate, scabrous, dark green in colour, can be easily broken, having abundant veins and lower surface is thicker than the upper surface[15]; panicles terminal composed of small six-flowered terminal umbellets, calyx campanulate, slightly 5-notched, downy; corolla tube cylindric as long calyx, segment 5-7; involucel of four-cordate, opposite, sessile leaflets; Flowers are numerous, small, soft, fragrant, have 6-8 white petals resembling with jasmine flower, which are arranged on a reddish tubal stalk[12]. This plant blooms during spring; and the plethora of bloom is so much that they are hardly ever without a flower during their blooming cycle[14] and it should be grown in a bright sunny spot in warm temperatures to thrive[14]. Flowers open towards the evening to night and fall in the morning. The fallen flowers look like a decorative carpet. Fruit/ is a dry, oblong, mucronate capsule, prominently veined, 1.25cm long and 1. 25cm wide, unripe green colored, ripe in summer season and become brown, compressed, 2-celled, each of which contains a yellowish brown, thin, flat, elevated in the centre, foliaceous seed kernel of the seed is white, bitter or tasteless and astringent[10,14,16].

Scientific classification[10,17]:

Kingdom: Plantae; **Division**: Magnoliophyta; **Class**: Magnoliopsida; **Order**: Lamiales; **Family** Oleaceae; **Genus**: Nyctanthes; **Species**: arbor-tristis, **Binomial name**: *Nyctanthes arbor-tristis*

Vernacular Names[10,14,15,17,18]:

English: Weeping Nyctanthes, Night Jasmine, Coral Jasmine, Tree of Sorrow
Urdu/ Unani /Persian: *Harsinghar, Haarsinghar, Hadsinghar, Had jora*
Sanskrit: Sephalika, Parijataka, Parijata, Rajanihassa (night smiling) and Atyuha (very sensitive)
Bengali: Sephalika, Seoli, Sheoli,
Hindi: *Siharu*, *Harsinghar*;
Marathi: Kharbadi, Kharassi, Khurasli, Partaka;
Tamil: Manja- Pavelam;
Kannada: Harsin;
Telugu: Poghada, Pagadamalle, Parijat, Sepali,
Punjabi: Pakura,
Oriya: Godokodiko, Gunjoseyoli, Singaraharo,
Gujarati: Jayaparvati, Parijatak, Par Booti,
Oriya: Godokodiko, Gunjoseyoli, Singaraharo

Mustamil Juz (Part used):

Flowers, flower stalk and leaves[12, 18]
Flower, seeds, leaves, bark, fruit and gum[11,14, 19]

Phytochemistry:

Phytochemistry of *N. arbor-tristis* has revealed the presence of diverse group of chemical constituents in different part of the plant. Flower yields steroids, carbohydrates, flavonoids and alkaloids apigenin, anthocyanin, D-mannitol, tannin, glucose, carotenoid, Essential Oil, Kaemferol, Nyctanthin, Glycosides, Quercetin, Rengylone, α-crocetin (or crocin-3), β-monogentiobioside, βmonogentiobioside-β-D, β-digentiobioside. Oil extracted from flower contains alpha-pinine, p-cymene, 1-hexanol methyl heptanone, phenyl acetaldehyde, 1-deanol and anisaldehyde. Alkaloids and glycosides contents are found in the bark[17]. Leaves contain

alkaloid nyctanthine along with nannitol, β-Amyrin, β-Sitosterol, hentriacontane, benzoic acid, mannitol, nycanthoside[16], astragalin, nicotiflorin, oleanolicacid, nyctanthic acid, friedelin, lupeol, astringent, resinous substances, ascorbic acid, coloring matters, sugar, and traces of an oily substance, tannic acid, methyl salicylate, carotene, an amorphous resin and traces of volatile oil[10,20,21]. Stem contains glycosides naringenin, 4-0-beta-glucapyranosyl-alpha-xylopyranoside and sitosterol. Many alkaloids, tannins and glycosides, and beta-sitosterol and oleanic acid have been isolated from the chloroform extract of the root. Seed contains Phytosterols, phenolic compounds, tannins, flavonoids, cardiac glycosides, saponins and alkaloids, arbortristosides A & B, nyctanthic acid, nyctanthoside[16].

***Mizaj* (Temperament)**
Gul (flower) - *Barid- Yabis* (Cold, Dry)[12,19]; *Haar*-2, *Yabis* (Hot-2, Dry)[18]
Qummah (flower stalk) - *Haar-2, Yabis* ((Hot-2, Dry)[14]
Barg (Leaf) - *Haar, Yabis*-1 (Hot, Dry-1)[19]; *Barg* (Leaf) and *Chhal* (Bark) - *Barid* (cold)[14]

***Muzir* (Harmful effect):**
It may cause *Sual* (cough)[19] but most of the physicians mentioned that it useful in cough and bronchitis/bronchial asthma[14,18].

***Musleh* (Correctives)**:
Katira (*Astragalus gummifer*)[19]

***Badal* (Substitute):**
Kutki (*Picrorhiza kurroa*)[19]

***Miqdar* (Dose):** 1-2 gm[11]

***Murakkabat* (compound):** *Habb-i Harsinghar*[4]

***Afaal* (Pharmacological Actions):**
Flower and stalk are *Mufarreh* (exhilarant), *Muqawwi-i Hawaas* (tonic for senses), *Muqawwi-i Qalb* (heart tonic)[12,14,18], *Daf-i Bukhar* (antipyretic)[11,16] (*Munaffis-i Balgham* (expectorant), *Mukhrij-i Safra wa Riyah*[15,18], *Muqawwi-i Bah* (aphrodisiac)[11,12]; leaf is *Musaffi* (blood purifier), *Mudir-i Baul* (diuretic)[14], *Mushil-i Balgham* (purgative of phlegm), *Mushil-i Safra* (cholagogue), *Muqawwi-i Meda* (stomachic)[14], *Kasir-i Riyah* (carminative)[14], *Mulaiyyin* (laxative)[12,14], *Daf-i Daad* (anti-fungal)[12,14,15], *Qatil-i Deedan* (Anthelmintic)[14,18], *Habis* (astringent)[14], *Muwallid-i Araq* (diaphoretic)[11,14], *Muhallil-i Waram* (anti-inflammatory)[16]. Root and gum are *Qawi Muqawwi-i Bah* (strong Aphrodisiac)[11,14].

***Istemal* (Therapeutic Uses):**
Quba (Ringworm)[11,12], *Bawaseer* (haemorrhoids)[11.19], *Yarqan* (jaundice)[12,18], *Khafaqan Haar* (palpitation of hot type)[18], *Khafaqan* (palpitation)[14] and *Fasad-i Dam* (blood impurities)[14], *Humma Muzmin* (chronic fever)[14,18], *Humma Murakkab* (compound fever)[12,14], *Jhaeen* (freckles), *Chheep/Behaq* (ptyriasis), *Waja al-Mafasil* (arthritis)[14], *Sual Yabis* (dry cough)[14,18], *Niqris* (gout)[14], *Khala* (fracture)[12,14,15,18], *Deedan-i-Ama* (intestinal worm)[14]. *Amraz-i Halaq wa Tanaffus* (diseases of throat and respiratory system)[18], *Irq al-Nasa* (sciatica), *Humma* (fever) and *Waja al-Mafasil* (rheumatism)[8,10], malaria[16], filarial fever[16], cold and cough[16], bronchitis[16] and *Amraz-i Ayn* (eye diseases)[14].

Remedies prepared with different parts of *Nychathes arbor-tristis* for various diseases:
Remedies prepared with different parts of *Nychathes arbor-tristis* are used to cure various diseases. *Naqoo* (diffusion) of flower is beneficial for haemorrhoids[11]; *Joshanda* (decoction) of flowers is useful for the treatment of arthritis; *Gul Qand* (semi-solid preparation of petals and sugar) 12 gm is taken orally in the morning as heart tonic and to cure palpitation[14,18]. Flower oil is effective in fracture[18]. Seed are highly beneficial for dandruff[12] and are also useful the treatment of piles and skin diseases[18,22]. seed kernel-12 gm are ground with 3 gm of black pepper, and gram sized piles are prepared, 3 gm along with cold water, is taken in the morning[16,18] for 7 days[14] in case of haemorrhoids; paste prepared with seeds and water, topically applied on scalp, is an effective remedy for dandruff[11,12] and also used topically in case of pityriasis and freckles[14]. Leaf is *Muqawwi-i Meda* (stomachic) and is added in food recipes. *Naqoo* ((diffusion) of leaf is diuretic[14], *Ras* (leaf juice) is diuretic, laxative and anthelmintic[14] ; it is used with *Shehad* (honey) for chronic fever and cough; with *Misri* (sugar crystal) for the treatment of bilious diseases; and with *Namak* (salt) for helminthiasis; fresh leaf juice is safe to use in infants as laxative[11,12], *Matbookh* (decoction) of leaf is used as antipyretic and harmless laxative for children[9]; leaf decoction with *Maweez* (*Vitis vinifera*) is beneficial for bilious fever; *Joshanda* (decoction) prepared with the leaves, young shoots of *Neem* (*Azadirachta indica* A. Juss)[8-10], is beneficial for malaria when used in a dose of 5 ml twice daily, for 3 days[16]; oral administration of leaf decoction is useful for fever and sciatica[10]; leaf extract is antihistaminic, tranquilizing and purgative[23]; for chronic fever, few new leaves are ground with water and used along with juice of *Zanjabeel/ adrak* (rhizome of *Zingiber officinalis*) avoiding the milk, fish and meat products during treatment[12,14,18]; fresh leaves are astringent and used with black pepper, to check the excessive menstrual bleeding[14]; moreover, paste prepared with leaves applied topically has been found effective for ringworm[12,18] and is also beneficial for other skin diseases like freckles and ptyriasis[14]. Some amount of bark and 5 black peppers, are ground with

water and used orally, for bleeding and non-bleeding hemorrhoids[14,18]; paste prepared with bark, *Kanji* (alcoholic preparation), oil, and *Saindha Namak* (rock salt) is beneficial in various ophthalmic disorders when applied externally over the eye[14]; 5 grains of bark is eaten with betel-nut and leaf, for expectoration of thick phlegm[10]. Fruit is useful for respiratory ailments; 3-4 fruits are ground and used orally with lukewarm water twice daily as full dose for cough and bronchitis for 5 days for 40 days respectively[16].

Scientific Studies

Anti-inflammatory activity:

Various studies reported that Nyctanthes arbor-tristis plant possesses anti-inflammatory activity. Saxena *et al.* reported anti-inflammatory activity of *Nyctanthes arbor-tristis.* In this study the water-soluble portion of the alcoholic extract of the leaves of *Nyctanthes arbor-tristis* (NAT) was screened for the presence of anti-inflammatory activity. NAT inhibited the acute inflammatory oedema produced by different agents, viz. carrageenin, formalin, histamine, 5-hydroxytryptamine and hyaluronidase in the hindpaw of rats. The acute inflammatory swelling in the knee joint of rats induced by turpentine oil was significantly reduced. In subacute models, NAT was found preventing granulation tissue formation in the granuloma pouch and cotton pellet test. Acute and chronic phases of formaldehyde induced arthritis were inhibited significantly. NAT was also found to inhibit the inflammation produced by immunological methods, viz. Freund's adjuvant arthritis and PPD induced tuberculin reaction[24]. Another study conducted by Omkar *et al.* has reported potent anti-inflammatory activity of the plant [6]. Analgesic and anti-inflammatory of β-sitosterol isolated from Leaf of *N. arbor-tristis* has been reported by Nirmal *et al*.[25].

Antioxidant activity:

Amarite *et.al* reported the antioxidant activity of carotenoid obtained from the plant *Nyctanthes arbortristis*[26]. Another study conducted on the root extracts to evaluate antioxidant activity by using different *in vitro* model and revealed that the Pet. Ether and hydroalcoholic extracts showed potent antioxidant activity by reducing power against the standard drug (Kaempferol)[27]. Ethanol and aqueous extract of shoot, seed and leaf of *Nyctanthes arbor-tristis* (*Harsinghar*) exhibited the antioxidant activity in DPPH scavenging antioxidant assays. Results revealed that all three aerial parts of *Nyctanthes arbor-tristis* possess antioxidant activity. Ethanol and aqueous extracts of shoot possessed more antioxidant activity then seed and leaf[28]. The antioxidant activity of leaf extract of this plant has also been reported in another study[29]. The hydroalcohol and chloroform extracts of whole plant of *N. arbor-trsitis* has also been reported to possess strong *in-vitro* and *in-vivo* antioxidant activity[30]. Ghosh *et al.*, identified a water-soluble polysaccharide with potent antioxidant activity from leaves of *N. arbor-tristis*[31].

Antibacterial activity:

Harsinghar (N. *arbor-tristis*) is considered to have antimicrobial activities. Kumar *et al*., reported that ethanolic leaf extract showed significant antibacterial activity on both Gram +ve and Gram -ve stains. But comparably the activity on *B. subtilis* was more than that of *E. coli*. The antibacterial activity obtained for the leaf extract was significant. The combined leaf extract of *Nyctanthes arbor-tristis* and *Nerium oleander* were also conducted in the same study which showed a synergistic effect i.e., antibacterial activity of the *Nyctanthes arbor-tristis* increased when used with *Nerium oleander*[32]. Antimicrobial activity of seed and leaf extracts of *Nyctanthes arbor-tristis* against human pathogens was exhibited in a study using Muller Hinton agar. Seed extract prepared in ethyl acetate had shown positive result on *Salmonella typhii* and *Klebsiella pneumoniae* and was less effective on *Streptococcus aureus*. Ethanol seed extract found effective on *E. coli* and *Streptococcus aureus*; hexane seed extract showed promising result with only *Klebsiella pneumonia*; methanol seed extract was showed significant positive results against *Escherichia coli* while acetone seed extract was effective against *Klebsiella pneumoniae*, *Streptococcus aureus* and *Escherichia coli*. Diethyl ether seed extract showed positive result only with *Streptococcus*. 2- Butoxy ethanol seed extract showed positive results on *Salmonella* and *Pseudomonas*. Ethyl acetate leaf extract showed antimicrobial activity on S*almonella*, *Streptococcus* and *Pseudomonas* but showed no effect on *Klebsiella* and *E. coli*. The methanol, ethanol, ethyl acetate and acetone extract of leaf showed good results. Leaf extracts showed better zone of inhibition when compared to seed extracts. Hexane leaf and seed extract were found to be least effective. Study concluded that the potent antibiotic property of leaf and seed extract of *Nyctanthes arbor-tristis*[33]. The antifungal activity of extracts of different parts of (dried leaves, seeds, stem, bark and flowers) of *N. arbor-tristis* plant measured through 'zone of inhibition' of fungal growth was exhibited against three clinical fungal pathogens -*Aspergillus niger, Penicillum* and *Aspergillus flavus*. Methanolic extracts from seed, stem, and bark part of the plant showed antifungal activity against all the three species. Distilled water extract of stem and bark showed antifungal activity against *A. niger;* and chloroform extract of leaves only found effective antifungal against *A. flavus*[34]. In another study antifungal activity of nanoparticles of Zinc oxide synthesized on flower extract of N. arbor-tristis and zinc acetate has been reported by Jamdagni *et al*.[35]. The presence of phytochemicals with adequate antibacterial and antifungal efficacy can be used for the treatment of bacterial and fungal infections.

Antidepressant activity:
Tripathi *et al*. has reported that leaf extract of *Nyctanthes arbor-tristis* exhibited antidepressant activity[36]. Another study was conducted by Tripathi *et al.* to evaluate the anxiolytic activity of leaf extract of *N. arbor-tristis* in animal model, and revealed promising results[37]. Das *et al*. reported that leaf, seed and bark of the *N. arbor-tristis* are helpful in decreasing dopamine and increasing the serotonin level, depicting CNS depressant activity[38]**.** In another study in which antidepressant effects of hydroalcoholic leaf extract (250 & 500 mg/kg) (NTL), flower extract (250 & 500 mg/kg) (NTF) and combination extract (leaf and flower extract in equal ratio) of *Nyctanthes arbor-tristis* (NAT) were evaluated viz. forced swim test in animal model. All extracts demonstrated a significant reduction of immobility time. Statistically remarkable differences in immobility time in groups treated with combination extract compared to groups treated with leaf and flower extract alone is observed and study concluded that the hydroalcoholic extracts showed remarkable antidepressant effect[7] and may help in discovery of new intervention for anxiety and depression.

Antidiabetic activity*:*
A study was conducted to investigate the antidiabetic activity of ethanol extract of stem bark of *Nyctanthes arbor-tristis* L. in streptozotocin (STZ) - nicotinamide induced diabetes in rats and compared with controlled group. Ethanol extract of stem bark of *Nyctanthes arbor-tristis* was administered orally in diabetic rats. It was found that it significantly lowered the blood glucose level in a dose-dependent manner. In glucose tolerance test, the extracts at the doses of 250 and 500 markedly reduced the external glucose load. The antidiabetic activity of (EENA) was comparable to that of diabetic control drug[39]. In another study, antidiabetic activity of ethanol extracts of aerial stem and leaves of *N. arbor-tristis* plant was studied subjected to the ethanol extraction using Soxhlet method in rats. The ethanol extract and glipizide provoked a significant fall in the blood sugar level in normoglycemic and glucose loaded rats[40].

Hypoglycemic and hypolipidemic activity:
In a study hypoglycemic and hypolipidemic activity of boiled aqueous extract of flowers (AEF) of *Nyctanthes arbor-tristis* has been reported in mice. Animals were orally administered with 500 mg/kg and 750 mg/kg of AEF, and glucose tolerance was performed before and after glucose challenge. In vitro alpha-amylase assay and glucose absorption from the gastrointestinal tract were also performed using 500 mg/kg of the extract. In addition, glycogen content in the liver and skeletal muscles, a complete lipid profile assay, and toxicological and biochemical parameters were conducted. It was observed that 500 mg/kg and 750 mg/kg of AEF significantly reduced fasting blood glucose levels (39%) respectively at 4 h post-treatment, while 500 mg/kg of AEF also decreased the random blood glucose level significantly by 32%. AEF significantly inhibited glucose absorption (85%) from the intestine and exhibited inhibition of alpha-amylase enzyme activity. It also decreased the level of total cholesterol (44.8%), triglyceride (53%) and increased (57%) the high-density lipoprotein cholesterol[41] depicting its hypolipidemic activity.

Anti-proliferative activity*:*
In a study, antiproliferative potentials of different fractions (hexane, chloroform, ethyl acetate, methanol) of flower extract of *N. abor-tristis* was shown using 3T3-L1 cells, primary peripheral blood mononuclear cells (PBMC) isolated from healthy and adult acute myeloid (AML) and chronic lymphocytic leukemia (CLL) patients, recombinant Jurkat T cells, and MCF7 cell lines. Inhibition of the 3T3-L1 cells differentiation was observed in the ethyl acetate and chloroform fractions, followed by the hexane fraction. Antiproliferative analyses revealed that *Nyctanthes* exerted a high specific activity against anti-AML and anti-CLL PBMC cells, especially by the hexane and ethyl acetate fractions, demonstrating the feasibility of *N. abor-tristis* in developing new drug leads against leukemia[42]. In another study phytochemical contents of the plant extracts were investigated for radical scavenging activity and total reducing power of a poly herbal formulation containing leaves of *Nyctanthes arbor-tristis*, unripe and ripe fruit pulp of *Aegle marmelos*, and the terminal meristem of *Musa paradisiaca* flower in the ratio 6:2:1:1 (Poly Herbal Formulation (PHF 1) and 1:1:1:1 (Poly Herbal Formulation (PHF 2)**.** Results revealed that PHF1 exhibited more potent anti-elastase against fibroblasts cells that can be used in reducing the process of skin aging, and PHF 2 found more cytotoxic against malignant melanoma cells[43].

Anthelmintic activity:
Ansari *et al.,* reported anthelmintic activity of aqueous, chloroform and acetone, extract of leaves of *Nyctanthes arbor-tristis* against Indian earth worm *Phereima posthuma*. The result revealed that all tested extract of *Nyctanthes arbor-tristis* shown anthelmintic activity in a dose dependant manner. Among the all extract, acetone extract at 0.5mg/ml concentration showed most promising anthelmintic activity[44].

Antipyretic Activity:
Harsinghar (*N. arbor-trisits*) is known for its antipyretic action since centuries ago. A study was carried out to reveal antipyretic activity of *N. arbor-tristis* in various dosage forms. Tablet, liquid oral and suspension dosage forms of dried leaves of *Nyctanthes arbor-tristis* and dried unripe fruits of *Piper nigrum* in combination, were tested in Brewer's yeast-induced pyrexia in rabbits. For the purpose, significant values for protection against increasing rectal temperature were observed

in animals. Study concluded that liquid oral and tablet dosage forms possess good antipyretic property as well as no significant signs of systemic toxicity and death was also noted in Wistar albino rats[45]. In another study, antipyretic activity of whole plant extract of *Nyctanthes arbor-tristis* has been reported in yeast-induced pyrexia in albino rats[46]. Saxena, *et.al* reported the analgesic, antipyretic and ulcerogenic activity of Hydroalcoholic extract of leaves of *Nyctanthes arbor-tristis*[47]. Antipyretic activity and hepatoprotective effect of Petroleum ether and methanol extracts of bark of *N. arbor-tristis* has been reported against Brewer's Yeast induced pyrexia and Carbon tetrachloride (CCl4) induced hepatotoxicity in mice model respectively[48].

Wound healing activity:

Wound healing activity in methanolic extract of *Nyctanthes arbor-tristis* leaves was exhibited on tensile strength of the skin having incision wound in Wistar albino rats**.** The animals were divided into 3 groups i.e. control, standard and testing group. A full thickness of excision wound of circular area (approx. 500 mm^2 and 2 mm depth was made on back of the anaesthetized rats. The control group was treated with simple ointment base B.P. The standard group was treated with Betadine 5% (w/w) ointment. The test group was treated with ointments with methanolic extract of N. *arbor-tristis* 2 % (w/w) incorporated in simple ointment base, for 16 days. Development of granulation tissues in rats treated with ointment containing 2 % (w/w) methanolic extract exhibiting wound healing activity of *N. arbor-tristis* extract[49].

CONCLUSION

Nyctanthes arbor-tristis is a very important medicinal plant and has been used in Unani medicine and folklores for the treatment of number of diseases such as fever, palpitation, jaundice, bronchitis, haemorrhoids, malaria, ringworm, dandruff, etc. Many chemical compounds isolated from the plant and phytochemical analysis demonstrates that due to presence of mentioned phytochemical components the plant is useful in different health problems. It has been very much used for their health care and practices in rural part of India due to its easy accessibility. Botanical and physico-chemical standardization of *Habb-e-Harsinghar* – A Unani formulation has been carried out by the researchers of Central Council for Research in Unani Medicine to set its standards for quality assurance for global marketing. However, *N. arbor-tristis* still remains a plant for further research studies. The plant needs to be researched on molecular basis to unmask its potential and more formulations can be proposed and used practically for treatment of several ailments.

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