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Medicinal uses of plant Nyctanthes arbor-tristis Linn(Parijat):A Review

Author
Ganesh K Aurade. Dr.S S Patil. M A Shetkar. Prafull D Chandanshive. Dr.S V Usnale.
(MSS Maharashtra college of pharmacy nilanga, latur 413521 Maharashtra, India)

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ABSTRACT: -Nyctanthe sarbor-tristis (Oleaceae) commonly known as night jasmine is a mythological plant with immense medicinal value in Ayurveda. The leaf juice is used to treat loss of appetite, liver disorders, biliary disorders chronic fever, malarial fever, obstinate sciatica and rheumatism.

Keywords:- Nyctanthes arbor-tristis; Antifungal activity; Night jasmine; Quality control

INTRODUCTION: -

Nyctanthes arbor-tristis Linn belonging to the family Oleaceae, is a mythological plant having high medicinal value in Ayurveda. It is commonly known as harsinghar in Hindi, parijat in Sanskrit and night jasmine in English. It is distributed widely in sub-Himalayan regions and southwards to Godavari and is predominantly native to southern Asia. The geographical distribution of the plant extends from northern Pakistan and southern Nepal through northern India and southeast to Thailand and also in other parts of the world [1]. The plants leaves are having immense medicinal value and are thus commercially exploitable. It is popular garden shrub that grows to a height of 3.0-4.5 m and holds an important role in conditions related to fever and inflammation [2]. Its leaves are rough with hairy surface, opposite, ovate in shape and serrate margin. The decoction of leaves is widely used in Ayurvedic medicine for the treatment of sciatica [3], arthritis [4] and malaria [5] besides this it is also used as tonic and laxative [6] [7]. This plant holds a promising role in expelling worms [8], wound healing, Immunomodulation [9] [10].It is also used as anti-helminthic [11] [12], anti-amoebic [13], anti-trypanosomal and larvicidal [14] [15]. The phytochemical analysis of the leaves revealed the presence of flavanol glycosides.(astragaline and Nicotiflorin), Triterpenoid (Nyctanthic acid and oleanolic acid), iridoid glycosides (arborside A, B, C) and Iridoid glucoside (arborside D) The different parts of this plant are having different medicinal values.

The plant is native to the subtropical Himalayas of Nepal and India and geographically distributed in southern parts of India, northern Pakistan and in southeast Asian countries like Thailand, Malaysia and Indonesia [6]. In India, it is distributed in the outer Himalayas and tract of Jammu and Kashmir, Nepal to East Assam, Bengal, Tripura and extended throughout the central region up to Godavari in south [17].

Taxonomical Classification: -

Kingdom: Plantae
Division: Magnoliophyta.
Class: Magnoliopsida
Order: Lamiales
Family: Oleaceae
Genus: Nyctanthes
Species: arbor-tristis
Binomial name: Nyctanthes arbor-tristis
Vernacular names

International Journal of Pharmaceutical Research and Applications
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Family: Oleaceae; Nyctanthaceae.
Unani: Harasingaar.
Sanskrit: Parijatha.
Siddha: Pavazha mattigai.
Hindi: Harsingar.
Ayurvedic: Paarijaata, Shephaali, Shephaalikaa, Mandaara.
English: Tree of Sorrow, Night Jasmine, Coral Jasmine.
Marathi: Parijathak.
Kannada: Parijatha.

Chemical constituents of Nyctanthes arbortristis Linn: -

Leaves: -Leaves contain D-mannitol, β-sitosterol, Flavanol glycosides, Astragaline, Nicotiflorin, Oleanolic acid, Nyctanthic acid, Tannic acid, Ascorbic acid, Methyl salicylate, Amorphous glycoside, Amorphous resin, Trace of volatile oil, Carotene, Friedeline, Lupeol, Lupeol , Glucose, Fructose, Iridoid glycosides, Benzoic acid.

Flowers: -
Flowers contain Essential oil, Nyctanthin, d-mannitol, Tannin, Glucose, Carotenoid, Glycosides, β-monogentiobioside ester or α-crocetin (or crocin-3), β-monogentiobioside, β-D monoglucoside ester or α-crocetin,β-digentiobioside ester or α-crocetin (or crocin-1).

Seeds: -
Seeds contain Arbortristoside A&B, Glycerides of linoleic acid, oleic acid, lignoceric acid, stearic acid, palmitic andmyristic acids, nyctanthic acid, 3-4 secotriterpene acid, a water soluble polysaccharide composed of D-glucose and D mannose.

Bark: -Bark contains Glycosides and alkaloids.VoiceStem contains Glycoside-naringenin-4-0-β-glucapyranosyl-α-xylopyranoside and β-sitosterol.

Uses of Nyctanthes Arbor-tristis Linn: -

Flowers: -

The flowers are used as stomachic, carminative, astringent to bowel, antibilious, expectorant, hair tonic and in the treatment of piles and various skin diseases and in the treatment of ophthalmic purposes. The bright orange corolla tubes of the flowers contain a coloring substance nyctanthin, which is identical with ά-Crocetin from Saffron. The corolla tubes were formerly used for dyeing silk, sometimes together with Safflower or turmeric.

Stems: -Traditionally the powdered stem bark is given in rheumatic joint pain, in treatment of malaria and also used as an expectorant. The bark is used for the treatment of snakebite and bronchitis. The stem bark pounded with Zingiber officinale and Piper longum is boiled in water and the resultant liquid is taken for two days for the treatment of malaria. The resulting paste on mixing with Arjuna bark is rubbed on the body to treat internal injury and for joint broken bones.

Leaves: -The leaves of Nyctanthes arbor-tristis Linn are used extensively in Ayurvedic medicine for the treatment of various diseases such as sciatica, chronic fever, rheumatism, and internal worm infections, and as a laxative, diaphoretic and diuretic. Leaves are used in cough reduction. Leaf juice is mixed in honey and given thrice daily for the treatment of cough. Paste of leaves is given with honey for the treatment of fever, high blood pressure and diabetes. Juice of the leaves is used as digestives, antidote to reptile venoms, mild bitter tonic, laxative, diaphoretic and diuretic. Leaves are also used in the enlargement of spleen. The leaf juice is used to treat loss of appetite, piles, liver disorders, biliary disorders, intestinal worms,

International Journal of Pharmaceutical Research and Applications
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chronic fever, obstinate sciatica, rheumatism and fever with rigors. The extracted juice of leaves acts as a cholagogue, laxative and mild bitter tonic. It is given with little sugar to children as a remedy for intestinal ailments

Seeds:-The seeds are used as anthelmintic and in alopecia. It is antibilious and an expectorant, and is also useful in bilious fevers. The powdered seeds are used to cure scurfy affections of scalp, piles and skin diseases.

Pharmacological Applications of Nat: -

Plant concluded the oxidative and protective role of hydro-alcoholic flower extract of NAT against the oxidative stress of hydrogen peroxide, H2O2. H2O2 is weak oxidizing agent that can penetrate the cell membrane and enter the cell where it reacts with Fe2 + and Cu2 + ions and forms hydroxyl radicals. These hydroxyl radicals further cause damage to the cell by interacting with the micro and macromolecules in the cell and inactivating enzymes usually by oxidation of the thiol (-SH) groups. They treated the lymphocytes isolated from chicken blood with H2O2 that decreased the viability of cells by lowering the cellular antioxidant, reduced glutathione (GSH). The level of GSH was increased by 1.22-fold significantly when the lymphocytes were treated with the flower extract of NAT. At the same time, the specific activity of marker of membrane damage, lactate dehydrogenase (LDH) was also found to decrease as compared to treated lymphocytes that suggests the non-toxic effect of extract on the cellular system. The experimental data of the study showed the antioxidant property of the crude extract of NAT. Some other research has concluded leaves and stem of Nyctanthes arbor-tristis as a potential source of natural antioxidant. Phytochemical analysis of stem and leaves of the plant showed presence of flavonoids, tannins, saponins, glycosides, alkaloids, steroids and phenolic compounds. The antioxidant activity of NAT might be considered due to the phenolic compounds which act as free radical term [16]. Chloroform extract showed inhibitory effect against only Pseudomonas aeruginosa and Klebsiella pneumoniae. It was also found that the antibacterial activity of fresh plant parts was more than that of the dried one.

Antibacterial activity: Antibacterial activity of flower, leaf, seed and fruit ethyl acetate and chloroform extract against gram-positive (Staphylococcus aureus) and gram-negative (E. coli, Klebsiella pneumoniae, Pseudomonas aeruginosa) bacteria was examined by K. Priya et al, 2007. 300mg of both ethyl acetate and chloroform extract showed significant antibacterial activity against the bacteria tested. Flower ethyl acetate and seed chloroform extract showed broad spectrum antibacterial activity against gram-negative bacteria as well as gram-positive bacteria while leaf extract showed antibacterial activity against only but all the gram-negative bacteria. Fruit and seed ethyl acetate while flower and seed is revealed presence of phytosterols, phenolics, tannins, flavonoids, glycosides and saponins. Phenolic compounds and tannin were found to be active against the bacteria. Tannins have been found to form irreversible complexes with proline rich proteins that results in inhibition of cell protein synthesis and play an important role as stable and potent antioxidant, astringent and in treatment of diarrhea and dysentery.

Anti-fungal activity: Different parts of NAT plant were examined for antifungal activity against three most prevalent clinical pathogenic fungi-Aspergillus niger, Penicillium and Aspergillus flavus. Fresh and mature leaves, seeds, stem, bark and flowers were collected and dried, and extraction was performed with distilled water, methanol and chloroform. The antifungal activity of the extracts was measured by well diffusion method in terms of “zone of inhibition” of fungal growth. The results revealed that only distilled water extract of stem and bark of NAT showed antifungal activity against A. niger only while chloroform extract of leaves was only effective against A. flavus. The study showed that the most effective results for antifungal activity was shown by methanolic extract of leaves,

Antihistaminic and Anti-asthmatic activity: Catalepsy is a condition where the limbs remain in whatever position they are placed. It is characterized by lack of response to the external stimuli and muscle rigidity and can be induced by neuroleptic drugs. Experimental results proved that the clonidine-induced catalepsy can be inhibited by the petroleum ether extract of NAT bark. The effect of clonidine-induced catalepsy in Albino mice was studied and it was concluded that the cataleptic effect of clonidine in mouse is mediated by histamine from the mast cell and due to the mast cell stabilizing property of the NAT, this extract was able to inhibit the clonidine-induced catalepsy. The observation of this study indicated the

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 47-56 www.ijprajournal.com ISSN: 2456-4494

antihistaminic activity of NAT bark and concluded that it may be useful in treatment of asthma.

Allergic asthma is a chronic inflammatory disease that affects breathing. It is characterized by bronchial obstruction reactions, airway inflammation and airway hyper-reactivity towards variety of stimuli like allergens, histamine, methacholine, etc. When exposed to allergen, the main component of the early asthmatic reaction is bronchoconstriction and it was concluded that under asthmatic conditions.

The bronchial obstruction reaction and airway hyper-sensitivity are associated with the deficiency of nitric oxide production which plays a major role in maintenance of airway balance. The ethanolic extract of NAT leaves were examined for histamine-induced dose-dependent contraction of tracheal smooth muscles which concluded that the extract could inhibit the contractile responses produced by histamine and thus confirmed the bronchodilatory activity of the ethanolic extract of NAT leaves on airway smooth muscles . The results of experiment showed that the acting mechanism of the extract is through increase in production of nitric oxide, NO. It has also been concluded that the antiasthmatic and anti-allergic activity of NAT leaves is due to the presence of β-sitosterol.

Wound healing activity: The wound healing activity of NAT was tested on Wistar albino rats by Matadeen et al, 2011.The rats were treated with 2% w / w NAT methanolic extract for 16 days. It was found that the complete epithelization of both incision and excision wounds took about 16 days and wounds were completely healed. It was concluded that 300mg dose / kg of NAT extract can be considered a good solution for healing both the types of Wound.

Immuno-stimulant activity: Aqueous leaf extract of NAT has been found to be a potent immunomodulator which is evidenced by both humoral and cell-mediated responses. Flower has also shown immune-stimulant activity that activates the cell-mediated immune system. Immunomodulator activity against systemic candidiasis in mice was shown by the seed and root ethanolic extracts of NAT. Both iridoid glucosides ie, arbotristosides A and C were isolated from seeds of the plant.

Anti-ulcerogenic and ulcer-healing property: Peptic ulcer, one of the majo-gastrointestinal disorders, occur due to imbalance between offensive (mainly acid, pepsin, H. pylori and bile salts) and defensive (mainly involves mucus-bicarbonate secretion and prostaglandin) factors. Reduction in production of gastric acid and gastric mucosal protection are the two major approaches for gastric ulcer disorder therapy. Arbortristoside-A and 7-O-trans-cinnamoyl-6β-hydroxyloganine from NAT have been reported to possess anti-ulcerogenic and ulcer-healing property. These two not only prevent the formation of irritant induced gastric ulcers but also increase gastric ulcer healing.

Analgesic and anti-inflammatory activity: The pathophysiological response of mammalian tissue towards various hostile agents such as infectious organisms, toxic chemicals, physical injury or tumor growth is called inflammation. Edema formation, leukocyte infiltration and granuloma formation are components of inflammation. Glucocorticosteroids and nonsteroidal anti-inflammatory drugs (NSAIDs) are the two main types of anti-inflammatory agents but due to their adverse side effects various alternatives of NSAIDs and opiates are being searched all over the world. NAT was examined for the same and experiments were carried out on various animal models. The methanolic extract of NAT stem bark showed the analgesic and anti-inflammatory activity by preventing stimulation of nociceptive components which may happened due to the inhibition of the production of prostaglandin and related compounds. Experimental results also showed that the extract reduced the rate of edema in carrageenan-induced rat paw edema model.

Anthelminthic activity: Parasitic diseases, also known as parasitosis, are infectious diseases caused or transmitted by parasites. Helminths of class Cestoidea and Trematoda are endoparasites (live inside body of the host) and cause helminthiasis, also called worm infection. They often live in the gastrointestinal tract of their hosts but may also burrow into the organs inducing physiological damage. Anthelminthics are the agents which are used to expel out the parasitic worms (helminths) from body, either by stunning or killing them. Alcoholic and aqueous extract of NAT bark was examined for their anthelminthic activity against Pheretima posthuma. P. posthuma due to its anatomical and physiological resemblance with the intestinal worm of human and easy availability was selected for this assay. The study revealed that the

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 47-56 www.ijprajournal.com ISSN: 2456-4494

alcoholic extract was not only able to paralyze the worm in 8.53 min but also caused death in 13.05 min. Phytochemical analysis revealed presence of tannin that was responsible for the antihelminthic activity of NAT. Tannin can bind to the free protein present in gastrointestinal tract of host animal or glycoprotein present on cuticle of the parasite and may cause death of the worm.

Antileishmanial activity: In a study, iridoid glucosides viz arbortristoside A, B, C and 6β-hydroxy-loganin isolated from NAT were reported for the antileishmanial activity. In another study, calceolarioside A isolated from the methanolic extract of NAT leaves by bioactivity-guided fractionation showed in-vitro antileishmanial activity, which was determined to be IC50 = 20µg / mL while its in-vivo efficacy, when it reduced the hepatic and splenic parasite burden by 79% and 80% respectively, was noted to be 20mg / kg body weight in L. donovani Ag83 infected golden hamster model. This was the first report isolating calceolarioside A from NAT and describing potent activity of NAT against visceral leishmaniasis.

Anti-viral activity: Anti-viral activity of NAT was examined against encephalomyocarditis (EMCV) and Semliki Forest Viruses (SFV) in Swiss albino mice. The experimental results showed that the crude ethanolic extract, n-butanol fraction and isolated iridoid glycosides (Arbortristosides A and C) showed inhibition of 75% of cytopathic effect caused by both the viruses.

In-vivo studies against EMCV at different doses showed that the crude ethanolic extract and n-butanol fraction protected 40% of animals infected with EMCV at 250mg / kg body weight dose while the aqueous fraction protected 50% of animals infected with EMCV at 125 mg / kg body weight dose. Whereas in case of in-vivo anti-SFV activity the result was most promising with n-butanol fraction that provided 60% protection to animals infected with SFV at 125 and 62. 5 mg / kg body weight dose and Arbortristoside A that also protected 60% of SFV infected animals but at a much lower dose of 31.2mg / kg body weight. Both these fractions and isolated compounds did not produce any significant antiviral activity when administered orally. Further study revealed that with increasing dose of virus (SFV) the level of protection declined. However, animal treated with Arbortristoside A recorded 66, 65 and 50% protection against 5, 10 and 100 LD50 concentration. Based on the experimental results, it was concluded that the arbortristiside A isolated from n-butanol fraction of NAT possess maximum antiviral activity against enveloped virus (SFV) while moderate antiviral activity of n-butanol fraction was observed against both these fractions and isolated compounds did not produce any significant antiviral activity when administered orally. Based on the experimental results, it was concluded that the arbortristiside A isolated from nbutanol fraction of NAT possess maximum antiviral activity against enveloped virus (SFV) while moderate antiviral activity of n-butanol fraction was observed against it.

Hypoglycemic and hypolipidemic activity: Diabetes mellitus is a major global disease from which millions of people are suffering. In diabetes, it is important not only to control blood glucose level but also the blood lipid level as diabetes tends to increase low-density lipoprotein cholesterol and decrease high-density lipoprotein cholesterol levels in blood that triggers coronary occlusions and blocks. It has been concluded that the present treatment of diabetes using synthetic hypoglycaemic agents may cause adverse effects resulting in hypoglycaemia, gastrointestinal disturbances, renal toxicity and hepatotoxicity and this is why plants are considered as an alternative. Different doses of boiled aqueous extract of fresh NAT flowers were examined for the hypoglycaemic and hypolipidemic activity in mice. 200, 500 and 750mg / kg of the extract was administered in mice and subsequently fasting and random glucose concentration were examined. After oral administration of the extract, the effect of extract on glucose tolerance, gastrointestinal glucose absorption, liver and skeletal muscle glycogen content, diaphragm uptake, serum lipid profile and in-vitro amylase assay were examined in mice. The experimental results concluded that 500 and 750 mg / kg of the extract reduced fasting glucose levels by 49% and 39% respectively at 4hr post-treatment while 500 mg / kg of the extract decreased the random blood glucose level significantly by 32% at 4hr post treatment. The extract also significantly inhibited glucose absorption from intestine by 85%, increased diaphragm uptake of glucose by 64%, decreased level of total cholesterol and triglycerides by 44. 8% and 53% respectively, and increased the high-density lipoprotein cholesterol by 57%. It also exhibits inhibition of α-amylase enzyme activity by 16.66%.

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 47-56 www.ijprajournal.com ISSN: 2456-4494

Antihyperlipidemic activity: Hyperlipidaemia is increased level of lipid in blood which is first and for most factor responsible for diseases like atherosclerosis, coronary heart disease, ischemic cerebro-vascular disease, hypertension, obesity and diabetes mellitus (Type II) etc. Methanolic extract of NAT leaves was examined for antihyperlipidemic activity in Wistar albino rats. The extract at the doses of 200 and 400 mg / kg body weight showed significant decrease in lipid profile like triglycerides, total cholesterol (TC), low density lipoprotein (LDL), very low-density lipoprotein (VLDL), and significant increase in high density lipoprotein (HDL). The effect of lipid lowering might be result of plant sterols (β-stigmasterol and β-sitosterol) which reduce cholesterol absorption and thus increase faecal excretion of steroids and thus results in decrease of body lipids. It was concluded that the methanolic extract of NAT leaves showed antihyperlipidemic activity with specific and non-specific mechanism which might be due to the presence of phytochemicals like phenol, triterpenoids and flavonoids in the extract.

Anti-arthritic activity: Arthritis is an autoimmune condition of synovial joints, triggered generally by inflammatory mediators and infections which is characterized by chronic inflammation that results in pain, inflammation of synovial joints, pannus formation, cartilage rupture, impaired movement and disability. Currently for treatment of arthritis nonbiologic disease modifying antirheumatic drugs (DMARD) (such as methotrexate), nonsteroidal antiinflammatory drugs (NSAID) (such as piroxicam), biological therapies (such as inhibitors of IL-6, IL-1 and TNF-α) and glucocorticoids (such as methyl prednisolone and triamcinolone) are used. NSAIDs are considered as the first line therapy of rheumatoid arthritis that effectively attenuate swelling, pain and joint stiffness but have adverse side-effects including stomach ulcers, bleeding.

Non-biologic DMARDs used for treatment can cause reversible alopecia, rash, nausea, loss of appetite, elevated formation of rheumatoid nodules, mouth ulcers and neurological problems while anti-TNFs therapy are responsible for abdominal pain, headache, itching, bruising, bleeding, rash, vomiting, diarrhea, injection site reaction, cellulitis and respiratory tract infections. Chronic use of glucocorticoids also has multiple adverse effects including increased risk of osteoporosis, diabetes mellitus, peptic ulcer, gastrointestinal bleeding, cataract and infection.

All the adverse effects related to the current treating therapies, increasing percentage of rheumatoid arthritis patients are going towards the alternative medicines. Methyl, ethyl acetate and n-hexane extracts of mature leaves of NAT were examined for anti-arthritic activity using rat model of FCA-induced arthritis. The comparative study of extracts showed that the ethyl acetate extract of NAT leaves was most promising than others. The ethyl acetate extract showed maximum inhibition of paw edema as compared to the other two extract. It more significantly attenuated infiltration of inflammatory cells in ankle joint, total leukocyte count and reduction in bone erosion as compared to other two as well as the reference drug, Piroxicam.

CNS depressant action: A study was carried out with water soluble portion of ethanol extracts of flowers, barks, seeds and leaves of NAT to evaluate CNS depressant activity of plant. It has been already concluded that the leaves of the plant possess hypnotic and tranquilizing activity whereas its flower possess sedative activity. The ethanol extract of plant was extracted by Soxhlet extraction and the extract was examined for the pharmacological activity in adult male Swiss mice. The CNS depressant activity was evaluated by observing the prolongation of sleeping in mice induced by pentobarbital sodium. The attempts were made to determine the possible mechanism behind the activity by determining their effect on brain monoamine neurotransmitters like serotonin and dopamine. The study showed that the ethanolic extract of leaves, flowers, seeds and bark (600 mg / kg) of NAT possess significant CNS depressant activity and some muscle relaxant activity. The leaves, flowers, seeds and bark showed significant and dose dependent prolongation of the onset and duration of sleep, which was comparable to chlorpromazine, the standard drug. The highest CNS depressant activity was observed to be possessed by the leaves. It was also concluded that the activity possess by the extract might be due to the decrease in dopamine and increase in serotonin level in brain.

Hepatoprotective activity: Petroleum ether and methanol extract of NAT bark were examined for the hepatoprotective activity using carbon tetrachloride (CCl4) induced hepatotoxicity in Swiss albino mice. The hepatic toxicity was induced in the liver of mice by injecting CCl4 and

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 47-56 www.ijprajournal.com ISSN: 2456-4494

the level of Serum Glutamate Pyruvic Transaminase (SGPT), Serum Glutamate Oxaloacetic Transaminase (SGOT), Alkaline phosphate (ALP), Direct Bilirubin (DB) and Total Bilirubin (TB) in the serum of mice was measured for determining the function of liver. Silymarin was used as standard drug for the study. The administration of Silymarin and both the extracts (100 mg / kg and 200 mg / kg) significantly decreased the serum marker enzymes (SGPT, SGOT, ALP, DB & TB). The dose of 200 mg / kg of methanol extract was found to be more effective in comparison to that of 100mg / kg methanol and 100 mg / kg and 200 mg / kg of petroleum ether extract of NAT. The phytochemical analysis of petroleum ether and methanol extract of NAT showed the presence of alkaloid, cardiac glycosides, tannin, saponin, terpenoid, phlobatannins, fixed oils, fats and flavonoids that might be responsible for the activity response which is triggered by infectious or aseptic stimuli that results in elevated body temperature which occur due to increase in concentration of prostaglandin E in certain parts of brain that further alter the firing rate of neurons that control thermoregulation in hypothalamus.

Antipyretics Anti-pyretic activity: Fever is a complex physiological are drugs that reduce the elevated body temperature. NAT was examined for antipyretic activity in albino rats for potential on normal body temperature and yeast-induced pyrexia. The whole plant extract of NAT showed significant antipyretic activity at the dose of 200 mg / kg by reducing normal body temperature and yeast-provoked elevated temperature in dose dependent manner. It was also found that the effect of whole plant extract of NAT dose was comparable to that of paracetamol (150 mg / kg), a standard antipyretic agent. In another study the petroleum ether and methanol extracts of NAT bark were examined for the antipyretic activity of the plant against yeast induced pyrexia in mice. Fever was induced by 20% aqueous solution (10 mg / kg) or Brewer's yeast subcutaneously injected into the dorsum region of mice and aspirin (150 mg / kg) was used as standard drug. It was found that both petroleum ether and methanol extract (100 mg / kg and 200 mg / kg) showed antipyretic activity by significantly reducing rectal temperature after its administration.

Anxiolytic activity: Hydroalcoholic extract of NAT leaves was examined in adult Albino rats and Wister mice for its anxiolytic activity using various models like elevated zero maze, elevated plus maze, open field exploratory behavior, novelty induced supressed feeding test and social interaction test. Extract was given orally to rats in two different doses i.e., 250 and 500 mg / kg that showed dose dependent significant increase in open field ambulation, rearing, self grooming and activity in centre manifesting anxiolytic activity of NAT. However, there were no significant changes in open field fecal droppings. In open field, animals are in novel environment, due to anxiety and fear, they express increased defecation and decreased ambulation, exploration, freezing, rearing and grooming behavior and these behavioral changes are attenuated by classical anxiolytics and augmented by anxiogenic agents. Similarly, anxiolytic agents increase responses in elevated plus maze and elevated zero maze tests, open closed arm entries and time ratios provide a measure fear induced inhibition of exploratory activities. In experimental results, it was found that NAT treated rats exhibited dose dependent significant increase in time spent in open arms and entries made on open arms whereas there was significant decrease in time spent in enclosed arms and entries on enclosed arms as compared to the control. The extract also increased social interaction and attenuated novelty induced feeding latency in comparison to vehicle treatment. Lorazepam (500 mg / kg; ip) was used as standard drugs for comparison which showed significant anxiolytic activity and the effects were found to be more than that of the NAT extract. Overall experimental results provided positive result for the anxiolytic activity of the hydroalcoholic extract of NAT leaves.

Anti-cancer activity: The methanolic crude extract of leaf, fruit and stem of NAT were examined in-vitro for antioxidant and anticancer activity of plant. By DPPH free radical scavenging assay antioxidant activity of extract was evaluated, it was reported that the dried fruit methanol extract of NAT showed 93.8% scavenging effect of phenolic crude at 1000mg / ml conc., Dried stem methanolic extract showed a moderate value of 69.9 % at 100 mg / ml conc. while least value was 27.8% that was observed with dried leaves methanol extract at 1.0 mg / ml conc. Based on antioxidant activities the anti-cancer activity was evaluated by MTT assay on MDB MB-231 cancer cell lines. It was found that out of all the extracts, dried fruit methanol extract showed high degree of inhibition against human breast cancer cell lines (MDA-MB 231).

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 47-56 www.ijprajournal.com ISSN: 2456-4494

The phytochemicals isolated from NAT dried fruit methanol extract were glycosides, tannins, phenols and steroids which were predicted to be responsible for the anticancer activity of the plant. In another study, the methanolic extract of leaves of NAT were examined for anti-cancer activity of the plant against Ehrlich Ascites Carcinoma (EAC) cells (107cells / mouse) where the extract was injected into intra-peritoneal route (200 and 400 mg / kg body weight) of Swiss Albino mice. For the study 5-Fluorouracil (20mg / kg body weight) was injected through intra-peritoneal route as standard anti-cancer drug. Based on the ability to inhibit cancer cell growth in ascitic fluid of mice, the anticancer activity of the extract was evaluated. Phenols and steroids which were predicted to be responsible for the anticancer activity of the plant. In another study, the methanolic extract of leaves of NAT were examined for anti-cancer activity of the plant against Ehrlich Ascites Carcinoma (EAC) cells (107cells / mouse) where the extract was injected into intraperitoneal route (200 and 400 mg / kg body weight) of Swiss Albino mice. For the study 5-Fluorouracil (20mg / kg body weight) was injected through intraperitoneal route as standard anti-cancer drug. Based on the ability to inhibit cancer cell growth in ascitic fluiof mice, the anticancer activity of the extract was evaluated. phenols and steroids which were predicted to be responsible for the anticancer activity of the plant. Various parameters were taken to establish the potency of the anticancer property of methanol extract of NAT leaves including percentage inhibition of total cell count, tumor volume, viable and non-viable cell counts; percentage increase in life span and hematological parameters. Administration of extract at the doses of 200 and 400mg / kg bw significantly reduced the total cell count and tumor volume. At 200 mg / kg conc. the percentage of inhibition of total cell count and percentage inhibition of tumor volume was observed to be 84.75% and 75.52% respectively while at 400 mg / kg conc. the percentage of inhibition of total cell count and percentage inhibition of tumor volume was observed to be 90.36% and 96.37% respectively. Administration of extract at doses of 200 and 400 mg / kg also significantly decreased the viable cell count and level of WBC while increased non-viable cell count, life span and the level of both RBC and haemoglobin. The overall results of the study concluded that the methanol extract of NAT leaves possess anticancer activity [22].

Health benefits of Harsingar: -

As Harsingar plant exhibit a number of medicinal values like anti-allergic, antibacterial, antiviral, anti-inflammatory [12], anti-diabetic, antipyretic, natural laxative, antihistaminic, antioxidant (13), excellent bronchodilator, etc. due to presence of mentioned phytochemical components the plant is very useful in different health problems. It is widely used in treatment of Bronchitis, arthritis, Asthma, cough, heartburn, nausea, Sciatica, Rheumatism, constipation etc. It reduces swelling due to its anti-inflammatory activity; protect the liver as a good hepato-protective agent. The leaf, seed, bark are helpful in decreasing dopamine and increases the serotonin level showing CNS depressant activity. The leaves decoction has significant aspirin like property thus helpful to manage the fever while seeds are mainly good for skin and hair.

Side effects and Toxicity: -

When it is taken in recommended dose no side effect is known but sometimes leaf intake may cause nausea and vomiting due to its bitter taste. It can reduce the blood sugar level in diabetic patient so monitor the sugar level. It is observed in several clinical studies for acute toxicity and high dose can have negative effects.

REFERENCES: -

[1]. An Activity and identification of polyphenols by Rp-hplc. Pharmacologyonline. 2010; 2: 57-782.
[2]. Kirtikar KR, Basu BD, Singh B, Singh MP. Indian medicinal plants 1975; 1 (2): 2392-93.
[3]. Nadkarni KM. Indian Plants and Drugs, 2001, 102-104.
[4]. Bansal Gulshan, Suri KA, Grover Parul. A Comprehensive review on Nyctanthes arbortristis. Int. J Drug Dev. & Res., 2015; 7 (1): 183-193.
[5]. Abhi1. Shandhar HK, Kaur M. An update on Nyctanthes arbor-tristis Linn. Journal of International Pharmaceutica Sciencia, 2011; 1: 77-86.shek Kumar Sah, Vinod Kumar Verma. Phytochemicals and Pharmacological Potential of Nyctanthes arbortristis: A ComprehensiveReview.International Journal of Res. Pharma. And Biomed. Sci. 2012: 3 (1): 420-427.
[6]. Champa Rani, Sunaina Chawla, Manisha Mangal, Mangal AK, Subhash Kajla,

Dhavan AK. Nyctanthes arbortristis Linn. (Night Jasmine) A Sacred ornamental plant with immense medicinal potential. Ind. J Trad. Knowl. 2012; 11 (3): 427-435.

[7]. Veeranki Nagavani, Raghava Rao KV, Ravi Kiran Ch, Raghava Rao T. In-vitro screening of nyctanthes arbor-tristis flowers for antioxidant

[8]. Shalini Tripathi PK, Tripathi M, Vijayakumar Ch, Rao V, Singh PN. Anxiolytic activity of leaf extract of nyctanthes arbor-tristis in experimental rats. Pharmacologyonline. 2010; 2: 186-193.

[9]. Repon Kumer Saha, Srijan Acharya, Syed Sohidul Haque Shovon, Apurba Sarker Apu, Priyanka Roy. Biochemical investigation and biological evaluation of the methanolic extract of the leaves of Nyctanthes arbortristis in vitro. Asian Paci. J Trop. Biomed. 2012; S15: 34-S1541.

[10]. Bhadouria RS, Bhargava S, Pancholi SS. Isolation and characterization of two alkaloids from the ethanolic extract of nyctanthes arbor-tristis linn. Leaves. Advance. Res. Pharma. & Biologist. 2012; 2 (4):342-344.

[11]. Kannan P, Ganjewala D. Preliminary Characterization of Melanin Isolated from Fruits and Seeds of Nyctanthes arbor-tristis. J Sci. Res. 2009: 1 (3): 655-661.

[12]. Bansal S, Bharatiand AJ, Bansal YK. Efficient In-vitro Regeneration of a Medicinal Plant Harsinghar (Nyctanthes arbor-tristis Linn.). Plant Tissue Cult. & Biotech. 2012; 22 (2): 137-142.

[13]. Prabodh Satyal, Prajwal Paudel, Ambika Poudel, William N. Setzer. Chemical composition and biological activities of essential Oil from leaf and bark of Nyctanthes arbor-tristis Linn.from Nepal. Open Access J Medicine. & Arom. Plants. 2012; 3 (1): 1-4.

[14]. Smita Parekh, Anjali Soni, Nyctanthes arbor-tristis: Comprehensive review on its pharmacological, antioxidant and anticancer activities, Journal of Applied Biology and Biotechnology, 2020: 8 (01): 95-104.

[15]. Anowar Hussain, Anand Ramteke, Flower extract of Nyctanthes arbor-tristis modulates glutathione level in hydrogen peroxide treated lymphocytes, Pharmacognosy Res, 2012: 4 (4): 230-233. DOI-10.4103 / 0974-8490.102272

[16]. Milind M Meshram, Swatee B Rangari, Shashank B Kshirsagar, Suraj Gajbhiye, Madhurim R Trivedi et al.Nyctanthes arbor-triris a herbal panacea, International Journal of Pharmaceutical Science and Research, 2012, Page No: 2432-2440, DOI-http://dx.doi.org/10.13040/IJPSR.0975-8323.3 (8) .2432-40

[17]. Laxmi Verma, Vaibhav Tamrakar, Narul Haque, Anil Kumar. Antifungal activity of different parts of Nyctanthes arbor-tristis Linn. (Parijat) against clinical pathogens, Shodh Darpan (Special Issue), 2016: 1 (4) .ISSN No. 2454-1516

[18]. Vidyavati Hiremath, Hiremath BS, Mohapatra S, Arun Kumar Das. Literary review of Parijata (Nyctanthus arbor-tristis Linn.) An herbal medicament with special reference to Ayurveda and Botanical literature, Biomed Pharmacol J, 2016, 9 (3), DOI-https: //dx.doi.org/10.13005/bpj / 1043

[19]. Reema Srivastava, Deepali Trivedi, Gauri Shukla, Pankaj Srivastava, Nyctanthus arbor-tristis: A wonder Indian herbal drug needs healthcare attention, Biomedical Journal of Scientific and technical research, published on June 11, 2018, ISSN: 2574-1241, DOI :10.26717 / BJStr.2018.05.001199

[20]. Champa Rani, Sunaina Chawla, Manisha Mangal, AK Mangal, Subhash Kajla, AK Dhawan et al, Nyctanthes abor-tristis Linn. (Night Jasmine): A sacred ornamental plant with immense medicinal potential, Indian Journal of Traditional Knowledge, 2011: 11 (3): 427-435.

[21]. Jadhav VS, Ghawate VB. Evaluation of combined wound healing activity of ethanolic extracts of leaves of Murraya koenigii and Nyctanthes arbortristis on rats, Drug Invention Today, 2017: 9: 2. ISSN: 0975-7619

[22]. Sasmal D, Sanjita Das, Basu SP. Review article on Phytoconstituents and therapeutic potential of Nyctanthes arbortristis Linn., Pharmacognosy reviews, July-Dec, 2007: 1: 2.

[23]. Bansal Gulshan, Suri KA, Grover Parul, A comprehensive review on Nyctanthes arbor-trisits, Int. J. Drug Dev. & Res., ISSN 0975-9344, January –March, 2015, 7.

[24]. Ansari Imtiyaz Ahmed, Patil Javesh K, Kamora Kunal Rajeshlal, Mandhan Priyanka Mahesh, Poptani Taruna Hareshlal, Girase

Ananda Narayan. Anthelminthic activity of Nyctanthes arbortristis leaves on Indian earth worms, Indian Journal of Drugs, 2016: 4 (2): 63-68. ISSN: 2348- 1684

[25]. Jadhav Santosh, Patil Manoj kumar. A Review on Nyctanthes arbortristis Linn. Rejuvinating herbs, International Journal of Research in Pharmacy and Pharmaceutical Science, 2016: 1 (1): 54- 62. March ISSN: 2455-698X

[26]. Sonakshi Antal, Vrish Dhwaj Ashwlayan, Anuj Kumar.Protective effect of Nyctanthes arbortristis on scopolamine induced amnesia in rats "A Behavioral and Biochemical approach", International Journal of Pharmaceutical Sciences and Research, Sr. 48, Page No .: 1346-1355, Accepted on: 01 December '2016, published on: 01 march'2017, DOI: 10.12040 / IJPSR.0975-8232.8 (3) .1346-55

[27]. Mark S. Le Doux, Murine models of Caytaxin deficiency, in Movement Disorders (Second edition), pages, 2015,