



## REVIEW ON PHARMACOLOGICAL EFFECTS OF NIGHT BLOOMING JASMINE (*CESTRUM NOCTURNUM*)

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### ABSTRACT

This article provides an overview on the pharmacological effects, uses of various plant parts, phytochemical constituents of *Cestrum nocturnum*. A short notes on taxonomy, synonyms *Cestrum nocturnum*, a plant belonging to the solanaceae family has many therapeutically active phytochemicals. *Cestrum nocturnum* is a garden shrub used as a remedy for different health disorders. This article gives a broad review on various Pharmacological activities of *Cestrum nocturnum* such as wound healing, antidiabetic, antiulcer, anti anxiety, antidepressant, anticancer, antioxidant, larvicidal, mosquito repellent, anti-pyretic, anti-inflammatory, analgesic antiepileptic, anti-HIV-1 and anti-malarial activity.

### INTRODUCTION

Many plants continue to provide numerous beneficial therapeutic activities and helpful to mankind in fighting various diseases. The Plant especially from family "Solanaceae" provides many therapeutically active ingredients, like atropine and hyoscyne, henbane, and nicotine etc<sup>(1)</sup>. *Cestrum nocturnum* also belongs to solanaceae family, which has been used traditionally and pharmacologically for the treatment of various disorders. Not only is used to treat ailments it is also used as a cosmetic as it is naturally provided with good fragrance which is vastly manufactured and exported by Indian and Middle East perfume Industry. It is believed to be the world's strongest smelling plant. Indeed the scent can reach up to 165 feet away from the location of plant.<sup>(2)</sup>

#### Description of plant:

"*Cestrum nocturnum*" is also known as Night Blooming Jasmine (raatki rani) is an evergreen woody shrub growing up to 4m long. It is native to the West Indies, but naturalized in South Asia. A powerful yet sweet perfume is released during the night. The fruit is a berry, and the flowers are either

greenish-white or yellowish. There are mixed reports regarding the toxicity of the flowers and foliage. The genus name *Cestrum* is thought to derive from the Greek word 'kestron', for similarity to a plant of that name, or 'kestrum', a tool used for engraving which the which the plant's anthers resemble.<sup>(3)</sup>



Figure 1: Flowering twig of *Cestrum nocturnum*

#### Chemical constituents<sup>(5-9)</sup>:

*Cestrum nocturnum* leaf have reported to contain the phytochemicals like alkaloids, flavonoids, saponins, terpenes, phenolic compounds, n-butanol and polysaccharides, calcinogenic glycoside, nocturnoside A and nocturnoside B, phenol glucosides (cesternosides A and B) carbohydrates and

volatile oils, glycosides, alkaloids, flavonoids, tannins, sterols, triterpenoids, Trans-2-Hexenal, cis-3-hexenyl acetate, cis-3-hexenol, trans-2-hexenol, linalool, eugenol, β-phenyl ethyl alcohol, cis- jasmone, methyl jasmonate, 1, 8-cineole, borneol, linalyl acetate, citronellyl propionate, methyl anthranillate, 1-heneicosyl formate, docosane, 2-mono linolein, dibutyl phthalate, 10-heneicosane, tetracosane. It also

contains some alkaloids like, nicotine, nor nicotine, cotinine, myosmine. Yuccagenin, tigogenin, nocturnoside A & B, cesternoside A & B, Cholestane glycosides, Pregnane glycoside and Flavonol glycosides. The flower and stem contain Carbohydrates, aerial parts contain Coumarins, and Flower contains volatile oils.

**Table 1: Taxonomy and Synonyms of *Cestrum nocturnum***

Taxonomy of <i>cestrum nocturnum</i> <sup>(3)</sup>	Synonyms <sup>(4-5)</sup>
Domain: Eukaryota	English : Night-blooming jasmine
Kingdom: Plantae	Bengali: Hasnahana
Subkingdom: Tracheobionta	Hindi : Raatki rani
Phylum: Spermatophyta	Manipur : Theibal lei
Subphylum: Angiospermae	Tamil : Raat rani ; Raatrirani
Class: Dicotyledonae	Marathi: Raat rani
Subclass Asteridae	German : NachtJasmin; N. Hammerstrauch
Order: Solanales	Portuguese: Jasmin da Noita; Dama da Noite
Family: Solanaceae	Japanese: Yakokwa
Genus: <i>Cestrum</i>	Chinese : Ye Xiang Shu
Species: <i>Cestrum nocturnum</i>	

**Table 2: Represents Pharmacological importance of various parts of the plant<sup>(10-22)</sup>**

S.No.	Plant part	Uses	Reference
1.	Flower	Anti tumour activity	Deng-PanWu, Tian-Yu <i>et al.</i> , 2017 <sup>(10)</sup>
2.	Flower	Antioxidant activity.	Sandeep B. Patil <i>et al.</i> , 2018 <sup>(11)</sup>
3.	Leaf	Anti hyperglycaemic	R.S. Sahane <i>et al.</i> , 2014 <sup>(12)</sup>
4.	Leaf	Anti-oxidant	R. S. Sahane <i>et al.</i> , 2014 <sup>(12)</sup>
5.	Leaf	Antihyperlipidaemic	R. S. Sahane <i>et al.</i> , 2014 <sup>(12)</sup> Hemant Kumar Nagar <i>et al.</i> , 2013 <sup>(13)</sup>
6.	Leaf	Wound healing Activity	Hemant Kumar Nagar <i>et al.</i> , 2016 <sup>(13)</sup> Anil Kamboj <i>et al.</i> , 2013 <sup>(14)</sup>
7.	Leaf	Antidiabetic activity	Anil Kamboj, <i>et al.</i> , 2013 <sup>(14)</sup> Hemant Kumar Nagar <i>et al.</i> , 2013 <sup>(13)</sup>
8.	Leaf	Larvicidal And Repellent Effect	Mostafa I. Hassan, <i>et al.</i> , 2011 <sup>(15)</sup>
9.	Leaf	Anti-pyretic, anti-inflammatory analgesic	A Bhatt, <i>et al.</i> , 2009 <sup>(16)</sup>
10.	Leaf	Anti-inflammatory	A Bhatt <i>et al.</i> , 2009 <sup>(16)</sup>
11.	Leaf	Analgesic	A Bhatt <i>et al.</i> , 2009 <sup>(16)</sup>
12.	Leaf	Hepatoprotective effect	M. Imranqadiret <i>et al.</i> , 2014 <sup>(17)</sup>
13.	Leaf	Anti Ulcer Activity	Uzma Saleem <i>et al.</i> , 2017 <sup>(18)</sup>
14.	Leaf	Anti-Anxiety	P. Katolkaret <i>et al.</i> , 2015 <sup>(18)</sup>
15.	Leaf	Antidepressant Activity	P. Katolkaret <i>et al.</i> , 2015 <sup>(19)</sup>
16.	Leaf	Burns and swellings	Chetan Jawale <i>et al.</i> , 2010 <sup>(20)</sup>
17.	Stem	Larvicidal And Repellent Effect	Mostafa I. Hassan, <i>et al.</i> , 2011 <sup>(15)</sup>
18.	Bark	Anti Diabetic	Anil Kamboj <i>et al.</i> , 2013 <sup>(13)</sup>
19.	Whole plant	Anti epileptic	Hector Perez-Saadet <i>et al.</i> , 2008 <sup>(21)</sup>
20.	Whole plant	Anti-malarial	Chetan Jawale <i>et al.</i> , 2010 <sup>(20)</sup>
21.	Aerial parts	Anti-HIV	Khalid Rashid <i>et al.</i> , 2013 <sup>(22)</sup>

## REPORTED ACTIVITIES:

### WOUND HEALING ACTIVITY:

The wound is defined as the impeding or the disordering of the anatomic and cellular continuity of tissue caused by chemical, physical, thermal, microbial or immunological injury to the tissue. Wound healing process consists of integrated cellular and biochemical cascades leading to the reestablishment of structural and functional integrated cellular and biochemical cascades leading to the reestablishment of structural and functional integrity of the damaged tissue. Wound healing properties of *Cestrum nocturnum* have been investigated by applying *Cestrum nocturnum* ointment of various concentrations on Albino Wistar rats by excision and incision models. The polyphenols and flavonoids present in leaf extracts of *Cestrum nocturnum* have antibacterial, anti-inflammatory, and anti-microbial properties. The study was conducted on 5 groups of Albino Wistar rats each consisting of 6 rats. The rats weighed between 180-200gms. Group 1 was left untreated i.e., considered as control, Group 2 served as negative control i.e., treated with ointment base, group 3 served as standard and was treated with povidone-iodine ointment USP, group 4 was treated with 2% ethanol extract of *Cestrum nocturnum* leaves and group 5 was treated with 5% of ethanolic extract of *Cestrum nocturnum* leaves. The incision and excision wounds were observed daily for the wound healing effect. The 5 groups of rats were assessed by conducting wound healing evaluation, epithelisation period, tensile strength evaluation, hydroxyproline estimation, histopathological study, and statistical analysis. The results revealed that the wound healing process was highly significant in the group treated with povidone-iodine ointment followed by 5% ethanolic extract of *Cestrum nocturnum* and 2% ethanolic extract of *Cestrum nocturnum*. More number of fibroblasts and blood vessels were seen in 5% ethanolic extract of *Cestrum nocturnum* treated group. Therefore, *Cestrum nocturnum* shows a concentration-dependent wound-healing effect.<sup>(23-25)</sup>

### ANTIDIABETIC ACTIVITY<sup>(14)</sup>

Diabetes mellitus commonly known as diabetes is a group of metabolic disorders identified by a high blood sugar level over a

prolonged period. Symptoms often consist of frequent micturition, increased thirst, and increased hunger. If left untreated, diabetes can lead to further complexity. The anti-diabetic activity of *Cestrum nocturnum* was evaluated in streptozotocin induced diabetic rats. The plant extract was prepared by drying the aerial parts of *Cestrum nocturnum* in shade for two weeks. The extract was prepared by treating the dried crushed powder of *Cestrum nocturnum* with a hydroalcoholic solution using the Soxhlets apparatus. Then this leaves extract is put through phytochemical screening to test the presence of tannins, glycosides, alkaloids, flavonoids, carbohydrates, and terpenoids.<sup>(12)</sup> Streptozotocin was injected into the rats at a dose of 150mg/kg to induce hyperglycaemia and they were kept under observation. After 48 hours, the animals were tested for glucosuria using diastex strips. After 12 days of injecting the streptozotocin injection, rats with fasting blood glucose levels higher than 200mg/DL were summed up as diabetic. Wistar rats weighing 200-250mg were used for this experimental study.

The rats were divided into 5 groups, each group containing 6 rats. Group 1 was considered as normal control and received 5ml/kg of normal saline. Group 2 was considered as diabetic control and received a vehicle i.e., Tween 80% and 5ml/kg of normal saline. Group 3 rats were given metformin at a dose of 10mg/kg. Group 4 was given a hydroalcoholic extract of *Cestrum nocturnum* (200mg/kg) and group 5 was given a hydroalcoholic extract of *Cestrum nocturnum* (400mg/kg). The drug solution, vehicle, and standard were given orally to the respective groups by gastric intubation once daily for 15 days at a specific period. The effect of the drug solution or standard on the body weight and body glucose was determined in animals. Flavonoids, tannins, saponins, sterols, and triterpenoids presence were detected by phytochemical analysis of *Cestrum nocturnum* leaf extracts. The glycemic levels were observed in all the groups, and it was identified that groups treated with metformin and hydroalcoholic extract of *Cestrum nocturnum* have their glycemic levels under control i.e., the glycemic levels were normal. The body weight was found to be significantly

improved in the groups administered with hydroalcoholic extract of *Cestrum nocturnum*. Therefore, both the groups were treated with hydroalcoholic extracts of *Cestrum nocturnum* have regained the normal body weight and glycemic levels.

#### **ANTI ULCER ACTIVITY<sup>(18)</sup>**

An ulcer is defined as a break in the skin or mucous membrane with loss of surface tissue, disintegration, and necrosis of epithelial tissue, and often pus.<sup>(14)</sup> Anti-ulcer properties of *Cestrum nocturnum* have been investigated by using methanolic and n-hexane extracts of various concentrations against ethanol and indomethacin-induced ulcer models in rats. The study was conducted on 4 groups of Albino Wistar rats, each group containing 5 rats. Group 1 was taken as normal control, this group received vehicle; Group 2 served as disease control; Group 3 served as standard and was treated with omeprazole 20 mg/kg, Group 4 was divided into 7 subgroups. Groups A, B, and C were treated orally at doses of 300 mg/kg, 500 mg/kg, and 700 mg/kg of methanolic extracts of *Cestrum nocturnum* respectively. Groups D, E, and F were treated orally with 300 mg/kg, 500 mg/kg, and 700 mg/kg of n-hexane extracts of *Cestrum nocturnum* respectively. Group G was treated with decoction at a dose of 10ml/kg orally. The groups were assessed for ulcer score, ulcer index, and anti-ulcer activity.

The histopathological studies and statistical analysis was conducted. The results revealed that the anti-ulcer activity was 75% with the standard group and 81% with the group treated with 700mg/kg of ethanolic and n-hexane extracts of *Cestrum nocturnum* showed a concentration dependant activity. The groups treated with the concentration decoction failed to protect the gastric mucosa as much as the extracts did. The anti-ulcer activity was shown by a decrease in lesions, reduced gastric juice volume, and acidity, with an increase in gastric pH. Therefore, both the extracts of *Cestrum nocturnum* have anti-ulcer and antisecretory activity.

#### **ANTI ANXIETY AND ANTIDEPRESSANT ACTIVITY<sup>(26)</sup>**

Anxiety can be defined as the feeling of unease or nervousness about something with an

uncertain outcome which is generally the body's natural response to stress<sup>(22)</sup>. The anti-anxiety activity of *Cestrum nocturnum* was tested by using the Elevated Plus maze method and Actophotometer. The ethanolic extracts and alcoholic extracts of *Cestrum nocturnum* leaves were used. American Psychiatry Association defines depression as a common and serious medical illness that negatively affects the patient.<sup>(19)</sup> The antidepressant activity of *Cestrum nocturnum* was tested using the Despair swim test is also known as Force swim test and the Tail suspension test. Wistar rats weighing 150-200g and swiss albino rats weighing 18-22g were used. Swiss albino rats were used to access the acute oral toxicity of *Cestrum nocturnum*. The rats were divided into 4, groups each group containing 6 animals. Group 1 was taken as normal control, and they received distilled water (1ml,p.o.), Group 2 consisted of 2 subgroups in which one subgroup received Diazepam (5mg/kg i.p) and another subgroup received Fluoxetine (10mg/kg i.p). Group 3 test group was treated with ethanolic extracts of *Cestrum nocturnum* (500mg/kg p.o). Group 4 test group was treated with aqueous extract of *Cestrum nocturnum* (500mg/kg p.o).

#### **Antianxiety Activity:**

The elevated plus-maze test is a simple method to assess anxiety-like behaviour in rodents. The test is based on the natural aversion of mice for open and elevated areas, and also their natural spontaneous exploratory behaviour in a new environment. The animal is allowed to freely explore the maze for 5minutes while the duration and frequency of entries into open and closed arms are recorded. This test was conducted in a sound-attenuated environment. The group treated with 500mg/kg of ethanolic extract of *Cestrum nocturnum* showed a significant increase in the number of entries and time spent in the open arm. The efficacy of 500mg/kg of ethanolic extracts of *Cestrum nocturnum* was similar to that of diazepam. Actophotometer test was conducted to evaluate the locomotor activity of rats. The rats were treated with drugs and were individually placed in an actophotometer. The basal activity scale was recorded for 10minutes after 30 and 60 minutes of drug treatment. The group treated with 500mg/kg of ethanolic

extracts of *Cestrum nocturnum* has shown a significant reduction in the locomotoractivity.<sup>(27,28)</sup>

**Antidepressant activity:** Despair swim test also known as force swim test is a rodent behavioural test used for evaluating the efficacy and action of antidepressant drugs. Animals were individually placed in a glass cylinder filled with water up to half its height. Animals were forced to swim for 5 minutes. Duration of immobility was observed during this time interval. A pre-test was carried out 24 hours before to check the fitness level of each test animal. The group treated with 500mg/kg of ethanolic extracts of *Cestrum nocturnum* has shown a significant decrease in the immobility time. 500mg/kg of ethanolic extracts of *Cestrum nocturnum* has shown similar efficacy like fluoxetine. Tail suspension test was used for screening of potential antidepressant drugs. Mice were suspended by their tails with the help of an adhesive tape. In this position, the mice cannot escape or hold swim test also known as force swim test is a rodent behavioral test used for evaluating the efficacy and action of antidepressant drugs. Animals were individually placed in a glass cylinder filled with water up to half its height. Animals were forced to swim for 5 minutes. Duration of immobility was observed during this time interval. A pre-test was carried out 24 hours before to check the fitness level of each test animal. The group treated with 500mg/kg of ethanolic extracts of *Cestrum nocturnum* has shown a significant decrease in the immobility time. 500mg/kg of ethanolic extracts of *Cestrum nocturnum* has shown similar efficacy like fluoxetine. Tail suspension test was used for screening of potential antidepressant drugs. Mice were suspended by their tails with the help of an adhesive tape. In this position, the mice cannot escape or hold any surface<sup>(24)</sup>. They were quantified for 5-6 minutes and the mice that remained motionless were considered immobile. The group treated with 500mg/kg of ethanolic extracts of *Cestrum nocturnum* has showed decreased immobility time i.e., it showed similar efficacy like fluoxetine any surface. They were quantified for 5-6 minutes and the mice that remained motionless were considered immobile. The group treated with 500mg/kg of ethanolic

extracts of *Cestrum nocturnum* has showed decreased immobility time i.e., it showed similar efficacy like fluoxetine.

#### **ANTI EPILEPTIC ACTIVITY<sup>(21)</sup>**

For investigating the neuropharmacological action, decoctions were prepared from the dried leaves of plant. Prepared decoctions were tested in various pharmacological models such as Picrotoxin induced convulsions, maximal electric shock seizures in mice and penicillin epileptic foci in rats, Prepared decoctions of extracts divided into different parts like D1, D2, D3, D4, D5. On repeated administration of five doses of D5 with a gap of 1hour interval, decreased the amplitude of Penicillin induced epileptic seizure spikes in both primary and secondary foci in rats.

#### **ANTI MALARIAL ACTIVITY<sup>(29,30)</sup>**

*Cestrum nocturnum* leaves containing volatile oils is used as powerful mosquito repellent, It was assessed by using crude methanolic extracts. Two hundred fifty grams of pulverized plant samples were prepared and placed in glass container. Methanolic extract was prepared and allowed to stand for 48 hours and filtered. Filterates were concentrated by using Rotary evaporator. Larvae were selected for bio assay. Control group (mosquito larvae were exposed to 60ppm methanol, experimental group treated with *cestrum nocturnum*. Mosquito Larvae were trapped by using Siphon. Treatment was conducted in triplicates. No. of dead larvae were counted after 24 and 48 hours and % mortality was computed. To calculate dead mosquito larvae arithmetic mean was used. Probit analysis was done to calculate LC<sub>50</sub>-LC<sub>90</sub> to determine lethal concentration. Due to the presence of high concentration of saponins, flavonoids, steroids, tannins, terpenoids it is considered to have high larvicidal action.

#### **ANTI HIV-1 Activity<sup>(22)</sup>**

Aerial parts of this plant were reported to have anti HIV-1 activity. Various extracts were prepared such as methanolic (80%), ethyl acetate, butanol, aqueous. These extracts were tested for their syncytia (multi nucleate cell resulting from multiple cell fusions of uninuclear cells) formation. Therapeutic index is greater than 10 and less than 100 when compared to standard. Phyto chemical analysis

of *Cestrum nocturnum* shown the presence of saponins, triterpenes, sterols and coumarins which are might be the reason for weak anti HIV-I activity

#### CONCLUSION:

The *Cestrum nocturnum* is well adapted as ornamental plant for its flower fragrance and therapeutic use. It is well known for its anti-bacterial, anti-inflammatory, anti-diabetic and anti-ulcer, anti tumour, anti oxidant activity and anti HIV-1 activity. The various active principles, responsible for such fragrance and therapeutic activities due to presence of polyphenols, saponins, sterols, tannins, triterpenoids and flavonoids in *Cestrum nocturnum*. However, further studies are required to identify the phytochemicals constituents present in fruit. Plant has got wide range of pharmacological actions, which may be therapeutically beneficial for overall health & wellness of population, and the need of the hour to further research in clinical aspect.

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