

# Neolamarckia Cadamba: A Comprehensive Pharmacological



Rubi Verma<sup>1\*</sup>, Fatma Chaudhary<sup>1</sup> and Amit Singh<sup>1</sup>

<sup>1</sup>M. Pharm Research Scholar, Monad University, India

Submission: October 04, 2018; Published: November 01, 2018

\*Corresponding author: Rubi Verma, M. Pharm Research Scholar, School of Pharmacy, Monad University N.H - 24 Delhi Hapur Road, Village Kastla - Kasmabad P.O. Pilkhuwa 245304, Distt- Hapur, Uttar Pradesh, India

## Abstract

*Neolamarckia cadamba* is one of such Ayurvedic remedy that has been mentioned in many Indian medicinal kinds of literatures. This review discusses about the medicinal values of *Neolamarckia cadamba*. Herbalism is use of plants for medicinal purposes. Herbalism, also known as phytotherapy is the use of plants to treat common ailments promotes wellness. It is the oldest form of medicinal healing known to man. We reviewed the Pharmacognostical & physicochemical study of *Neolamarckia cadamba* and its application in the treatment of various ailments like diabetes mellitus, diarrhoea, fever, inflammation, cough, vomiting, wounds, ulcers and antimicrobial activity. Thus, the review will give an onset for the researchers to explore the plants for its medicinal value.

**Keywords:** *Neolamarckia cadamba*; Pharmacological action; Traditional Uses Medicinal Parts

## Introduction

*Neolamarckia cadamba* Syn. *A. indicus*, *A. rich*, *Achiness* (Lam.) Rich. Ex. Walp, *Anthocephalus cadamba* (Family-Rubiaceae) commonly called *Cadamba* enjoys a hallowed position in Ayurveda- an Indian indigenous system of medicine. It is also named as *Kadam*. The tree is a medium to large sized deciduous tree attaining a height of 20-30 m and a girth of about 2-3 m with cylindrical branches and rounded crown. It is frequently found all the India on the slopes of evergreen forests up to 500 m. It is found in sub-Himalayan tract from Nepal eastwards on lower hills of Darjeeling in West Bengal where it is common; in Chota Nagpur (Bihar) and Andhra Pradesh, in the Andaman's, it is very common in damp places along large streams in Kerala on the west coast, and western ghats at low level in wet places. It is also distributed in Thailand and east-ward in Malaysian archipelago to Papua New Guinea [1].

The bark of the plant is reported to possess tonic, pungent, sweet, astringent, febrifugal, anti-inflammatory, digestive, carminative, diuretic, expectorant and antiemetic properties and is given to treat the fever and inflammation. The flowers are used as vegetable. The leaves are slightly aromatic with unpleasant but the decoction of leaves good for ulcers, wounds, and metorrhoea. It is useful in the treatment of snake-bite. It is often use in the form of powder (*kvatha churna*) which is an herbal formulation [2].

## Plant Details

**Scientific Name:** *Neolamarckia cadamba* Family (Rubiaceae)

India	: Kadambah and Priyaka Wild Cinchona
Malayalam	: Attutekka, Katampu
Indonesia	: Jabon
Malaysia	: Kalempayan
Cambodia	: Thkoow
Common Name	: Kadamb, Kadam

## General Botanical Description

- Habitat: India, East-ward in Malaysian archipelago to Papua New Guinea
- Parts used: Barks, Fruits, Leaves, seeds, Flowers and root.
- Bark: Dark brown, adjective with longitudinal fissures peeling off in thin scales.
- Leaves: Coriaceous, entire margin, elliptical-oblong, pulvinus base, with acute or shortly acuminate.
- Flowers: flowers are small, Orange colored with globose heads.

- f) Fruits: fruits are fleshy, orange, globose Pseudocarpanid yellow.
- g) Seeds: small and muriculate [3].

### Distribution and Habitat

*Neolamarckia Cadamba* is an early succession species which grows best on deep, moist, alluvial sites, often in secondary forests along riverbanks and in the transitional zone between swampy, permanently flooded and periodically flooded areas. Native range of *Cadamba* is Australia, China, India, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore, Vietnam and Maharashtra [4].

### Medicinal Uses of Neolamarckia Cadamba

#### Leaves

- a) The paste of the leaves of *cadamba* are tied over the wound or area affected with localized pain and swelling to reduce the complaints [5].
- b) *Cadamba* tree leaves are used for curing diabetes.
- c) An extract of the leaves used in mouth gargle.

#### Bark

- a) Bark is used to relieve fever [2].
- b) Bark of tree is used for blood related diseases [6].
- c) Bark is used for gargling to treat mouth ulcers and inflammation of the gums [2].

#### Root

- a) Root is used for urinary tract infection and renal calculi and glycosuria.
- b) Root is used in fevers, colic, muscular pains [3].

#### Flowers

- a) The paste of the flowers of *cadamba* is applied over black spots and pimples.
- b) Flowers are used in perfumes [7].

#### Aerial Parts

- a) The aerial parts are also used in treat diarrhoea and irritable bowel syndrome [8].

### Pharmacological Activity

#### Antidiabetic activity

Bussa et al. (2010) reported that an experiment in the Antidiabetic property of *N. cadamba* leaves extract of drug are effective in the treatment of diabetes and it is thought to be due to the presence of flavonoids, which stimulate the insulin secretion or possess an insulin-like effect. The alcoholic and aqueous extract of the roots of *N. cadamba* anti-diabetic activity in dose 400 mg/kg body weight and was tested against the normoglycaemic and alloxan induced hyperglycaemic rats [9,10].

Verma et al. (2005) investigated that the bark ethanol extract was the most active extract by the IC50 value of 5.86 µg ml<sup>-1</sup> [11-13]. Phytochemical analysis on bark ethanol extracts showed that they contained flavonoids; quinine, triterpenoid, saponins and tannin which were assumed have high contribution in antidiabetic activities. The result of ethanol extract bark showed that the ethyl acetate was the most active. GCMS analysis indicated the presence of dominant phenolic compounds such as pyrocatechol, antiroll, isopropyl myristate and phenol in which were suspected have antidiabetic activity [14-17].

Modilal et al. (2001) conducted on plant extract or phytochemical have involved in decreasing or increasing or stimulating different mechanisms in reducing diabetes and they have been listed in tabular form. This review, few molecules are used in diabetes management and they mechanisms or involved in signal transduction to initiate the insulin production or utilization of blood glucose level bring down to normal stage. The researchers have used different parts of the plant extracts or individual phytochemical for antidiabetic activities [18-20].

Acharyya [21] reported on hypoglycaemic activity in normoglycaemic and alloxan induced hyperglycaemic rats at dose levels of 100, 200 and 400 mg/kg, p.o. respectively. The extract was further oral glucose tolerance test in normal rats. The hypoglycaemic activity of the root was compared with reference glibenclamide (2.5 mg/kg, p.o.). The study of the roots extract caused reduction in the blood glucose level in both normoglycaemic and alloxan induced diabetic rats at the tested dose levels in a dose dependant manner. In the glucose-loaded animals, the extract also reduced the elevated blood glucose.

#### Analgesic, Antipyretic and Anti-Inflammatory Activities

Chandrasekhar [22] investigated that the defatted aqueous extract of the leaves of *N. cadamba* showed analgesic and anti-inflammatory activity at varying doses (50, 100, 300 and 500 mg/kg). The metabolic extract of the bark of *N. cadamba* was successfully for analgesic, antipyretic and anti-inflammatory activities. Dhara et al. (2000) examined analgesic and anti-inflammatory activity of methanolic extract of its bark in rodents. Analgesic effect was studied in acetic acid induced writhing and hot plate analgesic model of pain while anti-inflammatory activity was investigated using carrageenan induced paw oedema (acute) and grass pith granuloma (sub-acute) models of inflammation. The methanolic extract of bark of *Neolamarckia cadamba* was administered orally in the doses of 100, 200, 400 and 800 mg/kg/day of body weight these investigations provide the rational for the claim of *Neolamarckia cadamba* as analgesic and anti-inflammatory agent [23].

#### Antidiarrhoeal Activity

Mondal [6] reported the dry hydroethanolic extract (200-500mg/kg) of the flowering tops of *N. cadamba* exhibited a dose-dependent decrease in the frequency of faecal dropping in castor oil induced diarrhoea in mice. The extract produced

a dose-dependent reduction in intestinal fluids accumulation. Mujumdar [24] studies on Antidiarrhoeal property of the hydroethanolic extract of the flowering tops of *Anthocephalus cadamba* was assessed on experimental animals. The dry hydroethanolic extract (250-500 mg/kg body mass, p.o.) a dose-dependent decrease in the total no. of faecal droppings in mice. The extract produced a significant and dose-dependent reduction in intestinal fluids accumulation and in the gastrointestinal transit from 64.59 % and 71.19% at doses of 250 and 500 mg/kg. The reduction rates were 37.83% and 73.97%, respectively, with the control and standard drug group.

### Diuretic and Laxative Activity

Kumar [3] reported on the diuretic and laxative activity and it was found that the methanol extract (300 mg/kg) of the bark of *N. cadamba* significantly showed in increases the urinary output as compared with aqueous, chloroform and petroleum ether extract, whereas the chloroform extract (300 mg/kg) produced significant laxative property.

Mondal [6] reported the diuretic and laxative activity of various extracts of the barks of *Neolamarckia cadamba* (Roxb.) Bosser studied in Wistar albino rats. Furosemide (9 mg/kg, p.o.) and agar-agar (300 mg/kg, p.o.) were used as reference standards for activity comparison. The methanol extract significantly increased the urinary output as well as urinary electrolyte concentration at the tested dosage regimen that is comparable with the reference standard except in increasing the urinary output. The chloroform extract produced significant laxative activity.

Kumar [6] reported that the extracts of the barks of *Neolamarckia cadamba* were studied for its diuretic and laxative activity and it was found that the methanol extract (300 mg/kg) of the bark of *Neolamarckia cadamba* significantly showed in increases the urinary output (i.e., diuresis) as compared with aqueous, chloroform and petroleum ether extract, whereas the chloroform extract (300 mg/kg) produced significant laxative property.

### Antihepatotoxic Effects

Sahu [25] investigated that the hepatoprotective activity is due to the presence of chlorogenic acid (CGA) isolated from *N. cadamba*. It was found the intraperitoneal administrated of CGA to mice at a dose of 100 mg/kg for 7 days exhibited a better liver protective action than silymarin in CCl<sub>4</sub> administered mice. The antioxidative activity of CGA is responsible for hepatoprotective nature [26]. Reported on the effect of *Anthocephalus indicus* ethanol induced (3ml/kg body wt.) liver damage in rats. Treatment with powdered flowers of *Anthocephalus indicus* (500mg/kg) was found to protect the rat from hepatotoxic action of ethanol as evidenced by significant decrease in serum levels of AST, ALP, GPT and total bilirubinas well as significant increase in hepatic superoxide dismutase and catalase activities and significant reduction in lipid peroxides. Hepatic enzymes levels

as well as anti-oxidant enzyme levels were recovered partially on treatment with *A. indicus*. Keywords: *Anthocephalus indicus*, Ethanol, Hepatoprotective activity and Antioxidant activity [27-29].

### Hypolipidemic Activity

Umachigi studies on the carried out by the workers showed the marked decrease in the lipid level in alloxan (150 mg/kg body wt.) induced diabetic rats. Oral administration of root extract (500 mg/kg body wt.) of *Anthocephalus indicus* for 30 days in dyslipidemic animals resulted in significant decrease in total cholesterol, phospholipids, triglycerides and lipid peroxides [30].

### Antioxidant Activity

Bhardwaj et al. [5] reported that the extract of *N. cadamba* *Syn. A. indicus* possesses potent antioxidant activity by inhibiting lipid peroxidation and increase in the superoxide dismutase (SOD) and catalase activity [30]. Examined that the antioxidant potential of different extract/fractions of *Anthocephalus cadamba* the extract/fractions were screened for antioxidant activity using various in vitro assays superoxide anion radical scavenging assay and reducing power assay.

### Antiproliferative and Antioxidant

Silkar [31,32] studies on the *Anthocephalus cadamba* (Roxb.). The Bark methanol extract to evaluate Antiproliferative and antioxidant studies with presence of total phenolic contents. The high amount of phenolic contents showed phytochemical potency of *Neolamarckia cadamba*.

### Antimicrobial and Wound Healing Activity

Bhardwaj et al. [5] reported the antimicrobial activities and potent antibacterial and antifungal activity. The experimental evidence also shows that *N. cadamba* extract has potent wound healing capacity. Niranjan et al. [25] reported that the plant has been reported to possess potent antibacterial and antifungal activity against *Escherichia coli*, *Micrococcus luteus*, *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Klebsiella pneumonia*, *Proteus mirabilis*, *Candida albicans*, *Trichophyton rubrum*, *Aspergillus niger*, *Aspergillus flavus* and *Aspergillus indulines*. The experimental evidence also shows that *A. cadamba* extract has potent wound healing capacity [33,34].

### Anthelmintic Activity

George et al. [8] examined that the Aqueous and ethanolic extracts of mature bark of *Neolamarckia cadamba* has been reported for its Anthelmintic activity against earthworms, tapeworms, and roundworms. Mali RG et al. (2004) reported the cytotoxic, thrombolytic and anthelmintic activity of methanolic extract of the stem of *Neolamarckia cadamba* (Roxb.) The study adopted cytotoxic activity using brine shrimp lethality, thrombolytic activity using red blood cell of human and anthelmintic activity by using aquarium worm Tubificoides [35,36].

### Antifungal activity

Patel et al. [37] investigated that the antifungal property of the *Cadamba*. The extract of the bark and leaf of the *Cadamba* showed antifungal activity against *Aspergillus fumigatus* and *Candida albicans*. They have also found that the *Cadamba* leaf extract shows higher antifungal activity than the bark extract. *Cadamba* produces a strong antifungal action [38]. Reported the alcoholic and aqueous extracts of fruits of this plant showed significant antifungal activity against the organisms: *Trichophyton rubrum*, *Candida albicans*, *Microsporum*, *Aspergillus Niger*, with zone of inhibition of the maximum 15.0 mm and 12.0 mm against *Trichophyton rubrum* for ethanolic and hot water extracts, respectively. The MIC determined, was as low as 2.10 mg/ml and 2.5 mg/ml for ethanolic extracts of ripened fruit of *A. cadamba* against *Trichophyton rubrum* and *Aspergillus Niger*, respectively.

### Antiparasitic Activity

Pollard et al. [39] studied on the *Cadamba* produces an anthelmintic activity. The herb is effective in several parasitic infections including roundworm, tapeworm, pinworm, and threadworm. The parasitic infections occur due to the unhygienic habits and consumption.

### Antifilarial and Antimalarial Activities

Patel et al. [37] investigated that the mosquito-borne diseases like malaria, dengue, chikungunya, filariasis, and Japanese encephalitis cause thousands of deaths per year in India as well as in other developing countries. Therefore, mosquito control is a serious concern and necessary to enhance the health and quality of life of the country's residents and visitors. The management of vector-borne diseases has failed due to their increased resistance and revitalization against synthetic chemicals. Addition of gold nanoparticles to the extract has proved to be more lethal, leading to 100% mortality at the larval stage at a very low concentration with LC50 at 0.61 ppm. There is another study, which found that the dimethyl Sulfoxide extract of the *Cadamba* shows antimalarial activity.

Kumar et al. [24] *Anthocephalus cadamba* is ethno medically widely used in the form of paste by tribe in Western Ghats for treating skin diseases. The antibacterial properties of *Neolamarckia cadamba* against a wide range of pathogens were studied. The alcoholic extracts of fruits of this plant showed significant antibacterial activity against almost all the organisms: *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, with zone of inhibition of the maximum 24.0 cm and 22.0 cm against *E. coli*, *P. aeruginosa* respectively. The minimum MIC determined was as low as 1.00 mg/ml for methanolic extracts of green fruit of *A. cadamba* against *P. aeruginosa* and *S. aureus*, respectively.

### Antivenom activity

Mali et al. studied on the Snakebite is one of the major causes of the high mortality rate in India and other developing countries.

Various antivenom immunotherapies have been developed for specific treatment against snake venom envenomation. There are various side effects of such therapies, viz., anaphylactic shock, pyrogen reaction, and serum sickness. Most of these symptoms may be due to the action of higher concentrations of non-immunoglobulin proteins present in commercially available hyperimmune antivenom [40].

### Anticancer activity

Chandra et al. [41,42] reported that the *Cadamba* produces a significant antitumor activity. It used in several forms of cancer including colon cancer, breast cancer, and esophageal cancer. Cancer is a term used for a disease in which abnormal cells tend to proliferate in an uncontrolled way and in some cases metastasize. Extensive research has been done to find therapeutic treatments for cancer. Dwevedi et al. (2015) studies on the Cancer is a term used for a disease in which abnormal cells tend to proliferate in an uncontrolled way and in some cases metastasize. Extensive research has been done to find therapeutic treatments for cancer. The plant-based products have been examined as anticancer agents. The screening of various medicinal plants has found bioactive compounds which are effective chemo preventive as well as chemotherapeutic agents.

### Pharmacognostical & Physicochemical Study

[42] Investigated that the Pharmacognostical evaluation & physicochemical on the leaves of *Neolamarckia cadamba* They found that presence of single layer of epidermis & paliade cells, lamina is uniformly flat, collateral vascular bundles & cross celled stomata & physicochemical studies like ash value, loss on drying and extration value were established Pharmacognostical properties which help in identification, purity & the classification of the plant [43,44].

### Conclusion

The research in medicinal plants has gained a renewed focus recently. The main reason is that the system of medicine associated with number of side effects that often cause to serious problems. Though traditionally *Neolamarckia cadamba* has various medicinal activities like antioxidant, antidiabetic, hepatoprotective, Antidiarrhoeal, diuretic etc, but it is time to explore its medicinal values at molecular level with the help of various biotechnological techniques. Pharmacognostical & physicochemical studies have been reported. The work could also be done in this direction to ensure free utility of the plant and it has been proved by different animal models soon too.

### References

1. Prajapati, Purohit, kumar A (2007) handbook of medicinal plants. A complete source book, Agrobios (India) Publisher, Jodhpur, India. P. 52-53.
2. Kirticikar KR, Basu BD. Indian medicinal plants. (2<sup>nd</sup> edn). Lalit Mohan basu publishers, Allahabad, India. 1999: 1250- 1252.
3. Patel D, Kumar V (2008) Pharmacognostical studies of *Neolamarckia*

- cadamba (roxb.) Bosser leaf. *International Journal of Green Pharmacy* 2(1): 26-27.
4. Kokate Ck, Purohit AP, Gokhale SB (2004) A text book of Pharmacognosy. 4(1-2): 94-100.
  5. Bhardwaj SK, Laura JS (2008) Antibacterial properties of some plants-extracts against plant pathogenic bacteria *Rathyibacter tritici*. *Int J Biosci Biotechnol Res Asia* 4(2): 693-698.
  6. Mondal Sumanta, Kumar Gouri, Acharya Suman (2009) Analgesic, Anti- Inflammatory and Antipyretic Studies of *Neolamarckia Cadamba* Barks. *Journal of Pharmacy Research* 2(6): 1133-1136.
  7. Alam MA, Akter R, Subhan N, Rahman MM, Nahar L, et al. (2008) Antidiarrhoeal property of the hydroethanolic extract of the flowering tops of *Anthocephalus Cadamba*. *Rev Bras Farmacogn* 18(2): 155-159.
  8. George M Mores (1990) *The Kadamba Kula, A History of Ancient and Medieval Karnataka*, Asian Educational Services, Delhi, India. P. 10.
  9. Ansari SH (2005) "Essential of Pharmacognosy". Birla Publication 1: 591-592.
  10. Ghosh T, Maity TK, Bos A, Dash GK (2005) Anthelmintic activity of *Bacopa monierri*. *Indian J Nat Prod* 21(2): 16-19.
  11. Naithani HB, Sahni KC (1997) *Forest of Goa*, International Books distributors. Deharadun, India. pp. 318.
  12. *The wealth of India* (2006) A dictionary of Indian raw materials NISCAIRN press publisher, New Delhi, India. pp. 305-308.
  13. Antunes LM, Bianchi ML (2009) Bixin and Lycopene Modulation of Free Radical Generation Induced by Cisplatin-DNA Interaction. *Food Chem* 113(4): 1113-1118.
  14. Dogra SC (1987) Antimicrobial agents used in ancient India. *Indian J Hist Sci* 22: 164-169.
  15. Mishra RP, Siddique L (2011) Antibacterial properties of *Anthocephalus cadamba* fruits. *Asian J Plant Sci Res* 1(2): 1-7.
  16. Pal DC, Jain SK (2000) *Tribal Medicine*. Naya Prakash, New Delhi, India. 52: 246-247.
  17. Kapil A, Koul I, Suri OP (1995) Antihepatotoxic effects of chlorogenic acid from *Anthocephalus cadamba*. *Phytotherapy Research* 9(3): 189-193.
  18. *The Wealth of India* (1985) Vol- I. CSIR, New Delhi, India. 1: 305-308.
  19. Kiritkar KR, Basu BD (1933) *Indian Medicinal Plants*. (2<sup>nd</sup> edn). Vol-I. Lalit Mohan Basu, Allahabad, India. 1: 1251-1252.
  20. Majumdar A (2002) *Home Remedies in Ayurveda*. (1<sup>st</sup> edn). Amar granth publication, Delhi, India. pp. 296-297.
  21. Acharyya S, Rathore DS, Kumar HK (2010) Screening of *Anthocephalus cadamba* (roxb.) Miq. Root for antimicrobial and anthelmintic activities. *Int J Res Pharm Biomed Sci* 2: 297-300.
  22. Bhandary MJ, Chandrashekar KR (1995) Medical ethnobotany of the siddis of Uttara Kannada district, Karnataka, India. *J Ethnopharmacol* 47(3): 149-158.
  23. Ahmad I, Mehmood Z, Mohammad F (1998) Screening of Some Indian Medicinal Plants for their Antipyretic Properties. *J Ethnopharmacol* 62(2): 183-193.
  24. Kumar AN, Jeyalalitha T, Murugan K, Madhiyazhagan P (2013) Bioefficacy of plant-mediated gold nanoparticles and *Anthocephalus cadamba* on filarial vector, *Culex quinquefasciatus* (Insecta: Diptera: Culicidae). *Parasitol Res* 112(3): 1053-1063.
  25. Niranjana P, Saha, Koike, Zhonghua, Banerjee, et al. (2000) Triterpene on glycosides from the bark of *Anthocephalus cadamba*. *J. Chem. Res.* 1(1): 22-24.
  26. Lakhmale SP, Acharya R, Yewatkar N (2012) Etanomedicinal claims on antivenom activity of certain fruit and seed drugs-a review. *J Ayur Alli Sci* 1(1): 21-29.
  27. Banerji N (1977) New saponins from stem bark of *Anthocephalus cadamba* MIQ. *Indian J Chem B* 15: 654-655.
  28. Halliwell B, Gutteridge JM. The antioxidants of human extracellular fluids. *Arch Biochem Biophys* 280(1): 1-8.
  29. Umachigi SP, Kumar GS, Jayaveera K, Kishore KD, Dhanpal R (2007) Antimicrobial, Wound Healing and Antioxidant Activities of *Anthocephalus Cadamba*. *Afr J Complement Altern Med* 4(4): 481-487.
  30. Gupta A, Anand M, Yadav S, Gautam J (2013) Phytochemical studies and antioxidant activity of different leaves extracts of *A. Cadamba*. *Int J Futur Sci Engg Technol* 1: 21-25.
  31. Sikar, Kakkar KK, Chakre J (1992) *Glossary of Indian Medicinal Plants with active Principles*, CSIR Publication, New Delhi. P. 75. Anonymous, *The Wealth of India*, CSRI Publication, Delhi. pp. 305.
  32. Sikar IV, Kakkar KK, Chakre J (1992) *Glossary of Indian Medicinal Plants with Active principles*. Part 1. CSIR, New Delhi. 117: 1965-1981.
  33. Sandhya T, Lathika KM, Pandey BN, Mishra KP (2006) Potential of Traditional Ayurvedic Formulation, *Triphala*, as a Novel Analgesic Drug. *Cancer Lett* 231(2): 206-214.
  34. Banerji N (1978) Structure of two new saponins from stem bark of *Anthocephalus cadamba* MIQ. *J Indian Chem Soc* 55:275-278.
  35. Dubey A, Nayak S, Goupale DC (2011) *Anthocephalus cadamba*: A Review. *Pharma cog J* 2(18): 71-76.
  36. Ganjewala D, Tomar N, Gupta AK (2013) Phytochemical Composition and Antioxidant Properties of Methanol Extracts of Leaves and Fruits of *Neolamarckia Cadamba* (Roxb.) *J Biol Act Prod Nature* 3(4): 232-240.
  37. Patel DA, Darji VC, Bariya AH, Sonpal RN (2012) Evaluation of antifungal activity of *Neolamarckia cadamba* (roxb.) Bosser leaf and bark extract. *Int Res J Pharm* 2(5): 192-193.
  38. Chandel M, Sharma U, Kumar N, Singh B (2012) Antioxidant Activity and Identification of Bioactive Compounds from Leaves of *Anthocephalus Cadamba* by Ultra-Performance Liquid Chromatography/Electrospray Ionization Quadrupole Time of Flight Mass Spectrometry. *Asian Pac J Trop Med* 5(12): 977-985.
  39. Pollard JF (1969) A note on the nursery treatment of two species of Sabah. *Malay. Forester* 32(3): 269-271.
  40. Shantha TR, Vasanthakumar KG, Gopakumar K (2008) Pharmacognostical Studies on the Leaf of *Neolamarckia Cadamba* Bosser, Rubiaceae. *J Econ Taxon Bot* 32(1): 128-148.
  41. Chandrashekar KS, Prasanna KS (2009) Antimicrobial activity of *Anthocephalus cadamba* Linn. *J Chem Pharm Res* 1(1): 268-270.
  42. Chandrashekar MJ, Kaveriappa KR (1995) Medical ethnobotany of the siddis of Uttara Kannada district, Karnataka, India. *J. Ethnopharmacol* 47(3): 149-158.
  43. Shaua NP, Koike K, Banerjee S, Mandal NB, Nikaido T (2000) Triterpene Glycoides from bark of *Anthocephalus Cadamba*. *J Chem Res* 200(1): 22-23.
  44. Bhakuni DS, Dhar ML, Dhar MM, Mehrotra BN (1969) Screening of Indian Plants for Biological activity II. *Indian J Exp Biol* 7(4): 250-262.



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DOI: [10.19080/GJPPS.2018.06.555691](https://doi.org/10.19080/GJPPS.2018.06.555691)

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