



Medicinal Properties of *Neolamarckia cadamba* (Bur flower Plant): A Review

Sanjive Kumar

A.S. (P.G.) College, Mawana, Meerut

Abstract

There are a number of plants that have therapeutic use. Indian and Asian sub-continent is the home of such flora. Bur flower plant is commonly known as Cadamba in hindi and Sanskrit. It is one of the main medicinal plants used in ayurveda for treatment of various diseases. There are several studies which proved that different parts of Cadamba have different medicinal properties that includes Antioxidant activity, Anti-cancer activity, Anti-fungal activity, Anti-bacterial activity, Anti-diabetic activity, Anti-inflammatory & Analgesic activity, Hypolipidemic activity, Anti-pyretic activity, Diuretic & laxative activity and Hepatoprotective activity.

Keywords- Cadamba, Therapeutic, Ayurveda

Introduction

There are a number of plants that have therapeutic use. Indian and Asian sub-continent is the home of such flora. India is among the largest producer of herbal medicine in world, this is due the large number of medicinal plants are grown in India. Ayurveda is a branch of medicine that is practiced in Indian subcontinent for last thousands of years. This branch uses different parts like leaves, flower, bark, roots, fruits, seed and other parts of medicinal plants to cure different diseases like diabetes, high blood pressure, cardio-vascular disease, cancer, liver disease, gastro-intestine disease and many more alignment[1], [2].

Bur flower plant is commonly known as Cadamba in hindi and Sanskrit. It is one of the main medicinal plants used in ayurveda for treatment of various diseases. It is also known as Haripriya and considered as favorite tree of lord Krishna in Hindu mythology. It is also considered as holy tree by kadamba dynasty of south india. Karnataka government also celebrate a festival of kadamba tree (kadambotsava) every year in honor of kadamba dynasty[3]. It is known by several names in different languages, some of them are discussed in the table given below-

Common Names of bur- flower plant in different languages

S. No.	Language	Name
1.	Hindi	Kadamba
2.	English	Bur flower
3.	Assamese	Roghu
4.	Kannada	Kaduavalatige
5.	Malayalam	Kadambu
6.	Telugu	Rudraskadamba
7.	Tamil	Vellaikkatampu
8.	Bengali	kodom
9.	Sanskrit	Kadamba

Bur flower plant belongs to family Rubiaceae. It is found in all over India especially in evergreen forest of Himalaya region and south India. It is also well distributed in Bangladesh, Nepal, Sri Lanka, Myanmar, Philippines, Indonesia, Malaysia and other neighboring countries[4].

Classification

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Gentianales
Family	Rubiaceae
Genus	Neolamarckia
Species	<i>Neolamarckia cadamba</i>

It is a medium to long sized plant of height from 40 to 100 feet and girth of about 6 to 8 feet with cylindrical branches and rounded crown top[5]. It is a deciduous plant having green and clean branches. The leaves are green and glossy oval shaped having pinnate venation. The fruits are grown in rainy season having orange to yellow color. Its fruits are a very good source of vitamin-C. Almost all parts of bur flower tree including leaves, fruit, bark, stem, roots are used as traditional medicine to treat different ailments.

Methodology

In this study first the chemical constituents present in Cadamba was recognized by organized search. Then the medicinal properties of these constituents were recognized. In the next step the literature related to these medicinal properties are collected with the help of organized search. The searches were performed using various data base including PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>), Scopus (<http://www.scopus.com>), Scirus (<http://www.scirus.com>), Science Direct (<http://www.sciencedirect.com>) and Google Scholar (<http://www.scholar.google.com>).

Medicinal properties of Different part of Cadamba

Antioxidant property

There are several studies which show antioxidant properties of different parts of Bur flower plant. A study carried out by Ganjewala et.al. 2013 proved that the methanol extract of cadamba fruit and leaves have very high free radical scavenging property, however leaves extract shows better antioxidant property[6].

Another study carried out by Chandel et. al. 2012 to study the antioxidant property of leaves extracts. This study shows that total phenolic content is 148 mg/g, 194 mg/g, 182 mg/g and 107 mg/g in ethanol, ethyl acetate, butanol and water fractions respectively[7]. This study also proved that ethyl acetate extract have highest free radical scavenging activity[7].

A work was carried out by Alam et. al. 2008 to study the antioxidant and membrane stabilizing property of flowering tops of cadamba. This study used 70 % aqueous ethanol extract of flowering tops of cadamba to study the free radical scavenging power. This study showed that this extract has remarkable antioxidant property of scavenging DPPH, peroxide and nitric oxide free radicals[8].

Anti-Cancer Property

There are lots of studies that show the anti-cancer activity of different parts of bur-flower plants. A study carried out by Razali et. al. 2021 to study the effect of ethanol extract of cadamba leaves against breast cancer. The results showed that ethanol extract inhibits cellular growth in MCF-7 cells by inducing apoptosis and cell cycle arrest[9].

Another study carried out by Mishra et. al. 2018 to study the anti-cancer activity of fruit extract on human lung cancer. In this study seven alkaloids and terpenoids were extracted from fruit. Among them two compounds are found active against human lung cancer[10].

A study was carried out by Kumar et.al. 2015 to study the anti-cancer activity of cadamba bark. In this study three compounds are isolated from cadamba bark the triterpenoid saponins 3-*O*-[α -L-rhamnopyranosyl]-quinovic acid (1) and 3-*O*-[α -L-rhamnopyranosyl]-quinovic acid 28-*O*-[β -D-glucopyranosyl] ester (2), and the alkaloid cadambine (3)[11]. Among them compound 3 is proved to be most potential inhibitor for human colorectal and compound 2 proved to be most potential inhibitor for hepatocellular carcinoma[11].

Anti-fungal Activity

A study was carried out by Mishra et.al. 2011 to study the antifungal activity of fruit extract of cadamba. In this study antifungal activity of alcoholic and aqueous extract of ripen and un-ripen fruit of cadamba were studied against several species. The study prove that ethanol and methanol extract of ripened fruit have highest activity against *Trichophyton rubrum* and *Aspergillus niger* respectively[12].

Another study was carried out by Nalla et.al. 2022 to study the ethanol extract of cadamba leaves. This study showed that leaves extract of cadamba has several types of chemical compounds like steroids, flavonoids, tannins and glycosides. It also shows that ethanol leaf extract have anti-fungal activity at dose 100mg/ml [13].

Anti-bacterial Activity

The different parts of Bur-flower plant show various anti-bacterial activity, which is proved by several studies[12], [14], [15]. A study carried out by Pandey et.al. 2018 to study the antioxidant and anti-bacterial activity cadamba fruit extract. This study showed that immature fruit extract shows highest anti-bacterial activity and it is due to membrane permeation, and by inhibition of sugar and amino acid uptake[15].

Another study was carried out by Khandelwal et.al.2016 to study the antioxidant and anti-microbial efficacy of aqueous leaf extract of cadamba. In this study leaf extract of cadamba was tested against several gram positive and gram negative bacteria as well as against fungal strain. The results showed significant antibacterial and antifungal activity against *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Aspergillus niger*[14].

A study carried out by Mishra et.al.2011 to study the antibacterial activity of aqueous and alcoholic extract of ripened and unripen fruit. This study showed the significant antibacterial activity of alcoholic and aqueous extracts of fruits (ripened and un-ripened) of cadamba against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*[12].

Anti-diabetic

Anti-diabetic activity of different parts of cadamba is proved by several studies. Among them a study was carried out by Munira et.al. 2020 to study the anti-diabetic activity of cadamba flower extract on alloxan induced diabetic rat. This study showed that flower extract contain flavonoids and phenolic compounds which are responsible for the reduction of glucose level in alloxan induced diabetic rat[16].

Another study was carried out by Bussa et.al.2010 to study the anti-diabetic activity of bark extract on alloxan induced diabetic rat. The different dose of ethanolic extract of bark was evaluated to check the hypoglycemic activity in normal and alloxan induced rats. This study showed that 0.5g/Kg dose administer orally have significant anti-hyperglycemic activity in alloxan induced diabetic rat[17].

Another study was carried out by Ahmed et.al.2011 to study anti-diabetic activity of cadamba leaf extract on glucose induced hyperglycemic mice. In this study different dose of methanol extract was administer 1 hour before the glucose administration. The study shows that maximum hyperglycemic activity was shown at 400mg/kg body weight[18].

Anti-inflammatory & Analgesic activity

There are several studies which prove the Anti-inflammatory & Analgesic properties of different parts of cadamba plant. A study carried out by Pant et.al.2012 to study in-vitro anti-inflammatory activity of cadamba leaf extract. In this study different leaf extract were investigate for anti-inflammatory activity by Human red blood cell stabilization (HRBC) method. The results showed that methanol extract have significant membrane stabilizing action on human red blood cell, which proved anti-inflammatory activity of leaf extract[19].

Another study carried out by Yuan et.al.2020 to study Anti-inflammatory and analgesic activities of *Neolamarckia cadamba* and its bioactive mono-terpenoid, indole and alkaloids. In this study methanol, ethyl acetate and aqueous extract of *N. cadamba* were investigate for Anti-inflammatory and analgesic activities[20]. The above study showed that 3 β -dihydrocadambine is the main constituent and responsible for Anti-inflammatory and analgesic activities[20].

Another study was carried out by Chandrashekar et.al.2010 to study the Anti-Inflammatory Effect of the Methanol Extract from *Anthocephalus cadamba* Stem Bark in Animal Models. The results suggested that MEAC possess potent anti-inflammatory activity. The acute inflammatory model showed that all the doses of MEAC effectively suppressed the edema produced by histamine, so it may be suggested that its anti-inflammatory activity is possibly backed by its antihistaminic activity[21].

Hypolipidemic activity

A study carried out by Kumar et.al.2008 to study the hypolipidemic activity of cadamba fruit extract. The above study proved that fruit extract of dose 500mg/Kg by weight can cause significant lowering of plasma levels of total cholesterol, phospholipids, and triglyceride following reactivation of the post-heparin lipolytic activity[22].

Another study carried out by Kumar et.al.2010 to study lipid lowering activity of cadamba roots in hyperlipidemic rat. This study showed that the root extract (50–500 μ M) inhibited the generation of superoxide anions and hydroxyl radicals, in both enzymic and non-enzymic systems, *in vitro*. The results of the present study demonstrated both lipid lowering and antioxidant activities in root[23].

Antipyretic activity

Several studies proved the antipyretic property of cadamba plant. A study carried out by Usman et.al.2012 to evaluate the antipyretic activity of cadamba leaf extract. This study was carried out in wister strain weighing

150 to 200gm. In this study results indicate that chloroform, ethanol and aqueous extracts have significant antipyretic action within 30 minutes[24].

Another study was carried out by Pandey et.al.2016 to study the phytochemistry and pharmacology of *N. Cadamba*. The above study proved that various parts of *N. cadamba* are used in the treatment of various ailments such as fever, uterine complaints, blood diseases, skin diseases, tumour, anaemia, eye inflammation and diarrhoea. Other reported uses of *N. cadamba* include antihepatotoxic, antimalarial, analgesic, anti-inflammatory, antipyretic, diuretic and laxative[25].

Diuretic and laxative Property

A study carried out by Pandey et.al.2016 to study the phytochemistry and pharmacology of *N. Cadamba*. The above study proved that various parts of *N. cadamba* are used in the treatment of various ailments including diuretic and laxative property[25].

Another study carried out by mondal et.al.2009 to study the diuretic and laxative property of *N. cadamba* bark extract. In this study diuretic and laxative effect of various extract were evaluate on Wister albino rat. The results showed that methanol extract increase the urine output and have diuretic activity and chloroform extract produce significant laxative activity[26].

Hepatoprotective property

There are several studies which proved the hepatoprotective property of cadamba. A study carried out by Dolai et.al.2015 to study the effect of cadamba stem bark extract on carbon tetrachloride induced hepatotoxicity in rats. The results showed that cadamba stem bark extract increase the level of catalase, superoxide dismutase and reduced glutathione and reduced the levels of malondialdehyde[27]. That indicates the anti-inflammatory and hepatoprotective property[27].

Another study was carried out by Das et.al.2022 to evaluate the hepatoprotective potential of cadamba stem bark extract against chloroform and overdose of iron dextran induced hepatotoxicity in Swiss albino mice. The results showed that hydroalcoholic extract of stem bark of *N. cadamba* have capability to regulate the normal liver function and it is due the the free radical scavenging potential and iron chelating action[28].

S. No.	Medicinal Property	Parts have medicinal properties	References
1.	Antioxidant activity	Fruit, leaves, Flowering top	[6],[7],[8]
2.	Anti-cancer	Leaves, Fruit, Bark	[9],[10],[11]
3.	Anti-fungal	Fruit, leaves	[12],[13]
4.	Anti-bacterial	Fruit, leaves	[12],[14],[15]
5.	Anti-diabetic	Flower, bark, leaves	[16],[17],[18]
6.	Anti-inflammatory & Analgesic	Leaves, bark	[19],[20],[21]
7.	Hypolipidemic activity	Fruit, Root	[22],[23]
8.	Anti-pyretic activity	Leaves	[24], [25]
9.	Diuretic & laxative activity	Leaves, Bark	[25], [26]
10.	Hepatoprotective activity	Bark	[27], [28]

Conclusion

The above studies proved that different parts of Cadamba have different medicinal properties that includes Antioxidant activity, Anti-cancer activity, Anti-fungal activity, Anti-bacterial activity, Anti-diabetic activity, Anti-inflammatory & Analgesic activity, Hypolipidemic activity, Anti-pyretic activity, Diuretic & laxative activity and Hepatoprotective activity. These medicinal properties make cadamba a magical plant which can solve several medical problems, however there is a scope of further studies to identify the chemical compounds responsible for a particular medicinal property of Cadamba.

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