

A Compressive Review on Pharmacological Properties of Three Forest Trees

Atmaja Elina Mishra, Jibanjyoti Panda*

Plant Pathology and Microbiology Division, Regional Plant Resource Centre, Odisha, India

ABSTRACT

Good sources of medicinal agents are found for 100 years in the nature in the form of tree. These species are mostly found in forest and some belongs to RET group. A number of medicines (herbal product) have been isolated from this natural sources. In this documentation three number of important tree species have been reviewed for their pharmaceutical properties. (1) *Neolamarkia cadamba*, belonging to family Rubiaceae, (2) *Dalbergia sissoo* of family Fabaceae and (3) *Shorea robusta* commonly known as Sal tree grouped under family Dipterocarpaceae observed for their pharmacological action. Pharmacological activity such; antioxidant activity, anti-inflammatory, antipyretic, antiparasitic activity, antidiabetic activity, dermatological effects, antimicrobial effect, antihepatotoxic effects, antiulcer effect, antilipidemic, antidiarrheal effect, anthelmintic activity, analgesic activity and many more were documented.

Keywords: Medicinal agents; Forest; Natural source; Pharmacological properties

INTRODUCTION

Medicinal plants play a crucial role in the survival world. In recent ten decades, plants and plant products have been introduced as curing agent for number of disorders. This knowledge plant is known as Ayurveda science; has grown before at the middle age time frame. At this time, a little information on was available to the society [1]. World Health Organisation (WHO) have reported that, near about 80% of the population of developing countries depends upon traditional medicines, mostly herbal products as principal health care needs [2]. Now-a-days, the utilization of herbal medicines is taking pick ta the graph due to its safety, efficacy and pharmacological activity as contrast to synthetic pharmaceutical products [3]. In the present review, a attempt has been taken to prepare a compressive report on pharmaceutical properties of *Neolamarkia cadamba* (Roxb.) Bosser, *Dalbergia sissoo* Roxb., *Shorea robusta* Roth., *Terminalia bellerica*, *Terminalia chebula* commonly observed in forest regions. The plants are well known for their unique uses; tonic, impactful, diuretic, sweet, mitigating, stomach related, carminative, astringent, febrifugal, expectorant and antiemetic properties.

LITERATURE REVIEW

Plants plays main role in the pharmacological sector by producing a number of secondary metabolites. pharmacological activities such anti-diabetic, anthelmintic activity, antihepatotoxic effects,

antilipidemic, antioxidant, antimicrobial, anti-inflammatory and many more.

Pharmaceutical properties

Neolamarkia cadamba (Roxb.) Bosser

Anti-diabetics: Methanolic extract of *N. cadamba* was tested for antidiabetic activity and found to be highly efficient for decrease in the blood glucose level. The test was conducted in both normal and alloxan prompted diabetic Wistar rat skinned person rodents in a portion subordinate. Methanol indicating comparable decrease to the standard medication (glibenclamide) [4].

Antioxidants: *N. cadamba*, hydro ethanolic extract has been observed for reducing the degrees of thiobarbituric caustic receptive substances, a lipid peroxidation item, and expanded the movement of the cell reinforcement chemicals. It is recorded that; peroxidase and catalase make reductase in oxidative pressure in alloxan activate diabetic rat [5]. This type of antioxidant impacts may responsible for the oxidative balance of different crucial biomolecules (lipids, proteins) and different pathophysiological situation [6].

Antimicrobials: Different parts of *N. cadamba* found to be responsible for containing the compounds like; flavonoids, alkaloids and terpenes. *N. cadamba* found with resistance to microbial growth due to the presence of these compounds. Leaves of *N. cadamba* has been reported for antimicrobial activity an also

Correspondence to: Jibanjyoti Panda, Senior Research Fellow, Plant Pathology and Microbiology Division, Regional Plant Resource Centre, Odisha-751015, India, Tel: +91 7504140993; E-mail: jibanjyotip@yahoo.com

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been utilised to recover bleeding and wounds. It has been noticed for curing agent or used against the illnesses like roughness of throat, eye contamination and skin illnesses [7].

Anti-inflammatory activity: *N. cadamba* (methanolic) organic products found to be effective of human erythrocyte against hypotonic arrangement. Actuated lysis of human erythrocyte was maintained by the standard drug acetyl-salicylic acid (ASA) for membrane stabilizing activity. Methanolic extract has been reordered with a unique settling activity on human red platelet film [8,9].

Antilipidemics: Basically, root (*N. cadamba*) and natural product parts with different concentrate level of doges in hyperlipidemic grown-up male Charles Foster rodents. The concentrates also supposed to a lipid-bringing down impact as evaluated by inversion of plasma levels of complete cholesterol, phospholipids and fatty substance following reactivation of the post-heparin lipolytic movement. Root extracts were played a great role for complete cholesterol and fatty oils level, which was better as compare to natural product removes [10].

Antihepatotoxic effects: Hepatoprotective activity been recorded in this species, due to presence of chlorogenic corrosive (CGA) disconnected, normally observed in mice at a different ratio, which found with suitable liver defensive activity over silymarin (SM), in CCL₄ managed mice. This type of antioxidative action of CGA is liable for its hepatoprotective properties and CCL₄ is mostly used as a model of liver abuse [11].

Anthelmintic activity: *N. cadamba* has been reported its anthelmintic activity against night crawlers, tapeworms, and roundworms by the aqueous extracts of bark [12].

***Dalbergia sissoo* Roxb**

Anti-inflammatory and antipyretics: The phytochemical and pharmacological study reports say that ethanolic extracts were found in the barks (1000 mg/kg) of *Dalbergia sissoo* which showed anti-inflammatory activity as compared to others (300 mg/kg and 500 mg/kg) [13]. Methanolic extractions of leaves were significantly having anti-inflammatory and analgesic activities which were evaluated by using acetic acid induced writhing in rats [14]. *Dalbergia sissoo* seeds extract has peripheral analgesic and moderate antipyretic activity [15].

Antiparasitic activity: Plant extracts of *Dalbergia sissoo* were having anti-termite activity. So that they are used as an alternative for synthetic pesticides to eradicate termites form the buildings [16]. The leave extracts contained petroleum ether, carbon tetrachloride, benzene and ethanol. These extracts were possessed anthelmintic activity that are effective against Indian earthworms *Pheretima posthuma* and nematode *Ascardi galli*. The alcoholic leaf extracts of *Dalbergia sissoo* possessed acaricidal activity against resistant ticks [17-19].

Antidiabetic activity: The ethanolic extracts of leaves of *D. sissoo* were found to be anti-diabetic and are effective against BGL reduction (12%) in comparison to Glibenclamide in alloxan induced diabetic rats. From two types of doses (250 and 500 mg/kg), 500 mg/kg was more effective and caused significance reduction in blood glucose levels [20].

Dermatological effects: Ethyl acetate extraction from the bark of *Dalbergia sissoo* has been evaluated for its cytotoxicity and

melanogenic activity which was non-toxic and increased melanin content in comparison to hexane and ethanol extracts. Bark extracts of *Dalbergia sissoo* were stimulating B₁₆F₁₀ melanogenesis at very low concentrations which is used for the treatment of hypopigmentation diseases, such as vitiligo [21].

Osteogenic effects: A study report says that, Galbergiphenol (DGP), a flavonoid isolated from heartwood of *Dalbergia sissoo* is responsible for boneless in ovariectomized mice. Different types of compounds like genistein, biochanin A, pratensein and biochanin 7-O-glucoside were isolated from the leaves and these compounds showed increased alkaline phosphatase activity and mineralization. They were also responsible for osteogenic activity. *Dalbergia sissoo* extracts of leaves and pods possessed antiresorptive and bone-forming effects [22,23].

Antimicrobial effects: Methanolic extracts like okanin isolated from *Dalbergia sissoo* were showed antibacterial activity against various pathogens, Gram positive (*Micrococcus luteus* and *Staphylococcus aureus*) and Gram-negative bacteria (*Escherichia coli*, *R. planticola* and *Acinetobacter*) [24]. An herbal preparation was made from *Dalbergia sissoo* and *Datura stramoium* and was teste for its antibacterial activity against gram positive (*Staphylococcus aureus* and *Streptococcus pneumoniae*) which showed higher sensitivity and gram negative (*Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*) bacteria. Whole plant's extract including stem, bark, leaves, roots were having antimicrobial properties against eight human pathogenic bacterial strains like *S. aureus*, *S. pneumoniae*, *B. cereus*, *B. pumilus*, *E. coli*, *K. pneumoniae*, *P. aeruginosa* and *C. freundii* [25].

Antioxidant effects: Bark extracts of *Dalbergia sissoo* was found to have antioxidant activity by *in vitro* methods [26]. The aqueous and methanolic extracts of the stem bark and roots of *Dalbergia sissoo* showed antioxidant activity respectively [27].

Antiulcer effects: *Dalbergia sissoo* stem bark methanolic extract (DSME) was having antiulcer activity and was effective against diclofenac sodium-induced ulceration in rat. As per the treatment procedure, 200 and 400 mg/kg amount of DSME was orally administered to the rats once a day for 10 days [28].

Anti-diarrhoeal effects: Experimental studies on *Dalbergia sissoo* showed anti-diarrhoeal properties induced by castor oil in rats which was produced from the ether, ethanol and aqueous extracts of the bark. 200-400 mg/kg dose of ether extract was given orally which was found effective for diarrhoea. Ethanolic extracts of leaves of *D. sissoo* was induced diarrhoea and peristalsis in mice. Castor oil and magnesium sulphate was used to eradicate the diarrhoea and they have shown also some antibacterial, antiprotozoan and antiviral activities [29,30].

Cardiac effect: From the experiments it was studied that the effect of alcoholic extracts of *Dalbergia sissoo* leaf extract (DSE) induced myocardial injury in rats. Estimation of myocardial injury was done by using different markers like LDH, CK-MB. Rats were previously treated with DSE according to their body weight showed improvements in relative heart weight, heart rate, mean arterial pressure in induced myocardial injury [31].

Reproductive effects: *Dalbergia sissoo* has been evaluated for its ethanolic extractions which showed a greater anti-spermatogenic efficacy in healthy fertile men aged 25-35 years. An experimental setup was carried out by collecting semen samples from 15

healthy fertile men. The sperm mortality was examined by sander-crammer method and the dose dependent ethanolic effects on sperm mortality and viability was observed. 20mg/ml of ethanolic concentrations were caused complete immobilization of sperm within 3 mins [32].

Pharmacological properties

Shorea robusta Roth

Analgesic activity: Aqueous and methanolic leaf extracts of *S. robusta* was examined for the analgesic properties. 70% ethanol (30, 100, 300 mg/kg) was extracted from the dried powdered resin of *S. robusta* which produced some significant central and peripheral analgesic effect. Analgesic effect was induced by writhing and tail flick methods [33].

Antinociceptive activity: Methanolic extracts of *Shorea robusta* leaves were dried and were having antinociceptive activity. A dose of 200 and 400 mg/kg extracts were shown antinociceptive activity which was examined by using methods like acetic acid induced writhing, formaline induced pawlicking, tailclip and tailflick models in mice [34].

Anti-inflammatory activity: The phytochemical and pharmacological study reports say that, the aqueous leave extracts of *Shorea rebusta* was found to have anti-inflammatory activities which showed an activity with a dose of 100,200 and 500 µg/ml as compared to a standard dose 20 and 40 µg/ml of Diclofenac in HRBC membrane stabilization and same dose of Aspirin 200 µg/ml was shown activity using Heat induced Haemolytic method. The methanolic and aqueous leave extracts 500 µg/ml of *S. robusta* was shown good results in both the models. 33 Both the doses of methanol and aqueous extract (200 and 400 mg/kg) caused some significant effects in rats by different ways [35].

Antipyretic activity: Ethanolic extracts (70%) of *S. robusta* resin (SRE) was examined for its antipyretic properties. An experiment was carried out for antipyretic activity by using Brewer's yeast – induced pyrexia in rats. Rats were divided into 5 groups one rat in each, was treated in 5 types of treatments. The results demonstrated antipyretic activity and its traditional therapy was used in controlling fever [36].

Antibacterial activity: Floral parts of aqueous extract of *Shorea robusta* was prepared with cold water maceration. Well diffusion method was carried out to determine the antibacterial potency against gram positive bacteria *Staphylococcus aureus* and *Bacillus subtilis* and gram-negative bacteria *Klebsiella pneumoniae* and *Serratia marcescens*. Phytochemical analysis revealed that aqueous extract has showed inhibitory activity on different bacterial species tested against penicillin as a standard and some extra compounds that are tannins, flavanoids, cardiac glycosides and steroids having antimicrobial properties as well [36].

Anti-obesity activity: Monosodium glutamate was a compound which induced obesity in albino rats. An experiment was carried out by giving with monosodium glutamate with normal diet for 7 days to the rats and obese rats were obtained. The obese rats were again treated with a hydro-alcoholic extract of *Shorea robusta* (HASR) leaves in a dose about 200, 400 and 600 mg/kg for next 41 days. From the observation it was concluded that hydro-alcoholic extract of *Shorea robusta* acted as a potential drug for the treatment of obesity and correction of disturbed lipid profile [37].

Antiulcer activity: In a pharmacological study, it was concluded that two different doses (150 and 300 mg/kg) of *S. robusta* resin when dissolved in water was shown gastroprotective potentiality against gastric ulcers in rats. The protective effect of the resin was associated with normalization of antioxidant markers. So that pH of the gastric juice increased from 1.23 to 4.54 which was very harmful and creates severe acidity. This study clearly suggested that *S. robusta* resin have potentiality to fight against ulcer and having gastroprotective activity [38].

Antimicrobial activity: The aqueous, methanolic, petroleum and benzene extract of oleoresin of *Shorea robusta* were inhibited the growth of microorganisms. It showed significant activity against *Bacillus coagulans*, *Escherichia coli*, *Bacillus cereus* and moderate inhibition on *Salmonella typhi* and *Bacillus subtilis* and less activity against *Proteus vulgaris* and *Pseudomonas fluorescence*. But ethanolic extracts found with very promising result against *Staphylococcus aureus*, *S. epidermidis* and *Escherichia coli*, moderate inhibition on *Candida albicans* and *Bacillus coagulans*. The Petroleum ether showed strong activity against *Escherichia coli*, *Aspergillus flavus* and *Candida albicans* and whereas benzene extracts found effective against *Bacillus licheniformis*, *Bacillus cereus* and *Aspergillus flavus*. *Shorea robusta* resin have strong antimicrobial activity against pathogenic microorganisms [39].

Immunomodulatory activity: *Shorea robusta* bark has showed significant effect for stimulating immunomodulatory response in rats. Ethanolic extracts of the bark was administered orally to the mice at a dose of 100mg per day as per the body weight up to 300 mg/kg for 14 days. These bark extracts were found to be effective to enhance immunomodulatory response [40].

Kairomonal activity: Some compounds isolated from the bark of *Shorea rebusta* were having kairomonal/attractant properties against its dreaded pest sal borer, *Hoploceramyx spinicomis*. Many types of beetles were exhibited some behaviour like orientations, antennal activity, walking movement, biting and feeding to a particular compound and no. of beetles attracted towards it has been recorded. This study showed some positive behaviour and the chemical analysis possessing kairomonal properties [41].

Free radical scavenging and antioxidant activities: Antioxidants played a key role to produce tumors and inducing carcinogenesis. Natural and synthetic antioxidants were shown anticancer activity. The present study aimed to divulge the preventive nature of *Shorea robusta* bark extract (SRBE) during diethylnitrosamine (DEN) induced in liver cancer in male Wistar albino rats. SRBE supplementation (500 mg/kg body weight) prevents lipid peroxidation, hepatic cell damage which produced antioxidant activities and prevents hepatocellular carcinogenesis [42].

Wound healing activity: Ethanolic extracts of *S. robusta* have a significant role in healing excised and incised wounds by applying locally about 10% and 30% w/w. The concentration of the extracts accelerates the wound contraction and tensile strength of wounds in rats [43].

DISCUSSION

Compressive and valuable information came out by this study on pharmacological or medicinal properties of some important plant species. It is revealed that, *N. cadamba* has played a vital role in pharmacological activities or medicinal compound production.

Another plant, *Dalbergia sissoo* has also found rich in producing pharmaceutical and therapeutic products. Research reports on *S. robusta* has presented as an important medicinal plant used in a wide range of medical treatments. A number of pharmaceutical activities has been recorded through the different solvent extracts from all the parts of the species. All the documented plant species were found with good pharmaceutical activities such as; antioxidant activity, anti-inflammatory, antipyretic, antiparasitic activity, antidiabetic activity, dermatological effects, antimicrobial effect, antiulcer effect, antiarrhythmic effect, analgesic activity and many more. These species are well known for bring about promising herbal drugs for a long period of time without any adverse effects. Therefore, herbal products are highly recommended for its effectiveness as well as cost efficiency. Because, chemically synthetic medicines are rapid response but mostly found with side-effects. On other hand, with the correlation with synthetic medicines, herbal medicines may create a grate revolution in the field of medicine or pharmaceutical products.

CONCLUSION

Overall, this review may provide necessary information on pharmaceutical product obtained from the target species. There are a lot of herbal trees to be studied for their traditional uses and medicinal properties. Therefore, future study on the plant and plant-based products (herbal products) may create revolution in the area of medicine and pharmacological industry, which ultimately can change the scenario of the present society. Plantation of such type of herbal trees are highly recommended in huge amount for domestic or commercial production of herbal items. Apart from that, these species are big in size as well as in area, have the high rate for purification of environmental polluted air. It is mostly needed, because now-a-days most of the diseases are caused by air pollutions. Government along with people or NGOs should implement some attractive projects through which the plantation of such trees can be done in mostly in urban areas. Awareness programme should be conducted to spread the importance of the plants among the public. If it is possible, we can successfully create a green and healthy environment on the globe.

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