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Buchholzia coriacea: An African Plant with Pharmacological Importance

Madhukar Shende[1], Debarshi Kar Mahapatra[2]

[1]Department of Pharmaceutics, Dadasaheb Balpande College of Pharmacy, Nagpur 440037, Maharashtra, India
[2]Department of Pharmaceutical Chemistry, Dadasaheb Balpande College of Pharmacy, Nagpur 440037, Maharashtra, India.

ABSTRACT

Capparidaceae family includes the evergreen shrub Buchholzia coriacea (Wonderful cola), which may be found in Cameroon, Central African Republic, Gabon, Congo, Angola, Nigeria, and Ghana, among other locations. Diarrhea, malaria, rheumatism, ulcers, worm infestation, asthma and cough, diabetes, hypertension, mental disorders, and impotence were among the diseases for which conventional medicine saw it as a viable alternative therapy. Some of its ethnomedicinal knowledge have been ethnopharmacologically validated and published in peer-reviewed journals. As a consequence, the focus of this research is on a current assessment of its confirmed ethnomedicinal activities, which will serve as a research horizon for present and future researchers.

Key Words: *Buchholzia coriacea*, Ethnopharmacological, Ethnomedicinal, Phytochemicals, Pharmacotherapy, Natural

INTRODUCTION

Herbal medicine is a widely recognised alternative form of medicine that involves the diagnosis, prevention, and treatment of physical, mental, and social diseases using plant components. Relevant information on the effectiveness of herbal treatment has been traced back to past experiences and observations since man's creation. Scientific validation of plants with significant ethnomedicinal knowledge is needed for the development of alternative therapies to synthetic medications. Information on Citrullus lanatus, Tridax procumbens, Xylopia aethiopica, and Ocimum gratissimum, among other scientifically confirmed plants, was also gathered from different databases and published in scholarly papers. However, a current collection of scientifically validated information on Buchholzia coriacea for its folkloric claims in medicine is still missing, which is critical for cutting-edge research and drug development. As a consequence, this investigation was launched. RW Buchholz, a botanist who collected plants in Cameroon in the late 1800s, was named after B. coriacea, a member of the Capparidaceae family. It's a small to medium-sized evergreen tree that may reach 20 metres in height and can be found in Cameroon, the Central African Republic, Gabon, Congo, Angola, Ghana, and Nigeria, among other locations. The bark of B. coriacea is smooth, blackish-brown, or dark green. It has a broad crown, large glossy leathery leaves that are spirally gathered and clustered at branch tips, and conspicuous cream-white flowers in racemes at the branch ends. B. coriacea is a plant that is used as a fetish and medicinal herb in Gabon [1].

TAXONOMY PROFILE

Kingdom: Plantae

Phylum: Tracheophyta

Class: Spermatopsida

Subclass: Magnoliidae

Order: Brassicales

Superorder: Rosanae

Family: Capparaceae

Genus: Buchholzia

Species: coriaceae [2]

Corresponding Author:
Madhukar Shende, Department of Pharmaceutics, Dadasaheb Balpande College of Pharmacy, Nagpur 440037, Maharashtra, India.

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COMMON AND LOCAL NAMES

B. coriacea is also known as Wonderful Cola, Musk Tree, Cola Pime, and Elephant cola. It's known as "Ndo" in Mende (Sierra Leone), "Doe-fiah" in Kru-basa (Liberia), "Eson-bese" in Akan-asante (Ghana), "Banda" in Munga (West Cameroons), "Esson bossi" in Central Africa, "Kola Pimente" in French, "6wi" in Edo State, and "Okpo [3].

ETHNOMEDICINAL USES

B. coriacea possesses a wide range of medicinal qualities. This seed was given the name "good kola" because of its usage in traditional medicine. The most often consumed plant component is seeds, which may be cooked or eaten raw. In Africa, it is useful for the treatment of hypertension and the prevention of premature ageing. It's a memory-boosting brain food. Beautiful kola, which is rubbed on the forehead in Africa, may help to relieve migraine headaches. The stem bark extract is used as an enema to relieve back pain. Unspecified bark compositions are used to treat pleurisy, rheumatism, conjunctivitis, smallpox, scabies, and other skin disorders. Leaf decoctions are used to cure sterility in women. Filarial nematodes are treated with leaf infusions, while fever, ulcers, boils, and haemorrhoids are treated with powdered or pulped leaves. Ground fruits are used to make anodyne. Fruit extracts are used to treat worms, while fruit kernels are consumed to treat angina and nasal hemorrhage. Fruit scrapings may be used to treat asthma and cough. Seed formulations are used to treat a variety of ailments, including fever, diabetes, hypertension, cough, mental illness, and impotence. Seed pulp is used to treat snakebites. Menstrual problems and gastrointestinal disorders are treated with seed oil. The bark is used as a component in the manufacture of the arrow. Capsicum seeds, which have a spicy taste, may be substituted for the pepper. In Côte d'Ivoire, the seed is used in place of kola nuts. Wood is used in the construction of homes on occasion [4].

PHARMACOLOGICAL POTENTIALS

Anti-diabetic activity

The hypoglycemic effects of B. coriacea's methanol seed extract were shown to be synergistic with metformin, a popular oral hypoglycemic medication. Mouth administration of B. coriacea at doses of 100 mg/kg, 200 mg/kg, and 400 mg/kg per oral resulted in PBGR reductions of 37.73 percent, 12.30 percent, and 11.30 percent, respectively, after 4 hours of treatment. On the fourth and seventh days, the combination of extract (100 mg/kg) with metformin (100 mg/kg) resulted in PBGRs of 73.4 percent and 72.2 percent, respectively.

In streptozotocin-induced diabetic rats, oral treatment with 150 mg/kg, 300 mg/kg, and 600 mg/kg of methanol fruit extract of B. coriacea resulted in significant dose-dependent reductions in fasting blood glucose levels. Compared to negative control rats, blood concentrations of catalase and reduced glutathione were significantly higher in rats given glibenclamide (2 mg/kg) and various extract doses (150 mg/kg, 300 mg/kg, and 600 mg/kg). Triglyceride and total cholesterol levels in the blood were also decreased by the extract. The fruit extract reduced lipid peroxidation in diabetic rats in a dose-dependent manner.

Adisa et al. (2011) investigated the hypoglycemic activity and ameliorative effects of oral administration of ethanol extracts (EEBC) and butanol fraction (BFBC) of B. coriacea seeds in streptozotocin (STZ)-induced diabetic mice and rats, finding that fasting blood glucose (FBG) in hyperglycemic mice and normoglycemic rats was significantly lower within 4 hours in hyperglycemia. The extract and glibenclamide reduced FBG, serum aspertate aminotransferase (AST), and alanine aminotransferase (ALT) levels, as well as serum creatinine, urea, total cholesterol, triglyceride, and thiobarbituric acid reactive species (TBARS) products, in STZ-induced diabetic rats. The extract and glibenclamide combination significantly increased serum superoxide dismutase activity. B. coriacea seeds, according to Adisa et al. (2011), contain a powerful hypoglycemic and anti-oxidant substance that is believed to be a flavone glycoside high in BFBC and may be useful in treating diabetes-related secondary issues.

Anti-microbial activity

Ezekiel and Onyeoziri investigated the effects of fresh kola, hexane, and methanol extracts of B. coriacea on food-borne pathogens (Escherichia coli, Enterococcus faecalis, Staphylococcus aureus, Trichoderma viride, and Aspergillus niger) (2009). Fresh kola showed inhibitory zones against the test pathogens E. coli (62 mm), E. faecalis (40 mm), and S. aureus (40 mm) (50 mm). The two test fungi, T. viride and A. niger, were completely inhibited in their growth. The hexane extract showed inhibitory zones ranging from 20 mm to 40 mm with the test microorganisms E. coli (21 mm), E. faecalis (20 mm), and S. aureus (20 mm) (40 mm). On the other hand, T. viride and A. niger had no inhibitory effect. According to the extract, the inhibitory zones of several of the test pathogens ranged from 20 to 30 mm: E. coli (30 mm), E. faecalis (25 mm), S. aureus (20 mm), and T. viride (20 mm) (20 mm). It exhibited no inhibitory effect on A. niger.

Ajaiyeoba et al. (2003) discovered that fractions generated from the methanol extract of B. coriacea stem bark showed significant concentration-dependent antibacterial and antifungal activity when compared to the conventional antibiotics ampicillin and tioconazole. The methanol extract was shown to be non-toxic in the brine shrimp lethality (BSL) test, with an LC50 of 1031 g/mL. Lupeol and beta-

sitosterol were the two main components identified in the most active fraction.

In 2012, Chika and colleagues looked into the antibacterial properties of B. coriacea leaf extracts. Gram-positive and Gram-negative clinical isolates, as well as ESBL-positive E. coli isolates, were used in the research. The isolates were treated with N-hexane, methanol, and chloroform extracts of B. coriacea leaf for antibacterial activity utilising in vitro agar well diffusion techniques. The results show that extracts of B. coriacea leaf in N-hexane, methanol, and chloroform have moderate antibacterial activity against E. coli, Staphylococcus aureus, Shigella species, Klebsiella pneumoniae, and Bacillus subtilis test isolates. The ESBL was significantly inhibited by N-hexane and methanol extracts, whereas chloroform extract had little effect. The minimum inhibitory concentration (MIC) ranged from 6.25 mg/mL to 12.5 mg/mL for all of the test isolates. The MIC values of all ESBL-positive E. coli isolates were 50 mg/mL. B. coriacea leaf extracts were shown to have promising antibacterial activities, making them ideal for pharmaceutical and medicinal application.

This study used phytochemical research to identify the existence of phlobatannins, carbohydrates, proteins, tannins, saponins, alkaloids, and flavonoids in beautiful kola leaf. The ethanol extract (10-14 mm) and methanol extract (13-15 mm) elicited distinct zones of inhibition against S. aureus strains. The MICs of both extracts were 50 mg/mL and 100 mg/mL for specific strains of S. aureus. High throughput techniques should be employed to identify the main bioactive components of the wonderful kola plant extracts, according to Ejikeugwu and colleagues, so that they may be incorporated into pharmaceutical formulations for the treatment of bacterial infections.

The active components of these two plants were investigated. The leaves and the stem were screened separately. Aspergillus niger, Penicillum sp., Candida albicans, Fusarium oxysporium, and Aspergillus flavus were used to evaluate the antifungal capabilities of the leaves and stem. At 200 mg/100 mL, the extract's activity was compared to methanol as a control and tioconazole as a reference standard. According to Ogunmefun and Ajaiyeoba (2013), the findings of plant extract antifungal tests explain why they are utilised in traditional medicine.

Anthelmintic activity

Nweze and colleagues tested the effectiveness of a methanol seed extract of B. coriacea against a field strain of Trypanosoma congolense in experimentally infected mice of both sexes in 2011. For five days, the rats were given dosages of 250 mg/kg, 500 mg/kg, and 1000 mg/kg of the extract. The positive control mice were administered 3.5 mg/kg i.p. of diminazene diaceturate. In the study, there was no statistically significant change in body weights. The rectal temperatures of infected mice varied greatly. The packed cell volume (PCV) of infected mice was much smaller than that of uninfected mice. PCV was not substantially different in extract-treated and untreated mice. In both the extract-treated and untreated mice, parasitaemia levels gradually rose until all of the mice died. Six days after completing the diminazene diaceturate treatment, the infection reappeared. At the end of the trial, the diminazene diaceturate-treated group had a 50% relapse rate. The methanol extract of B. coriacea seeds showed no anti-trypanosomal activity against mice infected with T. congolense at the doses tested.

Using parasitized human group O blood, the anti-plasmodial effectiveness of B. coriacea aqueous extract was evaluated intraperitoneally in malaria-induced albino mice. The experimental control mice were given chloroquine, whereas the experimental animals were given B. coriacea aqueous extracts. Experimental animals treated with 120 mg/kg reduced parasitemia levels from 80 parasites per field on the first day to zero by the third day, while those treated with 120 mg/kg reduced parasitemia levels from 80 parasites per field on the first day to 7 parasites per field on the third day and from 81 parasites per field to 5 parasites per field, respectively. During treatment, there was a decrease in appetite, but this was restored as the parasitemia level decreased. Methanol leaf and stem extracts of B. coriaceae and Gynandropsis gynandra were evaluated for anthelmintic activity against Fasciola gigantica, Taenia solium, and Pheritima pasthuma, respectively. The reference medicine was piperazine citrate (10 mg/mL), whereas the control was distilled water. At five doses (10–100 mg/mL), all of the extracts exhibited substantial anthelmintic activity, with B. coriaceae and G. gynandra stem methanol extracts being the most active.

Anti-hypercholesterolemic activity

The ethanol extract of B. coriacea (EEBC) significantly reduced total cholesterol, LDL-cholesterol, and lipid peroxidation in hypercholesterolemic rats as compared to untreated hypercholesterolemic rats. AST and ALT activity in hypercholesterolemic rats given EEBC were not substantially different from those in the control group. According to Olaiya and colleagues, B. coriacea seeds contain a potent anti-hypercholesterolemic compound that may be utilised in clinical settings to treat hypercholesterolemia and its complications.

Anti-ulcer activity

Administration of 200 mg/kg and 400 mg/kg of B. coriacea seed extract significantly decreased the ulcerogenic effect of indomethacin in the stomach mucosa of Wistar rats when compared to controls.

Gastric anti-secretory activity

The extract reduced histamine-mediated stomach acid production and suppressed histamine-induced contractile responses in isolated guinea-pig ileum, which was comparable to the reference drug, chlorpheniramine. The extract possesses anti-ulcer effects.

Male reproductive parameters

The male reproductive system of albino rats was investigated using B. coriacea methanol seed extract. After 6 weeks of treatment of 200 mg/kg b.w. extract, the weight of the epididymis and seminal vesicle, excluding the testes and prostate gland, decreased substantially. The weight of visceral organs including the lungs, liver, heart, and kidneys remained unchanged. The motility and amount of sperm were also reduced significantly. The number of sperm and their morphology remained rather constant. The total tissue protein in the epididymis and testes of the treated rats increased significantly, and the animals were no longer fertile. According to histology results, the epididymal ducts were almost empty (although the epithelial lining appeared normal). Fewer spermatozoa and late-stage spermatids were seen in the testes, along with normal testicular epithelium. Obembe and colleagues theorised that B. coriacea extract may have anti-infertility effects as a consequence of their findings.

Anti-pyretic activity

The phytochemical properties and anti-pyretic effects of a methanol extract of B. coriacea leaves were also investigated. According to phytochemical study, the leaves of B. coriacea include tannins, flavonoids, alkaloids, glycosides, and saponins. B. coriacea leaf extract (50 mg/kg, p.o.) reduced pyrexia in a comparable manner to aspirin (100 mg/kg). The extract's LD50 indicated that it is well tolerated at a dose of 5000 mg/kg.

Gastrointestinal activities

Phytochemical, anti-spasmodic, and anti-diarrheal properties have also been found in the methanol extract of B. coriacea leaves. In 2013, Ibrahim and Fagbohum looked into the phytochemical and mineral characteristics of B. coriacea dried seeds. According to proximate analysis, the seeds of B. coriacea included moisture (1.30%), crude fat (2.30%), crude protein (13.34%), ash (6.6%), crude fibre (2.19%), and carbohydrate (2.19%). The mineral analysis revealed sodium (1.22 ppm), potassium (1.34 ppm), phosphorous (0.22 mg/g), calcium (0.19 percent), magnesium (1.62 percent), zinc (0.18 percent), iron (1.11 percent), and manganese (0.46 percent). Alkaloids (3.16 percent and 3.32 percent), glycoside (2.16 percent and 2.46 percent), saponin (2.10 percent and 2.23 percent), steroids (0.14 percent and 0.16 percent), tannin (6.46 percent and 6.73 percent), flavonoids (0.68 percent and 0.79 percent), terpenes (0.22 percent and 0.06 percent), reducing sugars (1.14 percent and 1.71 percent), and phenol (1.83 percent and 1.26 percent) were among the substances studied.

Hepatocellular Integrity

Phytochemical screening led to the discovery of flavonoids, saponins, oxalates, tannins, phytates, cyanogenic glycosides, and alkaloids. According to the findings of the proximate contents, the shelf-life of the examined seed samples decreased from oven-dried uncooked seed sample to fresh seed sample to cooked sample. When the AST, ALT, and alkaline phosphatase (ALP) levels of rats fed a compounded feed of fresh B. coriacea seed and oven-dried uncooked seed were compared to the control group, the AST, ALT, and ALP levels of the rats fed a compounded feed of fresh B. coriacea seed and oven-dried uncooked seed were higher. Based on the results of this study, the investigated seed's antibacterial effectiveness, especially when fresh or uncooked, cannot be disputed; nevertheless, the rate at which any of these forms affects hepatocellular integrity should be addressed [5].

CONCLUSION

This research showed the traditional usefulness and clinical potentials of B. coriacea, a medicinal herb extensively used in many parts of the world. However, ethnomedicinal claims of this beautiful plant's anti-inflammatory, anti-hypertensive, anti-asthmatic, anti-tussive, and aphrodisiac properties, among others, have yet to be scientifically validated, and further study is recommended. As a result of this review, the general public's attention is drawn to the use of natural products in disease management, as well as the development of plant products into standardised, quality-controlled phytopharmaceuticals and the characterization of their bioactive component, which can be used to develop more reliable and safer drugs.

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CONFLICT OF INTEREST

The authors declare no Conflict of Interest regarding the publication of the article.

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