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A Review on Pharmaceutical Therapy of the Buchanania (Chironji) Plant

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ABSTRACT: Buchanania Cochinensis is a Herbal drug medicinal plant many years old, it is commonly known as chironji. In India, it is found mostly in eroded lands belonging to the family Anacardiaceous. Many studies have shown how all parts of Buchanania (Chironji) may be beneficial to health in the prevention and treatment of a variety of conditions, such as diabetes, anti-inflammatory, analgesic, antibacterial, antifungal, antioxidant, adaptogenic, antidiarrheal, wound healing, diuretic, gastrointestinal disorders and neurodegenerative disease. The phytochemical screening extracts of this plant are present in various chemical constituents like Kernels lipids, neutral lipids, triacylglycerol and free fatty acids, these chemical extracts have good therapeutic effects shown to treat various diseases. Pinitol, vomicine, and celidoniol were the three main chemical constituents that were separated from the methanolic extract of leaves and were identified by spectral analysis, chemical testing, and proton nuclear magnetic resonance. The most important scientific studies on Buchanania's biological activity that are currently available are summarized in this article.

KEYWORDS: Buchanania cochinchinensis, Chironji, Medicinal plant, Therapeutic effects, Medicinal value.

I. INTRODUCTION

Hippocrates once said, "Let food be the medicine and medicine be the food." This advice is crucial in the fight against emerging illnesses and ailments. We deal with brand-new health issues every year that are brought on by inadequate nutrition and weakened immune systems. Researchers from all across the world are attempting to reduce medication deficiency by screening food and pharmaceutical agents. Thus, looking for an agent with both dietary and therapeutic properties would be the best course of action.

Because Buchanania (Chironji) is a highly heterozygous, cross-pollinated tree, its natural population exhibits great levels of variation [1]. Thus far, the genus Buchanania has yielded about twenty species. The Indian subcontinent is the origin of Buchanania cochinchinensis (Lour.) M.R. Almedia [Syn: Buchanania lanzan (Spreng.)], a member of the Anacardiaceae family [2].Buchanania lucida, Buchanania glabra, and Buchanania accuminata are the other species in the genus.

Figure 1: Buchanania (Chironji) in a natural wild population

BOTANICAL PROFILE OF BUCHANANIA (CHIRONJI)

Family – Anacardiaceae
Kingdom – Plantae
Order- Sapindales
Genus –Buchanania
Species – Buchanania lanzan
Synonyms – Buchanania latifolia, Buchanania Cochinensis, chironia sapida

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PLANT NAMES IN DIFFERENT LANGUAGES

Hindi - Pre-Savak, Char Chironji, Chiranji, Piyal, Priyal
Marathi- Piyal, Char, Charoli
Tamil - Charam
Malayalam – Nuramaram, Mungaappeezh
Telugu - Priyaluvu, Char, Charumaidi, Raj-Adanamu
Kannada – Maavu, Charoli, Kole
Bengali – Chironji, Piyal, Sarop
Oriya – Chanhara, Charu
Urdu- Chironji
Gujarati- Charoli
Sanskrit- Prasavakh, Akhatth, Muni, Piyala,

The tree is most frequently known as "Chironji" in its native regions of India, Nepal, and Burma, but it is also known as "Almondette" or "Little Gooseberry tree" in English [3]. Chironji's native range extends to the foothills of the western Himalayas, Bangladesh, China, Sri Lanka, Myanmar, Thailand, Laos, and Vietnam. The states of Chhattisgarh, Rajasthan, Jharkhand, Gujarat, Madhya Pradesh, Odisha, Maharashtra, Uttar Pradesh, Bihar, and Andhra Pradesh are where it is primarily found in India [4]. It is a medium-sized, evergreen tree that is usually 40 to 50 feet tall with a straight, cylindrical trunk [5].

Figure 2: Leaves, Fruits and Seeds of Buchanania cochinchinensis

The enormous therapeutic significance of practically every part of the plant, including the roots, leaves, fruits, seeds, and gum, is revealed by traditional indigenous knowledge. The roots can be used to cure diarrhea since they are cold, astringent, acrid, depurative, and constipating. Additionally, the root extract is utilized as an expectorant to treat blood disorders and biliousness. The leaf juice treats digestive problems and is used as a purgative, expectorant, aphrodisiac, blood purifier, and thirst quencher. It has reducing sugars, triterpenoids, saponins, flavonoids, and 2.64% tannins (0.35% gallo-tannins). Wounds are treated with crushed or powdered leaves [6].

II. PHYTOCHEMICAL STUDIES

Chemists have always been interested in the genus Buchanania because of its wide variety of phytochemicals. Sengupta and Choudhary's 1977 study on phytochemical research for Chironji was likely the earliest and most important [7]. Using gas-liquid chromatography (GLC), they examined the fatty acid content of Chironji seed oil and found that it contained 0.6% myristic acid, 33.4% palmitic acid, 6.3% stearic acid, 53.7% oleic acid, and 6% linoleic acid. The oil was found to include 3.2% trisaturated, 35.8% monosaturated–disaturated, 45.5% disaturated–monosaturated, and 15.5% tri-unsaturated glycerides, according to the analysis of triglyceride compositions. It is noteworthy that Chironji seed oil has a unique trait of having 22.7% di-palmitoleic, 31% dioleopalmitin, and 11.3% tri-olein [8]. Chironji seeds, sometimes known as kernels, are edible, nutritious, and can be used in confections in place of almonds. 3.0% moisture content, 59.0% lipid/fat, 19.0-21.6% protein, 12.1% starch/carbohydrate, 3.8% fiber, minerals, calcium (279.0 mg), phosphorus (528.0 mg), iron (8.5 mg), and vitamins, thiamine (0.69 mg), ascorbic acid/vitamin

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C (5.0 mg), riboflavin (0.53 mg), niacin (1.50 mg), are all present in the seeds. Additionally, 34–47 % fatty oil, which is used as an alternative to olive and almond oils, is also present. [6]

Tannins, triterpenoids, saponins, flavonoids, gallic acid, kaempferol-7-glucosides, quercetin-3-rahmnoglucoside, quercetin, reducing sugars, including a new glycoside, and myricetin-3'-rhmnoside3-galactoside are all said to be present in the leaves. [9,10] Pinitol, vomicine, and celidoniol were the three main chemical constituents that were separated from the methanolic extract of leaves and were identified by spectral analysis, chemical testing, and H nuclear magnetic resonance (Figure 3).[11]

Figure 3: Major chemical constituents of the Buchanania of leaves.

III. MEDICINAL AND CURATIVE PROPERTIES

Buchanania is an iconic plant that has long been used in traditional medicine to treat a variety of illnesses (Figure 4). It is used as a tonic and to treat bloody diarrhea and intrinsic hemorrhage in the form of a decoction. According to **Gaikwad et al. (2013),**[12]B. cochinchinensis has been employed in pharmaceutical applications as emulsifiers, controlled release agents, and tablet binders. A grown child who has stopped receiving breast milk should be fed sugar candies, madhuka (Glycyrrhiza glabra) honey, dried paddy, and B. Lanzan kernels made into a sweet bolus. Powdered kernels are used as an aphrodisiac and to treat fever and burning sensations when mixed with milk. Blood dysentery can benefit from the combination of bark powder and honey.[13] The Buchanania plant has a long history of traditional use in tropical tribal societies worldwide. In order to find novel, pharmaceutically active magic medications, extensive study is currently being conducted on all of these plants in this period of herbal science. We attempted to present a thorough overview of the worldwide efforts already made to investigate Buchanania's phytomedical value in this review.[14]

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Figure 4. Description of pharmacological significances of Buchanania (Chironji) plant.

ANTI-INFLAMMATORY AND ANALGESIC ACTIVITIES

One of the body's main physiological defense mechanisms, inflammatory actions contributes to defending against infections, burns, allergies, hazardous substances, and other unpleasant stimuli. Significant anti-inflammatory action was demonstrated by the methanolic extract of Buchanania lanzan leaves at various doses.[15] The study's reference medication, aspirin, yielded findings that were likewise comparable. It shows that the methanolic extract is effective as a treatment for both acute and long-term inflammatory diseases. The methanolic extract that was extracted from the roots of B. Lanzan exhibited notable analgesic and anti-inflammatory properties.[16]

ANTIBACTERIAL ACTIVITY

To assess the antibacterial activity of Buchanania lanzan seeds, three gram-positive (Staphylococcus aureus, Staphylococcus epidermidis, and Bacillus cereus) and two gram-negative (E. coli, S. flexneri) bacterial test pathogens were employed. The zones of inhibition were measured in order to analyze the results. 100 mg/ml was the inhibitory concentration used for both samples. The bacterial test pathogens, B. cereus and S. flexneri, exhibited notable zones of inhibition (measured in millimeters) in the methanol and ethanol-water extracts. [17]

ANTIFUNGAL ACTIVITIES

Using the well diffusion method, the inhibitory effects of several extracts on fungal growth were assessed. On PDA plates, an inhibitory activity test was run. After seven days, the zone of inhibition was seen. Against all three

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fungal strains, extracts from Buchanania lanzan seeds exhibited little antifungal action. [17]

ANTIOXIDANT ACTIVITY

Damage from free radicals causes oxidative stress, which is mitigated by antioxidants. Using the 1, 1-diphenyl-2-picryl-hydrazyl (DPPH) and reducing power method, Buchanania lanzan kernel methanolic extract is subjected to in vitro antioxidant activity testing. The Folin-Ciocalteu method is used to quantitatively evaluate the extract's total polyphenolic content. There is a notable amount of antioxidant activity in the extract. It is determined that the total polyphenolic content is 16.82%±23 mg of gallic acid equivalent/100. The extract's presence of phytochemicals such as tannins, saponins, and triterpenoids may be a factor in the antioxidant activity that has been reported.[18]

ANTIHYPERLIPIDEMIC AND ANTIDIABETIC ACTIVITY

Diabetes mellitus is a long-term metabolic illness brought on by decreased insulin action and/or an absolute or relative absence of insulin. A metabolic consequence of both clinical and experimental diabetes is hyperlipidemia.[19]

ADAPTOGENIC ACTIVITY

According to Alexander et al. (2010), adaptogens induce an adaptive response to a disease, are beneficial in treating a variety of unrelated illnesses, and seem to create a state of non-specific enhanced resistance to stress that leads to stress protection. The swim endurance model is used to assess the adaptogenic activity of the methanolic extract of B. Lanzan leaves in both normal and stressful conditions across all groups. The antistress activity is assessed using urinary vanillyl mandelic acid (VMA) and ascorbic acid as non-invasive indicators. VMA and ascorbic acid's 24-hour urine excretion is measured using spectrophotometric techniques. Before stress was created, the extract was administered daily at dosages of 10, 20, 30, 40, and 50 mg/kg body weight. This prevented stress-induced changes in urine biochemistry in a dose-dependent manner while leaving the levels in the normal control groups unchanged. Significant anti-stress action was shown by the methanolic extract.[20]

ANTIULCER ACTIVITY

A well-targeted treatment plan is necessary for the dangerous gastrointestinal condition known as peptic ulcer disease. The antiulcer properties of B. Lanzan roots are studied in an ethanolic extract. In order to investigate the antiulcer effectiveness of different extract doses (200 and 400 mg/kg orally), ulcers caused by ethanol in mice and ulcers induced by pylorus ligation in rats were studied. The ethanolic extract demonstrated a dose-dependent defense against the severely damaging effects of ethanol and pylorus ligation on the animal stomach mucosa. In addition to significantly reducing the ulcer index in both models, the extract treatment also prevented the accumulation of gastric secretion caused by the pylorus ligation. As a result, the extract has good therapeutic and preventative effects on stomach ulcers.[21]

ANTIDIARRHEAL ACTIVITY

According to Fontaine et al. (1988), diarrhea is characterized by an increase in the frequency, fluidity, or volume of bowel movements as well as wet stool and abdominal pain. The number of diarrheal episodes and the amount of feces produced in castor-oil-induced diarrhea were both considerably decreased by the ethanolic extract of B. Lanzan roots. B. Lanzan decreased the number of animals experiencing diarrhea and considerably postponed the beginning of diarrhea caused by castor oil. B. Lanzan successfully decreased the mice's intestinal propulsion of charcoal meal. The results show that the B. Lanzan roots' ethanolic extract possesses antidiarrheal properties. According to Kodati et al. (2010), B. Lanzan's tannin content most likely plays a role in its antidiarrheal effects.

WOUND HEALING ACTIVITY

B. Lanzan fruit ethanolic extract was applied to Albino rats to test its ability to promote wound healing and to investigate how dexamethasone inhibited this process. In this work, three wound models—excision, dead space, and incision—were employed. When it comes to incision wounds, breaking strength, hydroxyproline content, and granulation tissue dry weight are the characteristics that are examined. When it comes to excision wounds, the parameters that are examined are epithelialization and wound contraction.[22]

MEMORY BOOSTER

According to Reddy et al. (1997), Alzheimer's disease is a neurodegenerative brain ailment that progresses gradually and causes memory loss, odd behavior, personality changes, and eventually death. The degree of cognitive impairment is highly correlated with biochemical

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abnormalities such as metabolism, acetylcholinesterase (AChE) increase, and reduction of acetyltransferase and acetylcholine biosynthases (Ellen et al., 1997). The neuro-psychopharmacological effect of B. Lanzan seed extract (PEB) (500 mg/kg, oral) is investigated in rats used in experiments. Using step-down apparatus and elevated plus maze models, the effect of seed extract on memory acquisition and retention is investigated. The amount of the enzyme AChE at specific brain regions is also measured. Comparing the positive control and treated groups to the other groups, PEB (500 mg/kg) administration resulted in a significant reduction in transfer latency in the elevated plus maze, an increase in step-down latency in step-down apparatus models, and a decrease in acetylcholine esterase enzyme activity in various brain regions.[23]

ANTIVENOM ACTIVITY

B. Lanzan is included in the group of plants that have anti-venomous properties against snakes. In the Chhattisgarh region, B. Lanzan fruit and bark extract is used to treat snake bites (Minu et al., 2012). Via a number of in vitro and in vivo investigations, the ethanolic extract of B. Lanzan bark was evaluated for its ability to withstand the toxicity caused by the venom of the Naja kaouthia snake. Lethality, myotoxicity, phospholipase A2 activity, and human red blood cell lysis caused by N. kaouthia snake venom were all neutralized by the extract. The lethality caused by the snake venom at varied concentrations was greatly offset by the extract at 200 mg/kg and 400 mg/kg. The reduction in creatine phosphokinase level indicated a noteworthy decrease in myotoxicity. The extract was found to considerably reduce hemolytic activity in in vitro models used to measure it. Hemolytic studies were conducted at different extract concentrations using both direct and indirect methods. The extract dramatically neutralized over 50% of hemolysis. The outcomes demonstrated a notable reduction in the toxicity caused by the venom of N. kaouthia snakes.[24]

DIURETIC EFFECT

Any drug that increases the production of urine is a diuretic. At a dosage of 500 mg/kg, the alcoholic fruit extract and the hexane fractions of Buchanania angustifolia and B. Lanzan demonstrated a notable diuretic effect that seemed to be on par with that of the prescription medication furosemide. It was discovered that B. angustifolia was a more effective diuretic than B. Lanzan at the same dose. Nonetheless, additional research is urged to identify the active phytochemical component in order to precisely understand the mechanism of diuresis.[25]

CARDIOPROTECTIVE ACTIVITY

The study examines the cardioprotective properties of the ethanolic extract of Buchanania lanzan Spreng. (EEBL) in rats with isoproterenol-induced myocardial infarction. It assesses myocyte injury indicators, antioxidant defense system, serum levels, and electrocardiographic alterations. Myocardial infarction was generated in rats by administering isoproterenol at a dose of 200 mg/kg subcutaneously, with a 24-hour interval on the 29th and 30th days. ECG and metabolic markers were evaluated on the 30th day. Isoproterenol administration resulted in alterations in ECG pattern, such as ST-segment elevation indicative of myocardial infarction, elevated levels of cardiac injury markers (Creatine kinase-MB, lactate dehydrogenase, aspartate transaminase, and alanine transaminase), and reduced antioxidant defense system in the heart. Pre-treatment with EEBL significantly inhibited most of the parameters associated with isoproterenol-induced myocardial infarction in rats. The findings indicate that EEBL plays a crucial role in protecting the heart from isoproterenol-induced myocardial infarction by preserving the activity of natural antioxidant enzymes.[26]

EFFECT ON HEMATOLOGICAL INDICES

A study was conducted to examine the impact of methanolic extract from Buchanania lanzan Spreng seeds on hematological parameters. Eighteen male albino wistar rats were placed into three groups, with six rats in each group. Group I animals were given distilled water, whereas Group II and III got oral doses of 1000 mg oil/kg and 2000 mg oil/kg of extract, respectively, for 7 days. After the study concluded, blood samples were gathered and analyzed for packed cell volume (PCV), hemoglobin (Hb) levels, red blood cell (RBC) count, and white blood cell (WBC) count. The therapy group showed a notable increase in hematological indices such PCV, Hb, RBC, and WBC count, which was depending on the dose. The increase in PCV, Hb, and RBC levels suggests an anti-anemic impact, possibly resulting from enhanced generation of RBCs in the bone marrow.

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IV. CONCLUSION

The goal of the current review is to evaluate the considerable interest in Buchanania plant research while highlighting recent accomplishments, particularly in the fields of phytomedicines, traditional medicine, and other rapidly developing fields worldwide. The data that we have provided here unquestionably demonstrates the enormous potential of organic solvent extracts in treating and/or alleviating a variety of human issues. The antidiabetic effect of the leaf extracts is one of the most important discoveries. Perhaps connected to this antihyperlipidemic action is the regular consumption of leaf decoctions by tribal people for overall health. Lastly, we noted that Buchanania, like a great deal of other unknown forest plants, has great potential as a vast reservoir of magical compounds that would undoubtedly help humanity in the decades to come. Accordingly, it may be said that Buchanania is an herbal medicine that Indian tribes and traditional vaidya already utilize, however, more research and validity are required.

V. FUTURE PROSPECT

Buchanania can be utilized to make a variety of goods, including food, medicine, drinks, and other items that not only encourage value addition but also fruit sales in study areas and local weekly markets. It will assist in creating small-scale industries that will improve rural communities' ability to make ends meet financially. Because the majority of the process is done manually, which takes time, correct machinery setup is necessary for installing in order to increase the economic value. By using plant species sustainably, one can aid in conservation efforts provided appropriate legislation prohibiting the harvesting process.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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