ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 8, Issue 5, 2015

ISSN - 0974-2441

Review Article

BUCHANANIA LANZAN SPRENG: A VERITABLE STOREHOUSE OF PHYTOMEDICINES

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Received: 15 April 2015, Revised and Accepted: 11 June 2015

ABSTRACT

Buchanania lanzan Spreng, a dry deciduous forest tree of family Anacardiaceae is widely used by Indian tribes for treating various diseases. Three major chemical constituents of potent medicinal value, namely celidoniol, vomicine, epinitol have been characterized from an organic extract of leaves. Such extracts mainly exhibit antidiabetic, antihyperlipidemic, antioxidant, anti-inflammatory, wound healing, antidiarrheal, antivenom activity including a host of other curative properties. Very recently, unique biomaterials and biofilms are being extracted from seeds, which promise to become a major contributor in pharmaceutical industry. This review attempts to present thorough updated account of ongoing and emerging areas of research of this plant, especially in the field of phytomedicnes and pharmaceuticals.

Keywords: *Buchanania lanzan*, Phytochemicals, Curative properties, Phytomedicine.

INTRODUCTION

Buchanania lanzan Spreng. (Chironji) a well-known forest plant, of family Anacardiaceae. Chironji originated in the Indian sub-continent [1]. The tree is found as natural wild in the tropical deciduous forests of North, Western and Central India mostly with a monsoonal climate.

The tree grows most commonly on yellow sandy-loam soil. The bark is rough and dark grey or black. Leaves are broadly oblong, rounded base with a blunt tip and have straight, parallel veins. Flowers are small, greenish-white. Fruit is a yellowish-red drupe, one seeded, ripens from April to May. Flowering starts from January to March (Fig. 1) [2].

A picture of the twig of Buchanania lanzan is shown with dissecting significant different plant parts like flower, pistil and fruit [2] (Fig. 2).

B. lanzan, being a vulnerable medicinal plant, is included in the Red Data Book published by International Union for Conservation of Nature and Natural Resources. In the recent past, due to excessive felling of trees and overgrazing, considerable reduction in the population of *B. lanzan* in the forest and non-forest areas has been recorded [3]. This destruction has made the species vulnerable to over-exploitation, especially for its nutritive fruits [4,5].

ETHNOMEDICINAL IMPORTANCE

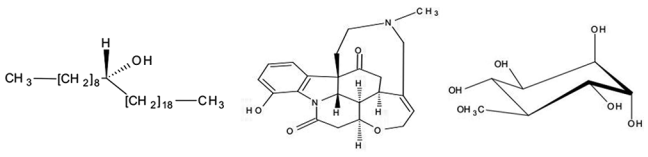
The tribal people often consume and sale the highly nutritious seeds to sustain and also to earn their livelihood. The seeds possess 3.0% moisture and are rich in lipid/fat (59.0%), protein (19.0-21.6%), starch/carbohydrate (12.1%), fibre (3.8%), minerals such as calcium (279.0 mg), phosphorus (528.0 mg), iron (8.5 mg) and vitamins such as thiamine (0.69 mg), ascorbic acid/vitamin C (5.0 mg), riboflavin (0.53 mg), niacin (1.50 mg) and also contain 34-47% fatty oil. The seeds are also used as expectorant and tonic. The oil extracted from kernels is applied on skin diseases and also used to remove spots and blemishes from the face. The root is used as expectorant, in biliousness and also for curing blood diseases. The juice of the leaves is digestive, expectorant, aphrodisiac, and purgative. The gum after mixing with goat milk is used as an analgesic [3]. Seed collection should be done from 2nd to 3rd week of May for quality seed collection with respect to fruit weight, kernel weight, germination percent, and chemical content i.e. oil, protein and sugar contents. Destructive harvesting could be checked by educating forest tribal population about collection of ripe fruits at proper time i.e. from 2nd to 3rd week of May without damaging the trees by organized collection [6].

This review is an attempt to present an updated comprehensive account about the ethnomedicinal and phytochemical investigation carried out on *B. lanzan*.

PHYTOCHEMICAL PROFILE

This plant like many other forest plants is storehouse of important unknown phyto-medicines. Till now sporadic reports have been published that reveals that specially leaf, bark, and seed are the major source of various important metabolites of great pharmaceutical value. Of late, researchers are focusing their attention on various forest plants including Chironji.

The leaves are reported to contain tannins, triterpenoids, saponins, flavonoids, kaempferol-7-o'glucosides, quercetin-3-rahmnoglucoside, quercetin, gallic acid, kaemferol, and reducing sugars, including a new glycoside, and myricetin-3'-rhmnoside-3-galactoside [7,8]. Three major chemical constituents isolated from the methanolic extract of leaves, characterized based on chemical tests and spectral analysis such as infrared, H nuclear magnetic resonance, mass spectroscopy were epinitol, vomicine, and celidoniol [9].



Celidoniol **Vomicine** **Epinitol**

The bark contains tannins, alkaloids, and saponins.

The seed and seed oil contains fibres, carbohydrates, mineral, fats, vitamin B_1, B_2, B_3, C, calcium, chlorine, copper, iron, magnesium, phosphorus, potassium, sodium, sulfur, fatty oil, β-amyrin [10]. The fatty acid composition of B. lanzan seed oil, determined by urea complex formation and gas liquid chromatography is found to contain following: Myristic, 0.6%; palmitic, 33.4%; stearic, 6.3%; oleic, 53.7%;

and linoleic, 6.0%. Triglyceride compositions of the native seed oil and its randomised product are calculated from the fatty acid compositions of the triglycerides and of the corresponding 2-monoglycerides produced by pancreatic lipase hydrolysis. The oil is composed of 3.2%, 35.8%, 45.5%, and 15.5% tri-saturated, monounsaturated di-saturated, di-unsaturated mono-saturated and tri-unsaturated glycerides, respectively. The special characteristic of the B. lanzan seed oil is its content of 22.7%, 31.0%, and 11.3% dipalmitoolein, dioleopalmitin, and triolein, respectively [11].

PROPAGATION AND ITS PROBLEM

The seeds are the major source of regeneration of *B. lanzan* in India. The major problem in the reforestation of *B. lanzan* is the low germination frequency of seeds due to seed borne fungal contamination (endogenous) during storage of seeds. Moreover, the fungal attack by *Fusarium* sp. (wilting disease) is common after sowing the seeds insoil. The seedlings are also attacked by *Fusarium monililforme* var. *Subglutinans* Wr. and Rg., *F. semitectum* Berk and Rav present in soil [12]. Excessive humidity and high temperature make environment conducive to fungal contamination. The seeds exposed to sunlight fail to germinate and soon lose their viability. Another hindrance is the presence of a hard seed coat which leads to low germinating capability. Therefore, in order to ensure further supply of this commercially useful tree species, other breeding methods are required. Plant tissue culture is one of the most effective techniques to micro propagate a plant of interest [13].

IN VITRO STUDIES

Calli are initiated from immature zygotic embryos cultured on Murashige and Skoog (MS) medium supplemented with various combinations of 2,4-dichlorophenoxyacetic acid (2,4-D), 6-benzyladenine (BA) and/or 1-naphthaleneacetic acid (NAA). The highest frequency (60%) of somatic embryo induction is observed on MS medium fortified with 4.53 µM 2,4-D, 5.32 µM NAA, and 4.48 µM BA. Although the combination of 2,4-D and NAA is found favorable for induction of somatic embryos, the maximum number of embryos (27.3±3.4 per culture) are recorded only on the medium containing 2.26 µM 2,4-D and 9.96 µM BA [14].

There is no report of somatic embryo encapsulation to produce synthetic seeds of *B. lanzan*. Synthetic seeds are defined as artificially encapsulated somatic embryos, shoot tips, axillary buds or any other meristematic tissue, used for sowing as a seeds and possess the ability to convert into whole plant under *in vitro* and *in vivo* conditions and keep its potential also after storage [15]. Plant regeneration from alginate encapsulated nodal segments and somatic embryos of *Dalbergia sissoo*, respectively was reported [16,17]. Alginate encapsulation of shoot tips and nodes for short term storage of *Corymbia torelliana* × *Corymbia citriodora* was done [18]. With the help of synthetic seeds, mass clonal propagation and *ex situ* conservation of *B. lanzan* can be done.

The decoated seeds are cultured on MS medium enriched with various concentrations of auxins and cytokinins alone or in combination. Combinations of benzyl amino purine (BAP) and NAA are found to be superior to BAP and indole butyric acid. MS medium supplemented with 22.2 mM of BAP and 5.37 mM of NAA promoted formation of the maximum number of shoots. Furthermore, each of these elongated shoots when independently transferred for rooting in MS medium with varying concentrations of kinetin, profuse rooting (66.7%) was noted only in kinetin at 23.2 mM, 15 days after culturing (RH 60%) [13].

MEDICINAL AND CURATIVE PROPERTIES

B. lanzan is a widely used plant with a history of traditional medicinal use for the treatment of various diseases. It is used in the form of decoction to treat intrinsic haemorrhage, diarrhoea with blood and as tonic. Grown up child who has left the breast milk should be given sweet bolus prepared of *B. lanzan* kernels, madhuka (*Glycyrrhiza glabra*) honey, parched paddy and sugar candy. Kernels made into a powder and used with milk as aphrodisiac and in case of fever and burning sensation. Powder of the bark mixed with honey is useful in blood dysentery [19].

This plant has a long history of folk use in tribal societies across tropical regions of the world. At present, in this era of herbal science, in depth research is being carried out in every such plants to discover pharmaceutically active novel magic drugs. In this review, we tried to project a comprehensive account of the global effort already undertaken to explore the phytomedicinal wealth of *B. lanzan*.

Anti-inflammatory and analgesic activities

Inflammation is considered as a primary physiologic defence mechanism that helps body to protect itself against infection, burn, toxic chemicals, allergens, or other noxious stimuli. The *in vivo* anti-inflammatory activity is evaluated in rats by using carrageenan-induced paw edema, as an acute model and formaldehyde induced arthritis as a chronic model. The methanolic extract of *B. lanzan* kernel (200 mg/kg body wt) significantly decreased paw volume, after oral administration of the extract [20]. The methanolic extract of the leaves of *B.lanzan* at different doses used showed good anti-inflammatory activity, which has been done significantly, by the formation of oedema induced by carrageenan. These results are also comparable to aspirin, the reference drugs used in this study. It indicates the efficacy of the methanolic extract as a therapeutic agent in acute as well as chronic inflammatory conditions [21]. The methanolic extract isolated from *B. lanzan* roots showed significant anti-inflammatory activity and analgesic activity. The extract at dose 400 mg/kg significantly reduced the oedema formation of rat paw at 1 and 3 hrs after carrageenan injection. Analgesia produced by methanolic extract in thermally and chemically induced pain model 400 mg/kg was more significant ($p<0.01$) when compared to that of MBL 200 mg/kg [22]. Soxhlet solvent extract of *B. lanzan* bark was assessed for its capacity to inhibit 15-lipoxygenase (LOX) and human cyclooxygenase-2 (COX-2). Methanolic extract inhibited LOX in a dose-dependent manner. Amongst the tested concentration, complete 15-LOX inhibition was observed at 200 µg. It inhibited 73.58% of the human COX-2 at 50 µg concentration [23].

Antioxidant activity

Antioxidants help to deal with oxidative stress which is caused by free radical damage. *In vitro* antioxidant activity is performed on metanolic extract of *B. lanzan* kernel by 1, 1-diphenyl-2-picryl-hydrazyl (DPPH) and reducing power method. Quantitative estimation of total polyphenolic content of the extract is estimated by Folin-Ciocalteu method. The extract exhibits significant antioxidant activity. Total polyphenolic content is found to be 16.82%±23 mg of gallic acid equivalent/100. Presence of phytochemicals such as triterpenoids, saponins, and tannins in the extract might contribute to the observed antioxidant activity [20]. The *in vitro* antioxidant activity of phenolic compounds in the methanol and acetone extract of *B. lanzan* root is established. Both extract shows good degree of electron donation capacity in terms of relative reductive efficiency (RRE), but methanolic extract shows more RRE (0.79) value as compared to acetone extract (0.60) due to more content of **phenolics**. In cyclic **voltammetry** measurement lower oxidation potential of methanol extract shows higher antioxidant efficacy. In DPPH system, the strongest radical scavenging activity was exhibited by the methanolic extract (EC_{50} = 0.24±0.02) [24]. Soxhlet solvent extract of *B. lanzan* bark exhibited DPPH scavenging capacity to a varied extent. Methanolic extract could scavenge 2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) radicles with IC_{50} of 0.25 mg/ml. As a measure of anti-ageing effect, anti-hyaluronidase and anti-elastase activity is measured. The extract inhibited both in a dose dependent manner. The extract abolished elastase activity and inhibited hyaluronidase as observed in zymogram by substrate-gel assay. The methanolic extract could prevent damage to DNA from hydroxyl radicals produced during Fenton reaction. An absence of hemolytic activity for this extract suggests the non-toxic nature [23]. Methanolic extract of *B. lanzan* leaf significantly ($p<0.05$) increased antioxidant activity as evidenced by increase in super oxide dismutase, catalase, glutathione, and decrease in the activity of lipid peroxidation (LPO) [25].

Antidiabetic and antihyperlipidemic activity

Diabetes mellitus is a chronic metabolic disease caused by an absolute or relative lack of insulin and or reduced insulin activity. Hyperlipidemic condition is metabolic complication of both clinical and experimental diabetes [26]. Low density lipoprotein in diabetic patients leads to abnormal metabolism and is associated with increase in very low density lipoprotein (VLDL) secretion and impaired VLDL catabolism. Ultimately, this leads to atherosclerotic plaque formation [27]. Wistar rats are divided into nine groups of six animals each, and 40 mg/kg of streptozotocin or streptozotocin with nicotinamide is administered intraparitonially to induce Types I and II diabetes. Those with blood glucose levels >190±8 mg/dl are administered the methanolic leaf extract of *B. lanzan* (100 or 200 mg/kg, body weight) or positive control for 21 days. Blood glucose and lipid profile are evaluated. Following induction, blood glucose level rose to 327.7±47.4 mg/dl, compared to the normal value of 910±3.2 mg/dl. Administration of the extract (100 or 200 mg/kg) significantly ($p<0.05$) decreased blood glucose level, serum lipid profile, and the extract exhibits antidiabetic and antihyperlipidemic activities in diabetic rat and needs to be further investigated for the treatment of both Types I and II diabetes mellitus [25].

Adaptogenic activity

Adaptogens cause an adaptive reaction to a disease and are useful in many unrelated illness and appear to produce a state of non-specific increased resistance during stress resulting in stress protection [28]. The methanolic extract of *B. lanzan* leaves are evaluated for adaptogenic activity using the swim endurance model in all groups under normal and stressed conditions. Urinary vanillyl mandelic acid (VMA) and ascorbic acid are selected as non-invasive biomarkers to evaluate the antistress activity. The 24 hrs urinary excretion of VMA and ascorbic acid are determined by spectrophotometric methods. Daily administration of the extract at doses of 10, 20, 30, 40 and 50 mg/kg body weight prior to induction of stress inhibited stress-induced urinary biochemical changes in a dose-dependent manner without altering the levels in normal control groups. The methanolic extract exhibited significant anti-stress activity [29].

Effect on genotoxicity and oxidative stress

Exposure to various environmental factors leads to free radical formation. The most common form of free radicals is oxygen. When an oxygen molecule becomes electrically charged, it tries to steal electrons from other molecules, causing damage to the DNA and other molecules and therefore cause mutagenesis [30]. To protect against oxidative damage, animals have many different types of antioxidants defences, these antioxidants decrease mutagenesis and carcinogenesis, in two ways: By decreasing oxidative DNA damage and by decreasing cell division [31]. The ethanolic extract of *B. lanzan* bark is used against cyclophosphamide induced genotoxicity and oxidative stress in mice. The prevalence of micronuclei in bone marrow, the extent of LPO, reduced glutathione and the status of the antioxidant enzymes, superoxide dismutase and catalase in liver of mice are used as intermediate biomarkers for chemoprotection. LPO and associated compromised antioxidant defences in cyclophosphamide treated mice are observed in the liver. Pre-treatment with *B. lanzan* extract 250, 500, and 1000 mg/kg, body weight, daily for 7 days significantly reduced the chromosomal damage and LPO with concomitant changes in antioxidants and detoxification systems. These results point out the presence of chemopreventive phytoconstituents in the crude extract offering protection against cyclophosphamide induced genotoxicity and oxidative stress in mice [32].

Antidiarrheal activity

Diarrhea is defined as an increase in the frequency, fluidity, or volume of bowel movements and is characterized by increased frequency of bowel sound and movement, wet stool, and abdominal pain [33]. Castor oil induced diarrheal test is used to assess the anti-diarrheal activity and gastrointestinal tract transit of charcoal meal test is used to assess the anti-propulsive activity of the ethanolic extract of *B. lanzan* roots along with phytochemical analysis. The ethanolic extract of *B. lanzan* roots significantly reduced fecal output in castor - oil induced diarrhea and also reduced the number of diarrheal episodes. *B. lanzan* significantly delayed the onset of diarrhea induced by castor oil and reduced the number of animals exhibiting diarrhea. *B. lanzan* efficiently reduced the intestinal propulsion of charcoal meal in mice. The data obtained indicate that the ethanolic extract of *B. lanzan* roots has antidiarrheal activity. Tannins present in *B. lanzan* probably contribute to its antidiarrheal property [34].

Antiulcer activity

Peptic ulcer disease is a serious gastrointestinal disorder that requires a well-targeted therapeutic strategy. The ethanolic extract of *B. lanzan* roots is investigated for its antiulcer activity. To assess the antiulcer activity of varied concentrations of the extract (200 and 400 mg/kg orally) evaluated for ethanol induced ulcer in mice and pylorus ligation induced ulcer in rats. The ethanolic extract showed a dose-dependent protection against gross damaging action of ethanol and pylorus ligation on gastric mucosa of animals. The treatment with the extract showed significant protection of ulcer index in both the models as well as also inhibited the pylorus ligation-accumulated gastric secretion. Thus, the extract is in possession of good preventive and therapeutic action on the gastric ulcers [35].

Wound healing activity

The ethanolic extract of *B. lanzan* fruits was used in Albino rats for wound healing activity and used to study the effect in dexamethasone suppressed wound healing. Three wound models *viz*., incision, excision and dead space wounds were used in this study. The parameters studied are breaking strength in case of incision wounds, epithelialization and wound contraction in case of excision wound and granulation tissue dry weight, breaking strength and hydroxyproline content in case of dead space wound. The dexamethasone treated group showed a significant ($p<0.001$) reduction in the wound breaking strength when compared to control group in incision type of wound model. Co-administration of *B. lanzan* with dexamethasone significantly ($p<0.001$) increased the breaking strength of dexamethasone treated group. In excision wound model, the percentage of the wound contraction is significantly ($p<0.05$) increased by *B. lanzan* only on 16th day and also it reversed the dexamethasone suppressed wound contraction on the 16 day. *B. lanzan* significantly ($p<0.001$) reduced the time required for epithelialization and reversed the epithelialization delaying effect of dexamethasone significantly ($p<0.001$) [36].

In-vivo wound healing supporting study mediated by carrageenan induced paw edema as anti-inflammatory activity. Herbal gel was formulated incorporating one of the active ethyl acetate sub-fractions in two concentrations (1% and 5%). Gel was evaluated for its spreadability, pH, color, consistency and appearance. The 5% gel exhibited significant increase in percentage of wound contraction as well as growth in tensile strength with 177 g ($p<0.05$) and 181.2 g ($p<0.01$), respectively [37].

Memory booster

Alzheimer's disease is a progressive neurodegenerative brain disorder that occurs gradually and results in memory loss, unusual behavior, personality changes, and ultimately death [38]. Biochemical abnormalities such as reduction of acetyltransferase, acetylcholine biosynthases and increase in acetyl cholinesterase (AChE), and metabolism are strongly associated the degree of cognitive impairment [39]. Petroleum ether extract of seeds of *B.lanzan* (PEB) (500 mg/kg, oral) is studied for its neuro-psychopharmacological effect in experimental rats. Activity of seeds extract on memory acquisition and retention is studied using elevated plus maze and step down apparatus models, and AChE enzyme level at discreet parts of brain is also estimated. Administration of PEB (500 mg/kg) to positive control and treated groups showed significant reduction in transfer latency in elevated plus maze, increase in step down latency in step down apparatus models and reduction of acetylcholine esterase enzyme activity in different regions of the brain as compared with the other groups [40].

Antivenom activity

B. lanzan includes in the list of the plants which have anti-snake venom activity. Fruit and bark extract of *B. lanzan* is used for the treatment of snake bite in Chhattisgarh region [41]. The ethanolic extract of *B. lanzan* bark was studied against toxicity induced by *Naja kaouthia* snake venom by various *in vivo* and *in vitro* studies. The extract was evaluated for neutralization of lethality, myotoxocity, phospholipase A2 activity and human red blood cell lysis produced by *N. kaouthia* snake venom. The extract at 200 mg/kg and 400 mg/kg significantly neutralized the lethality produced at different concentration of snake venom. Myotoxicity also decreased up to a significant level characterized by decline in creatine phosphokinase level. *In vitro* models for assessing hemolytic activity were found to be significantly decreased in the presence of the extract. Both direct and indirect hemolytic study was performed at various concentration of extract. More than 50% of hemolysis was significantly neutralized by the extract. Results showed significant neutralization of toxicity produced by *N. kaouthia* snake venom [42].

Diuretic effect

A diuretic is any substance that promotes the production of urine. The alcoholic fruit extract and n hexane fractions of *B. lanzan* and *Buchanania angustifolia* produced significant diuretic effect at a dose of 500 mg/kg, which appeared to be comparable with that of the standard drug **furosemide**. With the same dose *B. angustifolia* was found to be better diuretic than *B. lanzan*. However, further studies are encouraged to isolate the active phytochemical constituent for exploring exact mechanism of dieresis [43].

NOVEL APPLICATIONS IN MODERN DRUG DELIVERY SYSTEM

Some novel biopolymers have been isolated from the seeds of *B. lanzan* which demonstrates biofilm like activity. These are being tested in modern drug delivery system. A brief account about this emerging area is detailed here.

Ophthalmic biofilm from seed

A novel biomaterial from the seeds of *B. lanzan* was isolated and its biofilm forming ability by formulating various ophthalmic films using polyethylene glycol 400 as plasticizer and biomaterial as biofilm former was evaluated. Four formulations were prepared using biofilm former in different ratios by film casting technique. The formulated ophthalmic films were subjected to various evaluation parameters such as weight variation, uniformity thickness, folding endurance, hardness, surface pH, swelling index, and *in vitro* release studies. The drug release studies from the formulated ophthalmic films exhibited a promising stability, swelling index, folding endurance, and sustainability for a period of 8 hrs. The isolated biofilm former acts as a novel film former for formulating various ophthalmic films [44].

Biopolymer as micro emulsifier

A novel biomaterial from the seeds of *B. lanzan* was isolated and its bio stabilizing ability by formulating various zidovudine micro emulsions using sunflower oil as oil phase and biomaterial as bioemulsifier was evaluated. Three different zidovudine microemulsions were formulated using the bioemulsifier in different concentrations. The formulated micro emulsions were subjected to various evaluation parameters such as globule size, pH effect of centrifugation, viscosity, surface tension, and *in vitro* drug release. The formulated micro emulsions exhibit uniform globule size, promising stability against centrifugation effect in comparison to standard emulsion. The drug release studies from the formulated micro emulsions exhibited a promising transparency, stability, uniform globule size and shape, surface tension for a period of 24 hrs. The isolated bio-emulsifier acts as novel emulsifier for formulating various drug loaded micro emulsions [45].

Mucoadhesive tablets for sustained release drug delivery system

Mucilage obtained from seeds of *B. lanzan* evaluated for oral mucoadhesive drug delivery system containing losartan potassium. Physiochemical characteristics of mucilage, such as swelling index, microbial count, viscosity, hydration capacity, flow property, and pH were studied. The mucilage was evaluated for its mucoadhesive properties in compressed tablet, containing losartan potassium. Granules were prepared by wet granulation process using polyvinylpyrrolidone as binding agent. Mucilage was used in three different concentrations i.e. 21, 42 and 55% w/w. The tablet were prepared and evaluated for its physical property. Further *in vitro* dissolution and swelling index was determined. The property of bio adhesive strength of isolated mucilage was compared with Guar gum and HPMC E5LV, which was used as standard mucoadhesive agent concentration. Result revealed that tablets had good physiochemical properties, and drug release was retarded as concentration of mucilage increased. Formulations were subjected to stability studies for 3 months, all formulations showed stability with respect to release pattern. These results indicate that the seed mucilage can be a suitable excipient for oral mucoadhesive drug delivery system [46].

CONCLUSION

This review attempts to assess multivarious research interest on *B. lanzan* highlighting current achievements, especially in the field of phytochemistry, phytomedicines and other emerging area across the world. The information that we presented here definitely exhibits immense prospect of organic solvent extracts in curing and/or mitigating various human problem. Extracts of polar solvents from different plant parts are found to be specially promising in treatment of inflammations. Moreover such extracts especially from bark and

Fig. 1: A portion of the inflorescence (panicle)

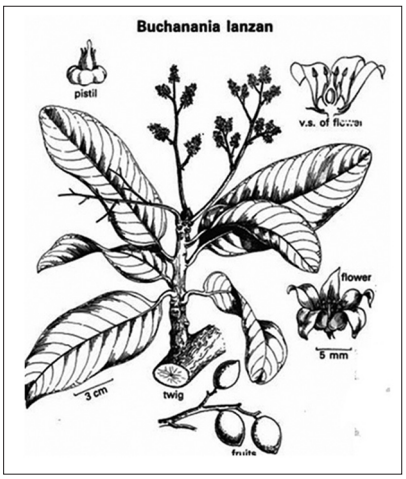


Fig. 2: A twig of *Buchanania lanzan* showing significant different plant parts

seed kernel definitely demonstrate strong reactive oxygen species scavenging activity. Another curious property of these extracts is in wound healing. An effective gel based remedy from bark extract has been formulated to cure wounds, which is under trial at present. One of the most significant findings is the antidiabetic property of the leaf extracts. The fact that tribal regularly consumes leaf decoctions for general well-being may be correlated with this antihyperlipidemic activity. In conclusion, we observed that, like many other unexplored forest plants, *B. lanzan* holds real promise as a veritable store house of magic chemicals that will surely benefit mankind in coming decades.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the infrastructural support from UGC Centre of Advanced Study, Department of Botany, University of Burdwan.

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