

DIVERSITY AND ETHNO-BOTANICAL POTENTIAL OF TREE PLANTS OF KATARNIAGHAT WILDLIFE SANCTURY, BAHRAICH (UP) INDIA: AN OVERVIEW-II.

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ABSTRACT

The plants are multipurpose, ethnobotanical, nutrimental, ethnomedicinal, ethnoveterinary and of environmental use in agro-forestry which provide shade, habitat for organisms, soil improvement, etc, many useful products are also obtained such as fruits, timber, fire wood and variety of metabolic chemicals which may be used in the form of home remedies and for traditional medicine. In Katarniaghat Wildlife Sanctuary there are fifty five tree plant species representing forty five genera belonging to thirty one families. Moraceae was found to be the largest family with seven plant species whereas

Euphorbiaceae and Mimosaceae with five; Anacardiaceae, Myrtaceae and Rubiaceae with three; Caesalpiniaceae, Ehretiaceae, Papilionaceae and Louraceae with two and rest twenty one families viz., Rutaceae, Apocyanaceae, Baringtoniaceae, Bombocaceae, Dilleniaceae, Ebenaceae, Tiliaceae, Ulmaceae, Malvaceae, Lythraceae, Sapotaceae, Annonaceae, Rutaceae, Sapindaceae, Dipterocarpaceae, Sterculiaceae, Bignoniaceae, Verbinaceae, Combretaceae, Meliaceae and Rhamnaceae with single plant species only. Considering the multipurpose importance of these trees of KWS, the present overview is an attempt to summarise the information's available on these plant which all are yet not popular due to one reason or the other despite providing an array of benefits.

KEYWORDS: Bahraich, Ethnobotanical, Ethnomedicinal, Ethnoveterinary, Katarniaghat Wildlife Sanctuary, Nutrimental Tree Plants.

INTRODUCTION

We cannot survive without plants. We depend on plants for food. directly in the form of grains, roots and tubers, fruits, vegetables, spices, oil and beverages. Much of our food also

comes indirectly from plants. We get our meat and milk from animals that are dependent on plants for food. Plants provide fuel, either as firewood or in the form of fossil fuel, to cook our food, keep us warm, run our machinery and light up our homes and cities. We also depend on trees for construction materials to build our houses and to craft our furniture. From cotton and flax we get fibres for our clothes. Plant dyes colour our clothes, at least before synthetic dyes were developed. In cities and towns, trees provide shade and shelter, and their flowers brighten the surroundings. Plants in parks and gardens contribute to the serene and peaceful environment, making such places favourite retreats (Chin, 2005).

The knowledge of utilizing wild plants was painstakingly passed on from generation to generation as a database of valuable information of the plants around him. It is natural to assume that certain members of the tribe were gradually entrusted with such knowledge. These were variously known as shamans, bomohs, healers or witchdoctors. As communications between settlements was then poor, it is likely that such knowledge developed independently in different locations (Chin, 2005). The primitive man, through his trial and error, has selected many wild fruits which are edible and subsequently domesticated them which played a very vital part in supplementary diet knowingly or unknowingly. Although due to the ignorance of modern generation the importance of wild plants has recently been decreasing yet many people specially in rural areas still use them extensively as a supplementary to their basic food requirement. A scientific study of wild fruits is important for the potential sources which are protective foods. The nutrients/pigments present in the fruits prevent different degradative/ageing process in our body and thus via restoring health offer longevity (Singh, 2011). These wild fruits would be utilized at the time of scarcity or cultivated as a source of food material for ever increasing population (Rashid *et al.*, 2008).

Biological resources are being viewed as national capital, waiting to be tapped for their potential utility, but at the same time demanding to be conserved for posterity. India being a tropical subcontinent has always supported a wonderful diversity of plants. Indian culture made use of its plant resources to maintain the health of the society, people and pets alike. Several traditions, rituals, taboos, totems, similes and beliefs related with plants, also got associated with the life of the Indian people. Plants also became intricate part in various spheres of the human society. The knowledge of use of plants got transferred from one to another generation since time immemorial. A good number of plants are being used curing various ailments and also for edible purposes. A large number of species used during

emergency and famine are not known to urban people but frequently used by tribal's. Due to several natural and manmade factors a good number of such plants are passing through serious threat.

India has been considered as one of the 17 mega-diversity centers of the world with a wide range of phyto-geographical variations. It consists of about 64 million hectares forest covers out of which 86% is tropical forest comprising 54% dry deciduous, 37% moist deciduous and 9% wet evergreen & semi-evergreen (Kaul and Sharma, 1971). As a characteristic feature, the tropical forest shows a huge variation in tree species diversity place to place (Pitman *et al.*, 2002). Among the different phyto diverse regions found in the country, the Terai region is one of them existing from Uttarakhand to West Bengal. It is the transition zone between two eco-climatic zones, the Gangatic plain towards south and Bhabhar towards north, along with the sub- Himalayan tracts (Tripathi and Singh, 2009). The region has lost majority of its natural forest due to deforestation chiefly for agriculture and lack of sustainable forest management in last many centuries (Bajpai *et al.*, 2012a,b). Now the natural forests of the region have been restricted to the wildlife protected areas only. Katarniaghat Wildlife Sanctuary (KWS) is also one of them.

Medicinal plants were used by people of ancient cultures without knowledge of their active ingredients. There is an ever increasing need to limit toxic clinical drugs (Lowan, 1993). Plants produce a diverse range of bioactive molecules making them a rich source of different types of medicines (Steffens, *et al.*, 1982). About 50% of all modern clinical drugs are of natural product origin and natural products play a vital role in modern drug development in the pharmaceutical Industry.

Traditional medicines are used by about 60 percent of the world's population. These are not only used for primary health care just in rural areas, in developing countries, but also in developed countries, where modern medicines are predominantly used. While the traditional medicines are derived from medicinal plants, minerals, and organic matter, the herbal drugs are prepared from medicinal plants only. Use of plants as a source of medicines has been inherited and is an important component of the health care system in India. There are about 45,000 plant species in India, with high concentration in the region of Eastern Himalayas, Western Ghats and Andaman Nicobar Island. The officially documented plants with medicinal potential are 3,000 but traditional practitioners use more than 6,000. India is the largest producer of medicinal herbs and is appropriately called the botanical garden of the world. In

rural India, 70 percent of the population is dependent on the traditional system of medicine, the Ayurveda, which is the ancient Indian therapeutic measure renowned as one of the major systems of the alternative and complementary medicine (Bhatia, *et al.*, 2013).

In Katarniaghat Wildlife Sanctuary there are fifty five tree plant species representing forty five genera belonging to thirty one families. Moraceae was found to be the largest family with seven plant species whereas Euphorbiaceae and Mimosaceae with five; Anacardiaceae, Myrtaceae and Rubiaceae with three; Caesalpiniaceae, Ehretiaceae, Papilionaceae and Louraceae with two and rest twenty one families viz., Rutaceae, Apocyanaceae, Baringtoniaceae, Bombocaceae, Dilleniaceae, Ebenaceae, Tiliaceae, Ulmaceae, Malvaceae, Lythraceae, Sapotaceae, Annonaceae, Rutaceae, Sapindaceae, Dipterocarpaceae, Sterculeaceae, Bignoniaceae, Verbinaceae, Combretaceae, Meliaceae and Rhamnaceae with single plant species only. The available literature reveals that most of the tree plants found in Katarniaghat Wildlife Sanctuary (KWS) are multipurpose, ethnobotanical, nutrimental, ethnomedicinal, ethnoveterinary and of environmental use in agro-forestry which provide shade, habitat for organisms, soil improvement, etc, many useful products are also obtained such as fruits, timber, fire wood and variety of metabolic chemicals which may be used in the form of home remedies and for traditional medicine. Considering the multipurpose importance of these trees of KWS, the present overview is an attempt to summarise the information's available on these plants which are yet not popular due to one reason or the other despite providing an array of benefits.

STUDY AREA

The study area Katarniaghat Wildlife Sanctuary (KWS) is situated in Bahraich district of Uttar Pradesh in India. It lies along Indo-Nepal international boarder and is situated between $27^{\circ} 41' - 27^{\circ} 56' \text{ N}$ and $81^{\circ} 48' - 81^{\circ} 56' \text{ E}$ covering an area of 440 km^2 with 116 to 165 m elevation. The sanctuary comes under the tropical moist deciduous forest of the Himalayan Terai-Bhabar region (Champion and Seth, 1968; Rodgers and Panwar, 1988). The forest of the sanctuary area has been classified into two major forest types (i) The Sal forest and (ii) The miscellaneous forest (Champion and Seth, 1968). Pedagogically the study area is made up of the alluvial soil of the Kaudiyala and Saryu rivers and its tributaries flowing adjoining to it. Geologically the sanctuary area has been divided into high and low land areas.

CLIMATE

A typical tropical monsoonal climate with three distinct seasons i.e. summer (April to June), winter (November to February) and warm-rainy (July to September) prevails in the study area. March and October are considered as transition months between the seasons. The mean maximum temperature ranges from 22⁰C in January to 40⁰C in May and the mean minimum temperature ranges from 8⁰C in January to 27⁰C in June. The annual rainfall ranges from 36 to 142 cm in winter, 34 to 662 cm in summer and 1294 to 1689 cm in warm-rainy seasons (Bajpai *et al.*, 2012).

OBSERVATIONS

At present the KWS has been divided in to three types of forests- miscellaneous forest, sal forest and teak plantation forest. The IVI of the plants in all the three forests are presented respectively while description of the plant. Since the list of the trees is big, the description of all is beyond the scope of this manuscript so we have taken five plants viz., **Barringtonia acutangula**, **Bauhinia purpurea**, **Bridelia retusa**, **Buchanania cochinchinensis**, and **Cassia fistula** for detail description.

Barringtonia acutangula (Linn). Gaertn.; Paniha, Samundarphal, Hijagal, Indian Oak (Barringtoniaceae, Lecythidaceae):

- **Synonym: Eugenia acutangula** Linn.

- It is an evergreen tree. It grown up to 13 mt tall with simple, alternative leaves with short petioled cuneate-elliptic, inflorescence 40 cm long pendulous racemes, 1.5 cm across, fragrant and dark scarlet flower with four lobed ovate calyx and 2 celled ovary. It has ellipsoid to ovoid berry, 1.5×0.6 cm, fibrous, truncate at both ends, crowned by small persistent calyx. Fruits quadrangular oblong The berry bears one ovoid black seed. . Abundant in aquatic and semi aquatic habitats, chiefly along the margins of nullah and rivulets. It prefers a permanently moist but well drained soil and position full sun. Phenology: April-May, September-November. The IVI value of *Barringtonia acutangula* in Katarniaghat Wildlife Sanctuary in Miscellaneous forest, Sal forest and Teak Plantation is 1.8, 0.0, 0.0 respectively.

➤ Ethnobotanical potential

- It is sometimes grown to provide shelter from the wind as wind break.
- The young leaves are eaten as vegetables.

- The flowers produce copious nectar and attract bees, who produce a good honey from it.
- The bark is a source of tannins.
- The heartwood is light pinkish to reddish-grey, or in some cases nearly white towards the outside of the log; it is not distinctly demarcated from the sapwood. Texture is medium to fine, the grain straight and the wood lustrous with a smooth feel. The wood is light in weight, soft and fairly durable. It is easy to saw, works well by hand and on machine and finishes to a dull smooth surface. It cut on the quarter it presents a noticeable silver grain, which should be taken advantage of in cabinet work, as it apparently does not warp much. If so cut. It is used for boat building, well constructions, rice pounders, cabinet work and carts. The wood turns black, if buried in mud.
- The bark is used to intoxicate fish.
- **Nutrients** Cellulose, Gallic Acid, Protein, Saponins, Starch, Stigmasterol and Triterpenoids.

➤ PHYTOCHEMICAL CONSTITUENT

- From wood of *Barringtonia acutangula* a new hexa-hydroxy triterpene, now named tanginol, isolated besides β - and γ -sistosterols, Barringtogenic acid and an unknown triterpene carboxylic acid (Sastry and Ramchandra, 1967).
- Nine tri-terpene saponins is actually documented that has acutangulosides A-F along with acutanguloside DF methyl esters and a one triterpene aglycone which were separated from a water extract of the bark of *Barringtonia acutangula* (Mills *et al.*, 2005).
- A new triterpene acid, was isolated from the fruits (Barua *et al.*, 1976).
- Three monodesmosidic glucuronide sponins of barringtogenol C, named barringtosides A, B and C have been isolated their methyl esters from the dried seeds of *Barringtonia acutangula* (Pal *et al.*, 1994).
- The bark contains 3, 3'-dimethoxy ellagic acid, dihydromyticetin, gallic acid, bartogenic acid and Stigmesterol (Sun *et al.*, 2006).
- Leaves were reported to possess steroidal compounds such as barringtogenic acid, tabgolic and acutangulic acids while the fruits yielded sponins based on barringtogenol B, C and D. bark contained tannin (16%) and heartwood contained barringtogenic acid, barringtogenol E and A new triterpene diacid, barrinic acid (Anonymous, 2000).

➤ Ethnomedicinal potential

- Plants are invaluable sources of pharmaceutical products and plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used many species for centuries to treat a variety of diseases (Patel *et al.*, 2011, Kaur *et al.*, 2013).
- It is a plant traditionally used for the cure and treatment of many ailments. In Ayurveda, its root, leaves and fruits are used in the treatment of jaundice, liver disorders, stomach disorders, leprosy and splenic disorders since many centuries (Kirtikar and Basu, 1935).
- It is used in the folklore in condition of kapha and pitta, leprosy, arthralgia, plumbago, skin disease, diarrhea, flatulence, haemorrhoids as an anthelmintic, various parts of *Barringtonia acutangula* have been used as medicine for curing various ailments like hemiplegia pain in joints, eye diseases, stomach disorders, cough leprosy, intermittent fever, splenic disorders and poisoning (Jain, 1991).
- The roots, leaves, fruits and seeds of *Barringtonia acutangula* are used for the therapeutic purpose. Powders from the stem bark seed and root bark utilized for treating various diseases (Warrier *et al.*, 1994).
- It is being used in asthma, blood impurity, diabetes, diarrhea, dyspnea, gingivitis, wounds.
- Its needs are to treat headache.
- The bark mixture of *Barringtonia acutangula* is used as a mouthwash to cure gum problems like gingivitis.
- Its bark is effective for the treatment of wounds.
- The mixture of bark and fruit is a good herbal remedy for diarrhoea.
- Its leaf juice is used to treat diarrhea.
- Its fruit seeds along with ginger juice is used to treat colic.
- The decoction prepared from its fruit and leaves is used to combat splenic disorders like spleen enlargement.
- Its fruit is best for combating venereal sores.
- The decoction of the bark is given as astomchic.
- The scraped bark is squeezed with coconut meat and the juice is consumed daily for treatment of pneumonia, diarrhea and asthma.
- Externally, it is used for poulticing wounds, ulcers, sores and itches.
- The root is considered aperients.
- Powered seed in small doses are given to children as an expectorant and emetic. It is also used as anthelmintic.

- The seed is also used to treat ophthalmia.
- The liquid obtained by pounding the wood in water is considered as haemostatic and given in menorrhagia.
- The leaves are used to treat diarrhoea and decency
- The bark is used in blood deficiency and for vitality (Bajpai *et al.*, 2016).
- The fruits are used in biliousness, bronchitis, eye sores, gleet, lumber pain, nasal catarrh and hallucination (Bajpai *et al.*, 2016).

➤ PHARMACOLOGICAL ACTIVITIES

▪ Antibacterial activity

- *Barringtonia acutangula* is usually confirmed to be a highly effective anti-bacterial agent. Aqueous, ethanolic, petroleum ether and chloroform extracts of *Barringtonia acutangula* has been evaluated against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella Pneumoniae*, *Enterococcus faecalls* and *Esherichia coli* the major urinary tract infection causing pathogens. The result showed that the Ethanol (95%) extract of *Barringtonia acutangula* exhibited broader spectrum of inhibition followed by chloroform, petroleum ether and aqueous extracts against the urinary tract pathogens under test (Sahoo, *et al.*, 2008).
- Crude extracts and VLC fraction from the stem bark of *Barringtonia acutangula* has also been screened for their antibacterial activities against two gram positive bacteria and two gram negative bacteria using a micro dilution titre assay. Petroleum ether extract showed good activity against all test organisms (Rahman *et al.*, 2005).
- The leaves extracts of *Barringtonia acutangula* was screened for 'in vitro' antibacterial potential in petroleum ether, ethyle acetate and ethanol against *Pseudomonas aeruginosa*, *Klebsiella pneumonia*, *Salmonella typhi* and *Salmonella paratyphi*. The ethanolic extract of the leaves of *Barringtonia acutangula* showed maximum antibacterial potential followed by ethyl acetate extract and petroleum ether extract when tested by Agar Disc Diffusion Method (Padmavathi *et al.*, 2012).

▪ Antitumour activity

- The ethanolic leaf extract of *Barringtonia acutangula* has anticancer activity as it inhibited the hepG 2 cell growth.(Woraratphoka *et al.*, 2012).
- The cytotoxic effect of fungal endophyte isolated from *Barringtonia acutangula* was tested by the MTT assay which showed the effect of its secondary metabolities on the cell viability in HT29, humon colon cancer cell line. The fungal extract from endophyte fungi EFB01 &

EFB02 showed 52% and 40% cyto-toxicity respectively when compared to the metabolite from EFB01 (Lakshmi and Selvi, 2013).

- The free radical scavenging and cytotoxicity of the plant by NO assay and MTT assay indicated in the ethyl acetate extract of *Barringtonia acutangula* against Colo 320 cells. Further, DNA fragmentation assay attributed the cytotoxicity that *Barringtonai acutangula* have anti-cancer potential (Florida *et al.*, 2012).

▪ Antioxidant potential

- The antioxidant study of hydroalcoholic extract of plant *Barringtonia acutangula* root (EBA) revealed that the hepatic antioxidant enzyme levels (SOD, CAT and GPx) are significantly decreased in STZ induced diabetic rats with high degree of lipid peroxidation at both test doses (250 mg/kg b.w./p.o. and 500 mg/kg b.w./p.o.) (Babre *et al.*, 2010). Methanolic extract of leaves by in vitro antioxidant assays (DPPH-radical scavenging and reducing power activity) (Kathirvel and Sujatha, 2012).

▪ Hypoglycemic activity

- Aqueous, methanol and chloroform extracts of *Barringtonia acutangula* fruit was evaluated for hypo-glycemic effect in OGTT and Steptozotocin induced hyperglycemic rats. The aqueous extracts of *Barringtonia acutangula* whole fruit at a dose of 400 mg/kg showed significant anti-hyperglycemic action (Khatib and Patil, 2011). In an other stydy, the crude aqueous ethanolic extract from roots of *Barringtonia acutangula* treatment as 250 and 500 mg/kg b.w/p.o. were found to reduce the blood glucose levels, significantly in both normal and glucose fed hyper-glycemic rats (Babre *et al.*, 2010).

▪ Central nervous system depressant activity

- The ethanolic extracts of *Barringtonia acutangula* leaves causes a maximum inhibition of neuronal activity in the central nervous system leads to its depressant activity. The ethanolic extracts of *Barringtonai acutangula* leaves possess significant CNS depressant activity by performing sodium pentobarbitone induced sleeping time assay, locomotor activity assay, rota rod test and exploratory activity (Y-maze test and hole board test). The ethanolic extracts of *Barringtonia acutangula* leaves caused a dose dependent reduction in motor activity in mice (Balaji *et al.*, 2012).

▪ Hepatoprotective effect

- The methanol extract of *Barringtonia acutangula* leaves exhibited significant hepatoprotective activity at a dose 250 mg/kg in carbon tetrachloride (CCL₄) with liquid paraffin (1:1) induced hepatic injury in rats in vivo and in vitro (Mishra *et al.*, 2011).
- In an another study, oral pre-treatment with aqueous extract (water, methanol, acetone, ethanol and petroleum ether) of the leaves of *Barringtonia acutangula* at the doses of 200mg/kg and 400 mg/kg, po showed significant hepato-protective activity against CCL₄ induced hepato-toxicity by decreasing the activities of serum marker enzymes and bilirubin and increasing the protein content in a dose dependant manner (Rashmi *et al.*, 2011).

▪ Antifungal activity

- *Barringtonia acutangula* has showed potential antifungal activity. The leaf extracts (n-hexane, chloroform, ethyl acetate and ethanol) of *Barringtonia acutangula* were subjected to antifungal activity against *Candida albicans*, *Aspergillus flavus*, *Aspergillus fumigatus* and *Aspergillus niger* using Minimum Inhibitory Concentration (MIC) method. The n-hexane extracts inhibited growth of pathogenic fungi at a lesser concentration followed by aqueous, ethanol, chloroform and ethyl acetate (Bharathi *et al.*, 2010).

▪ Anti-nociceptive and anti-inflammatory activity

- *Barringtonia acutangula* root possess significant central and peripheral anti-nociceptive as well as anti-inflammatory activity. Ethanolic extract of root of *Barringtonia acutangula* was evaluated at two doses of 250 mg/kg and 500 mg/kg body weight in mice and rats by using models like hot plate and acetic acid writhing tests for anti-nociceptive activity and Carrageenan induced rat paw edema (acute model) and cotton pellet induced Granuloma (Chronic model for anti-inflammatory activity respectively, both the activities have shown significant result in dose dependent manner (Quader *et al.*, 2013).

▪ Anthelmintic activity

- Ethanolic extract of leaves of plant *Barringtonia acutangula* was evaluated to explore the anthelmintic activity on adult Indian earthworms (*Pheretima postuma*) at the dose of 100 mg/kg. this dose of extracts has shown significant anthelmintic activity comparable to standard drug Piperazine citrate (Padmavathi *et al.*, 2011).

▪ Antidiarrheal activity

- The ethanolic leaf extract of *Barringtonia acutangula* showed significant antidiarrheal activity on castor oil induced diarrheal model in rats (Padmavathi, 2011).
- Methanol extract of *Barringtonia acutangula* leaves and seeds possess good anti-diarrheal activity. The extracts (200 and 400 mg/kg; p.o.) were tested using castor oil and magnesium sulphate-induced diarrheal models evaluate antidiarrheal activity. The extract also showed significant inhibition of defecation in both diarrheal models (Zafar *et al.*, 2012).

CONCLUSION

Medicinal plants form the backbone of traditional medicine. Herbal medicine based on the premise, that plants contain natural substances that can promote health and alleviate illness. Ethnopharmacological studies on such herbs/medicinally important plants continue to interest investigators throughout the world. Plants are invaluable sources of pharmaceutical products and plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used many species for centuries to treat a variety of diseases. Different parts of *Barringtonia acutangula* such as leaves, fruit, roots and axillary bud have been used traditionally to treat pains in body, eye ailments, abdominal disturbances, blood impurities, cold and asthma, diseases of liver, spleen and for diabetes.

❖ **Bauhinia purpurea** Linn.; Kachnar, Kaniar, Vanraja, Kaanchana, Bodanta (Caesalpiniaceae).

Bauhinia purpurea. is a medium sized evergreen tree growing up to 17 m tall. The bark is ashy to dark brown, nearly smooth, young parts brown-pubescent. The leaves are 7.5-15 cm long, rather than longer than broad, cleft about half way down into two acute or rounded bilobed very minutely pubescent when young, base usually cordate, 9-11 nerved; petiole 2.25-3.8 cm long. The flowers are conspicuous, pink and fragrant with five petals. Pedicels 5-13 mm long, stout, tomentose, bract and bracteoles small tomentose, tube 7.5-10 mm long, limb long as the tube. Petals 3.8 to 5 cm long, oblanceolate, long clawed, spreading veined. Stamens usually 3 fertile, others reduced to antherless filaments. Ovary downy, long-stalked; style long; stigma large, oblique. Pod 15-25 by 1.5-2 cm on a tomentose stipe 1.5 to 2.5 cm long, linear, flat, pointed, greenish, tinged with purple till ripe, late in dehiscing. Seeds 12-15 suborbicular, flattened, 1.3 cm. wide and dark brown smooth (Kritikar and Basu, 1991) Phenology: September-March. Though it is native to South China and South eastern Asia, it is

found throughout India, ascending to an altitude of 1300 m in the Himalayan (Khare, 2004). The genus *Bauhinia* consists of three hundred species (Chopra *et al.*, 1996). The IVI value of *Bauhinia purpurea* in Katarniaghat Wildlife Sanctuary in Miscellaneous forest, Sal forest and Teak plantation is 0.5, 0.0, 0.0 respectively.

➤ Ethnobotanical Potential

- The leaves are used as fodder during the lean period (Jha, 1995).

• Medicinal uses

- The young pods and mature seeds of kachnar are cooked and eaten by tribles.

➤ Phytochemecals

- *Bauhinia purpurea* contain major class of secondary metabolites, which are glycosides, flavonoids, saponins, triterpenoids, phenolic compounds, oxepins, fatty acids and phytosterols.

- From the ehtanolic extract of the whole plant of *Bauhinia purpurea* two new oxepins named bauhinia statins 1 and 2 have been isolated and the ehtanolic extract of root provides bauhinia statins 1, 2, 3 and pacharin, exhibit significant growth inhibition against a minipanel of human cancer cell lines (Pettit *et al.*, 2006). The structure have been established on the basis of chemical evidence and spectroscopic methods.

- A novel flavones glycoside, 5, 6-dihydroxy-7-methoxyflavone 6-O-b-D-xylopyranoside was isolated from the chloroform-soluble fraction of the ethanolic extract of *Bauhinia purpurea* stems (Yadav and Tripathi, 2000). Three glycerol derivatives and 6- buty-3-hydroxyflavone derivatives are 2, 3-dihydroxypropyl oleate, 2, 3 dihydroxypropyl linoleate, 2, 3-dihydroxypropyl 16-hydroxy-decanoate and 6-butyl-3-dihydroxyflavone, 6-(3''-oxobutyl)-taxifolin respectively isolated from methanolic extract of heartwood of *Bauhinia purpurea* (Kuo *et al.*, 1998).

- Two new dimoric flavonoids namely bis (3', 4'-dihydroxy-7-methyl-7, 8-furano-5'-mono methylalloxy)-5-C-5-biflavonyl and (4'-hydroxy-7-methyl 3-C- α -L-rhamnopyranosyl)-5-C-5-(4'-hydroxy-7-methyl-3-C- α -D-glucopyranosyl) bioflavonoid with protein precipitating property obtained from 70% aq.

- Acetone extract of *Bauhinia purpurea* leaves (Ragasa *et al.*, 2004). The petroleum ether fraction of ethanolic extract (95%) of *Bauhinia purpurea* leaf gave α -amyrin caprylate on successive column chromatography petroleum ether (60-80°) and chloroform which gives Liebermann-Burchard test of triterpene. The compound is characterized by spectral analysis (Verma and Chandrashekar, 2009).
- In the flower volatile oil of both *Bauhinia purpurea* and *Bauhinia variegata* found monoterpenes (e.g., α -terpinene, limonene, myrcene, linalool, citronellol acetate) and a phenylpropanoid (eugenol) (Wassel *et al.*, 1986).
- The aqueous methanolic extract of fresh flower of *Bauhinia purpurea* gives flavonoid quercetin and flavonoid glycosides isoquercetin, astragalin (Ramchandra and Joshi, 1967), butein 4'-O- β -L-arabinopyranosyl-O- β -D-galactoside (mp 265°) isolated from seed of *Bauhinia purpurea*. This gave the characteristic colour reactions of chalcone and on hydrolysis with 8% SO_4 for the 12 h gave butein and a disaccharide, the component sugars which were found as galactose and arabinose (Bharatiya *et al.*, 1979).
- A new glycoside 3, 4-dihydroxychalcone 4-O- β -L-arabinopyranosyl-O- β -D-galactopyranoside (mp 365°) isolated from seed which gave the characteristic colour reaction of a chalcone and gave 3, 4-dihydroxychalcone, galactose and arabinose on acid hydrolysis (8% ethanol H_2SO_4 for the 12 h). the identify the sugars was confirmed by co-chromatography with authentic samples and by the preparation of their osazones (Bhartiya and Gupta, 1981). After chalcone glycoside were isolated, glycoside-6-4'-Dihydroxy-3'-prenyl-3, 7, 5, 7'-Tetramethoxy flavones-6-O- α -L-rhamnopyranoside from acetone soluble of ethanolic extract from seed of *Bauhinia purpurea*.
- The CH_2Cl_2 extract of root of *Bauhinia purpurea* on purification yield eleven new compounds bauhinoxepin C-J, bauhinobenzofurin A, bauhispirorin A, bauhinol E, two flavonones (-)-stroboponin and demethoxymatteucinol and five known bibenzyls which possess various pharmacological activities (Boophona *et al.*, 2007). All the compounds were characterized by spectral analysis. Kachnar (*Bauhinia purpurea*) seeds were found to 17.5% crude seed oil. The amount of neutral lipids in the crude seed oil was the highest (99% of total lipids), followed by glycolipids and phospholipids, respectively. Linoleic, followed by palmitic, oleic and stearic, were the major fatty acids in the crude seed oil and its lipid classes. The ratio of unsaturated fatty acid to saturated fatty acid, was higher in neutral lipid classes

than in the polar lipid fraction. The oil was characterized by relatively high amount of phytosterols, wherein the sterol markers were β -sistosterol and stigmasterol. β -tocopherol was the major tocopherol isomer with the rest being d-tocopherol (Ramadana *et al.*, 2006). *Bauhinia purpurea* seed is a source of galactose and lactose binding lectin, a peptide which interact with carbohydrate. The amino acid sequence of peptide that bind with lactose is Asp-Thr-Trp-Pro-Asp-Thr-Glu-Trp-Ser and is obtained from *Bauhinia purpurea* lectin by affinity chromatography of peptide with Asp-N endoproteinase of trypsin on column of lactose-sepharose 4B or lactose, maltose, fucose and di-N-acetylchitobiose-Sepharose and by solid phase synthesis. This peptide exhibits lactose binding activity in the presence of calcium (Yamamoto *et al.*, 1991).

➤ Ethno-medicinal Potential

- The whole plant is used to dropsy, pain, rheumatism, convulsions, delirium and septicemia (Asolker *et al.*, 2000).
- Flowers buds and flowers fried in ghee are reported to be given to patients suffering from dysentery (Kalakoti and Pangrey, 1988).
- Flowers buds are also used as laxative and anthelmintic (Shiddamallayya *et al.*, 2010).
- Root bark is mixed with curd and used in hemorrhoids.
- The root bark paste with dried ginger is applied internally for treatment of goiter.
- The root is carminative (Chatterjee and Prakash, 1992). Infusion of small piece of root is used for the treatment of whole spot on face (Kamble *et al.*, 2010.)
- The concentrated decoction of bark is used to treat lymphadenitis by tribal people. (Pawar and Patil, 2007).
- The decoction of stem bark taken orally twice a day is very effective in asthma and other respiratory disorder as an anti-inflammatory agent (Patil *et al.*, 2008).
- The bark juice is taken in menstruation trouble
- The bark juice with honey is taken orally against leucorrhea (Das *et al.*, 2008.)
- Species of *Bauhinia* are rich in polyphenolics and are known for its medicinal properties (Patil, 2003).
- *Bauhinia purpurea* has been traditionally used to treat ailment like ulcer, wound, glandular swelling and stomach tumor.
- The decoction of the roots is used for expelling gases, flatulence and griping pain from the stomach and bowel.

- The bark of the plant is used as an astringent in the treatment of diarrhea.
- The decoction of the bark is recommended for ulcer as a useful wash solution.
- The bark of fruit and flower mixture with boiled rice water is used as maturant for boils and abscesses (Kurian, 2004).
- The decoction of flower works as a laxative (Wassel *et al.*, 1986).
- Fresh bark of *Bauhinia purpurea* (Vrindamaadhava) mixed with dry *Zingiber officinale*, pounded with sour gruel is prescribed in enlarge cervical glands as well as in goiter (Shaarangadhara Samhitaa, Bhavaprakaasha). Over the counter Kaanchanaara (*Bauhinia purpurea*) Gugglu (Shaarangdhar Samhitaa) is used to treat enlarge cervical glands, goiter and scrofulous tumors, so is kaanchan-ruminant nutrination's because of their high affinity with proteins (Yadav and Bhadoria, 2001). Although, there is no documentation on its traditional used to treat diseases, this plant has been used in the Indian folklore medicine to treat ailments like glandular swelling, skin diseases, ulcers, diarrhea, and stomach tumors (Kumar and Chandrasheka, 2011).

➤ Pharmacological properties

• **Antinociceptive, anti-inflammatory, analgesic and antipyretic properties:** The aqueous extract of leaf of *Bauhinia purpurea* possesses good antinociceptive, anti-inflammatory, analgesic and antipyretic. The crude dried extract for prepared in doses of 6.0, 30.0 and 60.0 mg injected to the respective. They have used antinociceptive (abdominal constriction, hot plate and formalin tests), assays. The 6.0 mg kg⁻¹ AEBP exhibited the highest antinociceptive activity, the 30.0 mg kg⁻¹ AEBP exhibited an equieffective anti-inflammatory activity when compare to the 100 mg kg⁻¹ ASA only between the interval times of 1-4h, the dose independent antipyretic activity qas observed only at the concentration 6.0 and 30.0 with the farmer showing remarkable activity even when compared with 100 mg kg⁻¹ ASA (Zakaria *et al.*, 2007). Zakari *et al.*, (2009) established the antinociceptive and anti-inflammatory activity of chloroform extract of *Bauhinia purpurea* leaves using animal models. The different dose 20, 100, 200 mg kg⁻¹ were prepared in dimethyl solfoxide were 100 mg kg⁻¹ extrct showed a less remarkable anti-inflammatory activity compared to the other doses tested. Analgesic and anti-inflammatory activities of ethanolic extract of stem of *Bauhinia purpurea* was subjected. Different CNS depressant paradigms like analgesic activity (Eddy's hot plate method and acetic acid writhing method) and anti-inflammatory activity (carrageenan induced paw edema) were carried out following the intra peritoneal administration of extract at dose level 50 and 100 mg kg⁻¹ was comparable with standard drugs (Shreedhara *et al.*, 2009). The

aqueous and methanolic extract of the stem bark of *Bauhinia purpurea* were tested for anti-inflammatory activity at dose level 300 mg kg^{-1} by carageenan induced rat paw edema. Both the extract were tested against standard drug diclofenac were ethanolic extract showed maximum activity, however the extract activity is less than standard drug (Chandrashekar *et al.*, 2009a,b). the ethyl acetate extract of stem bark of *Bauhinia purpurea* were found good analgesic activity tested at dose level 400 mg kg^{-1} by acetic acid induced writhing model and hot plate method (Chandrashekar *et al.*, 2009a).

- **Antimicrobial, antifungal and cytotoxicity activities:** The isolated compounds from root exhibited antimicrobial activity with MIC value ranging from 24.4 to $740.7 \mu\text{M}$. among all compounds bauhinoxepin J is a potent antimicrobial agent activity having MIC $24.4 \mu\text{M}$. among the isolated metabolites, compounds 6, 7, 8 and 13 exhibited antimalarial activity (IC_{50} $5.8\text{--}11.2 \mu\text{M}$), while compounds 1, 4, 9, 15 and 18 exhibited antifungal activity (IC_{50} $49.6\text{--}130.1 \mu\text{M}$). Compounds 1, 2, 4, 6, 7, 8 and 18 exhibited antitoxicity towards KB and BC cell line with IC_{50} values ranging from 10.5 to $72.3 \mu\text{M}$. compound 4 and 7 possess potent anti-inflammatory activity inhibiting the COX-2 enzyme with IC_{50} value of 6.9 and $10.1 \mu\text{M}$ respectively (Boophong *et al.*, 2007).

- **Anti-diabetics:** The rat showing blood glucose level $250\text{--}350 \text{ mg dl}^{-1}$ were considered as diabetic rat, induced by alloxan. The hypoglycemic activity of ethanolic extract and purified fraction-1 of stem of *Bauhinia purpurea* were studied and found that the dose of 100 mg dl^{-1} (i.p.) reduces serum glucose level of wistar rats due to inhibition of cyclooxygenase and promote β -cell recognition (Muralikrishna *et al.*, 2008).

- **Cardiac activity:** The cardiotonic activity of purified fraction-1 of ethanolic extract of stem of *Bauhinia purpurea* were studied and found that the fraction-1 exhibited positive inotropic and chronotropic effect on isolated frog's heart. Its action is blocked by β_2 -adrenergic blocker propranolol. The characterization of the isolated compound based on structural studies progress (Muralikrishna *et al.*, 2008).

- **Hormone regulation:** the aqueous alcoholic bark extract of *Bauhinia purpurea* (2.4 mg kg^{-1} b.wt.) and aqueous root extract *Withania somnifera* (1.4 g kg^{-1} b.wt.) on daily administration for 20 days, stimulating thyroid function in female mice. Both the plant extract showed an increase in hepatic glucose-6-phosphatase (G-6-Pase) activity and antiperoxidative effects as indicated either by a decrease in hepatic lipid peroxidation (LPO)

and/or by an increase in the activity of antioxidant enzyme (s). serum triiodothyronine (T_3) and thyroxine (T_4) concentration were increased significantly by *Bauhinia*, *Withania* could enhance only serum T_4 Concentration (Panda and Kar, 1999). Panda *et al.*, 2003 studied the role of *Emblica officinalis* L. and *Bauhinia purpurea*. extracts in regulating thyroid functions was studied in male mice. Oral administration of *Emblica officinalis*. fruit extract at 30 mg kg^{-1} body weight (b.wt.) each day for 20 days decreases serum T_3 and T_4 concentration and hepatic O_2 consumption. In contrast daily administration of *Bauhinia purpurea* at 2.5 mg kg^{-1} b.wt. Each day for 20 days increases serum T_4 concentration and O_2 consumption. Both the plant extract exhibited hepatoprotective effects as evidenced by decreased lipid per oxidation (Panda *et al.*, 2003).

- **Antioxidant activity:** The antioxidant activity of ethanolic extract (95% v/v) of *Bauhinia purpurea* exhibited significant free radical scavenging activity and reducing power activity when compare with ascorbic acid. The IC_{50} values were found to be 78.31 and 59.37 $\mu g\ ml^{-1}$ for ethanolic extract of leaves of *Bauhinia purpurea* and ascorbic acid, respectively (Joshi *et al.*, 2009). The ethanolic extracts of aerial parts do not shows antioxidant activity (Sliva *et al.*, 2005).

- **Active:** The ethanolic extracts of leaves and unripe pods of *Bauhinia purpurea* shows protective action on kidney induced by gentamic in induced nephrotoxicity. Extracts were administered intraperitoneal at dose level 300 mg/kg/day for eight days reduces blood vessel congestion, epithelial desquamation, and accumulation of anti-inflammatory cells and necrosis of kidney cells. This normalizes the increased level of serum creatinine, uric acid, uua and blood urea nitrogen (Lakshmi *et al.*, 2009).

- **Wound healing activity:** Four different models excision, incision, burn and dead space wound were used to determine wound healing properties of chloroform and methanol extracts of leaves of *Bauhinia purpurea*. Low dose 2.5% (w/w) and high dose 5% (w/w) of chloroform and methanolic extracts were prepared in hydrophilic and hydrophobic bases for excision, incision, burn wound models applied topically. *Aloe vera* 5% (w/w) was used as a standard. For dead space wound model 100 and 500 mg kg^{-1} and as a standard Aloe Vera 300 mg kg^{-1} were given orally. *Bauhinia purpurea* is having almost equal activity with aloe Vera in all four wound healing model (Ananth *et al.*, 2010).

- **Anti-diarrhea activity:** The ethanolic extract of leaves shows inhibitory effect at different dose level on animal models castor oil induced diarrhea in rats and gastrointestinal motility test by using charcoal meal. The inhibitory effects support the use of the leaves of *Bauhinia purpurea* in folklore medicine (Mukherjee *et al.*, 1998).

CONCLUSIONS

The scientific research on *Bauhinia purpurea* suggests a huge biological potential of this plant. It is strongly believed that detailed information as presented in this review on the phytochemical and various biological properties of the extracts might provide detailed evidence for the use of plant in different medicines. The phytochemical variations and efficiency of the medicinal values of *Bauhinia purpurea* is dependent on geographical location.

Even today, plants are the most exclusive source of drugs majority of the world population. Therefore, it remains a challenge for the scientist to provide efficient, safe and cheap medication especially for rural area. These *Bauhinia* species and their quantification of individual phytoconstituents as well as pharmacological profile based on in vitro, in vivo studies and on clinical trial should be further investigated.

❖ *Bridelia retusa* Hook. f.; (Euphorbiaceae):

Synonym: ***Bridelia squamosa*** Germ.

Bridelia retusa is a deciduous, large tree, usually up to 10 meters tall but occasionally to 20 meters. The bole is up to 30 cm in diameter, armed with scattered, pointed thorns up to 4 cm long. Quite common in forests and open land, reported from dry evergreen or deciduous forests, sandy-loamy soil, granite or basalt derived sandy soil, and limestone, at elevations from 50-600 meters, occasionally to 1,400 meters. A fairly fast-growing tree. The plant is reported to be resistant to fire in regularly burnt grassy savannahs. Phenology: August-October, October-January. The IVI value of *Bridelia retusa* in Katarniaghat Wildlife Sanctuary in Miscellaneous forest, Sal forest and Teak plantation is 3.9, 2.1, 0.7 respectively.

➤ Ethnobotanical Potential

- The tree is harvested from the wild for local use as a medicine, food and source of a good quality wood.
- The bark is used as a poison.
- The dark reddish, globose fruits up to 9mm in diameter are very astringent.

- The bark contains 16-40% tannins.
- The dull red wood is close-grained, moderately hard. The wood is of good quality and colour, it is used for construction, railway ties, rafters, posts, and floor-boards; also used for cart-shafts, wheels and agriculture implements. It is suitable for tool-handles and helves (Fern *et al.*, 2014).
- The wood is used as fuel.

➤ **Ethnomedicinal Potantial**

- The bark is antiviral, hypoglycemic, hypotensive. The bark contains tannins.
- Bark is used in diarrhoea, earache, and in wound healing and snake bite (Bajpai *et al.*, 2016).

❖ ***Buchanania cochinchinensis*** (Lour.) M.R.Almeida; Chiraunji, Char, Chironji, Akhatth (Anacardiaceae):

Synonyms: ***Buchanania lanzan***, ***Buchanania latifolia***, ***Chironjia sapida***

Chironjii is an almost evergreen, moderate sized tree with straight, cylindrical trunk, up to 10-15 m height and tomentose branches. Bark is rough, dark grey or black fissured into prominent squares, 1.25-1.75 cm thick, and is reddish-brown in side, and fibrous recurved, flat or more or less channelled, fracture and fibrous. The leaves are thickly cortaceous, broadly oblong with a rounded base. Flower small, greenish-white in color. Flowering start in January. Fruits globose small, hard. Seed laterally much compressed, creamish brown mottled with darker brown lines 0.4-0.6 cm long, 0.3-0.5 cm wide, occasionally separate cotyledon also occur, funicle stout, micropyle superior, linear, hilum present at the apex of round edge, slight pressure separates oily cotyledons; odour, plesent; taste, sweetish-oily. It is common in our forests mostly in eroded ravine lands. It avoids water logged areas, but occurs locally in clay soils. The plants grow on sandy-loam soil and is commonly found in the dry forests. It is found throughout India, Burma, and Nepal (Hemavathi and Prabhakar, 1988). In India it is found in the dry forests of Jharkhand, Chattisgarh, Madhya Pradesh, Varanasi and Mirzapur districts of Uttar Pradesh (Pandey, 1985). Phenology: January-April and May-June. The IVI value of *Buchanania cochinchinensis* in Katarniaghat Wildlife Sanctuary in Miscellaneous forest, Sal forest and Teak Plantation is 0.0, 0.7, 0.9 respectively.

➤ **Ethno-botanical Potential**

- The main constituents of seeds are albuminoids, oil and starch.

- The oral intake of seed increases strength.
- It is good for heart. The seed reduces kapha/phlegm inside body. It also decreases vata and pitta.
- Chironji nuts contains 3.0% moisture, lipid/fat 59.0%, protein 19.0-21.6%, starch/carbohydrate 12.1%, fibre 3.8% minerals like calcium, phosphorus, iron, and vitamins like thiamine, ascorbic acid, riboflavin and niacin.
- The kernel contain about 52% oil known as Pariyal oil (Wealth of India, Vol I, 233pp) is being used as substitute for olive and almond oil. This oil is used in skin diseases.
- An adhesive is also obtained from the tree and is available as Chironji ka gond.
- Chironji tree is known as Priyal in Ayurveda. For medicinal purpose all parts of this tree are used in Ayurveda.
- Two important formulations containing Chironji seeds as an ingredient are Puga khand and Priyal oil. The recommended doses in Ayurveda is 10-20 g.
- The stem bark contains alkaloids, tannins, saponins, reducing sugars, triterpenoids and flavonoids.
- Two important formulations which contain Pariyal bark as an ingredient are Ashok Ghrita and Nyagrodhadi churn. For therapeutic use, the recommended dosage of bark in Ayurveda is 5-10 gm.
- The bark of tree is used to treat fever, bleeding disorders, excessive thirst and blood dysentery.
- The whole kernel is used in sweet-meats or as a substitute for almond kernel.
- The chirongi oil is extracted from the fruits of *Buchanania cochinchinensis* is known as Char in India (Kumar *et al.*, 2012). It is being used for curing skin diseases and removing spots/blemishes from the face.
- Chironji nuts are used in preparation of many sweet items such as Halwa, kheer, laddu, paak etc. They are also used as dry fruits.

➤ Ethnomedicinal Potential

- The leaves contain tannins, triterpenoids, saponins, flavonoids and reducing sugars which are used as cordiotonic.
- The gum is useful in diarrhea and rheumatism.
- The roots are acrid, astringent, cooling, depurative and constipating and useful in treatment of diarrhea.

- The Char extracted from kernel is used for curing skin diseases and removing spots/blemishes from the face.
- The char oil contains palmitic and oleic acids which is applied to glandular swellings of the neck.
- Chironji nuts are used as brain tonic.
- The nuts are antioxidant and improve body immunity.

➤ **Home Remedies using Chironji nuts**

- Glowing skin, removing blemishes.
- Chironji face-pack: It is useful in making facial skin soft, smooth and glowing. For making the face-pack, nut is grinded in to fine thick paste along with gulab jal. This pack is applied on face and let it dry. After drying the pack is removed. This pack is applied for a week or up to desired result.
- Chironji-orange peel powder face pack: Chironji nut and orange peel power is grinded in to fine thick paste with the help of fresh cold milk. It is applied on face till it dries. After drying the pack is washed with plain water.
- For burning sensation in body 20 g chironji nut is being chewed very well.
- Seed oil in skin diseases, Leaves juice in blood purification, biliousness and burning sensation (Bajpai *et al.*, 2016).

❖ **Cassia fistula** Linn.; Amaltas, Golden shower tree, Indian laburnum (Caesalpiniaceae):

Cassia fistula is a medium sized deciduous tree, with an oval to rounded shape, 5-15 m in height and 5 m wide. Stems or young twigs sparsely to densely hairy. The bark of the young tree is a grey, smooth to slightly ridged and slender, and changes to a darker grey-brown when mature.

The leaves are smooth, ovate shape, hairy below, alternate, pinnate, and deciduous, with 3-8 pairs of leaflets. The leaf can range from 15-60 cm long, with each leaflet ranging from 7-15 cm long, and 2-7 cm broad. The leaves fall periodically, only to be replaced with new foliage. Leaves absent at flowering time. Leaves usually drop in April as a prelude to flowering which occurs from May to early July. The leaves on this tree are green year round, and remain green until they fall off and are replaced.

The flowers appear mainly from March to July. Flowers are bright yellow in color, and growing from pendulous 20-40 cm long racemes, each flower 4-7 cm in diameter with five yellow petals of equal size and shape.

Fruit is legume, pendulous, cylindrical, and brown in color, 20-60 cm long, 1-2.5 cm broad, with a pungent odor and containing several seeds. Seeds lenticular, light brown, lustrous. Flower buds are green when immature, and mature into brown to purple-black pods. The pods contain approximately 30-100 large hard flat, round seeds. Seeds lenticular, lustrous, and light brown in color.

Cassia fistula found in India, Pakistan, Myanmar, Australia, Egypt, Ghana, Mexico, Zimbabwe, Thailand, Malaysia and Sri Lanka. It is found up to 1,200 m in the Himalaya.

It prefers deciduous forests, sub tropical and tropical regions. They are also found in moist forest, woodlands and mountain habitats. It is mostly grown as avenue tree. Growth of this tree is best in full sun on well-drained soil. It is drought and salt tolerant, however it suffers if exposed to freezing weather, even briefly. Pollination is by various species of bees and butterflies.

➤ Ethno-Botanical Potential

- The wood of *Cassia fistula* is durable, hard, and heavy.
- It is suited for cabinetwork, farm implements, inlay works, posts, wheels, mortars etc.
- In many countries people use this tree as a firewood.
- It is grown because of its impressive yellow flowers that cover the entire canopy.

➤ Ethno-medicinal Potential

- *Cassia fistula* has many medicinal properties like astringent, cooling, purgative, febrifuge, tonic, laxative, anthelmintic, emetic, antiperiodic, febrifuge, diuretic, depurative, carminative, anti-inflammatory, and ophthalmic.
- It is used in many medical treatments like skin diseases, burning sensations, syphilis, boils, leprosy, ringworm affection, colic, dyspepsia, constipation, diabetes, strangury, cardiac problems, dry cough, bronchitis, malaria, rheumatism, fever, leprosy, Stomach disorders, inflammations and intermittent fever.
- The root paste is useful in skin diseases, burning sensations and syphilis.
- The Bark is useful in boils, leprosy, ringworm affection, diabetes, strangury and cardiac problems.

- The leaves are useful in skin diseases, burning sensations, dry cough, and fever.
 - Fruits are used in flatulence, colic, dysentery, inflammations and intermittent fever.
 - Flowers are useful in cardiac disorders, intermittent fever and general debility.
 - Cassia fistula is also used in the treatment of cancer, constipations, convulsions, delirium, diarrhea, dysuria, epilepsy, gravel, hematuria, pimples, and glandular tumors.
- **Constipation:** The pulp obtained from the fruit of the *Cassia fistula* tree is called the cassia pulp and is known to be an effective laxative. It can be consumed by children as well by expecting mothers. Approximately 50 grams of the pulp is soaked in water for over a night. It is then strained and used with around 25 grams of sugar. The pulp of the *Cassia Fistula* is a mild and harmless purgative.
- **Common Cold:** The problem of common cold can be relieved by using the Cassia Fistula herb. In cases of running nose the smoke from the burning of the *Cassia fistula* root can be inhaled. It is known to encourage profuse nasal discharge and helps in providing relief.
- **Fever:** The use of *Cassia Fistula* can help in relieving the problem of fever. The root of the Cassia Fistula tree is a well known widely used tonic that helps in reducing fever. An alcoholic extract of the Cassia Fistula plant is used to fight the black water fever.
- **Intestinal disorders:** Children suffering from the problem of flatulence the *Cassia Fistula* pulp can be applied externally around the navel area to ensure evacuation. This can be mixed with almond or linseed oil for easing bowel movement problems.
- **Aguesia:** The pulp of *Cassia Fistula* is used in chronic cases of ageusia. This disease is basically the losing of taste due to the excessive consumption of cocaine or opium. Approximately 24 grams of the *Cassia Fistula* pulp is mixed with around quarter liter of milk for use as a mouthwash for relieving this problem.
- **Skin disorders:** The leaves of *Cassia Fistula* tree are used in relieving skin irritation and in easing swelling as well as pain. The juice and the paste serves as a benefiting dressing for the problems of ringworm and the inflammation in the hand or feet caused mainly because of cold conditions. The leaves of the *Cassia fistula* can be rubbed on the problematic area caused due to rheumatism as well as facial paralysis.

CONCLUSION

Medicinal plants form the backbone of traditional medicine. Herbal medicine based on the premise, that plants contain natural substances that can promote health and alleviate illness. Ethnopharmacological studies on such herbs/medicinally important plants continue to interest investigators throughout the world. Plants are invaluable sources of pharmaceutical products and plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used many species for centuries to treat a variety of diseases. Different parts of *Barringtonia acutangula* such as leaves, fruit, roots and axillary bud have been used traditionally to treat pains in body, eye ailments, abdominal disturbances, blood impurities, cold and asthma, diseases of liver, spleen and for diabetes.

The scientific research on *Bauhinia purpurea* suggests a huge biological potential of this plant. It is strongly believed that detailed information as presented in this review on the phytochemical and various biological properties of the extracts might provide detailed evidence for the use of plant in different medicines. The phytochemical variations and efficiency of the medicinal values of *Bauhinia purpurea* is dependent on geographical location.

Even today, plants are the most exclusive source of drugs for majority of the world population. Therefore, it remains a challenge for the scientist to provide efficient, safe and cheap medication especially for rural areas. These *Bauhinia* species and their quantification of individual phytoconstituents as well as pharmacological profile based on *in vitro*, *in vivo* studies and on clinical trial should be further investigated.

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