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Review Article

Bischofia Javanica: A Potent Medicinal Plant

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Abstract

Medicinal plants are rich resources of ingredients for formulation of drugs. Traditionally, most of the plants are considered to be good for their therapeutic value by ethnic people. Bischofia javanica is an important plant used in traditional healing process by many communities in South East Asia. Plant contains diverse and complex bioactive compounds. Different parts of the tree viz leaf, flowers, bark, root, fruits and seeds have been used traditionally for treatment of stomach ailments, pharyngitis, tonsilitis, inflammation, infections and hair loss. The study focuses on the bioactive compounds, traditional use and pharmacological activity of this plant. Many pharmacological studies have been carried out using leaves of the tree and showed positive results for antioxidant, anti-inflammatory, anti-parasitic, anti-leukemic and anti-diabetic properties of the plant. There is an urgent need of systematic research work on the use of different parts of Bischofia javanica tree and its safety aspects, considering the vast potentiality of this tree, to be an effective source for medicine against for various diseases.

Keywords: bischofia javanica; phyllanthaceae; pharmacological activities; traditional knowledge

Introduction

Plants and plant parts have been in use as an ethno-medicine against various diseases among the tribal communities since ancient times. It is a very common practice against diseases in under- developed countries where people have limited access to modern health care facilities. Traditional knowledge of ethnic medicine is based on the fact that plants produce bioactive compounds through their primary or secondary metabolism. Discovery of new compounds is a pharmaceutical demand for which bioactive compounds from plants samples are routinely screened. The endogenous knowledge of ethnic communities is the most reliable source for available information on medicinal plants. Rig Veda is the oldest and the most important religious text of Hindu tradition. It has the oldest reference of traditional wisdom about medicinal use of plant [Kuldip S. Dogra et.al.2015]. China is one of the pioneers in usage of plant for medicinal and healing purposes. More than 5000 species plants with medicinal properties are routinely used in China [Tuxhill, 1999]. Phytochemicals present in Plants are extremely helpful in the treatment of different health problems such as stomach ailments viz diarrhea, constipation, dysentery, fertility issues viz low sperm count, menstrual disorders, respiratory tract disorders etc.

Medicinal plants have enormous usability. Bioactive compounds are found to be present on all parts of a plant e.g., seeds, roots, bark, fruits, leaves and flowers [M.R. Chowdhury et al, 2020]. China has been a pioneer in validating and improving traditional use of plants and systematically integrating them into mainstream healthcare systems. Phytomedicines are used as an important part of healing process in western world too. National Institute of Health at Bethesda, US has a 'Office of other Medicine" which contributes to integrate modern science and ancient traditional systems of medicine [NIH, Bulletin]. Therefore, Phytomedicines practices exist in many cultures across the globe to treat numerous diseases as an alternative to synthetic medicine [WHO Bulletin]. Modern public health care system depends largely on synthetic drugs which can have many side effects after prolonged use. In recent years, medicinal plants have regained widespread acceptance due to a growing belief in herbal therapy due to its fewer adverse effects as compared to allopathic medication. There is an urgent need to review invaluable age-old knowledge on medicinal plant to develop the renewed interest further and incorporate it into the current healthcare system for the benefit of humanity as a whole.

The dynamics of synthetic medications and their use in the current healthcare system can be altered by extensive pharmacological research for bioactive chemicals in plants. This study focuses on one such important plant, Bischofia javanica. It belongs to the family Phllanthaceae [Kanjilal n Kanjilal, 1982], originated from West Africa. Many communities in South East Asia use this plant in ethnic healing processes. Several parts of the plant are used traditionally in the treatment of common diseases. Few communities include part of this plant in their daily intake as it is perceived to be good for health.

Figure 1: Plant, flower, seed and leaves of Bischofia javanica

Bischofia javanica is found in abundance in South East Asia. It is known by different names in different languages viz Urium in Assamese, Kanjail in Bengali, Bishop Wood in English, Bhillar In Hindi, Akagi in Japanese and Nhoi in Vietnamese [Kanjilal et.al, 1982 and Sastri, 1950]. The Urium tree and its parts are shown in Figure 1. Pharmacological studies of the plant can pave new ways for formulation of new drugs based on its phytochemicals.

G.W. Bischoff, a Botanist from Royal Academy Amsterdam discovered this plant and it was named after him [Parker, 1956]. The genus 'Bischofia' has two species Bischofia javanica Blume and Bischofia polycarpa and belongs to the family Phyllanthaceae. Bischofia javanica is widely distributed in the Pacific Islands, Malaysia, South East Asia, Southern China, Taiwan, Southern Japan, Myanmar, and India.

Plant description:

Taxonomic position of **Biscofia javanica**	
Kingdom	Plantae
Order	Malpighiales
Family	Phyllanthaceae
Genus	Bischofia
Species	javanica

Table 1: Botanical classification of Bischofia javanica

Description of Bischofia javanica /Urium

Bischofia javanica or Urium is a large deciduous, fast growing, evergreen forest tree with cylindrical trunk and spreading crown. Its bark is light brown to greyish in colour while its straight stem has red to dark brown heartwood. Leaves are usually palmately 3 foliate, rarely 5 foliate on young shoots. Petiole is 3-8 inch long. Leaflets are 3-6 and 1.5 inch in size, elliptic or ovate-oblong usually crenate, glabrous. Flowers are greenish in colour, dicecious, apetulous in paniculate racemes. Fruits are fleshy and globulous in shape with .25 to .5 inch in size. Mature Fruit is brown and exudes a gummy juice. Seeds have flat cotyledons and smooth surface [Flora of Assam].

Chief phytochemicals of Bischofia javanica:

According to studies by Cambie (1984), Gupta (1988), and Whistler (1992), the main bioactive substances extracted from Bischofia javanica are tannin, amyrins, betulinic acid, friedelan-3ol, epifriedelinol, friedelin, luteolin and glucoside, quercetin, beta-sitosterol, stigmosterol, and ursolicacid. Tartaric acid, tannin, vitamin C, ellagic acid, fredelin, and friedelian were also extracted from the leaves of Urium tree. Tannins can be found in the stem bark of Bischofia javanica blume. It also contains Beta-sitosterol, epi-fiedelanol acetate, friedelin (A), betulinic acid (B), and its ester. Presence of alkaloids has also been reported [The Wealth of India, CSIR].

The plant's roots have -amyrin (C), -sitosterol (D), and urosolic acid [The Wealth of India, CSIR]. From the leaves of Bischofia javanica, a dimeric ellagitannin called bischofianin and five other tannins were identified [Takashi et al].

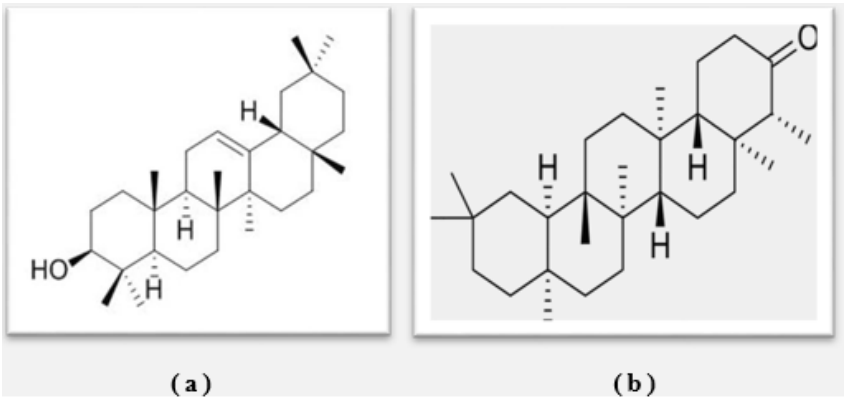

Figure 2: Chemical structure of 2 major bioactive compounds presents in Bischofia javanica (a) Amyrin and (b) Fridelin [Mai, T. N., 2017].

Traditional use of Bischofia javanica:

For a long time Bischofia javanica or Uriam tree is being used by the tribal communities around the world as food and medicine. The root of Bischofia javanica has medicinal uses [Li Bingtao, 1994]. Traditionally, Bischofia javanica is used for the treatment of various chronic conditions like inflammation, tuberculosis, ulcer, fracture and dislocation [Perry 1980, L. George, L. Sutharson]. Numerous phytochemicals from this plant have been shown antiparasitic, antimicrobial, anti-leukemic, anti-inflammatory, and anti-nociceptive capabilities [Allen et al., 2000; Khan et al., 2011; Lingadurai et al., 200]. Different parts of Bischofia javanica have traditionally been used to treat inflammatory disorders like ulcers, fractures, dislocations, and tuberculosis [Rai et al]. The Sikkimese people use the fruits to prepare wine [Panda et al]. Diarrhea can be treated with the young leaves [Kar et al.]. The leaf juice is effective to treat cancerous wounds as well as burns and ulcers. According to Gaul et al, young leaves can be taken orally to treat diphtheria and pharyngitis. The stem is traditionally perceived to be effective against diarrhea and stomach ache [Das et al].

Phytochemical studies and therapeutic importance:

Different parts of Bischofia javanica tree have been used traditionally in number of diseases. A good number of clinical and pharcological studies have been carried out on different parts of the tree, most of which have satisfactory results. Altschul in 1973, found that tonsillitis can be cured with a decoction, prepared from leaf extracts of Urium. Bourdya & Walterb, 1992, investigated traditional use of its ground bark for abortion. Ignacimuthu et al., in 2006 found that leaf paste of Bischofia javanica is applied to cure skin wounds in Mizoram. The paste of stem bark is also applied externally on the affected parts of skin sores. This Plant is indigenous to Mizoram and its local name is Romaviruksha pattai. In 2007, Lalfakzuala et al. studied that Urium leaf juice is used for the treatment of skin lesions by locals of Mizoram. Purkayastha et al 2007 carried out their investigation in medicinal plants from Dibru Saikhowa biosphere reserve, Assam and reported use of Urium tree bark for curing diarrhoea and dysentery.

According to Rai and Lalramnghinglova, 2010, tonsillitis and throat pain are treated with Bischofia javanica leaves and buds. They also use oral intake of infusion prepared from young shoot & leaves against diphtheria and decoction of the bark against cholera. There are few reports of on use of Bischofia javanica as hair stimulant. The leaves contain vitamin C and the bark contains tannin along with another alkaloid [Das et al. 2012]. According to Gupta et al.1988 and N.T. Mai. 2017, the leaf extract of B. javanica produced ten primary phytochemicals, including beta-amyrine, ursolic acid, betulinic acid, chrysoeriol, quercetin, friedelan-3-one, beta-sitosterol, fisetin, cynaroside, and triacontane. Though there are evidences in support of use of different parts of this plant as traditional medicines but there is an urgent need for evidence based scientific investigation to explore its potential as an effective medicinal plant against many neurodegenerative and lifestyle diseases.

Plant parts	Activities	Finding of the study	References
Leaf, flower, and stem bark	Antioxidant	Bischofia javanica blume leaf extract has demonstrated strong antioxidant capabilities.	Lingadurai Sutharson et al
Leaves	Free radical scavenging	Leaf extracts showsfree radical scavenging activities	-do-
Leaves	Antiflammatory	properties of the aqueous extracts of *B. javanica* leaves act as would healing and skin sores	Lalfakzuala et al.,
Fruit	Edible fruit	Used for making wine, fruit infusions are used as cold drinks in summers in Sikkim	Panda Ashok kumar, et al.2010
Seed oil	High food energy value.	Physico-chemical characteristics of Urium seed oil have been compared to those of other commonly used oils. It might be a significant source of necessary omega-3 fatty acids.	Indra, R.et al,2013
Leaf	Antiparasitic	Leaf extracts showed antiparasitic activity	Alen et al,2002
Leaf extract	Antidiabetic	Ethanol extract of *Bischofia javanica* can improve the quality and quantity of hyperglycemic rat sperm	Syafruddin Ilyas et al,2022
Leaf	Antimicrobial	Zone of inhibition was observed against bacteria using leaf extracts of Urium by Khan. et al.	Khan et al, 2001
Leaf extract	Antileukemic	Urium Leaf extract therapy as significantly effective in delaying progression of MNU-induced mammary gland tumour	Sutharson et al,2011
Leaves	Antinflammatory	Leaf extracts are used to cure Lactagogue and to improve flow of Milk	Lamxay et al, 2011

Table 2: Biological activities of Bischofia javanica/Urium and its constituents

Bioactive compounds such as steroids, saponins, terpenoids, phenols, flavonoids, proteins, tannins, glycosides and carbohydrates are present in leaf extracts of B.javanica [Chowdhury et al, 2020].Seed oil of B.javanica has similar physico-chemical properties with other edible oils. It has all characteristics to be a potent source of omega 3 fatty acids and linoleic acid [Indra, R. et al, 2013].

Japanese researchers Shun-ichi-wada and Reiko Tanaka investigated bark of Bischofia javanica and isolated betulinic acid and its derivatives 3β-o-(z)-coumaroylbetulinic acid and 3β-0-(e)-coumaroy lbetulinic acid. These compounds have shown catalytic inhibitory effects of Topo-II enzyme activities. Sutharson et al. discovered antileukenic activity of Bischofia javanica leaf extract in human leukemic cell lines in 2011, which supports the possible medicinal use of Bischofia javanica for cancer treatment in future.

Summary and outlook:

Bischofia javanica tree has all potential to be a powerful tool against various diseases. It is a versatile medicinal plant and has phytochemicals with a wide variety of chemical structures and roles. In order to fully utilize these chemicals' therapeutic potential against a variety of ailments, extensive research is required to understand their biological activities and potential pharmaceutical applications. A global search is currently underway for non-toxic, secure, and highly effective plant products with long-standing medical applications. The development of plant-based formulations should be given importance for safe and sustainable development in public health sectors. The time has arrived to deploy cutting-edge scientific methods and methodologies to integrate centuries-old information on Bischofia javanica or Urium with modern healthcare systems. From the earlier research works on Urium tree, it is evident that it can be tremendously beneficial for mankind and deserves special consideration and interest from researchers across the globe. Systematic scientific investigations on Bischofia javanica or Urium will definitely be a blessing for larger interest of the society.

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