

Pharmacological Properties of *Phyllanthus urinaria* L. : An Overview

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Abstract

Kalochitki is a small plant (herb) from Phyllanthus L. genus under Euphorbiaceae. It is secondhand in asthma, anemia, anuria, biliousness, bronchitis, diabetes, discharges, dropsical affections, diarrhea, febrifuge, gonorrhea, hepatitis B, hiccup, intestinal infections, jaundice, kidney, leprosy, urinary enteritis. This plant is medicinally most important because it carried some necessary phytochemicals including acid, alkanol, coumarin, flavonoid, lignins, phenol, phytallate, sterol, simple phenylpropanoids, terpenoids, tannins and few isolated compounds. This species has been shown to possess good antioxidant, anticancer, immunomodulatory, antibacterial, antiviral, antiangiogenic, antitumor, antiinflammatory and antidiabetic activities. This paper reviews mainly the pharmacological actions of Kalochitki for mass people to cure some important diseases.

Keywords: *Kalochitki, Antioxidant, Pharmacology, Secondary metabolite.*

Introduction

The genus *Phyllanthus* L. is found in almost over all stover parts of the cosmos (Burkill, 1996; Abdulla et al., 2010). This plant has been notorious in specific corner of India in eighteenth era. The common name of Kalochitki is Hazarmani, Stonebreaker or Windbreaker (Bharatiya, 1992). The scientific name of this plant is *Phyllanthus urinaria* L. Sometimes it is entitled gala of wind. The *Phyllanthus* L. genus comprises about 1200 species (Kathriarachchi et al., 2005). In Bangladesh, Kalochitki is found throughout the country (Abdulla et al., 2010).

There are eleven medicinally most important *Phyllanthus* L. species reported from Bangladesh in which Kalochitki is found all over Bangladesh which is grown in every corner in our country (Ahmed et al., 2008). Most of the places, it is found in wild. The foremost bioactive compounds has been isolated from Kalochitki are mainly acid, alkanol, coumarin, flavonoid, lignin, phenol, phytallate, sterol, simple phenylpropanoids, terpenoids, tannin, isolated compound and their derivative (Table 3).

The genus is of healing importance for many diseases in some countries like Cambodia, India, Thailand, Latin America especially Brazil and Africa

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(Moreira et al., 2013; Ugandhar, 2014). The plant which secretes some important bioactive compounds has been used clinically in Asia to treat some importance diseases (Unander et al., 1995; Xia, 1997). Though this species is used in many countries to cure some diseases, it is not used in Bangladesh. It is used in our country in unknown and discontinuously in mountain area as they do not used this species properly. It is used sometimes in non-scientific way. But in some countries it is used in clinically and scientific way as they have been researched in deeply specially in medicinal plants. So we should be researched in depth about medicinal plants especially *Phyllanthus* L. species. Kalochitki is one of the top most medicinal plants under this genus. There are so many research papers about this species which are mainly done by foreign countries. A lot of data about this plant but these are random and no specific. We should be researched deeply top to bottom about this plant. As a result, we can be cured some dangerous diseases to use this species because it is available in our country.

Aims and Objectives

The notable purposes of this review are-

- (i) to enlist the characteristics of Kalochitki,
- (ii) to present pharmacological action of enlisted phytochemicals of Kalochitki available in the literature.

Materials and Methods

Kalochitki was used in this research. This observation is fully a review paper to denote the research work. Methodology of the remark defines the strategy presumed and the steps followed to realize the ultimate goal and points of the study. As this studied is mostly subject to secondary data so it becomes very needed to explore data from respected sources without an appropriate methodology. The research paper has been prepared by collecting from different articles published in different journals, books, research publications, websites, internet and other documents. The necessary thoughts, ideas, facts and findings have been collected through internet browsing. So, this study is mainly depended on the data collected from secondary sources.

Results and Discussion

Plant Preview

In Bangladesh, Kalochitki is mainly found in Chattogram, Cox's Bazar, Dhaka, Jashore, Rajshahi and Rangamati districts. Besides this, it is found in every parts of Bangladesh especially it is wild in nature. This plant is an annual or sometimes perennial decumbent or erect, glabrous or puberulous herb, up to 0.5m long. The bark of this plant is greenish, smooth and soft. In Kalochitki, much branched at the stem base, branches flattened and winged.

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The leaf is alternate, stipulate, petiolate (0.50mm long), distichous, leaf blade undeviating or oblong-oblong- obovate, apex obtuse or acute and mucronulate, base obtuse and sometimes conspicuously asymmetrical. April-October is for flowering and fruiting time of this herb in Bangladesh. The flower is very minute, monoecious, greyish-yellow, axillary glomerulus on deciduous branchlets, male flowers pedicellate, females' solitary. The fruit is capsule, globose, smooth, with reddish blotches and tuberculate, yellowish, fruiting sepals. The seed is triangular, transversely ridged, light greyish-brown. It is propagated by seeds.

Table 1: Vernacular name of Kalochitki

No.	Features of Kalochitki	
1	Scientific name	<i>Phyllanthus urinaria</i> L.
2	Synonym	<i>Phyllanthus leprocarpus</i> Wight (1852)
3	English names	Shatter stone, Stonebreaker
4	Local names	Hazarmani
5	Hindi	Hazarmani
6	Sanskrit	Tamlaki
7	Malayalam	Chirukizhukanelli, Chukanna-kizha-nelli
8	China	Yexiazhu
9	Thailand	Look tai bai

Traditional uses of Kalochitki

This herb has secondhand in herbal remedy for more than two thousand (2,000) years all through the planet. This plant is used in various traditional medicinal purposes (Table 2) in Cambodia, India, Thailand, Latin America especially Brazil and Africa (Moreira et al., 2013; Ugandhar, 2014).

Table 2: Traditional uses of Kalochitki

No.	Medicinal Properties	References
1	acid, anemia, anuria, asthma, biliousness, bronchitis, cooling, diuretic, leprosy, sudorific, depurative, dropsical affections, emmenagogue, genito-urinary problems, gonorrhea, hiccup, sour, urinary discharges and fish poison	Chopra et al., 1956
2	astringent, tonic, febrifuge, diarrhea	Kirtikar et al., 1935
3	colonic contaminations, diabetes, hepatitis B, Kidney, urinary bladder troubles	Calixto et al., 1998
4	damages of liver cells	Hau et al., 2009
5	lessen the steatohepatitis	Shen et al., 2008
6	cardiotoxicity	Chularojmontri et al., 2005
7	contraction of trachea	Paulino et al., 1996
8	astringency	Dias et al., 1995
9	jaundice, kidney calculi, enteritis, painful disorder, dropsy and inflammation	Chudapongse et al., 2010
10	fish poison	Chopra et al., 1956

Phytochemicals

Kalochitki is a medicinal plant on account of carried numerous crucial phytochemicals namely coumarin, flavonoid, lignin, phenol, phytallate, sterol, simple phenylpropanoids, terpenoids, tannins, isolated compound and their derivative (Table 3).

Table 3: Major Phytochemicals isolated from Kalochitki and their pharmacological actions

No.	Name of Phytochemical Group	Name of Biochemicals	Pharmacological actions	References
1	Coumarin	Methylbrevifolin carboxylate	Antioxidant	Fang et al., 2008
2	Flavonoid	Quercetin, Rutin, Rhamnocitrin	Anti-inflammatory	Fang et al., 2008
3	Lignin	Phyltetralin, Phyllanthin	Anti-inflammatory	Fang et al., 2008
		Phyllanthin	Immunomodulatory	Inchoo et al., 2011
		7'-Hydroxy-3',4',5,9,9'-pentamethoxy-3, 4-methylene dioxy lignan	Antitumor	Giridharan et al., 2002
4	Phenol	Ellagic acid	Antiviral	Shin et al., 2005
			Antiangiogenic	Huang et al., 2011
		Methyl brevifolin carboxylate, Methyl gallate, Trimethyl-3,4-dehydrochebulate	Antioxidant and Anti-inflammatory	Fang et al., 2008, Zhorig et al., 1998
			Antitumor	Pang et al., 2011
6	Sterol	β -Sitosterol	Anti-inflammatory	Santos et al., 1995
7	Terpenoid (triterpenoids)	β -Amyrin	Analgesic	Recio et al., 1995
		Methyl gallate, Trimethyl 1-3,4 dehydrochebulate	Antioxidant	Fang et al., 2008
8	Tannin	Geraniin	Antioxidant	Lin et al., 2008
			Antiviral	Yang et al., 2007
		Corilagin		Yeo et al., 2015
		Excoecarianin	Antiviral	Cheng et al., 2011

Pharmacological actions

The miraculous pharmacological actions of *Phyllanthus urinaria* L. are antioxidant, anticancer, immunomodulatory, antibacterial, antiviral, antiangiogenic, antitumor, antiinflammatory and antidiabetic. The specific pharmacological actions are responsible for particular phytochemicals which are secreted from this plant. The short description of pharmacological actions of this plant is as follows-

Antioxidant activity

Fang et al. (2008) have isolated nine compounds from the extract of ethanol with *Phyllanthus urinaria* L. The antioxidant *in vivo* has investigated from these isolates. These also were investigated for their antioxidant *in vitro*. In another experiment, Geraniin is a compound which isolated from seventy percent (70%) aqueous acetone extract with this plant. It is a hydrolysable tannin. The antioxidant actions of geraniin in contradiction of DPPH radicals, hydroxyl radicals and superoxide radicals were gritty in contrast with optimistic controls (Lin et al., 2008).

Anticancer activity

Diverse extracts of several *Phyllanthus urinaria* L. have been shown anticancer actions. It is also shown anticancer correlated contrivances. Some cancer cell lines such as NCI-H1703, HeLa, 143B etc. have subdued by several species of *Phyllanthus* genus. *Phyllanthus urinaria* L. is one of them (Ismail et al., 2012; Zhao et al., 2015). In another experiment has showed that the extract of *this herb* with water to could diminish the growth by convincing the apoptosis in human cancer cells. This abnormal cell has originated from DNA fragmentation to establish by physical changes. Huang et al. (2011) has examined that this herb has not been side effect on normal cells but it has shown cytotoxicity on some abnormal cells like cancerous cell. One kind of bacteria as like *Helicobacter pylori* has been responsible to create peptic and gastric ulcers. The extract of this herb with methanol and chloroform have been activating against this type of destroying bacteria (Lai et al., 2008).

Immunomodulatory activity

Phyllanthus urinaria with *P. amarus* mixed by ethanol has shown immunomodulatory actions. This mixer has established to inhibit the actions of the CD 18 appearance and phagocytic activity on a few of human cells (neutrophils and monocytes) were down regulated (Jantan et al., 2014).

Antibacterial activity

The medicinally important *Phyllanthus urinaria* L. has been activated against *Helicobacter pylori* which is responsible to create chronic extension that can causes peptic and stomach cancer (Marshall & Warren, 1984; Marshall et al., 1985; Nomura et al., 1991; Blaser, 1993; Parsonnet et al., 1994; Telford et al., 1994; Cover & Blaser, 1996). This destroying bacteria stash VacA (a cytotoxin) that encourages to vacuole on gastric epithelial cells (Leunk et al., 1988; Catrenich and Chestnut, 1992). The crude extract of *Phyllanthus urinaria* with chloroform (PUC) and *Phyllanthus urinaria* with methanol (PUM) have been demonstrated antibacterial actions contrary to *H. pylori*.

Moreover, PUC extract has inhibited of κ B and IL-8 activation AGS cells. So, this *herb* is a chemo preventive material to active against peptic and gastric cancer (Lai et al., 2008).

Antiviral activity

There are so many plants in the cosmos which have displayed antiviral actions because it has contained pure and responsible phytochemicals (Cooper, 2005; Rajbhandari et al., 2009). *Phyllanthus urinaria* L. is one of the natural herbal plants which have been functioning against viral activity (Fang et al., 2008; Shen et al., 2008). In another experiment, extracts of *Phyllanthus urinaria* L. with the mixer of acetone + ethanol + methanol which introverted HSV contagions *in vitro* (Yang et al., 2005).

Antiangiogenic activity

Phyllanthus urinaria L. is one of the small plants which contained ellagic acid that exhibited antiangiogenic actions *in vivo* (Huang et al. 2011).

Antitumor activity

Phyllanthus urinaria L. extract has been experimented the effect of antitumor actions *in vivo* at first in Asia. The antitumor actions of this plant extract have been assessed by the effect on tumor developed in C57BL/6J carcinoma cells of mice. This is the cause of the significant reticence of tumor in a few growth rates. It reduced tumor size (Huang et al., 2006).

Antiinflammatory activity

Phyllanthus urinaria L. with ethanolic extract is the potent natural antiinflammatory agents which has confined nine phytochemicals. *In vitro* activities of this plant have been shown antiinflammatory actions. Activity against inflammatory mediators of these herbs is the first report on *Phyllanthus urinaria* L. Consequently, the specific phytochemicals isolated from these plants *might* be useful to treat the cell-mediated invulnerable diseases (Fang et al., 2008).

Antidiabetic activity

Diabetes is a common dangerous disease in many countries like us. Diabetes mellitus has affected human being of both developed and developing nation-states. *Phyllanthus urinaria* L. is cast off to delight diabetes (Lans, 2006). Aqueous extract with chloroform has confined bioactive compounds to have better effectiveness in dropping blood glucose level as associated to

metformin. Akhtar & Mahalingam (2015) has found that the above bioactive chemicals possess efficient antidiabetic actions.

Table 4: Plants parts of Kalochitki which are used in the above experiments

No.	Plant parts and solvent extracts	Pharmacological action	References
1	Ethanolic extracts of whole plants	Antioxidant	Fang et al., 2008
	70% aqueous acetone extracts of this plant		Lin et al., 2008
2	Aqueous extracts of Kalochitki	Anticancer	Ismail et al., 2012; Zhao et al. 2015
	Chloroform and methanolic extracts		Lai et al., 2008
3	Chloroform and methanolic extracts of Kalochitki	Antibacterial	Lai et al., 2008
	Crude extracts of this plant and chloroform		
4	Ethanolic extracts of Kalochitki	Immunomodulatory	Jantan et al., 2014
5	Acetone, ethanolic and methanolic extracts of Kalochitki	Antiviral	Yang et al., 2005
	Acetone extracts of Kalochitki		Yang et al., 2007
6	Water extracts of Kalochitki and ellagic acid	Antiangiogenic	Huang et al., 2006
7	Extract of Kalochitki	Antitumor	Huang et al., 2006
8	Ethanolic extract	Antiinflammatory	Fang et al., 2008
9	Chloroform added by aqueous extracts of Kalochitki	Antidiabetic	Lans, 2006

Conclusion

Any kind of plants are the gift of nature. Moreover, medicinal plants are useful for human being and from ancient time mankind have depended on natural plants as like herbal plants. We should deeply researched about medicinal plants specially *Phyllanthus urinaria* L. It also should be multiplied this herb to the conservation of biodiversity and discovery of new medicines. As a result, poor people even rich people can better the quality of life at rural communities. In Bangladesh, we should research on the pharmacological actions and investigate bioactive compounds.

Disclosure of conflict of interest

The author states no conflict of interest.

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