

A review on *Piper cubeba* L: A potential medicinal plant

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ABSTRACT

Now a days herbal medicines plays a major role to substitute the synthetic drugs with uncomplicated accessibility and culturally acceptable. The Indian traditional system mentioned enormous medicinal plants and their formulations in the management of various diseases. *Piper cubeba* Linn., is a flowering vine commonly known as tailed or java pepper belongs to family Piperaceae, is a folkloric plant has been cultivated in many countries including India. It possesses to have antiinflammatory, antinociceptive, cytotoxic, antimicrobial, antiprotozoal and antiproliferative activities. The fruits are berry and are used to treat gonorrhoea, dysentery, syphilis, abdominal pain, asthma. Essential oils and (-)-cubebin can be isolated and have been evaluated for treatment of various ailments. Thus, *Piper cubeba* L. proved a potential herb in the management of various diseases.

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1. Introduction

Traditional herbal drugs are well recognized in modern medication system due to presences of the active phytochemicals in plants. The World Health Organization (WHO) estimated that worlds 80% population exercise herbal medicines for elementary health care (Holley & Cherla, 1998). In the modern medicine approach, an herbal drug plays a great role to substitute the synthetic drugs with uncomplicated accessibility (Archana et al., 2015). The Indian traditional system mentioned enormous medicinal plants and their formulations in the management of various diseases such as diuretic, blood purifier antiphlogistic, chronic ulcers, chronic rheumatism, chronic nervous diseases, cholera amenorrhoea, piles and fistula (Nadkarni, 1996). In India, more than 3000 plants species are known to have medicinal properties. In the Indian system of medicinal use, Rig-Veda seems to be the earliest records of use of plants (Roberson, 2010). Traditional medicinal herbs are readily available and culturally acceptable. They offer an accessible and affordable health care regime and serve as an important source of lively-

-hood for indigenous rural populations. This resulted in an intense global search for plant extracts and their bioactive constituents as a basis for further pharmacological studies of health care.

Piper cubeba L., is a flowering vine commonly known as tailed or java pepper belongs to family Piperaceae, genus *Piper* which is a folkloric plant and has been cultivated in many countries including India for its fruit and essential oil (Dodson et al., 2000). In India, Charaka and Sushruta texts included *cubeba* in various remedies and in traditional Chinese medicine it is used for its alleged warming property. Arab physicians of the Middle Ages, the *cubeba* was used under the name of Kababa, when preparing the water of al butm (Mabberley, 1997). The genus *Piper* is represented with more than 1000 commercially and medicinally interesting species (Khare, 2004). Several species of this genus were found to have antiinflammatory, antinociceptive, cytotoxic, antimicrobial, antiprotozoal and antiproliferative activities. The fruits are berry and are used to treat gonorrhoea, dysen-

-tery, syphilis, abdominal pain, asthma (Eisai, 1995). Thus, based on literature survey, present study was undertaken to review on medicinal plant *Piper cubeba* in detail.

2. Phytochemistry

Thirteen different lignans including furanofuran lignans such as cubebin, hinokinin, yatein and isoyatein were appeared in the dried fruit of *Piper cubeba* (Elfahmi et al., 2007). About 15% of a volatile oil was obtained by distilling cubebis with water (Lawless & Julia, 1994).

The physicochemical analysis reported about 4.53% w/w moisture content and higher amount of extractive value 18.71% w/w in ethanol. The higher nutritive value; 353.95 Cal per 100 g of fruit powder was reported. The reports showed presence of phosphorous 19.52, iron 5.73 and zinc 0.27 ppm in the fruits. The qualitative phytochemical screening of ethanol extract revealed the presence of a wide range of phytoconstituents like carbohydrates, proteins, glycosides, saponins, diterpenes, phenols, flavonoids etc., and all other secondary metabolites (Muchandi & Dhawale, 2017).

3. In-vitro antioxidant activity

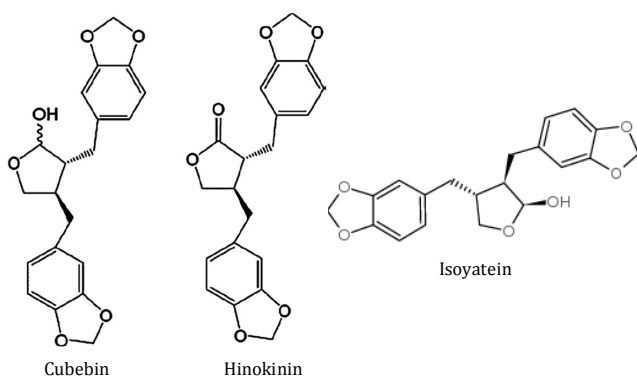
The ethanol extract of *Piper cubeba* fruit powder reported potent *in vitro* antioxidant capabilities like DPPH scavenging (93.88%), nitric oxide (89.06%) and hydroxyl radical (87.69%) scavenging activity 15, 16 at a concentration of 200 µg/mL (Muchandi & Dhawale, 2017; Gayatri & Shahu, 2011).

4. Presence of essential oil constituents in different parts of plant

The chemical composition of the essential oil of ripe berries (11.8 % v/w) and leaves (0.9 % v/w) of *Piper cubeba* were reported. Sabinene (9.1%), β-elemene(9.4%), caryophyllene (3.1%), epi-cubebol (4.3%), and cubebol (5.6%) are the main components of the berries oil. Trans-sabinene hydrate (8.2%), E-caryophyllene (5.0%), epi-cubebol (4.2%), γ-cadinene (16.6%), and cubebol (4.8%) are the main components of the leaves oil (Mulik & Laddha, 2015).

5. Isolation, characterization and quantification of (-)-cubebin

Lignans are secondary plant metabolites having wide range of therapeutic applications. (-)-Cubebin is a dibenzylbutyrolactone lignan chemically named 2,3-bis(3,4-methylenedioxybenzyl)-butyrolactone primarily obtained from plant *Piper cubeba* L. The article reported that, lignan can be isolated using simple solvent extraction technique and characterization by spectroscopic and HPLC method.



Study quantified about 0.42% of cubebin by HPLC and 0.118% of crystalline compound using solvent-solvent extraction method (Elfahmi, 2006).

6. Pharmacological screening

The extracts and isolated compounds of plant *Piper cubeba* scientifically proved for various pharmacological activities.

6.1. Antinociceptive, antipyretic and antimicrobial activity

Three doses (150, 300 and 600 mg/kg, i.p.) of essential oil obtained from the fruits of *Piper cubeba* were tested in acetic-induced abdominal writhing, tail flick reaction and hot-plate and Brewer's yeast-induced hyperpyrexia test models in animals. The study showed that the essential oil of *Piper cubeba* possesses peripheral and central anti-nociceptive activity along with antipyretic activity. Moreover, it showed a strong antibacterial and antifungal activities. These findings support the use of *Piper cubeba* in painful and inflammatory conditions (Ramzi et al., 2016).

6.2. In-vivo Clastrogenic Activity

Comet assay and micronucleus test were used to investigate the mutagenic potential of a crude ethanol extract of *Piper cubeba* seeds. The results indicate that when given at high doses of 1.0 g kg⁻¹ and 1.5 g kg⁻¹ *Piper cubeba* extract, induced a significant increase in the mean number of cells with DNA damage and micronuclei, indicating that the extract, or its metabolites, show moderate genetic toxicity in rodent cells and that caution is required regarding the indiscriminate use of high dose of *Piper cubeba* extracts by the public (Nayf et al., 2017).

6.3. Antiulcerogenic, anti-secretory and cytoprotective effects

The gastric ulcer protective potential of an aqueous suspension of *Piper cubeba* was evaluated against different acute gastric ulcer models in rats. At the doses 250 and 500 mg/kg body weight administered orally, showed a dose-dependent ulcer protective effects. Besides, it offered protection against ethanol-induced depletion of gastric wall mucus; and significantly replenished malondialdehyde (MDA) contents in the gastric tissue. Ethanol induced histopathological lesions of the stomach wall characterized by mucosal hemorrhages and edema was reversed by *Piper cubeba* aqueous suspension treatment (Mansour et al., 2013).

6.4. Antibacterial activity against selected bacterial pathogens

Different extracts including alcoholic, acetic, chloroformic and water extract of *Piper cubeba* fruit was evaluated for antibacterial activity against gram negative (G-) *Escherichia coli*, *Pseudomonas aeruginosa* and gram positive (G+) *Staphylococcus aureus*. All extracts showed antibacterial activity on these bacteria, but ethanol and acetone extracts were show the best antibacterial activity *S. aureus*, followed by chloroform extract and then water extract, on the other hand water extract showed inhibition activity against *E. coli* and *P. aeruginosae* followed by ethanol, acetone and chloroform extract (Tamadher & Al-Tememy, 2013).

6.5. Hepatoprotective activity

Piper cubeba ethanolic extract ameliorates CCl₄-induced hepatic injuries in male Wistar rats. Treatment with extract

significantly and dose dependently prevented drug induced increase in serum levels of hepatic enzymes. Furthermore, there was significantly reduced the lipid peroxidation in the liver tissue and restored activities of defense antioxidant enzymes NP-SH and CAT towards normal levels. The administration of extract significantly down regulated the CCl₄-induced pro-inflammatory cytokines TNF- α and IL-6 mRNA expression in dose dependent manner, while it up-regulated the IL-10 and induced hepatoprotective effect by down regulating mRNA expression of iNOS and HO-1 gene (Mansour et al., 2015).

6.6. Effects of *Piper cubeba* L. essential oil on Methicillin-resistant *Staphylococcus aureus*

Results indicated that the essential oils extracted from fruits of *Piper cubeba* has a good biological activity against methicillin- and oxacillin-resistant *S. aureus* ATCC 43300 strain and which acts on the cell wall and plasma membrane. The results were evaluated by using atomic force microscopy and transmission electron microscopy (Naiyf et al. 2017).

6.7. Cytotoxic activity in breast cancer cell lines

Fraction from *Piper cubeba* fruit exhibited cytotoxic activity against breast cancer cells and normal breast cells and lower toxicity against normal fibroblast cells. The cytotoxic effect of this fraction inhibited cell growth and appears to have induced apoptosis in MCF-7, MDA-MB-468, MDA-MB-231 and L929 cells (Potchanapond et al., 2015).

6.8. Protective effects against D-galactose induced neuronal lipofuscinogenesis

Oral dose 400 mg/kg of ethanol extract of fruits of plant significantly ($P < 0.001$) decreased the lipofuscin fluorescence from the hippocampus region of albino rats when compared with D-galactose treated group. The histochemical observations showed increased accumulation of lipofuscin granules in D-galactose treated group animals whereas *Piper cubeba* co-treated group showed a decreased number of lipofuscin granules in hippocampus region of brain and thus it may be useful in treatment of aging induced neurodegenerative diseases (Muchandi & Dhawale, 2018a).

6.9. Nephroprotective activity

Oral dose of 800 mg/kg and 100 mg/kg in pre-treated and post treated rat model against Gentamycin induced nephrotoxicity, serum urea and serum creatinine was significantly decreased. The nephroprotective effect was assessed on the basis of biochemical estimation and the histopathological examination of treated kidney (Qazi et al., 2012).

6.10. Synergistic effect on learning and memory enhancement activity

Ethanol extract of *Piper cubeba* L. and its combination with Ayurvedic preparation triphala showed synergistic potential on learning and memory against scopolamine induced amnesia. Thus, it concluded that, improvement in learning and memory was mediated by modulating the cholinergic function in hippocampus region of rat brain (Muchandi & Dhawale, 2018b).

Conclusion

Medicinal plant *Piper cubeba* L. proved a potential herb for treatment of various diseases. Thus, researcher should gain attention towards this plant for further evaluation and investigation.

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Conflict of interest

No conflicts of interest.

References

- Adriana PFJ, Fabio FP, Gustavo HBS, Edson LM. Clastogenicity of *Piper cubeba* (Piperaceae) seed extract in an *in vivo* mammalian cell system. *Gen Mol Biol.* 2007; 30(3):656-663.
- Archana D, Dixitha M, Santhy K. Antioxidant and Anti Clastogenic Potential of Piper Longum. *Int J App Pharm.* 2015; 7(2):11-14.
- Dodson CD, Dyer LA, Searcy J, Wright Z, Letourneau DK. Cenocladamide, a dihydropyridone alkaloid from *Piper cenocladum*. *Phytochem.* 2000; 53:51-54.
- Eisai PT. Medicinal Herb Index in Indonesia. Dian Rakyat, Jakarta, 2nd edition, 1995; pp 21.
- Elfahmi NV. Phytochemical and biosynthetic studies of Lignans, with a focus on Indonesian medicinal plants. University of Groningen, 2006.
- Elfahmi, Ruslan K, Batterman S. Lignan profile of *Piper cubeba*, an Indonesian medicinal plant. *Biochem Syst Ecol.* 2007;35:397-402.
- Gayatri N and Sahu RK. Phytochemical Evaluation and Antioxidant activity of *Piper cubeba* and *Piper nigrum*. *J Appl Pharm Sci.* 2011; 1(8):153-157.
- Holley J, Cherla K. The Medicinal Plants Sector in India, 1998.
- Khare CP. Indian herbal remedies: rational western therapy, Ayurvedic and other traditional usage, Botany, Springer, 2004.
- Lawless and Julia. The illustrated encyclopedia of essential oils:the complete guide to the use of oils in aromatherapy and herbalism. Element Books, 1995.
- Mabberley DJ. The plant book: A portable dictionary of the higher plants ; utilizing Kubitzki's The families and genera of vascular plants (1990), Cronquist's An integrated system of classification of flowering plants (1981) and current botanical literature arranged largely on the principles of ed. 1-6 (1896/97-1931) of Willis's A dictionary of the flowering plants and ferns. Cambridge [u.a.]: Cambridge Univ. Press. 1997.
- Mansour A, Ibrahim A, Mohammad R, Mohammed A, Syed R. Antiulcerogenic, Anti-Secretory and Cytoprotective Effects of *Piper cubeba* (L.) on Experimental Ulcer Models in Rat. *Int J Biotech Well Ind.* 2013; 2:173-181.
- Muchandi AA, Dhawale SC. Pharmacognostic evaluation and free radical scavenging activity of ethanolic extract of *Piper cubeba* fruits. *Asian J Phytomed Clin Res.* 2017; 5(2):42-52.
- Muchandi AA, Dhawale SC. Protective effects of ethanolic extract of *Piper cubeba* L. on D-galactose induced neuronal lipofuscinogenesis in albino rats. *Sci Eng Health Stud.* 2018a; 12(1):11-17.
- Muchandi A, Dhawale S. Synergistic Effect of the Combination of Ethanolic Extract of *Piper cubeba* and Polyherbal Formulation Triphala on Learning and Memory Enhancement against Scopolamine Induced Amnesia in Mice. *Toxicol Appl Pharmacol Insig.* 2018b; 1(1):1-5.
- Mulik MB, Laddha KS. Isolation, characterization and quantification of bioactive dibenzylbutyrolactone lignin (-)-cubebin from fruits of

Piper cubeba L. Ind J Nat Prod Res. 2015;6(3):189-193.

Nadkarni AK. In: Nadkarni's Indian material medica. Bobmay popular prakashan, 1996; 296-666.

Naiyf SA, Jamal MK, Khalid E, Alzaharni, Ramzi A, Mothana MS. Effects of *Piper cubeba* L. essential oil on methicillin-resistant *Staphylococcus aureus*: an AFM and TEM study. J Mol Recogn. 2017; 30:1-8.

Potchanapond G, Mananya M, Yaowapa S. Cytotoxic Activity of *Piper cubeba* extract in breast cancer cell lines. Nutrients 2015; 7: 2707-2718.

Qazi ZA, Jahan N, Ahmad G, Tajuddin. Nephroprotective effect of Kabab Chini (*Piper cubeba*) in Gentamycin induced nephrotoxicity. Saudi J Kidney Dis Transplan. 2012; 23(4):773-781.

Ramzi M, Mansour A, Jamal MK, Naiyf SA, Abdulrahman A, Mohammad R, Syed RA. Assessment of antinociceptive, antipyretic and antimicrobial activity of *Piper cubeba* L. essential oil in animal models. Pak J Pharm Sci. 2016; 29(2):671-677.

Roberson E. Medicinal plants at risk. Nature's pharmacy, our treasure chest: why we must conserve our natural heritage. http://www.biologicaldiversity.org/publications/papers/Medicinal_Plants_042008_lores.pdf. (Accessed January 2010).

Tamadher MK, Tememy Al, Antibacterial activity of *Piper cubeba* Linn. Fruit extracts against selected bacterial pathogens in Basrah city. Bas J Vet Res. 2013; 12(1):142-151.

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