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AN IMPORTANT MEDICINAL PLANT *PIPER CUBEBA* L.: A REVIEW

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ABSTRACT

Piper cubeba L., is a flowering creeper that is locally known as Java Pepper or Kabbab Chini or Cubeb pepper and belongs to the family Piperaceae, genus Piper, and is mainly cultivated for its fruit and essential oils. Geographical Distribution of this plant is in the Asian Countries, Africa, South and North America. It this plant contains essential oils, polyphenolic compounds, alkaloids and other phytochemical constituents which bears pharmacological activities such as antioxidant, anti-inflammatory, hepatoprotective, nephroprotective, gastro-protective, antidiabetic, antimicrobial, cognitive enhancement activities, Improving erectile dysfunctioning, Anti lipofuscinogenesis neural activity, anti leishmanial activity, anti-parasitic activity which is important for increasing human health. *Due to prsences of Volatile oil and Aromatic* odour justifies its use in cosmetics, in pharmaceutical, chemical industries and as culinary flavor in food industries. This review article was gathered by using various authenticated online sources like Scopus, Google Scholar, Research gate, Science Direct, Elsevier, PubMed, Web of Science and additional information were collectd from newly research article, library and various journals to spot the light and notarized the pharmacognosy, phytochemical constituents, pharmacological, industrial and food safety applications in attempt to divulge other reasonable therapeutic activities.

KEYWORDS: Piper cubeba, Pharmacognostic review of puiper cubeba.

INTRODUCTION

Piper cubeba L., is a flowering creeper that is locally known as Java Pepper or KabbabChini or Cubeb pepper and belongs to the family Piperaceae, genus Piper, and is mainly cultivated for its fruit and volatile oil. The two largest genera are Piper and Peperomia, each containing about a thousand species, of which about 30 species are medicinal in Asia and the Pacific.[1,2]

One such therapeutically important medicinal plant Piper cubeba has more than 700 species distributed in tropical and subtropical regions of the world.[3] This is a very variable species, which is grown mainly in Java and Sunatra. Efforts have been made to grow it in India, especially in Mysore, Karnataka state, but not or on a commercial scale.[4] Piper cubeba is a climbing shrub with a cylindrical, smooth zigzag, transversely striated stem at the node somewhat thickened. These species are mostly shrubs, climbing herbs, or trees and are widely distributed in tropical regions such as Asia, Central and West Africa, South and Central America, and the islands of the Pacific Ocean.[5] *Piper cubeba* inhabits Java, Sumatra, southern Borneo, the Moluccas and other islands in the Indian Ocean. It is most cultivated in Java and Sumatra; therefore, it is known as "Java pepper" for some time, but some African countries also export cubed pepper. It is cultivated in some West Indian islands.[6] *Piper cubeba* is a native plant from Indonesia.[4,7,8,9] Efforts have been made to grow it in India, most in Mysore, but not on a commercial scale, cubes can be easily grown by planting at the base of shade trees in coffee plantations. The fruits are collected when fully grown but still green and dried in the sun when they turn black and shrivelled.[10] Fruits of Piper cubeba wrinkled, rounded (5-7 mm in diameter), light brown to dark brown with a stalk 7 mm long, pericarp red to pale brown, testis fused with the pericarp, fruits hard and stony white and oily, found aromatic in characteristics, test pungent and slightly bitter.[11,12] Piper is used Pradeep Kumar DOI: 10.26855/ijfsa.2021.03.022 175 International Journal of Food Science and Agriculture for many purposes such as spices, food, fish poison, fish baits, insecticides, hallucinogens, oils, perfumes, ornaments and for medicine.[13,14] The use of Piper cubeba in Western medicine can be traced back to the Middle Ages.[15] In Indonesia, Piper cubeba is valued as a medicinal plant and is used in Indonesian traditional medicine to treat dysentery, go-norrhea, syphilis, diarrhea, asthma, enteritis, and abdominal pain.[16]

PLANT PROFILE

Piper cubeba is an important medicinal piper species, unremarkably called as tailed pepper (because of the stalks attached), Java pepper (in Java). It is grown in Indonesia mainly in the Java, Sumatra islands, Southern Borneo and in southern India. Piper cubeba cultivated for its fruit and essential oils that used as a spice in many countries and have many economical and medicinal important. The pharmacological activities of piper cubeba have outstanding record in the folk and Unani medicine.

Scientific investigations have reported the antioxidant, antimicrobial, nephroprotective, hepatoprotective, gastro protective, hypoglycemic, antiinflammatory, analgesic effects and antiasthmatic activities of Piper cubeba. Industrially, Piper cubeba can be used as flavoring agent, food preservative, insecticides, and nutritional properties and cosmetic.

TAXONOMICAL CLASSIFICATION

Kingdom- Plantae

Division-Magnoliophyta

Class-Magnoliopsida

Order-Piperales

Family-Piperacae

Genus-Piper

Species-cubeba

BOTANICAL CLASSIFICATION

Piper cubeba is a perennial woody climber with ash grey climbing stems and branches, rooted at joints. The plant is about 5-15m high.

Leaves: The leaves of the plant are ovate oblong with cordate or rounded base, glabrous, several veined with thick pedicle. They are simple, smooth and pointed at the tip. The lower surface is densely provided with minute sunken glands. They are entire margined, coriaceous and up to 15cm long and 6cm wide, The flowers are unisexual, small, densely set on the peduncle, perianth –less. They are arranged in smooth scaly spikes and female spikes are often curved.

The main flowering spikes are about 4cm long, have 2 or 3 stamens. The female spikes are made up of about 50 individual flowers, which mostly consist of the oblong ovary of 4 fused carpels with 4 sessile stigmas. The infructescence is 4-5 cm long, when ripe, the base of the ovary grows in to stem like, cylindrical lower part.

Fig. 1: Leavs.

Fruits: The fruits are stalked, more or less apiculate, sub-globose and 6-8 mm in diameter. The upper part of the cubeb fruit is globular, 3-6 mm diameter and covered with a grayish brown, reticulated pericarp, which is prolonged at the base in to a straight stalk. They possess a spicy, aromatic odor and a somewhat bitter and acrid taste. On breaking wall of the fruit a single subglobose, smooth, dark brown seed comes out which is measured 3-4 mm in width that contains a tiny embryo in a small cavity at the apex, Part used is the dried immature full-grown fruits.

Fig. 2: Fruits.

PHYTOCHEMICALS

The phytochemical draft of Piper cubeba is assigned by the assembly of typical categories of phytoconstituents like, terpenoids (essential oil), polyphenolic compounds (phenolic acids, flavonoids and lignans), alkaloids and others.[17]

Essential oil

Many tissues and organs like fruits, seeds, leaves, branches, roots and stems of Piper plants were reported to contain a number of essential oils (EOs). The presence of essential oils (EOs) is a characteristic property of the Piper cubeba, which is an abundant source of EOs

with different types as shown in figure 3, 4. The fruits of Piper cubeba are mainly composed of Sesquiterpene hydrocarbons and specifically β-caryophyllene (3.1%), epi-cubebol (4.3%), ,cubebol (5.6%), dcadinene, α and β-cubebene, copaene, germacrene, cubebinolide, cubenol, nerolidol, bicyclosesquiphellandrene[18,19] and minor amounts of Monoterpenes which includes Sabinene (9.1%), β-elemene (9.4%), α-thujene, carene, 1, 4-cineol and 1, 8-cineol, limonene, linalol, myrcene, safrole and sabinol.[16] Bos et al analyzed the essential oil present in the leaves and ripe berries of Piper cubeba with gas chromatography/mass spectra (GC/MS). The results showed that not significant differences were found in the composition between berry(11.8%) and leaf(9.1%) oil, although the berries have a considerable amount of constituents in traces (< 0.05%) that were not found in the leaves.[20]

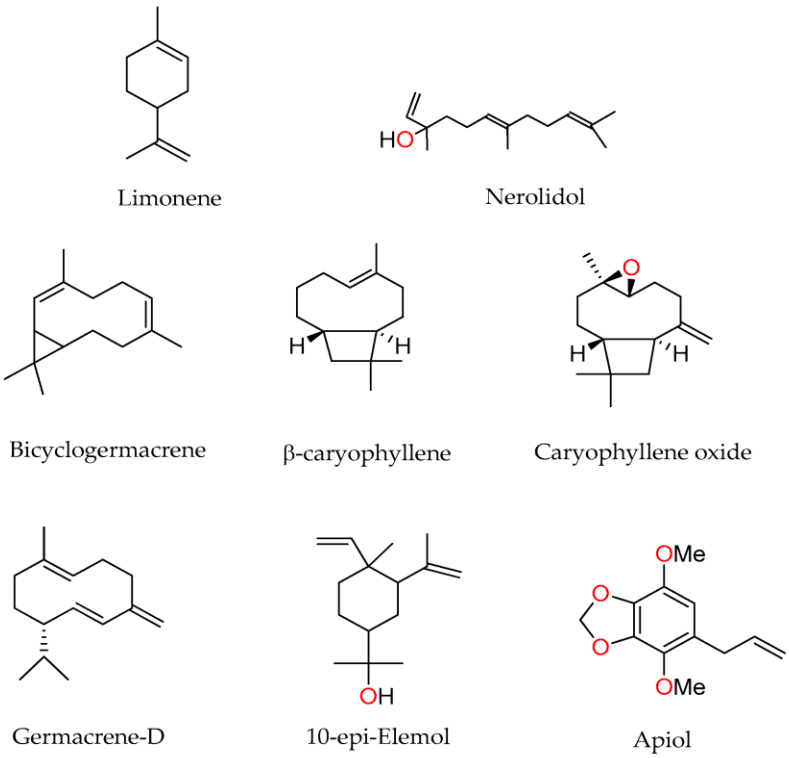

Fig. 3: Chemical structure of Essential oils of *Piper cubeba.*

Polyphenolic compounds

Phenolic acids and flavonoids: Several phenolic acids and flavonoids have been detected and isolated from piper cubeba as shown in figure 5. Ahmed R and Hameed S demonstrated the presence of Gallic acid (8 ppm), Caffeic acid (13 ppm), Syringic acid (3 ppm), Ferulic acid (11ppm) in the aqueous extract of the piper cubeba fruits in addition to the presence of Rutin (8ppm) and Catechin (5ppm).[21] In the same research, the content of total phenols was 2.11 mg/gm in the aqueous extract.[22]

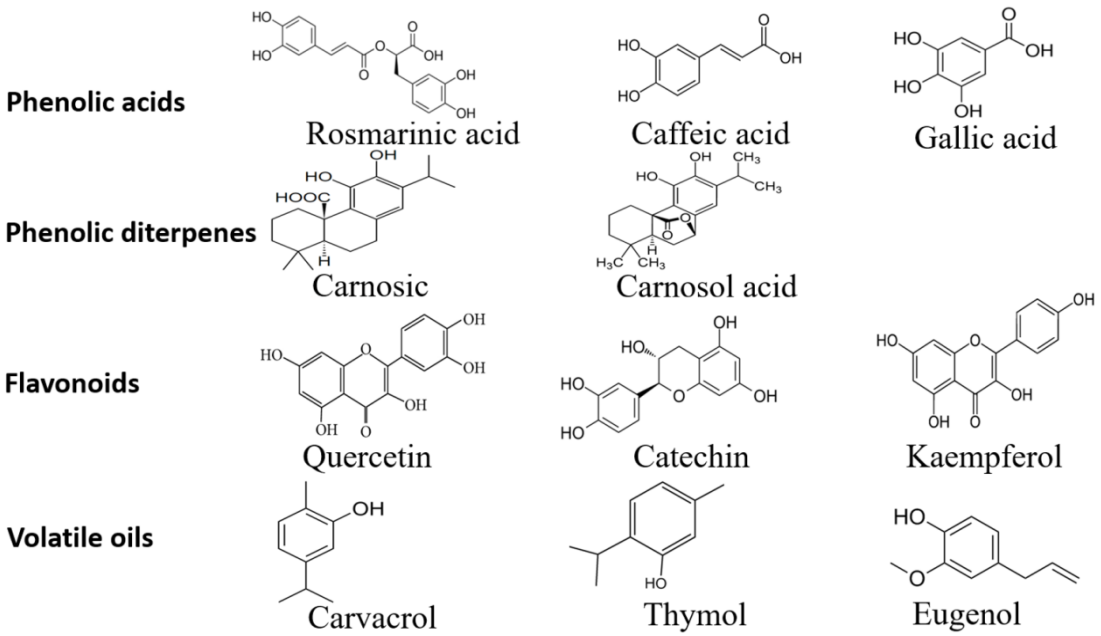

Fig. 4; 3: Chemical structure of Polyphenol compounds of *Piper cubeba.*

PHARMACOLOGICAL ACTIVITIES OF P*iper cubeba*

An endeavor has been made to raise updated research information on Piper cubeba from the internet using Google search engine and PubMed. Many researchers achieved their researches on Piper cubeba and its active constituents using latest progressing scientific technologies. The important pharmacological activities of Piper cubeba are discussed below.

1. Antioxidant activity

The antioxidant activities of Piper cubeba have been studied by plentiful research groups which assist the presence of different phytochemical constituents especially polyphenols, alkaloids, glycosides and other important secondary metabolites that have powerful antioxidant activity.5alpha-reductase inhibitory activity: Cubebin (major lignans) found in the Piper cubeba fruit extract show a potent testosterone 5 alpha-reductase inhibitory activity which was first identified by Hirata.[23]

2. Antimicrobial activity

Many studies revealed that the aqueous and/or alcoholic extracts of Piper cubeba have good antimicrobial activity against the selected gram positive and negative bacteria as well as fungi. This effects may be contributed to presence essential oils and lignans specially (-)-cubebin and (-)-hinokinin.[23]

3. Nephroprotective activity

Piper cubeba in experimentally studies demonstrated a significant protective and curative effect on stress induced antimicrobial renal insult in both the histological and biochemical parameter, oral suspension at the dose of 800 mg/kg and 100mg/kg as significantly decreased the elevated blood urea and serum creatinine. Hepatoprotective activity: The ethanolic extract of Piper cubeba fruits attenuates carbon tetra chloride (CCl4) induced hepatic damage which testifies the hepatoprotective activity with reduction in elevated levels of liver function, stabilized and repaired plasma membrane and hepatic tissue damage induced by CCl4.[23]

4. In the Treatment of erectile dysfunction

Erectile dysfunction (ED) increases with age, associated with many medical, psychological and drug side effects. Carvalho et al. investigated (-)-cubebin from the dried seeds of Piper cubeba effect on the contractility and relaxation of rat aortic rings with phenylephrine to evaluate the possible mechanism involved, elicited endothelium-dependent and endotheliumindependent vascular relaxation in rat aorta mediated by the nitric oxide (NO)/cyclic guanosine monophosphate (cGMP) signaling pathway, which improve erectile function.[23]

5. Gastro-protective activity

Piper cubeba suspension (PCS) produced a significant anti secretory, antiulcer and gastric cytoprotective effect in rats by reduction in the basal gastric acid secretion and ulceration.[23]

6. Anti-inflammatory activity

Some reports revealed that Piper cubeba L. extracts have anti-inflammatory activity by attenuating IL-6, which is stimulated by lipopolysaccharide (LPS), in THP-1 cells resulting in inhibition of cyclooxygenases (COX-1 and COX-2) and 5-lipoxygenase (5-LOX).[23]

7. Antiparasitic activity

Esperandim et al estimated the trypanocidal activity of cubebin and hinokinin in vivo during the chronic Chagas disease phase. Both of them showed interesting activity against Trypanosomacruzi, the parasite responsible for Chagas disease.[23]

8. Cognitive enhancement activity

Muchandi&Dhawale studied the role of ethanolic extract of Piper cubeba L. and its combination with Ayurvedic preparation triphala upon scopolamine induced amnesia in rat

model. Significant improvement in cognitive function (learning and memory) was mediated by modulating the cholinergic function in hippocampus region of rat brain.[23]

9. Antidiabetic activity

Ahmed et al evaluated in their study the effect of Piper cubeba aqueous and methanolic extracts on intestinal α-amylase and α-glucosidase in vitro, inhibition of these digestive enzymes, which affect glucose absorption, is an important strategy to regulate diabetes mellitus. According to Ahmed et al, aqueous extracts displayed good diabetic control compared with methanol extracts and greater digestive enzymes inhibition was manifested on α-glucosidase in comparison to αamylase inhibitory activity.[23]

10. Anti-lipofuscinogenesis neural activity

The protective effect of the Piper cubeba ethanol extract on neuronal lipofuscinogenesis in the hippocampus region of albino rats induced by Dgalactose was evaluated by Muchandi&Dhawale. Piper cubeba is proved to have a significant protective effects by decreasing the number of lipofuscin granules in hippocampus region of brain and may be useful in treatment of aging induced neurodegenerative diseases.[23]

11. Antileishmanial Activity

Different Piper cubeba extracts (n-hexane, ethyl acetate, methanol, and acetone) were evaluated in vitro against promastigotes of Leishmaniadonovani, the results demonstrated that Piper cubeba has good leshmanicidal activity due to the presence of two lignans (cubebin and hinokinin).[23]

CONCLUSION

On above Literature and review *Piper cubeba* is an important medicinal plant consider as illustrated in the aforementioned review with a various of Pharmacological and Therapeutics activities due to presense of various phytochemical components such as essential oil(Limonene, Nerolidol, Bicyclogermacrene, B- Caryophyllene, Caryophyllene oxide, Germacrene-D, 10-epi-Elemol, Apiol), polyphenolic compounds such as phenolic acids, flavonoids and lignans (Rosmarinic Acid, Caffeic Acid, gallic Acid, Carnosic,Cornosol Acid,Quercetin, Catechin, Kaempferol, Carvacrol, Thymol, Eugenol, alkaloids(Piperine), glycosides, tannins, amides and others. All these components have antioxidant, anti-inflammatory, hepatoprotective, nephroprotective, gastro-protective, antidiabetic, antimicrobial, cognitive enhancement activities, Improving erectile dysfunctioning, Anti

lipofuscinogenesis neural activity, anti leishmanial activity, anti-parasitic activity that are implemented in the traditional, pharmaceutical and clinical application and Aroma Therapy for its proven efficacy. Review target is to know primary information about active compounds responsible for the bioactivities of *Piper cubeba* which could contribute positively to new expitationin pharmaceutics, food and industrial areas.

CONFLICTS OF INTEREST

The authors have stated that there is no conflicts of interest.

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