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REVIEW ARTICLE

Ethno-medicinal, Phytochemical and Pharmacological review of an amazing medicinal herb *Peperomia pellucida* (L.) HBK.

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ABSTRACT

Peperomia pellucida (L.) HBK (Fam. Piperaceae) has been used as a (Rasayan) drug in the Ayurvedic system of medicines. *Peperomia pellucida* is reported to posse antipyretic, analgesic, anti-inflammatory, antimicrobial, refrigerant and CNS activity. Traditionally it is used in the treatment of headache, fever, eczema, abdominal pains, and convulsions. In traditional Ayurvedic system of medicine in India *Peperomia pellucida* is used as Rasa, Guna and Virya. Phytochemical screening of this plant has shown the presence of flavonoids, tannins, alkaloids, steriod and triterpenoid. Isolation of antifungal and anticancer constituents from this plant was also reported newly. The present study is based on the work done till date regarding the phytoconstituents and pharmacological activity of *Peperomia pellucida*.

Keywords: Piperaceae, Essential oils, Analgesics, Anti-pyretics, CNS activity.

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INTRODUCTION

Peperomia pellucida (L.) HBK is also known as shiny bush or silver bush belonging to family Piperaceae. In Sanskrit, it is known as Toyakandha, Varshabhoo. *Peperomia pellucida* is an herbaceous plant found in many South American and Asian countries. The species develops during rainy periods (often in the spring) and thrives in loose, humid soils under the shade of trees. [1-4]. It grows in moist habitat and is found throughout the major parts of India. In different parts of India it is known with different names like Lochi pata in Bangali [5], Mashitandu chedi in Malayalam and Pononoa in Assamese etc [5,6]. Whole plant or parts of plant are used for different purposes. Despite its wide range of folk medicinal uses in India sub-continent, there is very little scientific documentation available on its pharmacological and biological activities as well as its chemical constituents.

MATERIAL AND METHODS

TAXONOMICAL CLASSIFICATION [7].

Kingdom	Plants
Subkingdom	*Tracheobionta* – Vascular plants
Superdivision	*Spermatophyta* – Seed plants
Division	*Magnoliophyta* – Flowering plants
Class	*Magnoliopsida* – Dicotyledons
Subclass	*Magnoliidae*
Order	*Piperales*
Family	*Piperaceae*
Genus	peperomia
Species	*Peperomia pellucida*

Botanical description

Peperomia pellucida (L.) HBK is an annular herb. The roots are fibrous; stems translucent pale green, erect or ascending, usually 15-45 cm long, internodes usually 3-8 cm long, glabrous and the leaves are medium green on upper surface, lower surface whitish green, thinly fleshy, drying papery, broadly ovate, 1.5-4 (-5) cm long, 1-3.3 cm wide, palmately 3-nerved or 5-nerved, glabrous, apex acuminate, base subcordate to truncate, petioles 0.5-2 (-3) cm long, glabrous. One to several spikes are available, terminal and axillary or leaf-opposed, filiform, ca. 3-6 cm long, the rachis ca. 0.4-0.6 mm in diameter, glabrous, flowers well-spaced, peduncles ca. 0.6-1 cm long, glabrous; ovary ovoid; stigmas terminal and also fruits were subglobose, ca. 0.5 mm long, longitudinally ridged, apex beaked [8].

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GEOGRAPHICAL DISTRIBUTION

Peperomia pellucida is widely distributed in many South American and Asian countries [4, 9-11]. The plant is occasionally cultivated and sparingly naturalized in Hawaii [8]. In Fiji, this plant is occurring at elevations of sea level to about 400 m as a weed along roadsides, in plantations, on damp ground in shady places near houses, and occasionally along forest trails [12]. Some other region across the glove like southern regions of China [13], Samoa, New Guinea etc are the places where this plant are found in damp shady conditions and living bare ground which is mostly from sea level to 700 m [14,15]. The plant mostly found at tropical and subtropical parts of India. Basically the Native range of this plant is Tropical America, but now widely cultivated and naturalized throughout the tropics [8].

TRADITIONAL USES

Plants have played a significant role in maintaining human health and improving the quality of human life for thousands of years, and served as valuable components of food and medicines [16]. *Peperomia pellucida* leaves and stems may also be eaten as vegetable [17]. In salads, the fresh plant has the crispness of carrot sticks and celery. As Ethno-medicinal uses of this plant *Peperomia pellucida* has been applied for treating abdominal pain, abscesses, acne, boils, colic, fatigue, gout, headache, renal disorders, and rheumatic joint pain[6,18,19,20]. In Bolivia, Altenos Indians use the whole plant to stop hemorrhages. The roots are used to treat fevers and the aerial parts are used as dressing for wounds [21]. In northeastern Brazil, the plant has been used to lower the cholesterol level [9]. In Guyana and the Amazon region, it is a popular cough suppressant, emollient, and diuretic. It is also used to treat proteinuria [3, 4]. In the Philippines, a decoction of the plant is used to decrease uric acid levels and to treat renal problems [5]. In different region of Lakshmipur district of Bangladesh, the leaves of the plant are used by local people in the treatment of excited mental disorder [22]. It is also used topically for skin disorders such as acne and boils. In South America, A solution of the fresh juice of stem and leaves is used against eye inflammation [6]. Infusion and decoction of leaves and stems are used for gout and arthritis. According to Manila Medical Society *P. pellucida* is used to relieve arthritic pains, but can cause CNS depression [23]. This plant has externally used as a facial rinse for complexion problems. Pounded whole plant used as warm poultice for boils, pustules and pimples and also used for headaches, rheumatic pains and impotence [24]. *Peperomia pellucida* is also used in traditional Ayurvedic medicine [6]. It is described in Ayurveda as – Rasa – Katu and Madhur; Guna- Lakhu, rooksha, Teekshna; and Virya- Ushna. The plant is described to passify vitiated cough, pitta, constipation, kidney diseases, urinary retention, dysuria, urinary tract infections, emaciation, edema and general weakness. Infusion and decoction of leaves and stems of fresh plant are eaten as salad for the treatment of gout and arthritis [24, 25]. According to Ethno-botanical studies the whole plant has been in medicinal use since long. It is crushed and mixed with water to form a mixture, heated and administered orally to cure hemorrhage. It is also been applied against coughing, fever, common cold, headache, sore throat, diarrhea, against kidney and prostate problems and against high blood pressure [26].

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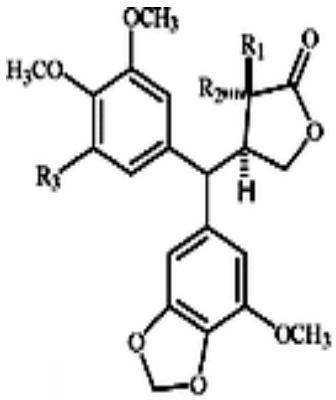
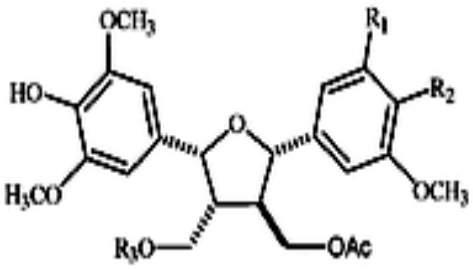
PHYTOCONSTUENTS

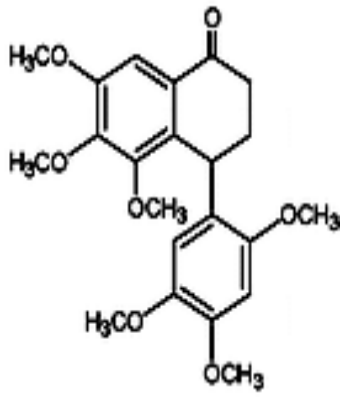
The plant *Peperomia pellucida* was found to have variety of chemical constituents. Phytochemical screening revealed the presence of alkaloids, cardenolides, saponins and tannins, while anthraquinones was observed to be absent [27]. Stem also contain alkaloid, tannins, flavanoids and steriods, except saponins. The roots of *Peperomia pellucida* also had shown the presence of alkaloid, tannins, steroids and carbohydrates etc. The essential oils of the plant were found primarily in medical literature. One study identified 71 compounds from the essential oils of 10 Piperaceae species. Sesquiterpenes appear to be the major chemical constituents in the essential oils. Carotol (13.41%) was the major hydroxylated sesquiterpene in a chemical analysis of *Peperomia pellucida*. Flavonoids, phytosterols, arylpropanoids (eg, apiols), substituted styrenes, and a dimeric ArC_2 compound or pellucidin A have been isolated. Antifungal activity has been documented for arylpropanoids such as the apiols. Other compounds, like the peperomins, have cytotoxic or anticancer activity in vitro. Isolated flavonoids include acacetin, apigenin, isovitexin, and pellucidatin. Isolated phytosterols include campesterol and stigmasterol.



	R_1	R_2	R_3
1	CH_2		OCH_3
2	H	CH_3	OH



	R_1	R_2	R_3
3	OCH_2O		H
4	OCH_3	OH	Ac



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Also contains five new compounds (1−5), including two secolignans, two tetrahydrofuran lignans, and one highly methoxylated dihydronaphthalenone. These compounds were accompanied by the known peperomins A, B, C [28], and E [29], 7, 8 - trans 8, 8‘ – trans -7‘ ,8‘- cis- 7, 7‘ – bis (5-methoxy-3,4 methylenedioxyphenyl) - 8 - acetoxymethyl- 8‘ hydroxymethyltetrahydrofuran, 7, 8 – trans - 8, 8‘ – trans - 7‘, 8‘ – cis -7- (5-methoxy-3,4 methylenedioxyphenyl) -7‘ -(4-hydroxy -3, 5-dimethoxyphenyl) -8, 8‘ diacetoxymethyltetrahydrofuran [30], sesamin [31], and isoswertisin [32]. Patuloside A (3-β-D-glucopyranosyloxy-1, 5, 6-trihydroxy-9H-xanthene-9-one) is a xanthone glycoside isolated from Peperomia pellucida. [1, 4, 33-40].

PHARMACOLOGICAL PROPERTY

Crude methanolic extracts of *Peperomia pellucida* has been reported as broad spectrum antimicrobial activity which was evaluated by the disk diffusion method. The fractions were found to be more active than the crude extracts [18]. Other studies document similar results for activity against numerous species, including *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* [41, 42]. Chloroform extracts from dried leaves of *Peperomia pellucida*, particularly the isolated compounds like apiol and pachypophyllin, has been reported a potent antifungal activity against Trichophyton mentagrophytes [35]. Antiprotozoal activity also reported in *Peperomia pellucida* plant. A whole plant extract inhibited growth of the chloroquine-resistant *Plasmodium falciparum* Indo strain by 95% in vitro at 100 mg/mL, and the rodent malaria *Plasmodium vinckei petteri* by 78% in vivo at 1,000 mg/kg. Anti-inflammatory and analgesic activity has been reported on aqueous extract of the aerial part of *Peperomia pellucida* plant. The activity was tested in rats and mice, respectively. Oral administration of 200 and 400 mg/kg of the aqueous extract exhibited an anti-inflammatory activity whereas 400 mg/kg of the plant extract had the highest analgesic activity [11, 18, 19]. A neuropharmacological effect of *Peperomia pellucida* leaves has been reported in mice. Both petroleum ether and ethyl acetate fractions of ethanol extract of *Peperomia pellucida* leaves contain psychoactive substances which are CNS depressant in nature. In petroleum ether fraction was more active than ethyl acetate fraction and at the same doses, effects of petroleum ether fraction on the duration of diazepam-induced sleep and latency of the death caused by nikethamide toxicity was better [22]. The antipyretic Activity of *Peperomia pellucida* Leaves in Rabbit has been reported. Antipyretic effects of petroleum ether and ethyl acetate soluble fractions of ethanol extract of the leaves of *Peperomia pellucida* were intra peritoneal (i.p.) administration at a dose of 80 mg/kg body weight significantly reduced the elevated body temperature of rabbit [43]. Cytotoxicity was also observed in crude extracts from *Peperomia pellucida* against the cancer cell lines HL-60, MCF-7, and HeLa [44]. *Peperomia pellucida* constituents' flavonoids have been known to possess anti-oxidant, anti-neoplastic, anti-ulcer, anti-inflammatory and anti-microbial activities. This plant also reported at dose-dependent increase in adverse effects in the major systems of the body such as integunrentarym, usculo-skeletal, nervous, respiratory, digestive and urogenital, covering the dose range from 6 g to 32 g per kg body weight of mouse along with a delayed appearance of adverse effects such as delayed time of death, delayed appearance of soft feces, and delayed recovery or no recovery from weight loss [45].

CONCLUSION

From the foregoing accounts it is evident that the plant *Peperomia pellucida* has been Ethno-medicinally used as a valuable therapeutic agent for a variety of diseases, as we have illustrated in this article. Moreover, numerous research works have proven its uses beyond the ethno-medicinal ones in experimental animals. Various compounds which were isolated from this plant may be responsible for its pharmacological activities. Being such a most useful and immense medicinal values that require more exploration in all the pharmaceutical aspect. So it needs further researches towards the development of safe and suitable medications. The road

ahead is to establish specific bioactive molecules, which might be responsible for these pharmacological actions.

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