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Phytochemical and Antibacterial Studies on *Peperomia Pellucida* (L.) H.B.K.

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Abstract
The present study was aimed to find out the phytochemical composition and antibacterial potential of *Peperomia pellucida* (L.) H.B.K. against the fish pathogens. Preliminary phytochemical constituents of *P. pellucida* were analysed using the standard procedure described by Harborne. The bacterial pathogens *Bacillus subtilis, Escherichia coli* and *Pseudomonas aeruginosa* were isolated from diseased tilapia and their identity was confirmed using the standard procedure. Antibacterial screening was carried out by agar well diffusion method against the selected pathogens viz., *Escherichia coli, Bacillus subtilis* and *Pseudomonas aeruginosa.* Phytochemical screening revealed the presence of alkaloids, steroids and phenolic groups. Among the five different extracts, the ethanolic extract exhibited maximum degree of inhibition followed by acetone and chloroform. Ethanolic extract showed the maximum degree of zone of inhibition against *P. aeruginosa* (14 mm) followed by *B. subtilis* (13 mm) and *E. coli* (10 mm). The present study results may direct to the discovery of new antibacterial compounds for treating various infections.

Keywords: *Peperomia pellucida*, Phytochemistry, Anti-bacterial.

Introduction

Peperomia pellucida (L.) H.B.K. (Piperaceae) is a small multipotent herb and employed to treat abdominal pain, fever, head ache, eczema, abscesses, acne, boils, colic, fatigue, gout, proteinuria, renal and skin disorders and rheumatic joint pain [1]. It is a popular cough suppressant, emollient and diuretic in Guyana and the Amazon [2]. In Philippines, the decoction of *P. pellucida* is used to decrease uric acid levels and to treat renal problems. *P. pellucida* (Silver bush) is very effective in the treatment of hypertension [3, 4]. Pulakmajumder [5] reported the occurrence of carbohydrates alkaloids, tannins, flavonoids, steroids and triterpenoids in stem of *P. pellucida*. Various studies have validated the versatile pharmacological properties of *P. pellucida* [6-8]. Xu *et al*. [9] extracted anticancer metabolites peperomins from *P. pellucida*. With this knowledge, the present study was aimed to find out the phytochemical composition and antibacterial potential of the medicinally important plant *P. pellucida.*

Materials and Methods

Peperomia pellucida (L.) H.B.K. was collected from the natural habitats of Nagercoil, Tamil Nadu, India and identified using the Flora of Madras Presidency. The plants were cut into small pieces, shade dried at room temperature for 15 days and powdered using mechanical homogenizer. 5 g of powdered plant material was extracted separately in the ratio of 1:6 at room temperature using various solvents viz., petroleum ether, chloroform, acetone, ethanol and water with regular shaking for 72 h. The extracts were filtered through Whatmann No.1 filter paper. It was transferred to glass container and kept at 4 ^{0}C before use.

The preliminary phytochemical constituents of different extracts of *P. pellucida* were qualitatively analysed using the standard procedure [10]. The bacterial pathogens *Bacillus subtilis, Escherichia coli* and *Pseudomonas aeruginosa* were isolated from diseased tilapia [11, 12]. The bacteria were identified and confirmed by conventional microbiology procedure [13]. Stock cultures of *Bacillus subtilis, Escherichia coli* and *Pseudomonas aeruginosa* were grown in nutrient broth at 30 °C and were sub-cultured and maintained in nutrient broth at 4 °C. Antibacterial screening was carried out by agar well diffusion method [14] against the fish pathogens *Bacillus subtilis, Escherichia coli* and *Pseudomonas aeruginosa.* Cultures were received in nutrient broth and incubated at 37 ^{0}C for overnight. The diluted bacterial culture was spread throughout the nutrient agar medium using sterile cotton swab and the wells were formed with the help of cork borer. Plant samples were poured with various concentrations (25, 50 and 100 µg/ml) separately and incubated at 37 ^{0}C for 24 h. Antibacterial activity was calculated by measuring the diameter of zone of inhibition in millimeter. Penicillin was used as positive control.

Results

Phytochemical screening of different extracts of *P. pellucida* revealed the presence of alkaloids, steroids and phenolic groups and the results were illustrated in Table 1. Aqueous extracts of *P. pellucida* showed the occurence of alkaloids, steroids and phenolic groups. Acetone and ethanolic extracts of *P. pellucida* demonstrated the presence of alkaloids and phenolic groups. Petroleum ether and chloroform extracts of *P. pellucida* confirmed the existence of steroids only. Flavonoids, saponins, anthraquinones and aminoacids failed to show their occurrence in any one of the five extracts tested.

The results of the antibacterial activity of ethanolic, chloroform, acetone, petroleum ether and aqueous extracts of *P. pellucida* were tabulated in Table 2. Among the five different extracts, the ethanolic extract exhibited maximum degree of inhibition followed by acetone and chloroform. The results of various extracts were compared with the standard antibiotic disc penicillin. Amikacin showed positive result against all the three pathogens. The 100 µg/ml of *P. pellucida*

ethanolic extracts showed the maximum degree of zone of inhibition against *P. aeruginosa* (14 mm) followed by *B. subtilis* (13 mm) and *E. coli* (10 mm). The 100 µg/ml of *P. pellucida* acetone extract exhibited the highest zone of inhibition against *E. coli* (13 mm) followed by *B. subtilis* (12mm) and *P. aeroginosa* (11 mm). 100 µg/ml of *P. pellucida* aqueous extracts demonstrated the maximum zone of inhibition against *B. subtilis* (10 mm) followed by *E. coli* (5 mm). Aqueous extracts of *P. pellucida* failed to show the inhibition against *P. aeruginosa*. The 100 µg/ml of *P. pellucida* chloroform extracts illustrated the maximum zone of inhibition against *B. subtilis* (10 mm) followed by *E. coli* (7 mm). The 100 µg/ml of *P. pellucida* petroleum ether extracts exhibited the zone of inhibition against *P. aeruginosa* only and failed to show the inhibition against *B. subtilis* and *E. coli.*

Table 1: Preliminary Phytochemical studies on different extracts of *P. pellucida*

Secondary metabolites	Petroleum Ether	Chloroform	Acetone	Methanol	Aqueous
Steroids	+	+	-	-	+
Alkaloids	-	-	+	+	+
Phenolics	-	-	+	+	+

Table 2: Antibacterial activity of *P. pellucida*

Organisms	Zone of Inhibition (mm)															
	Petroleum ether			Chloroform			Ethanol			Acetone			Aqueous			Amikacin (30 µg/ml)
	25	50	100	25	50	100	25	50	100	25	50	100	25	50	100	
E. coli	-	-	-	1	3	7	3	6	10	3	6	13	1	2	5	21
B. subtilis	-	-	-	5	7	10	3	5	13	3	5	12	2	4	10	25
P. aeruginosa	-	2	8	-	-	-	4	6	14	3	5	11	-	-	-	24

Discussion

Plants are rich source of medicinal properties in the name of secondary metabolites. These secondary metabolites are therapeutically used in various Indian medicine which give slow and steady state recovery from the diseases. The present phytochemical study revealed the presence of alkaloids, steroids and phenolic groups. Alkaloids, which is one of the largest phytochemical groups in plants has amazing effect on humans and this has led to the development of powerful pain killer medications including anti-asthmatic and anti-inflammatory [15, 16]. Alkaloids are chemical constituents from plant that can work on the nervous system of the human body and used for analgesic, antispasmodic and bacterial effects [17]. Plant steroids are known to be important for their cardiotonic, insecticidal, antimicrobial, antioxidant and antitumour activity [18]. Phenolic phytochemicals have antioxidative, antidiabetic, anticarcinogenic, antimicrobial, antiallergic, antimutagenic and anti-inflammatory properties [19, 20]. The antimicrobial activities of phenolic compounds may involve multiple modes of action. For example, oils degrade the cell wall interact with the composition and disturb cytoplasmic membranes [21]. The results of the present study confirmed the presence of alkaloids, steroids and phenolic compounds which will increase the folkloric usage to treat hypertension and renal problems.

P. pellucida extract was demonstrated to possess antibacterial activity against *Staphylococcus aureus, Bacillus subtilis, P. aeruginosa* and *E. coli* [22]. Akinnibosun *et al.* [23] studied the antibacterial activity of aqueous and ethanolic leaf extract of *P. pellucida* against *E. coli, Proteus mirabilis* and *P. aeruginosa* using agar-well diffusion method and reported that *E. coli* displayed the highest susceptibility in water extract followed by *P. aeruginosa* in ethanolic extract. In the present study also, *P. pellucida* was tested against *E. coli, Bacillus subtilis* and *P. aeruginosa* and we observed the zone of inhibition against the three bacteria with varied diameters. Hence the results of the present study supplemented the previous observations.

Conclusion

The antibacterial efficacy of *P. pellucida* confirmed that the plant extracts are novel spectrum antibacterial agent against *E. coli, B. subtilis* and *P. aeruginosa* and could be used in the treatment of infectious diseases. The results of the present investigation also support the claims by local practitioners of ethno medicine in the therapeutic efficacies of *P. pellucida.*

References

1. Arrigoni Blank MF, Oliveira RL, Mendes SS, Silva PDA, Antoniolli AR. Seed germination, phenology and antiedematogenic activity of *Peperomia pellucida* (L.) H.B.K., BMC Pharmacol. 2002; 2:12-19.
2. Ghani A. Medicinal Plants of Bangladesh. Asiatic Society of Bangladesh 1998; 77-78.
3. Ayitey-Smith E. Prospect and Scope of Plant Medicine in Health Care, Ghana University Press, Accra, 1989; 29.
4. Anslem A. Nature Power, Christian Approach to Herbal Medicine, Don Bosco Training Centre, School of PTP, Printing and Finishing, Akure, 2006; 206.
5. Pulakmajumder. Department of Pharmacognosy, Rajiv Gandhi Institute of Pharmacy, Trikaripurkasarajod, Kerala, India. IJCP 2011; 8(6).
6. Bojo AC, Garcia EA, Pocsidio GN. Antibacterial activity of *Peperomia pellucida* (L.) HBK (Piperaceae). Asia Life Sci. 1994; 3(1):35-44.
7. Aziba PI, Adedeji A, Ekor M, Adeyemi O. Analgesic activity of *Peperomia pellucida* aerial parts in mice. Fitoterapia 2001; 72:57-58.
8. Amadi BA, Ibegbulen CO, Egbebu AC. Assessment of the effect of aqueous extract of pawpaw (*Asimina triloba*) root on organ weights and liver functions of albino rats. Int. J. Natl. Appl. Sci. 2006; 2:79-81.
9. Xu S, Li N, Ning MM, Zhou CH, Yang QR, Wang MW. Bioactive compounds from *Peperomia pellucida.* J Nat Prod. 2006; 69:247-250.

10. Harborne JB. Phytochemical methods: A guide to modern techniques of plant analysis. 3rd edition, Chapman and Hall Company, New York, 1998, 1-302.
11. Hardi AL, Uddin MI. Seasonal variation in the intestinal bacterial flora of hybrid Tilapia (*Oreochromis niloticus* x *Oreochromis aureus*) culture in earthen pond in Saudi Arabia. Aquaculture 2004; 229(124):37-44.
12. Berch O, Nass KE, Harboe T. Shift in the intestinal microflora of Atlantic halivut (*Hippoglosius hippoglosius*) larvae during first seeding. Can J Fish Aquat Sci. 1994; 51:1899-1903.
13. Mukherjee KL. Medical Laboratory Technology. Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.
14. Perez C, Paul M, Bazerque P. An antibiotic assay by the agar well diffusion method. Acta Bio. Med Exp. 1990; 15:113-115.
15. Ganguly T, Sainis KB. Inhibition of cellular immune response by *Tylophora indica* in experimental models. Phytomed. 2001; 8(5):348-355.
16. Staerk D, Lykkeberg AK, Christensen J, Budnik BA, Abe F, Jaroszewki JW. *In vitro* cytotoxic activity of phenanthroindolizidine alkaloids from *Cynanchum vincetoxicum* and *Tylophora tanaka* against drug-sensitive and multidrug-resistant cancer cells. J Nat Prod. 2002; 65(9):1299-1302.
17. Okwu DE, Okwu ME. Chemical composition of *Spondias mombin* Linn. Plant parts. J Sustain Agric Environ. 2004; 6:140-147.
18. Callow RK. Steroids. Proceedings of the Royal Society of London Series A, 1936; 157-194.
19. Arts IC, Hollman PC. Polyhenols are disease risk in epidemiological studies. Amer J Clin Nut. 2005; 81:317-325.
20. Scalbert A, Manach C, Morand C, Remesy C, Jimenez L. Dietary polyhenols and the prevention of diseases. Cri Rev Food Sci Nutr. 2005; 45:287-306.
21. Khanahmadi M, Rezazadeh SH, Taran M. *In vitro* antimicrobial and antioxidant properties of *Smyrnium cordifolium* Boiss. (Umbelliferae) extract. Asian J Plant Sci. 2010; 9(2):99-103.
22. Bojo AC, Garcia EA, Pocsidio GN. Antibacterial activity of *Peperomia pellucida* (L.) HBK (Piperaceae). Asia Life Sci. 1994; 3(1):35-44.
23. Akinnibosun HA, Akinnibosun FI, German BE. Antibacterial activity of aqueous and ethanolic leaf extracts of *Peperomia pellucida* (L.) H.B. & K. (piperaceae) on three gram-negative bacteria isolates. Sci World J. 2008; 3(4):33-36.