Review Article

An Overview of *Ipomoea pes-tigridis* L. – A Potent Medicinal Plant

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ABSTRACT

Ipomoea pes-tigridis L. is an annual twining, hispid herb belongs to the family–Convolvulaceae. Traditionally it is used for various ailments *viz*. purgative, antidote, to treat pimples, headaches, swellings, poisonous string, snake bites etc. This review provides the pharmacognosy, phytochemistry, pharmacological aspects of this plant.

Keywords: *Ipomoea pes-tigridis* L. Convolvulaceae, Pharmacognosy, Phytochemistry, Pharmacology.

INTRODUCTION

Medicinal plants are utilized as a remedy for various kinds of diseases in everyday practice of human life. The presence of large number of secondary metabolites in herbal drugs *viz*. alkaloids, flavonoids, terpenoids, tannins, phenols, saponins, and glycosides, with remarkable pharmacological activities such as analgesic, antipyretic, antiiflammatory, antidiabetic, antitumor, wound healing, and cardioprotective effect etc. and acts against various human diseases. In India, the uses of herbal drugs were found to be in the Rigveda which was written between 4500-1600 BC. Primarily, all the drugs were natural origin, such as vegetable, animal and mineral products in their crude forms and the medical practice was called as traditional system. The 75% of Indian population depend on this traditional system of medicine. With an enormous section of ever-increasing population relying on herbal remedies, it is essential that plant products that have been used for such a long time be scientifically supported for their efficacy.[1]

Ipomoea pes-tigridis L. (Family – Convolvulaceae) is an annual twining, hispid herb, commonly known as "Tiger Foot Morning Glory" (English), "Vyaghrapadi" (Sanskrit) and "Pulichuvadu" (Tamil). All the parts of this plant are used for various ailments. Leaves are used as purgative, antidote, useful to treat pimples, headaches, swellings, poisonous string, snake bites etc. The plant also possesses medicinal properties against inflammation, skin disease, boils, gout, ulcer, arthritis, rheumatism, dropsy and burning sensation.[2-6] Powdered leaves are smoked to get relief from bronchial spasm and roots are used to treat urinary retention, constipation and gynecological disorders.[7-8] Besides these numerous phytochemicals and multitude biological activities also reported. This review provides the morphological characters, pharmacognosy, phytochemistry, pharmacological aspects of this plant.

Morphological characters:

Herbs annual, twining, with spreading hispid aerial parts. Stems 0.5-3 m. Petiole 2-8 cm; lamina circular or transversely elliptic in outline, 2-10×3-13 cm, palmately deeply divided; segments (3-)5-9, elliptic or oblong, tapered at both ends, densely pubescent, apex mucronate. Inflorescences capitate, few flowered; peduncle 4-11 cm; bracts hirsute; outer involucral bracts oblong to linear-oblong, 2-2.5 cm; inner bracts smaller. Flowers sessile. Sepals lanceolate, slightly unequal, 1-1.4 cm, hirsute on both sides. Corolla white, funnel-form, 3-4 cm. Stamens included; filaments glabrous. Pistil included; ovary 2-loculed, glabrous. Stigma 2-lobed. Capsule ovoid, ca. 7 mm, 4-valved. Seeds ellipsoid, ca. 4 mm, gray tomentellous.[9]

Distributions: Widely distributed in tropical to subtropical regions of South & South East Asia, Tropical Africa; Naturalized elsewhere.

Pharmacognostic studies:

Babu et al., Sandhya et al., Sameemabegum et al., have studied the detailed pharmacognostical characters of root, stem, leaf and petiole.[10-12]

*Root***:** Cross section roughly circular in outline with small fissures; periderm consist of tangentially elongated cells, thin-walled about 8-12 layers; phloem consist fibre bundles; starch grains and druse crystals present in phloem parenchyma and cortex; xylem is divided by medullary rays and formed fan wing shaped; growth rings distinct; vessel elements oval or circular in shape, wide and solitary.

*Stem***:** Transverse section circular in outline, single layer epidermis with long unicellular filiform trichomes; laticifers present in cortex and pith; thin layer of phloem fibres is present just above the phloem; vascular bundles collateral, open; vessel elements oval or angular in shape; druse crystals scattered in cortex; abundant starch grains present in pith.

Petiole: Petiole circular in outline and furrow in adaxial side; epidermis single layer with compactly arranged cubical cells and covered by filiform unicellular trichomes; druses crystals found scattered in collenchyma; vascular bundles arranged as three dorsal, two ventral and open type.

Leaf: Epidermis consist conical shaped cells with trichomes; midrib triangular; vascular bundle in centre region, phloem surrounds the central xylem bundle; druses crystals found in spongy parenchyma; stomata amphistomatic and paracytic type.

Phytochemical studies:

There is lack of much information on the literatures of specific chemical constituents of *Ipomoea pes-tigridis*. The preliminary phytochemical screening of leaves shows that the presence of tannins, terpenoids, cardiac glycosides, flavonoids, glycosides, alkaloids and diterpenes.[13] Seed contains ergoline and clavine alkaloids.[14] Sharma studied the nutritional values of this plant and found that it is highly nutritive with peak of 4195.20.20 cal/g energy and 24.25% crude protein, 0.196% phosphorus and 5.8% potassium.[15]

Pharmacological activities:

Antioxidant and cytotoxic activity

Bhaskar and Aruna studied the *in vitro* antioxidant activity (DPPH and nitric oxide free radical assays) and cytotoxic activity of ethanolic extract of *I. pes-tigridis* against A375, B-16-F10, and NHDF cell lines. The results showed promising *in vitro* antioxidant potential and significant cytotoxicity with IC_{50} values ranging from 12.02±3.14 µg/mL to 136.42±2.92 µg/mL. These findings suggest that ethanol extract may contain compounds with potential anticancer properties.[16]

Analgesic activity

The analgesic property of *I. pes-tigridis* ethanolic extract was evaluated by radiant heat tail- flick method and acetic acid-induced writhing in mice. The ethanolic extract showed a significant dose dependent reduction of the number of writhes ($P<0.05$) with 100 mg/kg b.w. dose giving the highest reduction. The extract showed an insignificant elongation of the hot plate reaction time ($P>0.05$). This preliminary study shows that the ethanolic leaf extract of *I. pes-tigridis* has significant analgesic activity.[17] Md. Rabiul Hossain et al., also studied the analgesic activity of *I. pes-tigridis* extract using both acetic acid-induced writhing test and hot plate method in mice. The results showed significant analgesic activity ($p<0.05$) and exhibited 16.56% and 33.125% of inhibition of writhing response at 100 mg/kg and 200 mg/kg respectively. 100 mg/kg dose exhibited maximum nociception inhibition at 30 min and 200 mg/kg exhibit highest nociception inhibition also at 30 min. 200 mg/kg extract exhibit basal reaction time 14 and 100 mg/kg extract exhibit basal reaction time 13.8, where the positive control shows basal reaction time 12.8 at 30 min.[18]

Anticancer activity

The anticancer activity of *I. pes-tigridis* leaves hydro-alcoholic extract against liver HEPG2 cell line was carried out using MTT assay method. The results revealed that the hydro-alcoholic extract showed significant cytotoxic effect in the concentration range at 500 µg/mL produce 99.87% of cell inhibition. There was a dose-depended increase in the cytotoxic activity was observed. Thus, the study confirmed the anticancer properties of *I. pes-tigridis* against liver cancer.[19]

Anti-acne activity

Sandhya et al., screened the anti-acne activity of herbal hydrogel containing *I. pes-tigridis* against *Propionibacterium acnes and Staphylococcus epidermidis* microorganisms by disc diffusion method. *P. acne* was incubated in brain heart infusion medium with 1% glucose for 72 h under anaerobic conditions. Clindamycin (10 mg/ml) was used as the standard and formulation devoid of extract (placebo) was used as the control. *Staphylococcus epidermidis* was inoculated in tryptic soy broth (TSB). The results showed formulation with 2% herbal hydrogel exhibited a potent anti-bacterial activity against *S. epidermidis* and *P. acnes* by producing a zone of inhibition 22.2±0.05 mm and 17.0±0.04 mm respectively. The standard clindamycin was found to possess excellent activity with inhibition zone 28.5±0.004 mm and 21.2±0.003 mm. The control did not show any anti-acne activity, which clearly shows that the result obtained from the herbal hydrogel was due the activity of herbal extract.[20]

Antimicrobial activity

The antimicrobial activity of *I. pes-tigridis* synthesized Silver nanoparticles (AgNPs) was examined against 4 multi drug resistant bacteria like *Staphylococcus aureus, Streptococci sp*., *Escherichia coli* and *Pseudomonas sp*. Primary screening showed that the *I. pes-tigridis* synthesized AgNPs showed significant activity (zone of inhibition) against *Pseudomonas* sp. (18.0±0.0 mm), *S. aureus* (14.3±0.6 mm), and *Streptococci* sp. (14.0±0.0 mm) and moderate activity against *E. coli* (12.8±0.00 mm), as compared to the plant extract. The activity was observed in dose-dependent manner.[21] The ethyl acetate and *n*-hexane extract of *I. pes-tigridis* were studied for antimicrobial efficacy using disc diffusion method against both gram-positive and gram-negative bacteria viz. *Bacillus subtilis, S. aureus, E. coli, Pseudomonus aeruginosa, Salmonella typhi, Salmonella paratyphi,* and *Vibrio cholera*. Both extracts showed moderate antimicrobial activity against *S. aureus, B. subtilis, V. cholera* and other organisms show no inhibition.[22]

Anti-hyperglycemic activity

The antihyperglycemic effect of hydro-alcoholic extracts of *I. pes-tigridis* was evaluated in Wistar albino diabetic rats induced by Alloxan monohydrate (150 mg/kg). The study showed maximum reduction of 67.2% and 66.3% glucose levels was observed in animals receiving 200 mg/kg and 400 mg/kg per day of hydro-alcoholic extracts after 4 weeks of treatment, respectively. The alteration in biochemical parameters such as hepatic glycogen content and hepatic glucokinase, hexokinase and glucose-6- phosphate levels in diabetic rats were partially restored by *I. pes-tigridis* extract.[23]

Hepatoprotective activity

Bheemreddy et al., investigated the hepatoprotective potential of *I. pes-tigridis* against Paracetamol (2 g/kg b.wt.) induced hepatotoxicity in rats. Petroleum ether, ethyl acetate and methanolic extracts (each 200 mg/kg b.wt,) of *I. pes-tigridis* were administered to normal and experimental hepatotoxicity rats for 7 days and compared with Silymarin, a standard hepatoprotective reference drug. Blood biochemical parameters *viz*. liver marker enzymes (ALT, ALP, AST and GGT) and serum (total bilirubin, total protein, total cholesterol, triglycerides, Albumin, urea and creatinine) were evaluated. Paracetamol-induced rats exhibited the elevated activities of liver enzymes and blood serum parameters. However, the oral administration of ethyl acetate extract given rats showed major reduction in the level of SGOT, SGPT, ALP, GGT, creatinine, urea, total bilirubin, total cholesterol, triglycerides and also significantly elevated the concentration of total bilirubin and albumin when compared to Pet. ether and methanol extracts. Thus, their study confirmed that the ethyl acetate extract possesses hepatoprotective activity against paracetamol induced hepatotoxicity.[24]

Thrombolytic and Cytotoxic activity

Md. Rabiul Hossain Chowdhury et al., evaluated the *in vitro* thrombolytic activity and *in vivo* cytotoxic activity of ethyl acetate and *n*-hexane extracts of *I. pes-tigridis* using Brine shrimp lethality bioassay test. The results showed both extract exhibits average clot lysis activity and significant lethality against Brine shrimp. Thus, concluded that *I. pes-tigridis* possesses potent cytotoxic properties.[22]

Anticonvulsant and Antianxiety activity

The anticonvulsant and antianxiety activity of ethanolic extract of *I. pes-tigridis* were studied by Anaha and Manohar. Maximal electroshock seizure model was used to evaluate the anticonvulsant activity and Hole-board test, open-field test was used to measure the antianxiety activity of ethanolic extract (200, 400 mg/kg b.w.). Diazepam (5 mg/kg b.w. & 1 mg/kg, i.p) used as a standard. The results revealed that the mice which were treated with extract 400 mg/kg showed a significant (P<0.0001) effect in all the phases on MES-induced convulsion, the number of head dipping in hole-board test and the locomotor activity in open-field test than the lower dose (200 mg/kg) when compared to control.[25]

CONCLUSION

This review has presented the complete details of botanical characteristics, traditional uses, pharmacognosy, phytochemistry and pharmacological activities of *Ipomoea pes-tigridis* L. so far studied. It has been noted that there is lack of much information on the literatures of phytochemical constituents of this plant. Thus, further study needs to be conducted to identify the phytochemicals responsible for the biological activities.

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