A REVIEW ON PHARMACOLOGICAL, MEDICINAL AND ETHNOBOTANICAL IMPORTANT PLANT: MARTYNIA ANNUA L.

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ABSTRACT

Martynia annua L. belongs to family Martyniaceae is an herbaceous annual plant, spread throughout India. It is commonly known as the Cat's claw or Devil's claw. In India, traditional healers used M. annua in the treatment of epilepsy, inflammation, sore throat, burns, itching, skin affections and tuberculosis. Martynia annua L. contains alkaloids, tannins, saponins, glycosides, flavonoids, anthocyanins, amino acid, steroids and phenols. This weed has been known to possess anthelmintic, analgesic, antipyretic, antibacterial, anti-convulsant, antifertility, antinociceptive, antioxidant, CNS depressant and wound healing activity. A wide range of chemical compounds including oleic acid, arachidic acid, linoleic acid, palmitic acid, gentisic acid, stearic acid, pelargonidin diglucuronide, cyanidin-3-galactoside, p-hydroxy benzoic acid, apigenin, apigenin-7-o-glucuronide have been isolated from this plant. The aim of this review article was to summarize the information related to botany, phytochemistry, traditional and pharmacological activity of the Martynia annua L. plant.

Key words: Martynia annua L., Martyniaceae, Kakanasika, Antifertility, Antibacterial, Wound healing.

INTRODUCTION

India has a rich legacy of using medicinal plants. The knowledge of medicinal plants has been gathered in the course of many centuries (Negi et al., 2012). Form thousands of years an impressive number of modern drugs have been isolated from natural sources because nature has been a good source of medicinal properties. In daily life diseases have been treated by various medicinal plants for years in all over the world. (Flora et al., 2013). According to World Health Organization different cultures has been maintained their health by herbal medicine or traditional medicine, which is the accumulation of the knowledge, skills and practices that is based on theories, beliefs and indigenized by locals. Nature always stands as a golden mark to represent the outstanding phenomena of symbiosis Human diseases have been treated by natural products from plant, animal and minerals (Pandey et al., 2013) and The World Health Organization (WHO) also evaluated that 80% of the world's population uses some herbal remedy for their primary healthcare needs (Suryawanshi and Tare, 2013). Nowadays medicinal plants have been utilized in Ayurvedic, Homeo and Unani system of medicine. In today's medicine many compounds have a complex structure and generating the bioactive compounds chemically at a low price which is not easy (Rose et al, 2014).

In India, about 80% of the population, in rural as well as urban areas, are being used plants for various purposes such as food, medicine, healthcare, clothing, shelter, agriculture etc. (Kenwat et al., 2013). One of the greatest emporia of ethnobotanical wealth has been represented by over 53.8m tribal people in 5000 forest dominated by villages of tribal community and compromising 15% of the total geographical area of Indian landmasses, which occupies the Indian subcontinents. (Chowdhuri 2000). In India, it has been reported that about 2500 plant species serve as regular sources of medicine (Kenwat et al., 2013).

Martynia annua L. as medicinal plant

Since ancient time, Martynia annua L. (Martyniaceae) is one of the medicinal herbs used by native people for various medicinal purposes. The plant is native to Mexico but now well adapted throughout India on waste lands (Suryawanshi and Tare, 2013). Martynia annua L. is a well-known small herbaceous annual plant, distributed throughout India. It is commonly known as the Cat's claw or Devil's claw indicates to the inner woody capsule which splits open at ones end into two curved horns or claws (Kenwat et al., 2013; Singhai and Lodhi, 2011). In ayurveda the plant is known as kakanasika, which is being used in Indian traditional medicines for epilepsy, inflammation (Dhingra et al., 2013) and applied locally to tuberculosis glands of camel’s neck. The juice of leaves is used as a gargle for sore throat, fruit in inflammation,
leaf paste has beneficial effect when applied to the bites (Singhai and Lodhi, 2011). In the Southwest among all Native American tribes this plant is a popular for basket making. The genus and species were first authentically described by Carl Linnaeus in his 1753 publication Species Plantarum (Pandey et al., 2013).

Occurrence

Vernacular names

English: Devil’s claw, Tiger’s claw
Hindi: Hathajori, Bichu, Ulat-kanta,
Telugu: Garudamukku, Telukondichchettu
Marathi: Vinchu
Gujarat: Vichchida
Konkani: Sherccnui

Phytochemistry

Chemical Constituents: The chemical analysis of Martynia annua L. plant reveals the presence of glycosides, tannins, carbohydrates, phenols, flavonoids and anthocyanins. The leaves mainly have chlorogenic acid, p-hydroxy benzoic acid, snapic acid and fatty acids such as palmitic acid and stearic acid (Singhai and Lodhi, 2011). The flowers of these plant chiefly contain cyanidin-3-galactoside and pelargonidin-3, 5diglucoside while gentisic acid are present in fruits (Mali et al, 2002). The seeds indicates the presence of arachidic acid, cyclopropenoid, linoleic acid, malvalic acid, oleic acid, palmitic acid and stearic acid (Kirtkar and Basu, 1987). Other major biological compounds comprise apigenin, apigenin-7-ooglucuronide. (Dhingra et al., 2013).

Phytochemical Review: Pharmacology, medicinal plants and drugs are come to be popular words in these days. All are put together to work on a specific medicinal plant and go along with their pharmacological, phytochemical studies etc.(Kenwat et al,2014). The qualitative phytochemical investigation was done on the extracts of whole Martynia annua L. plant and found the presence of glycosides, tannins, carbohydrates, phenols, flavonoids, anthocyanins, terpenoid, steroid, phenol, cardiac and saponin glycosides (Singhai and Lodhi, 2011; Dhingra et al., 2013). The presence of maximum number of secondary metabolites was noticed in the alcoholic extracts of Martynia annua L. followed by acetone extracts (Rose et al, 2014). Sermakkani and Thangapandian, 2010 tested different phytoconstituents on acetic leaves extracts of Martynia annua L. The analysis of acetic extracts of leaves specifies the presence of alkaloids, tannins, saponin, glycosides, flavonoids, anthocyanin, amino acid, steroids and phenols. During the phytochemical study, the methanolic extracts of leaves exhibited higher amount of chemical constituents. The aqueous and alcoholic extract of Martynia annua L was tested through GC-MS analysis and found the presence of 28 compounds in which oleic acid present in high amount (Kenwat et al., 2013).

Ethnomedicinal uses

Whole plant: Santal tribes uses the whole plant for fever, hair loss, scabies, sores and carbuncles on the back (Flora et al., 2013). Decoction of whole plant is given in pneumonia and cold fever and theentire plant is also used to treat menstrual disorders (Suryawanshi and Tare, 2013).

Leaves: The leaves of Martynia annua L are given in epilepsy and its juice is gargled for sore throat. The leaves are beneficial in treatment of gargoyle, treat epilepsy, tuberculous, sore throat and also assumed as local sedative effect (Flora et al., 2013). The leaves are edible and they are used as antiepileptic, antiseptic. The leaf paste is used for wounds of local animals (Dhingra et al., 2013).

Root: The roots are used for the treatment of snakebite (Rehman et al, 2012).

Fruit: The fruit of Martynia annua L is also used as the local sedative and fruits are also beneficial in inflammation and burns (Kenwat et al., 2013). Ash of fruit is mixed with coconut oil and it is applied on burns (Babu et al, 20610). The fruits of Martynia annua L. are also used as antitode to scorpion stings and venomous bites. In folk medicine, the fruits are used for the treatment of asthma. (Watt, 1972; Dhingra et al., 2013). In Pateshwar hilly area of Western Maharashtra, the natives uses the unripe fruits as antiseptic and for wound healing. (Suryawanshi and Tare, 2013).

Seeds: Seed oil is applied on swellings and also for treating itching and skin affections (Khare, 2007). The ayurvedic pharmacopoeia of India recommended that the seed of Martynia annua L. useful in arresting of graying of hair (Babu et al, 2010). The seeds are also applied locally for itching and eczema (Suryawanshi and Tare, 2013).

Pharmacological Activity

The present review explores the pharmacological potential of the Martynia annua L. plant

Antihelmintic Activity: The antihelmintic activity against earthworms Pheritima posthuma was tested by petroleum ether extract of Martynia annua L. roots showed effective result compared with the reference drug albendazole (Nirmal et al, 2007).

Analgeseic Activity: : The analgesic activity was experimented by petroleum ether, chloroform, ethanol and aqueous extracts of Martynia annua L. fruits on Swiss albino mice using hot plate and tail flick methods and for antipyretic effect against brewers-yeast- influenced hyperpyrexia in adult Wister rats. The all extract show significant analgesic and antipyretic activity at 20 mg/kg. It was also observed that the petroleum ether and chloroform extracts exhibits greater analgesic and antipyretic activities as compared to ethanol and aqueous fruit extract of the plant (Kar et al, 2007).

Antibacterial Activity: The chloroform, ethyl acetate and methanol extract of Martynia annua L. leaves were tested on gram positive and gram negative bacteria for antibacterial activity. All the solvent extracts show antibacterial action respective to different bacteria. Chloroform extract showed higher antibacterial activity against Proteus vulgaris, Bacillus subtilis and B. thuringensis. Ethyl acetate extract was potentially effective against Salmonella paratyphi A, Salmonella paratyphi B, Proteus mirabilis, P. vulgaris and
**Klebsiella pneumonia**, while the methanol extract, shows greater antibacterial potential towards *Proteus vulgaris*, *B. subtilis*, *S. paratyphi* B and *Pseudomonas aeruginosa*. The antibacterial activity was carried out by Disc Diffusion method. (Sermakkani and Thangapandian, 2010).

**Antifungal Activity** The antifungal activity of *Martynia annua* L along with thirteen coastal sand dune plants (CSDPs) belonging to nine families were screened from Arnala and Kalamb beach. The results obtained and suggest that, 90% colonization were found *C. rotundus*, *E. zeylanica* var. zeylanica, *I. pes-caprae* (Arnala beach), *L. procumbens* (Kalamb beach), *Martynia annua*, *P. punctatum* and *S. orientale* etc. (Kumar *et al.,* 2012).

**Anticonvulsant Activity:** The anticonvulsant activity was investigated by methanol extract of *Martynia annua* L. (MEMA) leaves at doses of 200 mg/kg and 400 mg/kg. The dose were significantly reduced the duration of tonic hind leg extension and protect the animals from seizures. The MEMA 200 mg/kg and 400 mg/kg have shown 66.31 % and 82.731 % protection respectively against maxima electroshock (MES) induced seizures. For these comparison, the standard drug phenytoin (100%) was taken. While form the comparison with the standard drug diazepam (100%) the MEMA 200 mg/kg and 400 mg/kg have also shown 70.33% and 82.88% protection of convulsion and 83.33% and 100% protection of mortality respectively against pentyleneetetrazol (PTZ) which induced epilepsy. However, the anticonvulsant activity of MEMA was due to the potentiation of neurotransmitter in brain (Babu *et al.,* 2010).

**Anticipetive Activity and CNS Depressant Activity:** For antinociceptive and CNS depressant activity petroleum ether, ethyl acetate and methanol extracts of *Martynia annua* L. root were evaluated. Amongst all extracts petroleum ether extract showed significant increase at the dose of in reaction time by doing hot plate method and also showed more inhibitory effect on standard drug pentazocine and paracetamol and withering induced by acetic acid against all extracts. Apart from this the petroleum ether extract at 50 mg/kg dose also showed significant decrease in the locomotor activity when they were compared with standard drug diazepam. At the dose of 30 mg/kg, it potentiates pentobarbitone sodium induced sleeping time up to 215.34% (Bhalke and Jadav, 2009).

**Antioxidant Activity:** The antioxidant activity of methanol and aqueous extract of *Martynia annua* L. leaves were evaluated by in vitro methods, namely, reducing power assay, DPPH radical-scavenging activity, nitric oxide scavenging activity,$\text{H}_2\text{O}_2$ radical scavenging activity, superoxide radical scavenging assay, hydroxyl radical-scavenging activity, and total antioxidant capacity. The higher antioxidant activity was found in methanolic extract compared to aqueous extract (Nagda *et al.,* 2009).

**Wound Healing Activity:** The wound healing effect was evaluated by methanol fraction of ethanolic extract of *Martynia annua* L. leaves which shows significant by stimulating of wound contraction as well as epithelialization. Moreover the phytochemical studies was tested and evaluated that the methanol fraction mainly contains flavonoid, luteolin which were responsible for enhancement of wound healing process due to the free radical scavenging mechanism (Lodhi and Singhai, 2011; Dhungra *et al.,* 2013).

**Antidiabetic** The antidiabetic activity of methanol extracts of *Martynia annua* L (MEMA) flower investigated by Saiyad and Gohil (2013) in streptozotocin (STZ) and Streptozotocin-Nicotinamide (STZ-NIC) which induced diabetes in Wistar rats. MEMA showed tremendous reductions in blood glucose, triglyceride and glycosylated hemoglobin levels and showed the increased HDL levels in diabetic rats (after 21 days). A result discovered that the MEMA exhibited good antidiabetic activity in STZ and STZ-NIC which induced diabetic rats (Kenwatt *et al.,* 2013).

**Antifertility:** The antifertility effect on male rates by 50% ethanol extract of *Martynia annua* L. root at dose of 50 mg/kg, 100 mg/kg and 200 mg/kg body weight. The result showed significant decreases in the weights of testes, epididymitis, seminal vesicle and ventral prostate on male rats. Moreover, the antifertility effect was found to be dose dependent without changing general body metabolism (Mali *et al.,* 2002).

**Pharmacological Review:** The pharmacological investigation was studied by Shubhanker *et al.,* 2012. They studied the qualitative and quantitative investigation of this plant.

**Qualitative investigation**

**Internal structure of leaf Martynia annua L:** The leaves of this plant were uniformly cut and boiled with liquid beach solutions in the test tube which were place in boiling water-bath. Then pieces of root were cut and placed on slide and leaf were also cut then put the flurigllycerol and HCL mounted in glycerine water and observed the characters like epidermal cells and palisade cells.

**Description of the stem of Martynia annua L:** A very young stem of this plant were selected because secondary commences usually early in this plant. Transverse section were taken and stained appropriately for the internal structure. The stem is square in cross section and it shows the arrangement of plant tissues like stomata and tricoimes.

**Quantitative investigation:** The quantitative microscopy was executed to determine stomata number, stomata index and palisade ratio on epidermal strip.

**Physicochemical activity:** The physicochemical activity of powdered *Martynia annua* L. leaves are found to be more in crude drug while testing on total ash content value and water soluble ash value. Ash value is a measure of quality and purity of the crude drug. Alcohol and water soluble extractive values were determined for discover the amount of alcohol and water soluble compounds. The leaves showed the more amounts of water soluble compounds than alcohol soluble compounds. (Shubhankar *et al.,* 2012)

**Conclusion**

In the present review, the pharmacological pharmacognostical and physicochemical characteristics of *Martynia annua* L are defined. Various parameters recognised in present review
which will help in controlling the standards and quality of raw material of *Martynia annua* L. The phytochemical investigations shows the presence of various phytoconstituents which may contribute to the different pharmacological activity of this plant. These phytoconstituentstheatres an important role in the treatment of various diseases like epilepsy, inflammatory, sore throats, scorpion stings and snake bites. Although the plants grown in rubbish heaps and in waste places, the herb is being used as an important medicinal plant since a long period of time. In view of the wide-ranging medicinal value of *Martynia annua* L. plants as described in Ayurvedic literature, it is imperative that more clinical and pharmacological trials are needed to investigate the unexploited potential of this plant.

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