



Full Length Research Article

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

¹Hiral A Gadhavi and ²Dr. Himanshu Pandya

¹Research Scholar, Department of Botany, Gujarat University, Ahmedabad

²Assistant Professor, Department of Botany, Gujarat University, Ahmedabad

Accepted 29th November, 2017; Published Online 30th December, 2017

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-3,5-diglucoside, cyanidin-3-galactoside, p-hydroxy benzoic acid, apigenin, apigenin-7-oglucuronide 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 % 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 ethno-botanical 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,

*Corresponding author: Hiral A Gadhavi,
Research Scholar, Department of Botany, Gujarat University,
Ahmedabad.

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, Telukondicchettu
Marathi: Vinchu
Gujarati: 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, snopic 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-oglucuronide. (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 testified different phytoconstituents on acetone leaves extracts of *Martynia annua* L. The analysis of acetone 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 tribals 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 the entire 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 gargle, 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.*, 2010). The fruits of *Martynia annua* L. are also used as antidote 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).

Analgesic 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 Wistar 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 pentylenetetrazol (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 writhing 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, H₂O₂ 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; Dhingra *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 (Kenwat *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).

Pharmacognostical Review: The pharmacognostical 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 fluriglycerol 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 trichomes.

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. (Shubhangkar *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 phytoconstituents play 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.

Acknowledgements

The author is thankful to DR. Himamshu A Pandya of Department of Botany, Gujarat University, Ahmedabad (Gujarat) for his encouragement and for providing library and laboratory facilities during this investigation.

REFERENCES

- Bhalke, R. D. and Jadhav, R.S. 2009. Antinociceptive activity and CNS depressant activity of *Martynia annua* L. root. *International Journal of Pharmaceutical Sciences*, 1(2), 333-335.
- Chatpalliwar, V. A., Joharapurkar, A. A., Wanjari, M. M., Chakraborty, R. R. and Kharkar, V. T. 2002. Anti-inflammatory activity of *Martynia diandra* GLOX, Indian Drugs, 39(10), 543-545.
- Chowdhuri, S. K. 2000. From Ethnobotany, In Studies in Botany, Mitra, D., Guha, J. and Chowdhuri, S. K. (Eds), (pp-855-867). Kolkata: Manasi Press.
- Dhingra, A. K., Chopra, B. and Mittal, S. K. 2013. *Martynia annua* L.: A Review on Its Ethnobotany, Phytochemical and Pharmacological Profile. *Journal of Pharmacognosy and Phytochemistry*, 1(6), 135-140.
- Flora, G., Mary, J. M., Chandra, M., Nanthini, M., Shalini, K., Shantha, P., Siva, R. A. and Valli, S. 2013. Study on antioxidant potential of different parts of *Martynia annua* Linn.— A road side weed. *International Journal of Development Research*, 3(9), 051-054.
- HarishBabu, B., Mohana, L. S. and Saravana, K. 2010. A studies on phytochemical and anticonvulsant property of *Martynia annua* Linn. *International Journal of Phytopharmacology*, 1(2), 82-86.
- Kar, D. M., Nanda, B. K., Pardhan, D., Sahu, S. K. and Dash, G. K. 2004. Analgesic and antipyretic activity of fruits of *Martynia annua* Linn. *Hamdard Med*, 47: 32.
- Kenwat, R., Prasad, P., Sahu, R. K. and Roy, A. 2014. Preliminary Phytochemical Screening and In Vitro Antioxidant Efficacy of Fruit Oil of *Martynia annua* Linn. *UK Journal of Pharmaceutical and Biosciences*, 2(1), 16-22.
- Kenwat, R., Prasad, P., Satapathy, T. and Roy, A. 2013. *Martynia annua* Linn: An Overview. *UK Journal of Pharmaceutical and Biosciences*, 1(1), 7-10.
- Khare, C. P. (Ed.). 2007. Indian Medicinal Plants An illustrated Dictionary. (pp-399-400): Springer publications.
- Kirtikar, K. R. and Basu, B. D. 1987. Indian medicinal Plants. (2nd ed. Vol. III), (pp- 1854-1855). Deharadun: International Book Distributors.
- Kumar, S., Prasad, A. K., Iyer, S. V., Vaidya, S. K. and Sahu, A. R. 2012. Systemic review: Pharmacology, phytochemistry and pharmacology of *Martynia annua* Linn. *Int J Res Med*, 1(1), 34-39.
- Mali, P. C., Ansari, A. S. and Chaturvedi, M. 2002. Antifertility effect of chronically administered *Martynia annua* root extract on male rats. *Journal of Ethnopharmacology*, 82(2-3), 61-67.
- Nagda, D., Saluja, A. and Nagda, C. 2009. Antioxidant activities of methanolic and aqueous extract from leaves of *Martynia annua* Linn. *Journal of Pharmacognosy*, 1, 288-297.
- Negi, R. S., Pareek, A., Menghani, E. and Ojha, C. K. 2012. Ethno-medicinal studies at Sanchor and Mount Abu regions, Located Sirohi district of Rajasthan. *Cibtech Journal of Pharmaceutical Sciences*, 1(1), 14-21.
- Nirmal, S. A., Nikalye, A. G., Jadav, R. S. and Tambe, V. D. 2007. Anthelmintic activity of *Martynia annua* Linn. *Indian Drugs*, 44(10), 772-773.
- Pandey, P., Sharma, P., Gupta, R., Garg, A., Shukla, A., Nema, N. and Pasi, A. 2013. Formulation and evaluation of herbal effervescent granules incorporated with *Martynia annua* Linn extract. *Journal of Drug Discovery and Therapeutics*, 1(5), 54-57.
- Rehman, A., Ahmed, S., Riaz, T., Abbas, A., Abbasi, M. A., Siddiqi, S. Z. and Ajayib, M. 2012. *Martynia annua* Linn: Comparative Antioxidant Potential of Its Stem and Leaves. *Asian Journal of Chemistry*, 24(8), 3335-3338.
- Rose, L. G., Vinnarasi, J. R. and Anto, A. A. 2014. Phytochemical Screening and Cytotoxic Activity of *Martynia annua* Linn. Leaves Extracts. *International Journal of Chemistry and Pharmaceutical Sciences*, 2(10), 1160-1163.
- Saiyad, M. F. and Gohil, K. J. 2013. To investigate antidiabetic potential of *Martynia annua* Linn. flower extracts in wistar rats. *WJPR*, 2(2), 486-499.
- Sermakkani, M. and Thangapandian, V. 2010. Antibacterial and phytochemical analysis of *Martynia annua* Linn. *Plant Archives*, 10(1), 223-225.
- Sermakkani, M. and Thangapandian, V. 2010. Phytochemical and Antibacterial activity of *Martynia annua* Linn. against the different pathogenic bacteria. *Journal of Herbal Medicine and Toxicology*, 4(2), 221-224.
- Singhai, A. K. and Santram, L. 2011. Preliminary pharmacological evaluation of *Martynia annua* Linn leaves for wound healing. *Asian Pacific Journal of Tropical Biomedicine*, 421-427.
- Suryawanshi, J. S. and Tare, H. L. 2013. Phytochemical Screening and antibacterial activity of *Martynia annua* Linn unripe fruits and flower extracts. *International Journal of Universal Pharmacy and Life Sciences*, 3(2), 81-86.
- Watt, G. 1972. Dictionary of the economic products of India. (Vol. V). New Delhi: Cosmo Publications.