

A Critical Review on Ethnobotanical, Phytochemical and Pharmacological Investigations of *Martynia annua* Linn.

Review Article

Rahul Kumar Gupta^{1*}, Meena Deogade²

1. PhD Scholar, 2. Professor,
MGAC & HRC, Wardha(H), Maharashtra, India

Abstract

Martynia annua Linn (Martyniaceae) is an important herbaceous annual medicinal herb found as a wild plant throughout India. In spite of the fact that the majority of its parts are utilized as a part of folklore and it is known as *kakanasika* in *Ayurved*, fruits, seeds, roots and Leaves are the most vital parts which are utilized therapeutically. The present article gives an account of updated complete information on its phytochemical and pharmacological properties. The review shows that large numbers of phytochemical constituents have been isolated from the *Martynia annua* Linn plant which possesses actions like *Antioxidant, Anthelmintic, Analgesic and Antipyretic, Antibacterial, Anti-convulsant, Antinociceptive and, Antifertility, Central Nervous System (CNS) depressant, Wound Healing, Antidiabetic, Gastroprotective, Antifungal, Cytotoxic Activity* and various other important medicinal properties. In folk medicine, Decoction of whole plant is used in pneumonia and cold fever. Leaves are eaten in times of scarcity and also given in epilepsy and its juice is gargled for sore throat. The fruits are used for the treatment of *asthma*; the seeds are also applied locally for itching and eczema. The Roots are boiled with milk and taken as a tonic and roots made into a poultice and applied in snake bite. For the last few decades or so, extensive research work has been done to prove its biological activities and pharmacology of its extracts. The aim of this review article was to summarize the information associated to Pharmacognostical, ethnobotanical, traditional, Phytochemical and pharmacological activity of the *Martynia annua* Linn plant.

Keywords: *Martynia annua* Linn, *Martyniaceae*, *Kakanasika*, *Antioxidant*, *Cytotoxic Activity*.

Introduction

Martynia annua Linn (Family: *Martyniaceae*) is a folklore medicinal plant used to heal wounds and treat cancer, rheumatism, epilepsy, inflammation, sore throat, burns, itching, respiratory tract and skin diseases. It is commonly found in dense clumps on roadsides, degraded moist and dry deciduous forest, waste lands and over-grazed pasture. It is a weedy alien species native to tropical and sub-tropical region of Mexico, Central America, Burma, West Pakistan and naturalized throughout India. Its excellent dispersal mechanism has helped it extend throughout the tropical world as a wild plant.(1)

The plant is commonly known as the Cat's claw or Devil's claw because of the 2-hooked form of their seed pods. In *Ayurveda*, the plant is known as *Kakanasika* and it is also important ingredient of *Chyavanprasha avaleha* & *Tryushnadi Ghrita*.(2) *Materia medica* of India gives bunches of data on the folklore practices and conventional aspects of therapeutically important natural products. The evaluation of these drugs is mostly based on Pharmacognostical, Phytochemical and Pharmacological investigation.(3)

Aim and objective

The aim of this review is to summarize the information and knowledge about the *Martynia annua* Linn and updating available research data on the aspects of botany, Pharmacognosy, phytochemistry, ethno pharmacology and Pharmacological studies.

Materials and methods

Information obtained about *Martynia annua* Linn from classical textbooks as well as Research papers published on *Martynia annua* Linn were collected from internet.

Vernacular Name

Martynia annua Linn is commonly known as "Devil's claw", "Tiger's claw" in English, "Hathajori", "Bichu", "Ulat-kanta" in Hindi, "Vichhida" in Gujrati, "Vinchu" in Marathi, "Puli - Nakham" in Malayalam, "Baghnoki" in Bengali, "Thelkodukkukkay", "Puli-nagam" in Tamil, "Garudamukku", "Telukondicchettu" in Telugu, "Shernui" in Konkani.(4)

Classical Review

Charaka Samhita:

Acharya *Charaka* has mentioned *Kakanasa* as ingredients of *Chyavanprashavaleha* for *Rasayan Karma* (5), as ingredients of *Tryushnadi Ghrita* for *Kasa Rog* (6), as ingredients of *Dhupan Dravya* for *Apasmara Rog* (7) and as ingredients of *Baladi yamak sneha* for *Yoni roga chikitsa* (8).

*Corresponding Author:

Rahul Gupta

MGAC&HRC,

Wardha(H),

Maharashtra, India

Email: drrahulkgupta17@gmail.com

Sushruta Samhita

Acharya Sushruta has mentioned *Kakanasa* as ingredients of *Anuvasan Vasti Dravya* along with other drugs.(9)

Dhanwantari Nighantu

This is one of the most authentic texts of *Dravyaguna* written in 7-10th century A.D. In this text Author has categorised this plant in *Karveeradi Varga* and *Kakanasa* has its synonyms as *Dhankshnasa*, *Kaktundphala*, *surangi*, *Taskarsnayu* and *Dhwankshundaphala*. It is said to have *Tikta* (Bitter) *Rasa*, *Ushna Virya* and is used for Purification of wound (External use), constipation and its fruits are used for preparation of oil.(10)

Kaidev Nighantu

This is one of the most authentic texts of *Dravyaguna* written in 14th century A.D. In this text Author has categorised this plant in *Aushadhi Varga* and *Kakanasa* has its synonyms as *Chorsnayu*, *Jeevaniya*, *Kakangi*, *Kakasya*, *Kakasyasya*, *Shirobala* and *Surangika*. It is constituted by *Kashaya*(Astringent), *Tikta* (Bitter) *Tikta*, *Katu* (Pungent) *Rasa*, has *katu vipaka* and is *Ushna Virya*. It is used in *Shotha*, *Rakta Vikar*, *Switra*, *Kushtha*, *Kaphaj Vikar* and it also used for emetic purposes.(11)

Bhavprakash Nighantu

This is one of the most authentic texts of *Dravyaguna* written in 16th century A.D. In this text Author has categorised this plant in *Guduchiyadi Varga* and According *Acharya Chunekar* Fruit paste of *Martynia annua* Linn is used in scorpion Bite by Local use and Oil prepared by Fruits is used in various Skin Disorders by Local application and Leaf paste is used in *Apachi* by Local application.(12)

Raj Nighantu

This is one of the most authentic texts of *Dravyaguna* written in 17th century A.D. In this text author has categorised this plant in *Guduchiyadi Varga*. It is constituted by *Madhur*(Sweet) *Rasa*, has *Sheet Virya*. It is used in *Pittaj* disorders, *Greying of Hairs* and It is used as *Rasayana*(Rejuvenation) and Root, Whole plant and Fruit are the useful parts of *Martynia annua* Linn.(13)

Adarsha Nighantu:

This is an *Ayurvedic* text in which the content of *Dravyaguna* has been discussed at large. In this text author has categorised this plant in *Arkadi Varga*. The different synonyms and regional names have been told. According to *Acharya Vapalal Vaidya* *Kakanasa* is controversial drug and Fruit of *Kakanasa* Should be resemblance with Beak of crow and due to this *Pentatropis microphylla* should be considered as original *Kakanasa* And *Martynia annua* Linn has *Trikantak* (3 hooks) in shape and *Trikantak* is synonym given to *Gokshur* in ayurvedic literature so according to him due to its shape it should be considered as original *Gokshura*.(14)

Botanical descriptions of *Martynia annua* Linn (15–18)

Martynia annua Linn is herbaceous, solid, erect, expanded, soggy pubescent, annual plant creating to a height of 0.25– 1 m, secured with thick glandular sticky hairs. The Stems are erect and typically woody at base.

Leaves are kidney-shaped, inverse with lamina reniform, 15 – 23 cm wide, chordate, sinuate lobed, limp, peak intense, base chordate, margins entire to shallow-sinuate to be toothed, palmately veined, petiole 9– 14 cm long and sticky-topped glandular hairs exhibit on both the upper and lower leaf sharp edge surfaces.

Flowers are bell shaped,, purplish white, with dim purple markings and sick noticing having raceme inflorescence. Pedicels 1– 2 cm long, thickening and recurved in natural product. Calyx is around 15-20 mm long. Corolla is around 55-65 mm in general, tube around 35-45 mm long. Corolla is pipe shape campanulate, spotted on the inward surface, the spots yellow, pink or purple. Stamens are two.

Fruits are hard, bi-lobed, and woody with 2 sharp recurved snares

Seeds are brown to black, 2 to each pod.

Morphological characters of *Martynia annua* Linn as shown in fig.1.



Fig 1: *Martynia annua* Linn plant

Microscopy of *Martynia annua* Linn.

Transverse section of leaf is charactering by presence of multicellular covering trichome on upper and lower epidermis, palisade cell, spongy parenchyma, vascular bundle and collenchyma as below the upper epidermis and above lower epidermis. Transverse section of stem of *Martynia annua* Linn is charactering by existence of trichome, parenchymatous cortex, endodermis, vascular bundles and centralize pith and transverse section of root of *Martynia annua* Linn is charactering by existence of epidermis, parenchymatous cortex, endodermis and vascular bundles(4,19).

Powder Microscopy

Powder microscopy of plant is characterizing by the presence of spiral vessel, stomata, trichome and breaded epidermis(20)

Physicochemical parameters of *Martynia annua* Linn.(21)

Physicochemical constraint includes moisture content, total ash, acid insoluble ash, water soluble ash, water and alcohol soluble extractive. Table 1 provides a summary focusing on the values for physicochemical parameter.

Table 1: Physico-chemical characters of the leaf powder of *Martynia annua* Linn

S. No.	Parameter	Values (%)
1.	Total Ash	4.1%
2.	Acid insoluble ash	0.3%
3.	Water Soluble Ash	2.21%
4.	Moisture Contents	81.1%

Propagation

It is propagated by seed propagation method which remains inside the pod and attaches itself by its spines to vehicles, machinery, animals and humans. Flowering and fruiting season of plant is Aug.-Sept.

Properties And Actions of *Martynia annua* Linn(1)

Martynia annua Linn is considered as *Kaknasika* in *Ayurved* and it has *Madhura Rasa*, *Madhura Vipaka*, *Sheeta Virya* and *Pittaghna*, rejuvenating properties and important formulations are *Chyavanprasha Avaleha* and *Tryushanadi ghrita* and it is used in *Palita* and therapeutic Dose of drug is 2-5 gm in powder form.

Traditional and Ethnobotanical information of *Martynia annua* Linn.

Plant is used in Indian traditional medicine and in folklore for curing various diseases and each part of the plant is being used to treat many diseases. Plant is being used in Indian traditional medicines for epilepsy, inflammation and tuberculosis.(2) the leaves of the plant are eaten in times of scarcity and also used as antiepileptic and antiseptic, applied locally to tuberculous glands of the neck, leaves juice used as a gargle for treating sore throat and leaf paste for curing wounds of domestic animals.(22,23) The fruits of *Martynia annua* Linn used as local sedative and also used as antidote to scorpion stings to venomous bites and stings. The fruit is considered alexiteric and useful in inflammations while ash of fruit mixed with coconut oil applied on burns.(2) Seed oil applied on abscesses and for treating itching and skin affections. The *Ayurvedic Pharmacopoeia* of India suggested the uses of *Martynia annua* Linn seed in graying of hair.(20) The fruits of *Martynia annua* Linn used as local sedative and also used as antidote to scorpion stings to venomous bites and stings. Whole plant is also used by *santal tribals* for fever, hair loss, scabies, sore and carbuncles on the back. It has been used from ancient time in traditional medicine of India. In folk medicine, the fruits are used for the treatment of asthma; the seeds are applied locally for itching and eczema. The leaves are given in epilepsy and its juice is gargled for sore throat. Decoction of whole plant is given in pneumonia and cold fever. The roots made into a poultice and applied in snake bite.(25) Roots of *Martynia annua* Linn are boiled in milk and taken as a tonic in folklore.(26) In Tribal Pockets of Satpura Plateau in Madhya Pradesh, Root paste of *Martynia annua* Linn is used in folk medicine to treat Cancer and rheumatism.(27) A detailed view of the ethnomedicinal uses of different parts of the plant is given in Table 2.

Table 2: - Ethanobotanical information on *Martynia annua* Linn.

S. No.	Plant part	Preparation	Traditional uses	Reference
1	Fruit	Paste	Alexiteric	(28)
2	Fruit	Paste	Inflammations	(28)
3	Fruit	Paste	Scorpion- sting	(25)
4	Leaves	Paste	Applied to tuberculous glands	(28)
5	Leaves	Juice	Gargle	(28)
6	Fruit	Oil	<i>Tinea corporis</i>	(29)
7	Leaves	As such	To kill bugs	(29)
8	Ripe fruit	Oil	Scabies	(29)
9	Root	Paste	Sedative	(29)
10	Leaves	Paste	Antidote to venomous stings	(30)
11	Leaves	Paste	Epilepsy	(23)
12	Leaves	Eaten as such	Scabies	(23)
13	Root	Extract	Antifertility	(22)
14	Root	Boiled with milk	Tonic	(26)
15	Root	Paste	Cancer & Rheumatism	(27)
16	Leaves	Eaten as such	Neck cancer	(32)
17	Leaves & Roots	Eaten as such	Treatment of Tuberculosis & sore throat	(33)
18	Fruit oil	Oil for local application	Eczema	(34)
19	Seeds & fruits	Powder	<i>Asthama</i> , Itching (Seeds) & Eczema(frui	(35)

Phytoconstituents of *M. annua*

Qualitative phyto-chemical screening of entire plant extracts of *Martynia annua* Linn demonstrates the existence of carbohydrates, glycosides, phenols, tannins, flavonoids and anthocyanins. GC-MS studied on aqueous and alcoholic extract of *M. annua* showed the existence of 28 compounds in which oleic acid present in the high amount. Other main organic compounds contain p-hydroxy benzoic acid, cyanidin-3-galactoside, pelargonidin-3-5-diglucoside, gentisic acid, palmitic acid, linoleic acid, arachidic acid, stearic acid, apigenin, apigenin-7-oglucuronide. MEMA (methanolic extract of *Martynia annua* Linn) leaves exhibits the existence of higher amount of glycosides, alkaloids, terpenoid, tannins steroids, and saponins and moderate quantity of cardiac glycosides, anthroquinones and phenols While, it doesn't exhibits the existence of flavonoids and resins. The leaves mainly contain chlorogenic acid, sinapic acid, p-hydroxy benzoic acid and fatty acids such as palmitic acid and stearic acid. The flowers of the plant mainly contain cyanidin-3-galactoside and pelargonidin-3, 5-diglucoside while gentisic acids are there in fruits. The seeds show the existence of arachidic acid, cyclopropenoid, linoleic acid, malvalic acid, oleic acid, palmitic acid and stearic acid.(1) Table 3 provides a summary focusing on the phytoconstituents present in different parts of the plant.

Table 3: Phytoconstituents of *Martynia annua* Linn. plant

S. No.	Plant part	Phyto-constituents	Type	Reference
1	Fruits	Gentisic acid	Lipid	(31)
2	Leaves	Chlorogenic acid	Phenolic acids	(36)
3	Leaves	p-hydroxy benzoic acid	Phenolic acids	(36)
4	Seed	Arachidic acid	Lipid	(37)
5	Seed	HCN	Cyanogenic group	(37)
6	Seed	Linoleic acid	Lipid	(37)
7	Seed	Malvalic acid	-	(37)
8	Seed, leaves	Palmitic acid	Lipid	(36)
9	Seed, leaves	Stearic acid	Lipid	(36)
10	Seeds	Cyclopropenoid	-	(37)
11	Whole plant, Flowers	Pelargonidin-3,5-diglucoside	-	(31)
12	Whole plant, Flowers	Cyanidin-3-galactoside	-	(31)
13	Whole plant, Seed	Oleic acid	Lipid	(37)
14	Whole plant, Seed	Apigenin, Apigenin-7-O-beta- D- glucuronide	Flavonoids	(38)

Pharmacological Activities

The plant has Analgesic and Antipyretic, Anthelmintic, Antibacterial, Anti-convulsant Antinociceptive and Central Nervous System (CNS) depressant, Antifertility, Antioxidant, Wound Healing, Antidiabetic, Gastroprotective, Antifungal and Cytotoxic Activity. The use of *Martynia annua* Linn as medicine is fairly large. A detailed view of the Pharmacological potentials of the plant is given in **Table 4**.

Table 4 : Pharmacological Activities of *Martynia annua* Linn.

S.N.	Type of activity	Plant Part	Research Activity	Ref.
1	Analgesic and Antipyretic Activity	Fruits	The analgesic activity was studied by petroleum ether, chloroform, ethanol and aqueous extracts of <i>Martynia annua</i> Linn. 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 <i>et al</i> , 2007).	(39)
2	Anthelmintic activity	Roots	The anthelmintic activity against earthworms <i>Pheritima posthuma</i> was investigated by petroleum ether extract of <i>Martynia annua</i> Linn. roots showed effective result compared with the reference drug albendazole (Nirmal <i>et al</i> , 2007).	(40)
3	Antibacterial activity	Leaves	The chloroform, ethyl acetate and methanol extract of <i>Martynia annua</i> L. leaves were studied 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 <i>Proteus vulgaris</i> , <i>Bacillus subtilis</i> and <i>B. thuringensis</i> . Ethyl acetate extract was potentially effective against <i>Salmonella paratyphi A</i> , <i>Salmonella paratyphi B</i> , <i>Proteus mirabilis</i> , <i>P. vulgaris</i> and <i>Klebsiella pneumonia</i> , while the methanol extract, shows greater antibacterial potential towards <i>Proteus vulgaris</i> , <i>B. subtilis</i> , <i>S. paratyphi B</i> and <i>Pseudomonas aeruginosa</i> . The antibacterial activity was carried out by Disc Diffusion method. (Sermakkani and Thangapandian, 2010).	(41)

S.N.	Type of activity	Plant Part	Research Activity	Ref.
4	Anti-convulsant activity	Leaves	The anticonvulsant activity was tested by methanol extract of <i>Martynia annua</i> L (MEMA) leaves at doses of 200 mg/kg and 400 mg/kg. The doses were significantly reduced the duration of tonic hind leg extension and protect the animals from seizures. The methanol extract of <i>M. annua</i> 200 mg per kg and 400 mg per kg have revealed 66.31 % and 82.73% protection respectively against to maxima electroshock (MES) induced seizures. For these comparisons, 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).	(2)
5	Antinociceptive activity and Central Nervous System (CNS) depressant activity	Roots	For antinociceptive and CNS depressant activity petroleum ether, ethyl acetate and methanol extracts of <i>Martynia annua</i> L. root were studied. 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).	(34)
6	Antifertility activity	Roots	The antifertility effect on male rates by 50% ethanol extract of <i>Martynia annua</i> L root at dose of 50 mg/kg, 100 mg/kg and 200 mg/kg body weight were studied. The result revealed 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).	(22)
7	Antioxidant activity	Leaves	The antioxidant activity of methanol and aqueous extract of <i>Martynia annua</i> L. leaves were studied by in vitro methods, namely, reducing power assay, DPPH radical-scavenging activity, nitric oxide scavenging activity, H ₂ 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).	(35)
		Fruit oil	Rameshroo et al. reported in vitro antioxidant activity of <i>M. annua</i> from its fruit oil. Superoxide radical and DPPH radical methods were used for assessing antioxidant effect where IC ₅₀ being 87.56 µg/ml and 106.80 µg/ml correspondingly. Fruit oil exhibits 87.25 ± 1.13 mg per 100 grams of total polyphenol substance. As per the study report it is a prospective source of natural antioxidants.	(36)
		Fruit extracts	The fruit extracts shows antioxidant potential which indicated that it can help to enhance immune system. Antioxidant activities deliberated by various methods like DPPH free radical scavenging, ferric reducing power and oxidative stress mechanism by lipid peroxidative assays. The ethanolic fraction revealed maximum extent but in water these activities were also significant. The phenolic compounds and flavonoids are responsible of antioxidant activities.	(37)
8	Study On Antioxidant Potential	Leaf, stem & endocarp with seed	In this study ascorbic acid, flavonoid, tannin and phenol content of different parts of <i>M. annua</i> using spectrophotometric methods were studied. The result of this study revealed that the leaf and stem of <i>M. annua</i> have significant amount of flavonoids, phenols, tannins and ascorbic acids compared to endocarp with seed. Study revealed that <i>M. annua</i> is a potential source of natural antioxidants.	(38)
9	Wound Healing activity	Leaves	The wound healing effect was studied by methanol fraction of ethanolic extract of <i>Martynia annua</i> 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).	(27)

S.N.	Type of activity	Plant Part	Research Activity	Ref.
	Comparative Antioxidant Potential of Its Stem and Leaves	Stem and leaves	The comparative antioxidant potential and radical scavenging activities were studied using different antioxidant assays such as ferric reducing antioxidant power (FRAP), 2,2'-diphenyl-1-picrylhydrazil (DPPH) scavenging, total phenolic contents (TPC) and total antioxidant activity by phosphomolybdenum complex method. The study results revealed that n-butanol soluble fraction of stem showed highest % scavenging of DPPH (83.62 ± 0.38 % at concentration of $250 \mu\text{g/mL}$) as compared to other studied fractions. The ethyl acetate soluble fraction of leaves also displayed good activity (82.88 ± 0.34 %) nearly equal to it.	(39)
	Anti-diabetic Activity	Flower	The antidiabetic activity of methanol extracts of <i>Martynia annua</i> L (MEMA) flower studied 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).	(48)
	Gastro-protective Activity	Leaves	Jain and Bhandarkar reported gastroprotective activity of MEMA leaves in rats with 200 mg/kg and 300 mg/kg body weight on ethanol-induced gastric ulcer. Results were observed by calculating ulcer index based on lesion index and pH which showed significant inhibition on the ulcer lesion index in rats hence effect of ethanol extract with 300 mg/kg dose significantly ($p < 0.05$) change the gastric volume, ulcer index, and pH.	(49)
	Antifungal Activity	Whole plant	The antifungal activity of <i>Martynia annua</i> L along with thirteen coastal sand dune plants (CSDPs) belonging to nine families were studied from Arnala and Kalamb beach. The results obtained and suggest that, 90% colonization were found <i>C. rotundus</i> , <i>E. zeylanica</i> var. <i>zeylanica</i> , <i>I. pes-caprae</i> (Arnala beach), <i>L. procumbens</i> (Kalamb beach), <i>Martynia annua</i> , <i>P. punctatum</i> and <i>S. orientale</i> etc. (Kumar et al, 2012).	(50)
	Cytotoxic Activity	Leaves	Cytotoxic activity of alcoholic and acetone extracts of <i>M. annua</i> was studied by J.Vinnarasi et al (2014) in terms of brine shrimp lethality bioassay. The alcoholic and acetone extracts of <i>M. annua</i> was observed to be mainly effective at which half mortality of brine shrimp nauplii occurred were found to be 239.48 and 328.21ppm respectively. The results of the study revealed the cytotoxic Potential of <i>M.annua</i> .(J.Vinnarasi et al, 2014)	(51)

Conclusion

Though *Martynia annua* Linn. is an invasive obnoxious weed, the literature survey reveals the therapeutic efficiency of the plant. The phytochemicals isolated from this medicinal plant has been effectively using in many health problems since a long time. The present review work provides a wide area of interest for planning and conducting research on this wonderful plant for the development of novel drug for the future.

References

- <http://www.backyardnature.net/q/martynia.htm> Sierra Gorda Biosphere Reserve, QUERÉTARO, MÉXICO September 14, 2007 [Internet]. [cited 2018 Apr 15]. Available from: <http://www.backyardnature.net/q/martynia.htm>
- Babu HB et al. Studies on phytochemical and anticonvulsant property of *Martynia annua* Linn. International Journal of Phytopharmacology 2010; 1 (2): 82-86.
- Kumar Shankul et al, Pharmacognostical, phytochemical and pharmacological review on *Ipomoea carnea*, Novus International Journal of Pharmaceutical Technology 2012, 1(4):9-18.
- Kumar S et al. systemic review: pharmacognosy, phytochemistry and pharmacology of martynia. Int J Res Med. 2012; 1(1):34-39.
- Charak Samhita, with Charaka Chandrika Hindi commentary, by Dr. Brahmanand Tripathi and Dr. Ganga Sahay Pandey, Chikista Sthana Chapter 1/1, Verse No. 64 Chaukhamba Surbharti Prakashan, 2007.p.21. In.
- Charak Samhita, with Charaka Chandrika Hindi commentary, by Dr. Brahmanand Tripathi and Dr. Ganga Sahay Pandey, Chikista Sthana Chapter 18, Verse No. 41-42 Chaukhamba Surbharti Prakashan, 2007.p.647. In.
- Charak Samhita, with Charaka Chandrika Hindi commentary, by Dr. Brahmanand Tripathi and Dr. Ganga Sahay Pandey, Chikista Sthana Chapter 10, Verse No. 38 Chaukhamba Surbharti Prakashan, 2007.p.414. In.
- Charak Samhita, with Charaka Chandrika Hindi commentary, by Dr. Brahmanand Tripathi and Dr. Ganga Sahay Pandey, Chikista Sthana Chapter 30, Verse No. 50-51 Chaukhamba Surbharti Prakashan, 2007.p.1019. In.
- Yadavji Trikamji, Narayan Ram , editors, Sushruta Samhita of Sushruta, Chikitsa sthan, chapter 37, verse 13,20 , 5th edn (reprint), Varanasi: Chaukhamba orientalia; 1992;. In.

10. Sharma PV (2008), Editor of Dhanwantari Nighantu, Chaukhambha orientalia, Varanasi. pg no. 125. In.
11. Sharma P.V, Kaidev Nighantu, 1st Edition 1979, Chowkhamba Orienta, Varanasi, Delhi; p.- 133. In.
12. Pandey.G.S, Bhavprakash Nighantu, 4thEdition1969, Chowkhamba Snaskrit Snasthan, Varanasi,p -440. In.
13. Narahari P, Raj Nighantu, Edited by Indradev Tripathi , 1st Edition, Krishna Das Academy, Varanasi, p.- 51. In.
14. Vaidya Bapala Gl, Nighantu Adarsha, 1st Edition 1968, Chowkhamba Vidyabhavan, Varanasi, Uttarardha, p -25. In.
15. Chopra RN et al. Glossary of Indian Medicinal plants, National Institute of Science Communication, New Delhi 1996; 181.
16. Kirtikar K R; Basu B D, Indian Medicinal Plants, Vol.III, International Book Distributors and Publisher, Dehradun, 1999, 1994:1730.
17. Oudhia P. Medicinal weeds in groundnut fields of Chhattisgarh (India). Int.Arachis News let. 1999; 19: 62- 64.
18. Trease GE, Evans WC. Trease and Evans Pharmacognosy: A Physicians guide to Herbal Medicine 13th Edition, Bailliere Tindall. London, 1989.
19. Katare V et al. Phytochemical and Pharmacognostical studies of *Martynia annua*. IRJP. 2012; 3(6): 104-08.
20. The Ayurvedic Pharmacopoeia of India, Part I, volume III, page no.120-22.
21. Subhangkar N. Shankul Kumar et al. systemic review: pharmacognosy, phytochemistry and pharmacology of *Martynia annua* Int J Res Med. (2012),1(1),34-39. 2012;5.
22. Anonymous. The Ayurvedic Pharmacopoeia of India. Part I, Vol. III, Ministry of Health & Family Welfare, Government of India, New Delhi, 77- 78. In.
23. Anonymous. The Wealth of India. Publication and information Directorate, CSIR, New Delhi, 1985, 307.
24. Bansode S, Nirmal S, Jadhav R. Pharmacognostic, phytochemical and pharmacological study of *Martynia annua* Leaves” (Family: Martyniaceae). :4.
25. <http://www.efloraofgandhinagar.in/herb/martynia-annua> 15/4/2018.
26. “Study on Utilization Pattern of Plants in Ethno-Medicinal Uses Prevalent in Tribal Pockets of Satpura Plateau in Madhya Pradesh” by Madhya Pradesh State Biodiversity Board, Bhopal (M.P.) Traditional healers (Village – Marhapatha, Block – Bargi, Dist. – Jabalpur (Madhyapradesh).
27. Mhaskar KS, Blatter E, Caius JF. Indian Medicinal Plants. Vol. II, Sri Satguru Publications; Delhi, 2000, 556-559.
28. Singh NP, Panda H. Meditational herbs with their formulation. Daya Publishing House, New Delhi, 2005, 671.
29. Watt G. Dictionary of the economic products of India. Vol. V, Cosmo Publications; New Delhi,1972.
30. Mali PC, Ansari AS, Chaturedi M. Antifertility effect of chronically administered *M. annua* root extract on male rats. Journal of Ethnopharmacology 2002; 82(2-3): 61-67.
31. Pandey G, Sharma M. Govind Pandey, S Madhuri Some medicinal plants as natural anticancer agents, pharmacognosy review Year : 2009 Vol: 3 Issue :6 P- 259-263. Pharmacogn Rev. 2014 Dec 31;3:259–63.
32. Gurrapu S. Gurrapu et al. Medicinal Plants Used By Traditional Medicine Practitioners In The Management Of HIV/AIDS-Related Diseases In Tribal Areas Of Adilabad District, Telangana Region. Am J Sci Med Res [Internet]. 2017 Aug 10 [cited 2018 Apr 15];2(1):239–45. Available from: <http://globalsciencepg.org/21.01%20swapna%20239-245.pdf>
33. Chinna Eswaraiiah M et al. an overview on *Martynia annua* L. International Journal of Pharmaceutical Research & Development 2013; Vol 5(02): April-2013 (113 – 118) [Internet]. [cited 2018 Apr 15]. Available from: <https://www.ijprd.com/AN%20OVERVIEW%20ON%20MARTYNIA%20ANNUA%20L.pdf>
34. *Martynia annua* Linn: A traditional Drug for Asthama, Itch and Eczema, Short Research communication, 2 (3) 1981 (P. 427)Ab.pdf [Internet]. [cited 2018 Apr 15]. Available from: [http://www.ccras.nic.in/sites/default/files/viewpdf/jdras/Archives/Volume_02_No_3_Spet_1981/2%20\(3\)%201981%20\(P.%20427%20\)Ab.pdf](http://www.ccras.nic.in/sites/default/files/viewpdf/jdras/Archives/Volume_02_No_3_Spet_1981/2%20(3)%201981%20(P.%20427%20)Ab.pdf)
35. Lodhi S, Singhai A K. Preliminary pharmacological evaluation of *Martynia annua* Linn leaves for wound healing. Asian Pacific Journal of Tropical Biomedicine 2011; 1(6): 421-427.
36. Hosamani KM, Sattigeri RM, Patil KB. Studies on chemical compounds of *Martynia annua* syn. *M. diandra* seed oil. Journal of Medicinal and Aromatic Plant Sciences 2002; 24(1): 12.
37. Rastogi RP, Melhotra BN. Compendium of Indian Medicinal Plants. Vol. II, CDRI, Lucknow, 1993, 446.
38. Kar D M et al. Analgesic and antipyretic activity of fruits of *Martynia annua* Linn. Hamdard Med. 2004; 47: 32.
39. Nirmal SA, Nikalye AG, Jadvav RS, Tambe VD. Anthelmintic activity of *Martynia annua* roots. Indian Drugs. 2007; 44(10): 772-773.
40. Sermakkani M, Thangapandian V. Antibacterial and phytochemical analysis of *Martynia annua* L. Plant Archives. 2010; 10(1): 223-225.
41. Bhalke RD, Jadhav RS. Antinociceptive activity and CNS depressant activity of *Martynia annua* L. root.
42. Nagda D, Saluja A, Nagda C. Antioxidant activities of methanolic and aqueous extract from leaves of *Martynia annua* Linn. Journal of pharmacognosy. 2009; 1: 288-297.
43. Kenwat R et al. Preliminary phytochemical screening and in vitro antioxidant efficacy of fruit oil of *Martynia annua*. UK J Pharm Biosci 2014;2:16-22.

44. Arshad Z, Saied S, Naz S. Antioxidant Activities and Phytochemical Screening of *Martynia annua* Fruit Extract. Biosci Biotechnol Res Asia [Internet]. 2017 Dec 25 [cited 2018 Apr 15];14(4):1363–9. Available from: <http://www.biotech-asia.org/vol14no4/antioxidant-activities-and-phytochemical-screening-of-martynia-annua-fruit-extract/>
45. Flora G, et al., Study on Antioxidant Potential Of Different Parts Of *M. annua* Linn. IJDR, Vol. 3, Issue, 9, pp.051-054, September, 2013.
46. Aziz-Ur-Rehman et al., *Martynia annua*: Comparative Antioxidant Potential of Its Stem and Leaves, Asian Journal of Chemistry; Vol. 24, No. 8 (2012), 3335-3338.
47. Saiyad Moinali F, Gohil Kashmira J. To investigate anti-diabetic potential of *Martynia annua* Linn. flower extracts in wistar rats. WJPR.2013; 2(2): 486-499.
48. Jain Suchit , Bhandarkar Sharad , Gastroprotective activity of leaves on ethanol induced ulcer in rats, Asian Journal of Pharmacy and Pharmacology 2016; 2(1):19-22.
49. Vishal R. Kamble, Bazegah K. Sayed and Nazia Qureshi. Screening of CSDPs for AM Fungal Association from Arnala and Kalamb Beach Maharashtra, IOSR Journal of Pharmacy and Biological Sciences 2012; 2(4):44-47.
50. Vinnarasi J, Raj AAA, Rose GL. Phytochemical Screening and Cytotoxic Activity of *Martynia annua* L. Leaves Extracts. 2014;4.
