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Achyranthes Aspera -An Important Medicinal Plant: A Review

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ABSTRACT

Achyranthesaspera (Amaranthaceae) is an important medicinal herb, commonly available plant in India. commonly known as apamarga. In traditional systems of medicines, seeds, roots, leaves, flower and shoots are the most important parts which are used medicinally. The present article gives updated information of medicinal properties Plant. The review reveals that wide numbers of phytochemical constituents have been isolated from the plant which possesses activities like anticancer, antiperiodic, diuretic, purgative, laxative, antiasthmatic, hepatoprotective, anti-allergic and various other important medicinal properties. The crushed plant is used to treat asthma and wounds. Decoction of powdered leaves with honey or sugar candy is useful for treatment of diarrhoea and dysentery.It has been claimed that this plant's saponins have phosphorylase activity on the heart. Root extract is used in eye problem malarial fever, asthma, hypertension, and diabetes . also used to treat kidney stone, tooth pain. [2] Achyranthesaspera show various pharmacological actions such asantiparasitic, hypoglycaemic, cancer chemo preventive, hepatoprotective, analgesic and antipyretic, anti-inflammatory and anti-arthritic, anti-oxidant, nephroprotective, anti-depressant, diuretic, bronchoprotective, cardiovascular, anti-allergic, immunomodulatory activity. [3]

Key Words: Achyranthesaspera, Medicinal properties, chemical constituents, pharmacological activities.

INTRODUCTION

One species of plant in the Amaranthaceae family is Achyranthes aspera.Achyranthes aspera annual herb that grows throughout India, consists of 160 genera and approximately 2400 species of herbs.

Its is common weed. It is found inroad sides, Disturbed areas, gardens, crops, grasslands.[3]

This is prerennial or annual shrubby herb.this plant consist both male male and female characheristic (Hermaphrodite).Flowering time is from july to September and seed ripen in October.Achyranthesaspera show various pharmacological actions such asantiparasitic ,hypoglycaemic ,cancer chemo preventive ,hepatoprotective, analgesic and antipyretic, anti-inflammatory and anti-arthritic ,anti-oxidant,nephroprotective ,anti-depressant ,diuretic ,bronchoprotective ,cardiovascular ,anti-allergic ,wound healing ,immunomodulatory activity.Insankrit it is called as apamarga.

Generally they are available in two types: 1. Red apamarga(rakta)

2.White apamarga(shweta)

scientific name of red apamarga is *Puppalialappaceae*and scientific name of white apamarga

is *achyranthes aspera.*

Fig .1 a) *Puppalialappaceae* **b)** *Achyranthes aspera.*

Taxonomic classification

Kingdom: Plantae

Family: Amaranthaceae

Genus: Achyranthes

Species: A. aspera

common names: Roughchaff-flower ,chaff flower,devil's horsewhip

Sanskritnames: Apamarga [2]

1.1 Geographical Source :

Easily found anywhere in India road sides, Disturbed areas, gardens, crops, grasslands up to the height of 2100 m .Also found in South Andaman Islands, Baluchistan, Ceylon, Tropical Asia, Africa, Australia and America.[3]

1.2 Morphology

Height : height of Achyranthesaspera upto1.2 m tall.

Leaves: oval- elongated,green leaves and 1.5-7 cm long, 0.4-4 cm wide.

Inflorescence: In Inflorescence of Achyranthesaspera flowers are arrange on long peduncle..[3]

Stem:Hairy, cylindrical,solid and it is a herb but woody at end.[3]

Flowers :Both bracts and bractioles are present in flower,sessile,complete, actinomorphic,hypogynous.Perianth of flower made up of 5 tepals. Male reproductive structure of flower consist of 10 stamens, out of which 5 are fertile.Female reproductive structure of flower consist of bicarpellary with single style and capitate stigma.[3]

Fruits :fruit are egg shaped, 2.5-3mm long .

Seeds :The seed of this plant is endospermic,brownin colour and which is 2mm long.

Fig 2.1 Leaves of *achyranthes aspera*

Fig 2.2 Inflorescence of *achyranthes aspera*

Fig 2.3 Seeds of achyranthes aspera

Fig 2.4 flowers of achyranthes aspera

Fig 2.5 Roots of achyranthes aspera

1.3 Traditional Uses:

Decoction of whole plant used for leprosy,.

The achyranthesaspera also used for asthma, fever, cough, arthritis, haemorrhoids, renal disorders, and pneumonia with its anti-inflammatory properties.

The leaves pulp of fresh AchyranthensAspera and flowering spikes is used for scorpion bites when applied externally,.

Mixture of flowering spikes with sugar used for dog bites and hydrophobia.

Leaf juice ofAchyranthesaspera is used for wound healing and ulcer relief.

The ashof achyranthesasperais used to treat bleeding piles and abdominal problems.

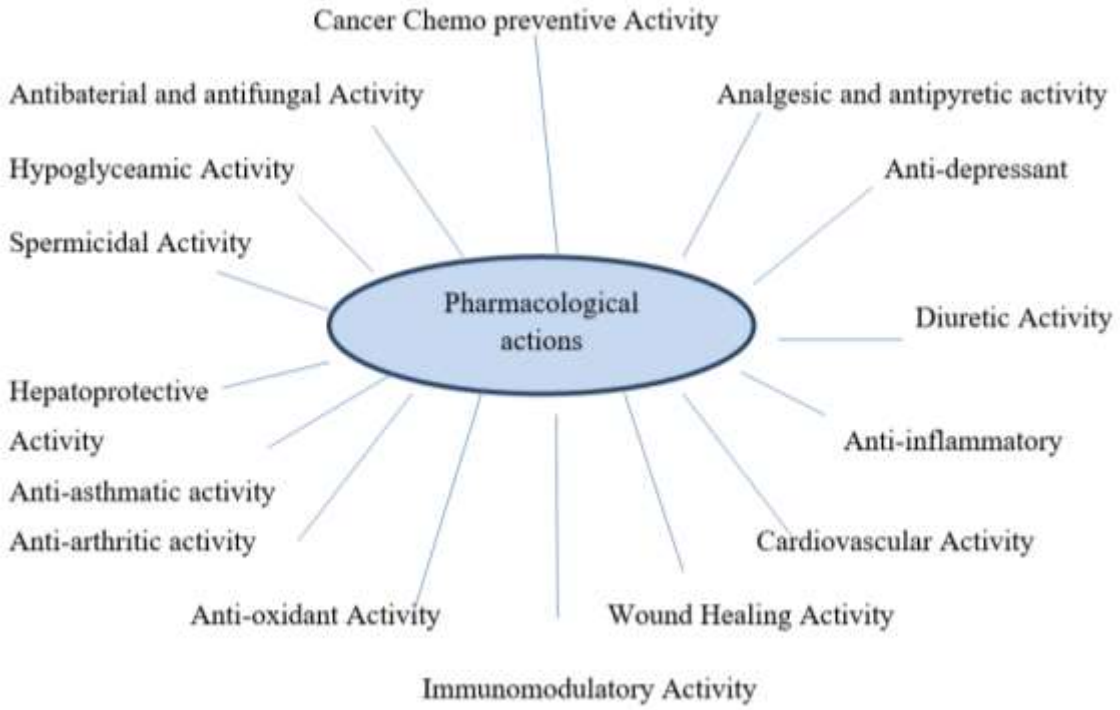
The root of this plant is also used as tooth brush to clean the mouth and to cure bad odour of teeth.

Root extract from achyranthusaspera is used as eye drop to treat night blindness [4]

1.4 Phytoconstituents present in different parts of plants:

Parts of plant	Chemical constituent
Root	Ecdysteron Ecdysone Achyranthin Oleanolic acid n-hexacos-14-enoic acid, strigmasta-5, 22-dien-3-β-ol, trans-13-docasenoic acid, n-hexacosanyl, n-decaniate, n-hexacos-17-enoic acid and n-hexacos-11-enoic acid.[5]
Seed	Pentatriacontane Hexatriacontane, Triacontane, Hentriacontane Linoleic acid, Oleic acid, Palmitic acid, Stearic acid ,Behenic acid, Arachidic acid, Myristic acid, Lauroic acid Fruit Saponin A, B, C, and D. [5]
Leaves	p-benzoquinone, hydroquinone, spathulenol, nerol, αionone, asarone and eugenol, 36,37-dihydoxy-henpentacontan-4-one 16-hydroxy-26-methyl heptacosan-2-one, 27cyclohexyl heptacosan-7-ol β-sitosterol, 28-hydroxy pentatriaconaten-7-one 4-methyl-heptratriaconate-1-en-10-ol,tetracontanol-2. [5]
Inflorescences	β- D-glucopyranosyl-3β[O-α-L-rhamnopyranosyl[1→3)-O-β-D-glucopyranuronosyloxy]oleanolate, β-D-glucopyranosyl3-β-[O-β-D-galactopyranosyl (1→2)-O-β-D-glucopyranuronosyloxy] oleanolate, β-D-glucopyranosyl 3β-[O-β-D-glucopyranuronosyloxy] oleanolate[5]
Shoots	Triacontanol , 36, 47-dihydroxyhenpentacontan-4-one [5] 27-cyclohexylheptacosan-7-ol and 16-hydroxy-26-methylheptacosan-2-one.
Stem	10-octacosanone[5]

1.5 Pharmacological actions :



Pharmacological actions

Spermicidal Activity:

The spermicidal activity of 50% ethanolic extract of the roots of *Achyranthes aspera* was performed. 50% ethanolic extract of the roots of*achyranthes aspera* possessspermatotoxic effects.Additionally, preliminary research suggested that a protein might be the active principle. This study compared the in vitro effects of a 58 kDaAchyranthes protein (Ap) that was extracted from Achyranthesaspera using conventional techniques with those of nonoxynol-9 (N-9). The sperm immobilization studies showed that about 150 µg of Ap was able to immobilize sperms completely within seconds at a lower concentration than N-9 (250 µg). [6]

Antibaterial and antifungalActivity :

Petroleum ether, Chloroform and Methanol extract of dried leaves of Achyranthesaspera were obtained by infusion and maceration were screened for their antibacterial and antifungal activities.With the exception of the methanolic extracts of Achyranthesaspera leaves obtained by infusion, which demonstrated a strong inhibitory activity against the Gram-positive bacteria Staphlyococcus aureus with a minimal inhibitory concentration (MIC) of 5000 µl ml-1, the majority of the extracts lacked antifungal and antibacterial activities.The minimal inhibitory concentration values to dermatophyte strains were 2500 µl ml-1 against Trichophyton rubrum (LM-09, LM-13) and Microsporumcanis. In conclusion, it appears that Achyranthesaspera has non-specific antimicrobial activity.[5]

Hypoglyceamic Activity: The ethane extracts were tested against 5 different species of human pathogenic bacteria and 17 fungal strains by the agar-solid diffusion methodWith the exception of the methanolic extracts of Achyranthesaspera leaves obtained by infusion, which demonstrated a strong inhibitory activity against the Gram-positive bacteria Staphlyococcus aureus with a minimal inhibitory concentration (MIC) of 5000 µl ml-1, the majority of the extracts lacked antifungal and antibacterial properties. The extract of Achyranthesaspera leaves was assessed for its in-vivo anti-diabetic effects on Streptozotocin-induced diabetic rats. The production of insulin is dependent on beta cells, which are selectively destroyed by streptozotocin. Blood glucose levels rise following streptozotocin therapy when there is an insulin deficiency.[7]

Cancer Chemo preventive Activity: According to A. Chakraborty et al. (2002), tumor promoter 12-O-tetradecanoylphorbol-13-acetate-induced early antigen activation by the Epstein-Barr virus in Raji cells is inhibited by methanolic extracts of leaves, alkaloid, nonalkaloid, and saponin fractions.[9]

Hepatoprotective Activity: An extract from the roots of Asperaaspera may be able to inhibit the growth of colon and liver cancer cell lines. The presence of phytoconstituents that have been shown to act as cytotoxic agents, such as alkaloids, phenolics, flavonoids, terpenoids, etc., has resulted in the potential anticancer activities..[8]

Analgesic and antipyretic activity: Sutar N.G. et al. (2008) reported the use of brewer's yeast-induced and hot plate methods to extract methanol from leaves for analgesic and antipyretic properties, with aspirin serving as the standard medication.[10]

Anti-inflammatory: Achyranthesaspera Linn. (Amaranthaceae) alcohol extract's anti-inflammatory properties in Wistar rats following oral administration at doses of 50, 100, and 200 mg/kg. The cotton pellet granuloma test (a chronic inflammatory model) and the carrageenan-induced paw edema method (an acute inflammatory model) were used for this. Granuloma formation was significantly suppressed in the alcohol extract. All together, these findings show encouraging anti-inflammatory activity against inflammation, both acute and chronic. Bradykinin and prostaglandin inhibition may also be important. For the first time, a scientific study has been conducted on Achyranthesaspera roots, revealing their promising anti-inflammatory activity.[11]

Anti-arthritic activity:Achyranthesaspera'santiarthritic activity on formaldehyde was tested, and the results indicate that oral AEAA administration provided a significant ($p < 0.01$) dose-dependent protection against arthritis induced by formaldehyde. On the twenty-first day, A. aspera was observed to exhibit a 30% and 38.33% inhibition of paw volume at the various doses of 250 mg/kg and 500 mg/kg, respectively. The joint swelling was measured at day 14 and was found to be 27.2% and 36.36, respectively. On days 21 and 14, diclofenac (10 mg/kg) reduced arthritis and joint swelling by 36.61%.[12]

Anti-oxidant Activity:counter-actant A 1, 1-diphenyl-2-picrylhydrazyl (DPPH) scavenging assay was used to test the Achyranthesaspera Linn. leaves and roots' methanol extract's activity. The extract exhibited dose-dependent antioxidant activity. The ascorbic acid reference standard's IC50 value in the DPPH scavenging assay was 7.81 µg/ml, while the IC50 values of the leaf and root extracts were found to be 241.86µg/ml and 129.91µg/ml, respectively. According to this study, methanolic extract from roots has stronger antioxidant properties than methanolic extract from leaves.

Nephroprotective Activity:According to T. Jayakumar et al. (2009), lead acetate-induced nephrotoxicity in male albino rats was prevented by a methanolic extract of the entire Achyranthesaspera plant. [13]

Anti-depressant Activity: The methanolic extract of Achyranthesaspera leaves was tested for antidepressant activity, and the results indicate that the extract has antidepressant effects on rats and mice when tested using the tail suspension test and forced swimming test.[14]

Diuretic Activity: An investigation into the diuretic activity of Achyranthesaspera seeds revealed a noteworthy diuretic effect in adult male albino rats. In rats, achyranthine (5 mg/kg, orally) exhibited diuretic effects.[15]

Anti-asthmatic activity: The anti-asthmatic activity of the medication was tested using an ethanol extract of the aerial portion of A. aspera. One of the chronic inflammatory diseases that causes bronchoconstriction and inflammation in the airway pathway is bronchial asthma. It is also the cause of the

hyperresponsiveness of the bronchi to most stimuli, including mast cells, lymphocytes, and eosinophils. Several agonists, including histamine, acetylcholine, bradykinin, and 5-hydroxyltrytamine, are in charge of the contractile responses**.** [16]

Cardiovascular Activity:An isolated frog, guinea pig, and rabbit heart's contraction force was enhanced by a combination of saponins extracted from Achyranthesaspera seeds, according to the results of a cardiovascular activity on isolated saponin. Prosthalol and mepyramine partially inhibited the stimulant effect of the lower doses (1-50 µg). Prosthalol did not prevent the effect at higher doses of saponin. Additionally, the saponins raised the failing papillary muscle's contraction force and the tone of the hypodynamic heart.[17]

Cardiovascular Activity: Adrenaline bitartrate or Achyranthesasperasaponin increased phosphorylase an activity but had no effect on total phosphorylase activity when perfused into an isolated rat heart. [18]

When the water-soluble alkaloid achyranthine from Achyranthesaspera was isolated, cardiovascular activity was conducted on the animals. The results showed that the frogs and dogs' respiration rates and amplitudes increased, blood vessels dilated, and blood pressure and heart rate dropped. Tubocurarine did not inhibit the alkaloid's spasmogenic effect, and its contractile effect on the frog rectus abdominal muscle at 0.5 mg/ml was less than that of acetylcholine (0.1 mg/ml).[19]

Wound Healing Activity:Achyranthesaspera leaf extracts in both ethanolic and aqueous form for their ability to heal wounds. Two wound models—the excision wound model and the incision wound model—were used to investigate the wound healing activity.[20]

Immunomodulatory Activity: Comparing the treated animals to the control group, cyclophosphamide treatment resulted in a significant decrease in Hb, total WBC count, and RBC count, which had an immunosuppressive effect. When compared to the group that received only cyclophosphamide, treImmunomodulatory agents are simply defined as substances that modify or normalize pathophysiological processes without acting specifically as sti mulants or suppressors.Cyclophosphamide is an immunosuppressive medication that inhibits both humoral and cell
mediated immunity, acting on defense mechanism cells in different ways against different invaders.There is a significant reduction in Hb, RBC, and W BC counts with cyclophosphamide.When compared to control animals, cyclophosphamide treatment for three days resulted in a significant decrease in Hb, total WBC count.When the group receiving treatment with the extracts was compared to the one receiving only cyclophosphamide, there was a significant increase in counts on several hematological parameters following the administration of the myelosuppressive drug. A substantially higher ($P<0.01$) methanolic extract.[21]

CONCLUSION:

AchyranthesAspera easily found anywhere in India road sides, Disturbed areas, gardens, crops, grasslands up to the height of 2100 m . Also found in South Andaman Islands, Baluchistan, Ceylon, Tropical Asia, Africa, Australia and America. Traditionally use of achyranthesaspera in asthma, fever, cough, arthritis, haemorrhoids, renal disorder, scorpion bites,dog bites, hydrophobiaand .Leaf juice ofAchyranthesaspera is used for wound healing and ulcer relief.

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