

PHARMACOLOGICAL AND MEDICINAL USES OF *ACHYRANTHES ASPERA*

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Abstract: Herbal medicines are widely used since time immemorial indicating that herbs are a growing part of modern, high-tech medicine. India has an ancient heritage of traditional herbal medicine. The medicinal plants are used for treatment of various diseases because of their safety and effectiveness. The problem of microbial resistance is growing and the outlook for the use of antimicrobial drugs in the future is still uncertain. Therefore, actions must be taken to control the use of antibiotic, to develop research to better understand the genetic mechanisms of resistance, and to continue studies to develop either synthetic or natural new drugs. Numerous studies have been done on herbals confirming their potential antimicrobial property against microorganisms. One of the strategies towards attaining this objective is the rational localization of bioactive phytoconstituents. *Achyranthes aspera* (*Amaranthaceae*) is an important medicinal herb found as a weed throughout India. Though almost all of its parts are used in traditional systems of medicines, seeds, roots and shoots are the most important parts which are used medicinally. The present review describes some of the important medicinal properties of *Achyranthes aspera*, which are instrumental in making it potent against infections.

Keywords: Medicinal properties, pharmacological activities, Antimicrobial medicinal plants, Microbial resistance, Antibiotics.

Introduction

Knowledge of herbs has been handed down from generation to generation for thousands of years [Bown 1995]. Herbal medicines have a strong traditional or conceptual base and the potential to be useful as drugs in terms of safety and effectiveness leads for treating different diseases. World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species [Srivastav et al. 2011]. According to the WHO more than 80 % of the world's population relies on traditional herbal medicine for their primary health care [Vijayan et al. 2007]. Plants have an extraordinary ability to synthesize aromatic substances which are usually phenols or their oxygen-substituted derivatives. The medicinally active plant compounds are usually their secondary metabolites like terpenoids, quinones, flavonoids, tannins etc that are responsible for protecting the plants from microorganisms, insects and other natural pests. In the recent past

there has been a tremendous increase in the use of plant based health products in developing as well as developed countries resulting in an exponential growth of herbal products globally. One of the many plants used is *Achyranthes aspera*. *A. aspera* Linn. belongs to the family Amaranthaceae, is an annual, stiff erect or procumbent, annual or perennial herb, 1-2m in height, often with a woody base, commonly found as a weed of waysides, on roadsides [Anonymous 2005, Jain et al. 2006, Zafar 2009]. *Achyranthes aspera* Linn. is a well-known plant drug in Ayurvedic, Unani-Tibbi, Siddha, Allopathic, Homeopathic, Naturopathic & Home Remedies [Dhale et al. 2013]. It is an annual shrub found distributed throughout the tropical and subtropical regions. It is commonly found in India, Baluchistan, Sri Lanka, tropical Asia, Africa, Australia, and America [The Wealth of India 1985]. This wild tropical plant is known by different names such as *Chirchita* (Hindi), *Apamarga* (Sanskrit), *Aghedi* (Gujarati), *Apang* (Bengali), *Nayurivi* (Tamil), *Kalalat* (Malyalam), [Dwivedi et al., 2008] and *Agadha* (Marathi) in India. The plant is used in indigenous system of medicine as emenagogue, antiarthritic, antifertility, laxative, ecboic, abentifacient, anti-helminthic, aphrodisiac, antiviral, anti-plasmodic, antihypertensive, anticoagulant, diuretic and anti-tumor [Anonymous 1985, Ratra et al. 1970]. It is also useful to treat cough, renal dropsy, fistula, scrofula, skin rash, nasal, infection, chronic malaria, impotence, fever, asthma, piles and snake bites [Singleton 1999]. This plant is astringent, digestive, diuretic, laxative, purgative and stomachic. The juice of the plant is used in the treatment of boils, diarrhea, dysentery, hemorrhoids, rheumatic pains, itches and skin eruptions [Londonkar et al. 2011]. It is reported to contain alkaloids, flavonoids, saponins, steroids and terpenoids. Flavonoids have shown to prevent or slows the development of some cancers [Narayana et al. 2001] and mostly act as an anti-oxidant and anti-inflammatory agents.



Fig 1: Roots of *Achyranthes aspera*



Fig 2: Inflorescence of *Achyranthes aspera*

Taxonomic classification

Kingdom – Plantae

Subkingdom - Tracheobinota

Super Division - Spermatophyta

Division - Mangoliophyta

Class - Mangoliophsida

Subclass - Caryophyllidae

Order - Caryophyllales

Family - Amaranthaceae

Genus - *Achyranthes*

Species – *Aspera*

Geographical Source

The plant is widespread in the world as a weed, in Baluchistan, Ceylon, Tropical Asia, Africa, Australia and America. It is found on road sides, field boundaries and waste places as a weed throughout India up to an altitude of 2100 m and in South Andaman Islands [Anonymous 2005, Gupta 2010]. In the northern part of India it is known as a medicinal plant in different systems of folk medicine.

Traditional Uses

Achyranthes aspera L. (Family Amaranthaceae) is a common plant of the study area abundantly found in wastelands. It is known as “Prickly chaff flower” in English and “*Chirchita*”, “*Onga*”, “*Latjeera*” or “*Apamarga*” in local language and dialects. The plant is highly esteemed by traditional healers and used in treatment of asthma, bleeding, in facilitating delivery, boils, bronchitis, cold, cough, colic, debility, dropsy, dog bite, dysentery, ear complications, headache, leucoderma, pneumonia, renal complications, scorpion bite, snake bite and skin diseases etc [Jain 1991]. Traditional healers claim that addition of *A. aspera* would enhance the efficacy of any drug of plant origin.

Pharmacological actions

➤ **Spermicidal Activity:** Extracts from roots of *Achyranthes aspera* have been reported to possess spermicidal activity in human and rat sperm, as studied by Paul et al. (2010). Study was made on hydroethanolic, n-hexane and chloroform extracts, which were found to be most effective for sperm immobilization, sperm viability, acrosome status, 5'-nucleotidase activity and nuclear chromatin decondensation. Vasudeva and Sharma (2006) reported the ethanolic extract of the root of *Achyranthes aspera* shows post coital antifertility activity in female

albino rats. According to their study, the extract exhibited 83.3% anti-implantation activity when given orally at 200 mg/kg body weight.

➤ **Antiparasitic Activity:** Ethyl acetate extracts of *A. Aspera* have been proved to contain anti parasitic activity by Zahir et al. (2009). It has been studied that dried leaf, flower and seed extract of *A. Aspera* are active against the larvae of cattle tick *Rhipicephalus* (*Boophilus*)*microplus* (Acari:Ixodidae), sheep internal parasite *Paramphistomum cervi*.

➤ **Hypoglycaemic and Cancer Chemo preventive Activity:** Aqueous methanolic extract of the whole plant have been shown to possess hypoglycaemic activity by Akhtar and Iqbal (1991). Methanolic extracts from leaves of *Achyranthes aspera* have been proved to have cancer preventive action on Epstein- Barr virus early antigen activation induced by tumor promoter 12-O-tetradecanoylphorbol-13-acetate in Raji cells, as reported by Chakraborty et al. (2002).

➤ **Hepatoprotective Activity:** Bafna and Mishra (2004) reported that the methanolic extract of the aerial parts of *Achyranthes aspera* shows hepatoprotective activity on rifampicin induced hepatotoxicity in albino rats. Methanolic extract showed dose dependent decrease in the levels of SGPT, SGOT, ALKP and total bilirubin.

➤ **Anti-inflammatory, anti-arthritic and Anti-oxidant activity:** Alcoholic extract of the roots of *Achyranthes aspera*, was found to exhibit anti-inflammatory activity in Wistar rats using carrageenan-induced paw edema method and cotton pellet granuloma test, as studied by Vijaya Kumar et al. (2009). Gayathri et al. (2009) also reported antioxidant activity on leaves and roots.

➤ **Nephroprotective Activity: Methanolic extract of the whole plant of *Achyranthes aspera*** was shown to produce nephroprotective activity against lead acetate induced nephrotoxicity in male albino rats, as reported by Jayakumar et al. (2009).

➤ **Anti-depressant Activity:** Barua et al. (2009) showed that Methanolic extract of the leaves of *Achyranthes aspera* shows anti-depressant effect in mice and rats using forced swimming test in mice and rats and tail suspension test in rats.

➤ **Cardiovascular Activity:** Achyranthine, a water-soluble alkaloid isolated from *Achyranthes aspera*, decreased blood pressure and heart rate, dilated blood vessels, and increased the rate and amplitude of respiration in dogs and frogs. The contractile effect of the alkaloid at 0.5 mg/ml on frog rectus abdominal muscle was less than that of acetylcholine (0.1 mg/ml), and its spasmogenic effect was not blocked by tubocurarine.

- **Bronchoprotective Activity:** Ethanolic extract of *Achyranthes aspera* shows bronchoprotective effect in toluene diisocyanate (TDI) induced occupational asthma in Wistar rats as reported by Goyal et al. (2007). The total and differential leucocytes were counted in blood and bronchoalveolar (BAL) fluid. Liver homogenate was utilized for assessment of oxidative stress and lung histological examination was performed to investigate the inflammatory status of airway. The results suggest that *Achyranthes aspera* treated rats did not show any airway abnormality.
- **Anti-allergic and Wound Healing Activity:** Datir et al. (2009) reported that the petroleum ether extract (200 mg/kg, i.p.) of the plant shows significant antiallergic activity in both milk induced leukocytosis and milk induced eosinophilia in mice. Thus the antiallergic activity of *A. aspera* may be due to the presence of steroids. Thus these steroids present in the plant may be responsible for the antiallergic activity. Edwin et al. (2008) investigated the ethanolic and aqueous extracts of leaves of *Achyranthes aspera* for wound healing activity.

Conclusion

Scientists and researchers across the world are eyeing plants as a future source of unlimited antimicrobial agents and are in a desperate need of isolating compounds to keep in pace with the resistance of microorganisms. It is seen from the literature that *Achyranthes aspera* is a very important plant for its large number of medicinal properties. Thus, *Achyranthes aspera* is proved to be a multipurpose medicinal agent, thus instrumental in curing large number of ailments. It's study paves the way for further attention and research to identify the active compounds responsible for the plant biological activity, to characterize the active compounds and to elucidate the exact mechanism of action by which they exert their antibacterial effects.

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