CIBTech Journal of Pharmaceutical Sciences ISSN: 2319–3891 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/cjps.htm
2014 Vol.3 (1) January-March, pp.6-11/Singh et al.
Research Article

PHARMACOGNOSTIC EVALUATION OF *ACHYRANTHES ASPERA* LINN. WHOLE PLANT

***Harjeet Singh, Rajesh Sannd and Biresh Kumar Sarkar**
National Institute of Ayurvedic Pharmaceutical Research (CCRAS), Moti Bagh Road, Patiala, Punjab-147001
**Author for Correspondence*

ABSTRACT
The whole plant of *Achyranthes aspera* or its specific parts (leaf, stem, root and seeds) has been utilized for treatment of vomiting, bronchitis, heart diseases, piles, dysentery, blood diseases and as laxative, stomachic, tonic and carminative in Ayurveda. The present investigation involves the macroscopy, microscopy, physicochemical evaluation and preliminary phytochemical studies of *Achyranthes aspera* whole plant. These observations will help in proper authentication and standardization of the drug and also to check adulteration in the raw drug.

Keywords: *Ayurveda, Pharmacognosy, Achyranthes Aspera, Microscopy, Physicochemical*

INTRODUCTION
The World Health Organization (WHO) estimates that about 80% of the population living in the developing countries relies almost exclusively on traditional medicine for their primary health care needs. India has a rich heritage of traditional medicine and people have been using these medicines for many centuries. The traditional system of medicine mainly consists of three major systems namely Ayurveda, Unani and Siddha. In almost every system medicinal plants play a major role and constitute the backbone of traditional medicine. Indian Materia Medica includes about 2000 drugs of natural origin almost all of which are derived from different traditional systems and folklore practices. Out of these drugs derived from traditional system, most of the drugs are of vegetable origin (Nadkarni, 1976; Anonymous, 2004; Sharma *et al.*, 2000).
The process of evaluating the quality and purity of crude drugs by means of various parameters like morphological, microscopical, physical, chemical and biological observation is called standardization. Standardization is essential for herbal drugs in order to assess the quality of the drugs based on pharmacognostical, phytochemical and biological principles. Traditional remedies have always played an important role in Indian societies. However, among more than 250,000 species of higher plants, only about 10% have been scientifically investigated. Therefore it becomes necessary to design proper quality control methods for herbal drugs (Anonymous, 1999).
Pharmacognostic studies help in identification and authentication of the plant material. Appropriate identification and quality assurance of the starting materials is an essential prerequisite to ensure reproducible quality of herbal medicines which will contribute to their safety and efficacy. Simple pharmacognostic techniques used in standardization of plant material include its morphological, anatomical and biochemical characteristics (Anonymous, 1998).
Achyranthes aspera Linn., belongs to the family Amaranthaceae is distributed throughout tropical, sub-tropical and warmer regions of the world. The genus *Achyranthes* is derived from Greek achyron, chaff and anthos, flower, referring to the chaffy parts of the flower. It is an erect or procumbent, annual or perennial herb, 1-2m in height, often with a woody base, commonly found on roadsides. Most of the authors equate the drug with *Achyranthes aspera* Linn. (Amaranthaceae) and this goes well with the name apamarga, because its fruiting spikes with barbed prickles stick to the clothes of human beings and body of the animals passing its way (Anonymous, 1985; Anonymous, 2000).
Achyranthes aspera Linn., holds a reputed position as a medicinal herb in different systems of medicine in India. According to Ayurveda, it is bitter, pungent, heating, laxative, stomachic, carminative and useful for the treatment of vomiting, bronchitis, heart diseases, piles, abdominal pains, ascites, dyspepsia,

dysentery, blood diseases etc. In Ayurveda, two varieties, red and white are mentioned. It is described in 'Nighantus' as purgative, pungent, digestive, a remedy for the inflammation of internal organs, piles, itch, abdominal enlargements and enlarged cervical glands. The diuretic properties of the plant are well known to the natives of Indian and European physicians. Different parts of the plant form ingredients in many native prescriptions in combination with more active remedies (Charde *et al*., 2011).

Though the plant holds a reputed position in Ayurveda but no systematic studies have been established. Hence an effort has been made to lay down the Pharmacognostical and phytochemical standards of *Achyranthes aspera* Linn.

Synonyms

Botanical	- *Achyranthes aspera*
Ayurvedic	- Apamarga, Chirchitaa
Unani	- Chirchitaa
Siddha	- Nayuruvi
English	- Prickly chaff flower
Chinese	- Nieou si
Sanskrit	- Aghata
Hindi	- Chirchita, Latjira
Gujarati	- Safad Aghedo
Tamil	- Shiru-kadaladi
Telugu	- Uttaraene
Malayalam	- Kadaladi
Punjabi	- Puthkanda
Arabian	- Atkumah
French	-Achyranth a feuilles rudes, collant, gendarme
Persian	- Khare-vazhun
Spanish	- Mosotillo, rabo de gato, rabo de chango, rabo de raton

Geographical Source

The plant is found throughout tropical, sub tropical and warmer regions of the world upto an altitude of 2100m. The plant is widespread in Pakistan, Sri Lanka, tropical Asia, Africa, Australia and America. The plant is found throughout almost all plains of Indian states. It is a gregariously growing troublesome shrub of waste places, roadsides, grasslands etc (Anonymous, 1985; Anonymous, 2000).

An erect herb or under shrub from 0.3-0.9m high; stem stiff, not much branched; branches terete or obsoletely quadrangular, striate, pubescent. Leaves few, usually thick, 3.8-6.3 by 2.5-4.5 cm., elliptic or obovate, sometimes nearly orbicular, usually rounded (rarely subacute) at the apex, finely and softly pubescent on both sides, entire; petioles 6-20 mm long. Flowers greenish white, numerous, stiffly deflexed against the woolly-pubescent rachis, in elongate terminal spikes which are at first short but soon lengthen, reaching as much as 50 cm long in fruit; bracts 3 mm. long, broadly ovate, acuminate, membranous, aristate, persistent; bracteoles 3mm long, broadly ovate, concave, with a spine as long as the blade, hard in fruit, falling off with the fruiting perianth. Perianth 4-6 mm. long, glabrous and shining; sepals subequal, ovate-oblong, finely pointed, with narrow white membranous margins. Stamens 5; staminodes truncate, fimbriate. Utricle oblong-cylindric, truncate at the apex, thinly membranous, enclosed in the hardened perianth, smooth, brown, rather more than 2.5 mm. long. Seed subcylindric, truncate at the apex, rounded at the base, brown.

Uses in folklore medicine

The whole plant can be used for the treatment of dropsy, skin eruptions, colic, astringent and purgative. The plant is also used in heart disease, ascites, uterine-bleeding, as an antidote to snake bite, as diuretic, in piles and in dysentery. The whole plant can also be used in fractured bones, intestinal parasites, whooping cough, respiratory troubles, and for asthma treatment. The herb is found to be used in abdominal disorders and as antitumour agent. The drug can also be used in renal disorder, mild and malarial fever, as a laxative and in leucoderma. The inflorescence is used in cough and also in hydrophobia. The stem is used

in pyorrhea and scorpion bite while the twigs are used in toothache. The seeds are also used as an emetic, purgative, cathartic, in gonorrhea, for the insect bites, snake bite and in hydrophobia. The drug can be given for cough including whooping cough and as an antiasthmatic. The leaves can be processed to be used as eye drops. The leaves can be used to apply on cuts, boils, blisters. These can be used for inflamed ears and eyes. The root is used in body pain including waist and ribs pain. Labour pain can be mitigated by the root. Therapeutically it can be used as antipyretic, antirickettsial, as a tonic and as a contraceptive. The root is also claimed to be used in whooping cough, menstrual disorders burn healing for snake bite and scorpion sting. Inhaling the fume of *Achyranthes aspera* mixed with *Smilax ovalifolia* roots is suggested to improve appetite and to cure various types of gastric disorders. Ash of the plant is applied externally for ulcers and warts (Anonymous, 1985; Anonymous, 2000; Kirtikar *et al.*, 1975).

MATERIALS AND METHODS

Collection of plant material

The fresh plant of *Achyranthes aspera* was collected in the month of December from botanical garden of NIAPR, Patiala and authenticated by Dr. DP Singh, Dept. of Botany, Punjabi University, Patiala. A voucher specimen was submitted at Dept. herbarium. The fresh plant was collected and fixed immediately for anatomical studies.

Macroscopic

The macroscopic characters such as size, shape, margin, nature, texture, apex, surface, colour, odour, taste were studied for morphological investigation.

Microscopic

For microscopy, free hand section of stem, root and leaf were cut and stained according to the prescribed method (Khandelwal, 2006; Kokate, 1994).

Physicochemical Evaluation

The extractive values, ash values and loss on drying were performed according to the official methods prescribed in Ayurvedic Pharmacopoeia of India and WHO guidelines on quality control for medicinal plant materials (Anonymous, 1992).

Phytochemical screening

The preliminary phytochemical screening for stem, leaves and root were carried out as per WHO Guidelines on quality control for medicinal plant materials (Anonymous, 1992).

RESULTS AND DISCUSSION

Powder Drug with Chemical Reagents: The powder drug with different chemical reagents show different colour.

Table 1: Powder analysis with different chemical reagents

Sr. No.	Reagents	Colour
1.	Powder as such	Light Green
2.	Powder + conc. H_2SO_4	Dark Brown
3.	Powder + Glacial Acetic Acid	Dark Green
4.	Powder + conc. HCl	Light Green
5.	Powder + conc. HNO_3	Brown
6.	Powder + 5% KOH Solution	Yellowish Green
7.	Powder + $FeCl_3$	Yellowish Green
8.	Powder + 1N NaOH	Yellowish Green
9.	Powder + Ammonia	Green

Flourescence Analysis

Most of the crude drugs fluorescence when their powder is exposed to UV radiation. The fluorescence characteristics of powdered drug were studied under ultraviolet radiation after treating with different chemical reagents. The drugs show characteristic behaviour with different chemical reagents.

Table 2: Fluorescence analysis of Powdered Drug of *Achyranthes aspera* Linn.,

Sr. No.	Reagents	UV (254nm) Fluorescence	UV (366nm) Fluorescence
1.	Powder as such	Light Green	Light Green
2.	Powder + 1N NaOH in H_2O	Green	Light Green
3.	Powder + 50% HCl	Light Green	Green
4.	Powder + 50% H_2SO_4	Green	Light Brown
5.	Powder + 50% HNO_3	Green	Dark Brown
6.	Powder + Pet. Ether	Green	Light Green
7.	Powder + Ammonia	Green	Green
8.	Powder + Methanol	Green	Reddish Brown
9.	Powder + Chloroform	Green	Reddish Brown
10.	Powder + Iodine solution	Dark Green	Dark Brown
11.	Powder + 5% $FeCl_3$ solution	Yellowish green	Dark Brown

Physicochemical evaluation

The loss on Drying (LOD), Ash Values likes (Total Ash, Acid insoluble ash, Water soluble ash) water soluble extractive, Alcohol soluble extractive and Swelling Index of powder are given in table.3

Table 3: Physicochemical parameters of *Achyranthes aspera* Linn., whole plant

S. No.	Parameter	Value (% w/w)
1.	Foreign matter	Nil
2.	Loss on Drying	15.33%
3.	Ash Values	
	A. Total Ash	11.6%
	B. Acid insoluble ash	2%
4.	Extractive Values	
	A. Water soluble extractive	13%
	B. Alcohol soluble extractive	9%
5.	Swelling index	5

Microscopic

Root- Transverse section of root shows suberised cork cells upto 10 layers. Cortex consists of 4-6 rows of conjunctive parenchymatous tissue. Vessels having simple and bordered pits with helical thickening are present. Tracheids are also present with tapering end walls. Pith is absent.

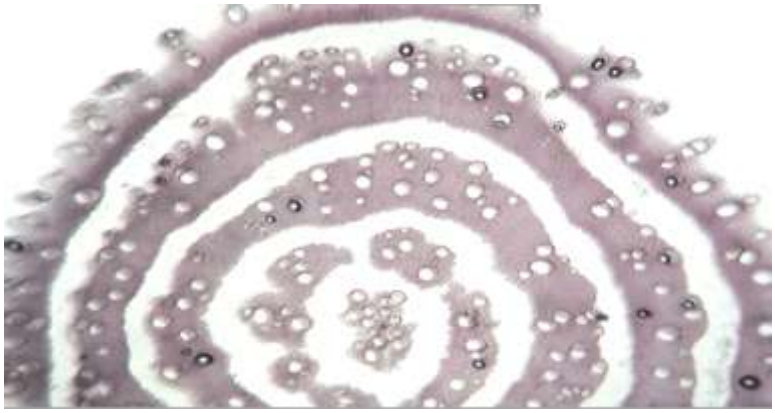

Figure 1: T. S. of *Achyranthes aspera* Linn. (Apamarga) root

Stem- TS of stem is quadrangular in shape irregularly with 8-10 prominent ridges. Beneath each ridge collenchyma is present. Rosette crystals of calcium oxalate are present in the phloem parenchyma. Isolated and radial rows of pitted xylem vessels are seen.

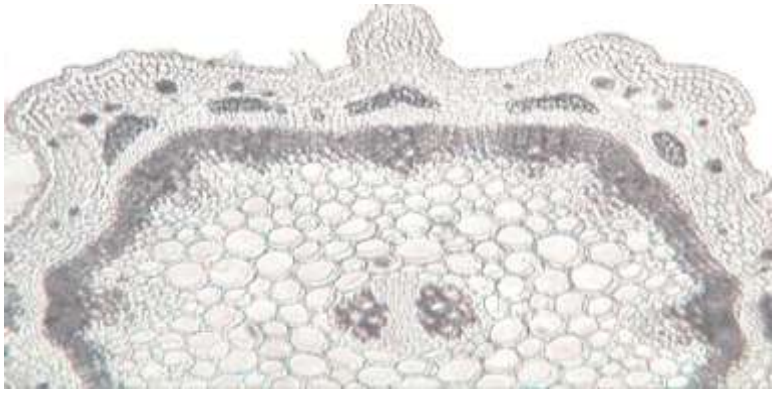

Figure 2: T. S. of *Achyranthes aspera* Linn. (Apamarga) stem

Leaf- TS through the midrib shows trichomes of covering and glandular types on upper and lower epidermis. The trichomes are more in number on lower epidermis. Anomocytic types of stomata are present in upper as well as lower epidermis. Upper epidermis is covered by cuticle. Calcium oxalate crystals in rosette form are distributed in ground tissue. Palisade layer and spongy mesophyll can be seen.

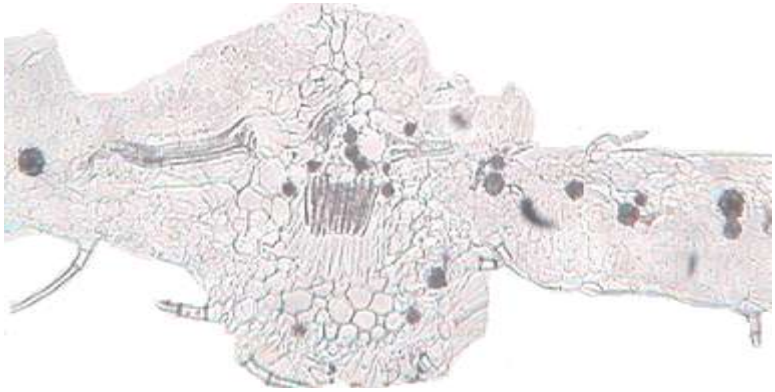

Figure 3: T. S. of *Achyranthes aspera* Linn. (Apamarga) leaf through midrib

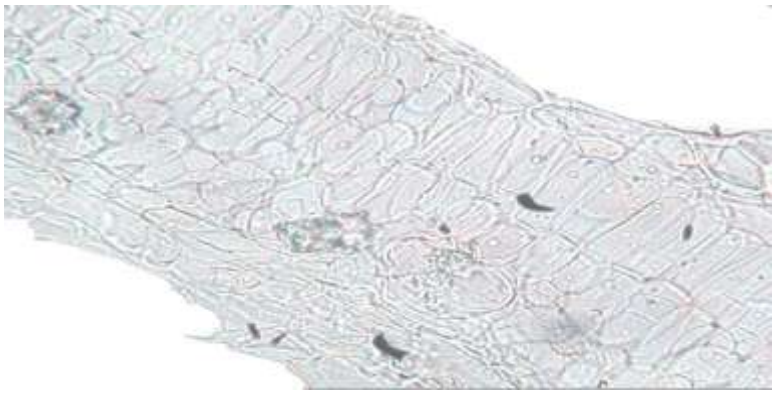

Figure 4: T. S. of *Achyranthes aspera* Linn. (Apamarga) leaf through lamina

Phytochemical screening

The preliminary phytochemical screening for whole plant powder was also carried out according to the standard procedures described in the literature. The extracts and powdered drug were subjected to tests for different phytochemicals. The extracts and powdered drugs were found to contain saponins, alkaloids, glycosides, carbohydrates, flavonoids and tannins.

Conclusion

Achyranthes aspera has numerous uses in traditional system of medicine to treat several ailments like asthma, pneumonia, liver complaints, rheumatism, scabies, menstrual disorders, gastric disorders and skin diseases. Due to its wide significance it becomes necessary to standardize it for use as a drug. No pharmacognostical work on this plant has been reported so far. The present study is undertaken to lay down these standards. The work reveals standardization profile of drug *Achyranthes aspera* which would be very useful in botanical identification and authentication of plant drug and may help in preventing its adulteration.

ACKNOWLEDGEMENT

The authors are thankful to Mr. Santosh K. Shakya, Lab Technician, NIAPR, Patiala for extending help in carrying out this work.

REFERENCES

Anonymous (1985). *The Wealth of India,* Raw Material, Revised Edition **I** (CSIR, New Delhi) 55-57.
Anonymous (1998). Macroscopic and microscopic Examination: *Quality Control Methods for Medicinal Plant Materials*, WHO, Geneva.
Anonymous (1999). *Indian Herbal Pharmacopoeia*, IDMA, **II** (Mumbai and RRL, Jammu Tawi) 1-8.
Anonymous (1999). *The Ayurvedic Pharmacopoeia of India*, Part-1, **II** (Govt. of India, Ministry of Health and Family Welfare, Dept. of AYUSH, New Delhi) 7-9.
Anonymous (2000). *The Wealth of India*, First Supplement Series **I** (NISCAIR, New Delhi) 17-18.
Anonymous (2004). *Indian Medicinal plants* **I** (Indian Council of Medicinal Research, New Delhi) 140-164.
Charde R, Shukla A, Bukhariya V, Mehta J and Bajaj J (2011). *Achyranthes aspera* Linn. (Chirchira): A Magic Herb in Folk Medicine. *International Journal of Biomedicinal and Advance Research* **2**(06) 228-240.
Khandelwal KR (2006). *Practical Pharmacognosy* (Nirali Prakashan) 09-19.
Kirtikar KR and Basu BD (1975). *Indian Medicinal Plants* **III** (Allahabad) 2065-2068.
Kokate CK (1994). *Practical Pharmacognosy*, (Vallabh Prakashan) 04-29.
Nadkarni KM (1976). *Indian Materia Medica* **I** (Popular Prakashan Pvt. Ltd.) 21-22.
Sharma PC, Yelne MB and Dennis TJ (2000). *Database on Medicinal Plants used in Ayurveda* **I** (Central Council for research in Ayurveda and Siddha) 11-21.
WHO (1992). *Quality Control Methods for Medicinal Plant Materials Geneva*: (Organization Medicinale De la Sante, Geneva) **9** 22-34.