

Ethnomedicinal Potential of *Achyranthes Aspera* Linn. (Amaranthaceae)



Botany

KEYWORDS: *Achyranthes aspera* Linn. (Chirchira), ethno-medicine, pharmacological and clinical activities, Ayurvedic system.

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ABSTRACT

Achyranthes aspera Linn. (Chirchira) is possibly the most valuable ethnomedicinal/traditional medicinal plant in all parts of India. Each plant part of Chirchira herb has a number of medicinal properties and is thus widely exploited by tribal, herbal healers and rural people for their health care. Chirchira has also important position in Ayurvedic system of therapy. Several experimental studies have demonstrated the multiple pharmacological and clinical properties of this herb and it is now considered as an important source of distinctive natural products for development of medicines against various diseases. This article gives a bird's eye view mainly on the ethno-medicinal/traditional medicinal values of Chirchira along with their safely evaluation.

Introduction

Utilization of plants for medicinal purposes in India has been documented long back in ancient literature because they are essential to human survival. The consumption, management and valuation of wild plants are central aspects of the traditional knowledge in many human populations. Thus, plants gathering, the diffusion and conservation of knowledge within the community are traditional practices that have contribution to the subsistence of many cultures. In most of the societies, the medical system coexists with several traditional systems. These traditional medical systems are generally based on the uses of natural and local products, which are commonly related to the people's perspective on the world and life ¹.

In India, there are about 54 million indigenous people of different ethnic groups inhabiting various terrains. These indigenous groups possess their own distinct culture, religious rites, food habit and have a rich knowledge of traditional medicine ^{2,6}. Knowledge of herbs has been handed down from generation to generation for thousands of years ⁷. Herbal drugs constitute a major part in all traditional systems of medicines. Herbal medicine is a triumph of popular therapeutic diversity. Plants, above all other agents, have been used for medicine from time immemorial because they have fitted the immediate personal need are easily accessible and inexpensive ⁸. 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. An upward trend has been observed in the research on herbals. 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 ⁹. According to the WHO more than 80 % of the world's population relies on traditional herbal medicine for their primary health care ¹⁰. Plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plants ¹¹. In recent time, there has been a marked shift towards herbal cures because of the pronounced cumulative and irreversible reactions of modern drugs. However, due to over population, urbanization and continuous exploitation of these herbal reserves, the natural resources along with their related traditional knowledge are depleting day by day ¹².

Achyranthes aspera Linn. is well known herbaceous plant in India as well as other countries since long as one of the most versatile medicinal plant having a wide spectrum of biological activities. *Achyranthes aspera* Linn. belongs to the family Amaranthaceae. It is an annual stiff erect herb, about 0.3 to 0.9 m high and found as a weed on wayside and waste places throughout India. It is known as apamarg in Sanskrit literally means kept away from the 'dosas'. It is also known as Aghedo and Aghedi in Gujarati, Chirchira and Chirchitta in Hindi and Prickly chaff flower in English and so on in other languages. This plant

has been mentioned in manuscripts of Ayurveda and Chinese medicines. In ayurveda, two varieties, red and white are mentioned. It is described in 'Nighantas' as purgative, pungent, digestive, a remedy for inflammation of the internal organs, piles, itch, abdominal enlargement and cervical gland. The diuretic properties of the plant are well known to the natives of India and European physician. Different parts of plant are used as ingredients in many native prescriptions in combinations with more active remedies ¹³.

Review methodology:

In view of the high medicinal values of this plant, an effort is made to evaluate medicinal potential of *Achyranthes aspera* Linn in this review article. The focus of this review is to provide information on the geographical distribution, taxonomic classification, botanical description, taxonomic features, pharmacognostic or microscopic features, phytochemistry and ethnomedicinal Utilization of *Achyranthes aspera*. All the provided information was extracted from the related published research papers and books as given in references.

Geographical distribution:

The plant is widespread in the world as a weed, in Baluchistan, Ceylon, Tropical Asia, Africa, Australia and America. In India, it is easily found anywhere on roadsides or on the edges of field and waste places as a weed throughout up to an altitude of 2100 m and in South Andaman Islands.

Taxonomic classification:

Kingdom	: Plantae
Subkingdom	: Tracheobionta
Super Division	: Spermatophyta
Division	: Mangoliophyta
Class	: Mangoliopsida
Subclass	: Caryophyllidae
Order	: Caryophyllales
Family	: Amaranthaceae
Genus	: <i>Achyranthes</i>
Species	: <i>aspera</i>

Botanical description:

Synonyms:	
Latin	- <i>Achyranthes aspera</i>
Sanskrit	- Aghata
Hindi	- Latjira, Chirchira

Gujarati	- Safad Aghedo
Tamil	- Shiru-kadaladi
Telugu	- Uttaraene
Malayalam	- Kadaladi
Punjabi	- Kutri
Unani	- Chirchitaa
Ayurvedic kharika	- Apaamaarga, Chirchitaa, Shikhari, Shai-
Persian	- Khare-vazhun
Arabian	- Atkumah
French darme	- Achyranth a feuilles rudes, collant, gen-
Spanish rabo de raton	- Mosotillo, rabo de gato, rabo de chango,

Taxonomic features of *Achyranthes aspera* :

- Erect, 0.3-0.9 m. high; stem stiff, not much branched; branches terete or absolutely quadrangular, striate, pubescent.
- Leaves few, usually thick, elliptic or obovate, sometimes nearly orbicular, usually rounded (rarely subacute) at the apex, finely and softly pubescent on both sides, entire; petioles 06-20mm. long.
- Flowers greenish white, numerous, stiffly deflexed against the woolly-pubescent rachis, in elongate terminal spikes which are at first short soon lengthen, reaching as much as 50 cm. long in fruit; bracts 3 mm. long, broadly ovate, acuminate, membranous, aristate, persistent; bracteoles 3 mm. 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.
- Fruit an indehiscent dry utricle enclosed within persistent, perianth and bracteoles,
- Seed subcylindric, truncate at the apex, rounded.

Pharmacognostic or Microscopic features:

Root – Mature root shows 3-8 layered, rectangular, tangentially elongated, thin-walled cork cells; secondary cortex consisting of 6-9 layers, oval to rectangular, thin-walled, parenchymatous cells having a few scattered single or groups of stone cells; followed by 4-6 discontinuous rings of anomalous secondary

thickening composed of vascular tissues; small patches of sieve tubes distinct in phloem parenchyma, demarcating the xylem rings; xylem composed of usual elements; vessels simple pitted; medullary rays 1-3 cells wide; small prismatic crystals of calcium oxalate present in cortical region and numerous in medullary rays.

Stem – Young stem shows 6-10 prominent ridges, which diminish downwards upto the base where it becomes almost cylindrical; epidermis single layered, covered by thick cuticle having uniseriate, 2-5 celled, covering trichomes and glandular with globular head, 3-4 celled stalk; cortex 6-10 layered, composed of parenchymatous cells, most of them containing rosette crystals of calcium oxalate; in the ridges cortex collenchymatous; vascular bundles lie facing each ridge capped by pericyclic fibres; transverse section of mature stem shows lignified, thin-walled cork cells; pericycle a discontinuous ring of lignified fibres; vascular tissues show anomalous secondary growth having 4-6 incomplete rings of xylem and phloem; secondary phloem consisting of usual elements form incomplete rings; cambial strip present between secondary xylem and phloem; secondary xylem consisting of usual elements, fibres being absent; vessels annular, spiral, scalariform and pitted, fibres pitted, elongated, lignified; pith wide consisting of oval to polygonal, parenchymatous cells; two medullary bundles, either separate throughout or found in some cases, present in pith; micro-sphenoidal silica crystals present in some epidermal, cortical and pith cells.

Leaf-

Petiole - Shows crescent-shaped outline, having single-layered epidermis with thick cuticle; ground tissues consisting of thin-walled, parenchymatous cells containing rosette crystals of calcium oxalate; 4-5 vascular bundle situated in mid region.

Midrib - Shows a single layered epidermis, on both surfaces; epidermis followed by 4-5 layered collenchyma on upper side and 2-3 layered on lower side; ground tissue consisting of thin-walled, parenchymatous cells having a number of vascular bundles; each vascular bundle shows below the xylem vessels, thin layers of cambium, followed 8 by phloem and a pericycle represented by 2-3 layers of thick-walled, non-lignified cells; rosette crystals of calcium oxalate found scattered in ground tissues.

Lamina - Shows single layered, tangentially elongated epidermis cells covered with thick cuticle having covering trichomes which are similar to those of stem found on both surfaces; mesophyll differentiated into palisade and spongy parenchyma; palisade 2-4 layered of thick parenchyma larger, slightly elongated in upper, while smaller and rectangular in lower surface; spongy parenchyma 3-5 layers thick, more or less isodiametric parenchymatous cells; idioblast containing large rosette crystals of calcium oxalate distributed in palisade and spongy parenchyma cells; stomata anisocytic and anomocytic in both surface; stomatal index 4.5-9.0 on upper surface, 9.0-20.0 on lower surface; palisade ratio 7.0-11; vein islet number 7-13 per sq. mm³³.

Phytochemistry:

Tab. 1: Chemical constituents of *Achyranthes aspera* Linn.

S. No.	Constituents	References
1.	Saponins from alcoholic extract of defatted seeds	Gopalanchari and Dhar (1958)
2.	Oleanic acid from seeds	Khastgir et. al. (1950)
3.	Saponins A and B	Hariharan and Rangaswami (1970)
4.	Saponins C and D from unripe fruits	Sheshadri et al. (1981)
5.	AA, CHO, protein, Fe, Ca, phosphorous	Satyanaryana et al. (1964)
6.	Achyranthine, N-methyl pyrrolidine -3 carboxylic acid	Basu (1957)
7.	Water soluble base, betaine	Kappor and Singh (1966)
8.	Vitamin C	Hasan (1962)
9.	Ecdysterone	Banerjee and Chandha (1970)
10.	Inokosterone ecdysterone in callus and tissue culture	Hiroshi et al. (1971)
11.	Enzyme level	Purohit et al. (1980)

Ethno-medicinal Utilization:**Amenorrhoea**

Local Name: Chirchiri and Chatjeera.

Locality: Kheri district, Uttar Pradesh.

User/tribe: Traditional herbal healers and rural people.

Mode of Administration ► For treating amenorrhoea, the crushed roots (50 gr.) is boiled in 250 ml water and allowed to cool. This decoction is drunk once daily at bed time, for 07 days.

Anti-fertility agent

Local Name : Chirchira and Latjeera.

Locality : Kheri district,

Uttar Pradesh

User/tribe: Tharu tribal.

Mode of Administration ► Decoction of the root is given orally to women after menstrual period

Asthma

Local Name: Anghedo and Chircheria

Locality: Varanasi district, Uttar Pradesh and Bhavnagar district, Gujarat

User/tribe: Kol tribe and rural people

Mode of Administration ► One teaspoonful seed powder along with a little amount of black paper is given with honey twice a day for one month for the treatment of asthma. Juice of leaves is also employed in asthma.

Boils & blisters

Local Name: Chichida

Locality Nainital, Uttaranchal

User/tribe: Tharu tribe

Mode of Administration ► Paste of the leaves applied on boils and blisters.

Chest pain

Local Name: Chirchiti

Locality: Purulia district, West Bengal

User/tribe: Santals, Birhor and Kumis

Mode of Administration ► Root decoction of this plant with the *Zizyphus mauritiana* is fed to cure pain in chest.

Cold & headache

Local Name: Putkanda, Sajji and Latjeera

Locality: Jaunsar & Garwal, Uttaranchal and Bahraich, Uttar Pradesh

User/tribe: Tharu and Jaunsari tribe

Mode of Administration ► Leaf juice applied on cold headache.

Cough & bronchitis

Local Name: Putkanda, Sajji and Latjeera.

Locality: Jaunsar & Garwal, Uttaranchal and Bahraich district, Uttar Pradesh.

User/tribe: Tharu and Jausari tribe.

Mode of Administration ► Paste of the roots is given orally for the treatment of the cough and bronchitis.

Cough & cold

Local Name: Latjeera

Locality: Basti district, Uttar Pradesh

User/tribe : Tharus tribe

Mode of Administration ► The whole plant boiled in water with common salt and the decoction taken for relief from cold and cough.

Cuts & wounds

Local Name: Apamar

Locality: Dhar and Jhabua district, Madhya Pradesh

User/tribe: Bhils and Bhilalasand tribe

Mode of Administration ► Decoction of leaves applied externally for cuts and wounds.

Diabetes mellitus

Local Name: Chirchiri and Chatjeera

Locality: Kheri district, Uttar Pradesh

User/tribe Traditional herbal healers and rural people

Mode of Administration ► In diabetes mellitus, paste of the root, mixed with honey is made into pills of about 03 gram each; two pills are taken once daily with water.

Displacement of umbilicus

Local Name: Chirchiri and Chatjeera

Locality: Kheri district, Uttar Pradesh

User/tribe: Traditional herbal healers and rural people

Mode of Administration ► A root piece is tied to the right forearm of the patient twice in week i. e. on Sunday and Tuesday in the case of displacement of umbilicus (locally known as Puntanhar).

Dysentery

Local Name: Lahchichra and Chirchirda

Locality : Nainital, Uttaranchal and

Raebareli and Gorakhpur district, Uttar Pradesh

User/tribe : Tharus tribal and rural people

Mode of Administration ► About 05 gr. seed powder is given with water thrice a day to cure dysentery. Powdered root bark along with sugar is also given for dysentery. The root when tied on the waist is said to cure dysentery.

Fever

Local Name: Chichida, Lahchirida, Chirchiri and Chirchiti

Locality : Gorakhpur district, Uttar Pradesh

User/tribe: Tharu, Kol, Santhal, Paharia and Oraon tribal

Mode of Administration ► Powdered root one teaspoonful three times a day for 3-4 days is given for the treatment of fever.

Gynecological disorders

Local Name: Anghedo, Agara, Chichira and Lahchichira

Locality: Raebareli and Basti district, Uttar Pradesh and Bhavnagar district, Gujarat

User/tribe: Tharus and Rural people

Mode of Administration

- ▶ Juice of plant as vaginal douche hastens labour pains or produces abortion.
- ▶ Fresh root is put in vagina for easy delivery.
- ▶ Decoction of root is given along with milk to increase menses and to prevent conception.
- ▶ About 05 gr. root powder is given once a day to women for easy delivery.
- ▶ A necklace made of small pieces of the stem worm round the neck of women to facilitate childbirth.
- ▶ Powdered root administered in to vagina for abortion

Infant sores

Local Name : Chirchiri and Chatjeera

Locality: Kheri district, Uttar Pradesh

User/tribe Traditional herbal healers and rural people

Mode of Administration ▶ The fresh leaves are ground to make a fine paste and placed on to sores of the infant suffering from rickets.

Insect bite

Local Name: Chirchiri and Chatjeera

Locality: Kheri district, Uttar Pradesh

User/tribe: Traditional herbal healers and rural people

Mode of Administration ▶ In the case of pneumonia to relieve chest pain a lukewarm paste of the leaves is applied on chest of patient.

Jaundice

Local Name Chirchiri

Locality Varanasi district, Uttar Pradesh

User/tribe Kol

Mode of Administration ▶ The ash of the whole plant is applied on the body of the jaundice patient and the decoction of the stem bark of *Mangifera indica* and *Madhuca indica* is used for taking bath for 2-3 for the treatment of the jaundice. The garland of the plant is put around the neck for the same purpose.

Loss of appetite and laxative

Local Name: Nayuruvi

Locality: Kanyakumari district, Tamilnadu

User/tribe: Local people

Mode of Administration ▶ Decoction of the plant is used as laxative and is remedy for flatulence eating cooked seeds improves appetite.

Malaria fever

Local Name: Uwang

Locality: Jaunsar distict, Uttaranchal

User/tribe: Jaunsari

Mode of Administration ▶ Root extract is given orally in malaria fever three times a day for 2-5 days. Root paste is also applied on body twice a day for 5-7 days for the same purpose.

Pneumonia

Local Name: Chirchiri and Chatjeera

Locality : Kheri district, Uttar Pradesh

User/tribe : Traditional herbal healers and rural people

Mode of Administration

- ▶ In the case of pneumonia to relieve chest pain a lukewarm paste of the leaves is applied on chest of patient.

Pyorrhoea

Local Name: Chirchiri and Chatjeera

Locality: Kheri district, Uttar Pradesh

User/tribe : Traditional herbal healers and rural people

Mode of Administration ▶ In pyorrhoea, a fresh stem is advised to be used as tooth brush.

Rheumatism and gout

Local Name: Chirchiria and Chichida

Locality: Varanasi and Gorakhpur district, Uttar Pradesh

User/tribe: Kol and Tharu Tribe

Mode of Administration ▶ One teaspoonful root powder along with black pepper is given thrice a day for 15 days for the treatment of rheumatism and gout. Leaf paste together with mustard oil and camphor is applied locally in rheumatism and gout.

Scorpion bite

Local Name: Utharani, Anghedo and Kidiche jadu

Locality: Mahaboobnagar district, Karnataka; Bhavnagar district, Gujarat, and Uttara Kannada district, Karnataka

User/tribe: Adivasis and herbalists

Mode of Administration ▶ Paste of root is applied on scorpion sting. The root juice is externally applied 4-5 times with an interval of one hour for venomous scorpion sting too. The root paste is also used as an antidote to scorpion stings

Snake bite

Local Name: Chirchiri, Utharani, Kidiche Jadu and Chirchitta

Locality: Mahaboobnagar district, Gujarat; Nainital district, Uttaranchal; Alwar district, Rajasthan

Local people, Gowlis,

User/tribe: Tharu and herbalists

Mode of Administration

- ▶ Seed powder used (1 tsp 2 times daily) against snake bite.
- ▶ The root paste is also used as antidote to snake bite.
- ▶ Root juice is applied externally 4-5 times with an interval of one hour for venomous snake bite.
- ▶ The root extract is given orally as an antidote to snake bites.

Spermatorrhoea

Local Name: Chirchira

Locality: Nainital district, Uttaranchal

User/tribe: Tharu tribal

Mode of Administration ▶ The root paste mixed with black pepper is given orally for three days for treatment of spermatorrhoea.

Stomatitis (In case of children)

Local Name: Chirchiri and Chatjeera

Locality: Kheri district,

Uttar Pradesh

User/tribe: Traditional herbal healers and rural people

Mode of Administration ► In the treatment of stomatitis, in the case of children, a long tender twig of the stem is chewed and also tied to the both forearms of suffering children

Strained back

Local Name Chirchiri and Chatjeera

Locality Kheri district, Uttar Pradesh

User/tribe Traditional herbal healers and rural people

Mode of Administration ► To treat strained back (Locally know as chik), the crushed leaves are rubbed on aching back with a light massage.

Conclusion

The information on ethnomedicinal/traditional medicinal utilization of *Achyranthes aspera* collected from different authentic literatures is presented in this review paper. The information collected in this review paper revealed that *Achyranthes aspera* Linn. is known by different local/vernacular names such as Agara, Anghedo, Apamar, Chatjeera, Chichida, Chichira, Chircheria, Chirchira, Chirchirda, Chirchiri, Chirchiria, Chirchiti, Chirchitta, Kidichejadu, Lahchichira, Lahchichra, Lahchirida, Latjeera, Nayuruvi, Putkanda, Sajji, Utharani and Uwang in different district of India.

In India *Achyranthes aspera* Linn. was used by herbal healers, rural farmers and tribal like Adivasis, Bhilalas, Birhor, Gowlis, Jausari, Kumis, Oraon, Paharia, Santals, Santhal, Tharu and Tharus of different state of India to treat the several of diseases and ailments of human. These diseases and ailments were amenorrhoea, anti-fertility agent, asthma, boils & blisters, chest pain, cold & headache, cough & bronchitis, cough & cold, cuts & wounds, diabetes mellitus, displacement of umbilicus, dysentery, fever, gynecological disorders, infant sores, insect bite, jaundice, loss of appetite and laxative, malaria fever, pneumonia, pyorrhoea, rheumatism and gout, scorpion bite, snake bite, spermatorrhoea, stomatitis (in case of children) and strained back.

Different parts of *Achyranthes aspera* were used as medicine by the herbal healers, rural farmers and tribal of different states of India for the treatment of different diseases and ailments of human. Among the different plant parts, the root were found to be, most frequently used part for the treatment of various ailments followed by other parts like leaf, seed, and stem and whole plants. The methods of using these plant parts vary according to the nature of diseases. The methods of preparation fall into categories viz. decoction, extract, juice, paste, powder, complete plants etc. In some cases, various plant parts also used in dried and fresh form directly. Most common method of preparation was decoction and paste of different plant parts followed other forms of utilization.

The use of medicinal plants in the management of various illnesses is due to their phytochemical constituents and dates back antiquity³².

It is seen from the literature that *Achyranthes aspera* is a very important plant for its large number of medicinal properties as well as medicinally important chemicals like Saponins from alcoholic extract of defatted seeds, Oleanic acid from seeds, Saponins A and B, Saponins C and D from unripe fruits, AA, CHO, protein, Fe, Ca, phosphorous, Achyranthine, N-methyl pyrrolidine-3 carboxylic acid, Water soluble base, betaine, Vitamin C, Ecdysterone, Inokosterone ecdysterone in callus and tissue culture. The plant shows many pharmacological activities like spermicidal, anti-allergic, cardiovascular, nephroprotective, antiparasitic, hypoglycaemic, analgesic and antipyretic. Thus, *Achyranthes aspera* is quite promising as a multipurpose medicinal agent so further clinical trials should be performed to prove its efficacy.

The prevalence of a variety of climatic conditions puts India in a supreme position with respect to richness of medicinal flora. As such, India should occupy a significant position in the world trade of botanical drugs. India should focus on Agro-technology, process technology, standardization, quality control, research and development of herbal drugs. Now, the time has come to compile and document available knowledge on our valuable plant resources and to prove their utility scientifically through detailed phytochemical, biological and pharmacological investigations at selected centre in different regions of the country. India should adopt organized cultivation of medicinal plants that have export potential and import substitutions. Efforts should be made to cultivate potential medicinal plants as field crops. Their conservation should be done in appropriate ecological conditions. In order to push India as a significant player in the global herbal product market, herbal products should be standardized as per WHO guidelines.

Pictures of *Achyranthes aspera*



(A) Habit of *Achyranthes aspera*



(B) Close up view of single plant of *Achyranthes aspera*





(C) Close up view of inflorescence of *Achyranthes aspera* with leaf



(E) Close up view of inflorescence of *Achyranthes aspera*



(D) Close up view of leafing of *Achyranthes aspera*

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