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Review of Pharmacognosticevalution and standardization of the plant achyranthus aspera: Phytochemical profile and antioxidant and Antimicrobial qualities

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Abstract:

This study provides an extensive pharmacognostic evaluation and standardization of Achyranthus aspera, a traditional medicinal plant. The plant extracts were evaluated for their phytochemical composition of antioxidant activity and antibacterial activities. Phytochemical study listed biologically active compounds including alkaloid, flavonoid, saponin, and tannins ect. The extracts have an excellent anti-oxidant and anti-bacterial activity against a variety of illnesses. The plant extract was standardized using a physicochemical and analytical examination. The findings show that Achyranthus aspera has potential therapeutic uses, necessitating more research into its usage as a botanical medications in the prevention and treatment of illnesses.

Keywords: plant achyranthus aspera, Phytochemical, antioxidant, Antimicrobial

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Introduction

Knowledge of herbs has been handed down from generation to generation for thousands of years Herbal drugs constitute a major part in all traditional systems of medicines. In the recent past there has mostly plant based health products is used in developing as well as developed countries.[1]Medicinal plants have played a vital role in healthcare across human communities for centuries. A significant portion of ethno-medicinal products consists of plant extracts, and approximately half of the medicinal products used in clinical settings are derived from natural substances or their derivatives. [2] 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. [3]Medicinal plants are gaining much interest recently due to their special attributes as a large source of therapeutic phytochemicals that may lead to the development of novel drugs. [4]

Chirchira has occupied a pivotal position in Indian culture and folk medicine. It has been used in all most all the traditional system of medicine viz., ayurveda, unani and sidha. Chirchira, botanically known as Achyranthes aspera Linn.[5]*Achyranthus aspera* Linn. [Amaranthaceae] is grown in India, in tropical and sub tropicalparts.[6] Achyranthes aspera L., locally known as "Telenge or ambulale"[7] Apamarg (in Hindi) and Rough Chaff flower in English.[8]belonging to the family Amaranthaceae.[9] It is an erect annual herb that grows up to 0.3–1 m in height with stiff branches and thick and elliptic leaves. The plant bears greenish white flowers.[10] [11] They have also been used as folk remedies for reducing internal heat due to increased metabolism in the disease state as well as antipyretic, snake bite, and wound healing. [12] Different parts of this plant's seeds, roots, leaves, and stems are used separately for different diseases as antimicrobial, anti-cancerous, and anti-ulcer agents.[11]

S.No.	Language	Name	Reference
1.	Hindi	Apamarg, s Chirchita ,Latjira	[8]
2.	English	Rough Chaff flower, Red chaff tree Prickly Chaff flower	[8]
3.	Sanskrit	Apamarg, Aghata	[32]
4.	Gujarati	Aghedi, SafadAghedo	[32]
5.	Bengali	Apang	[32]
6.	Tamil	Nayurivi, Shiru-kadaladi	[32]
7.	Malyalam	Kalalat, Kadalad	[32]
8.	Marathi	Agadha	[32]
9.	Latin	Achyranthesaspera	[33]
10.	Telugu	Uttaraene	[33]
11.	Ayurvedic	Apaamaarga, Chirchitaa, Shikhari, Shaikharika	[33]
12.	Spanish	Rabo de gato, Mosotillo, Rabo de raton ,Rabo de chango,	[33]
13.	French	Collant, Achyranth a feuillesrudes, Gendarme	[34]
14.	Unani	Chirchitaa	[34]
15.	Persian	Khare-vazhun Arabian - Atkumah	[17]
16.	Punjabi	Kutri	[17]
17.	Nepali	Dattivan	[35]

Synonym:

Tonomical Classification:

1.	Kingdom	:Plantae	36
2.	Subkingdom	Tracheobinota	36
3.	Super Division	Spermatophyta	32
4.	Division	Mangoliophyta	32
5.	Class	Mangoliophsida	32
6.	Subclass	Caryophyllidae	32
7.	Order	Caryophyllales	32
8.	Family	Amaranthaceae	32
9.	Genus	Achyranthes	32
10.	Species	Aspera	32

Botanical Description-

S. No.	Parts	Description	Ref.
1	**Foliage (Leaf)**	Green, papery leaves (1.5-7 cm long, 0.4-4 cm wide) are broadly obovate (egg-shaped) or elliptic-oblong (oval-elongated). They are hairy on both sides.	**3, 37**
2	**Seeds**	These are round at the base, sub-cylindric, truncate at the apex, endospermic, brown coloured.	**38**
3	**Height**	Typically, it attains a height ranging from 0.2 to 2.0 m, o□en supported by a woody base. Typically, it attains a height ranging from 0.2 to 2.0 m, o□en supported by a woody base. 0.2-2.0 m high. The base is woody, angular or ribbed, simple or branched, nodes are bulged, often tinged with pink color.	**39**
4	**Root**	Cylindrical root, 0.1-1.0 cm in thickness, slightly ribbed, gradually tapering, yellowish-brown in color, secondary and tertiary roots present	**34**
5	**Stem**	Square, yellowish-brown, branched, hairy, erect, cylindrical, solid, and hollow when dry.	**30**
6	**Flower**	Arranged in long spikes form in inflorescences, 8- 30 cm long, 3-7 mm wide, bisexual greenish-white, numerous, sessile, bracteate with two bracteoles, one spine lipped, actinomorphic, hypogynous, 5 perianth segments, membranous, 5 stamens, short filament, anther, two celled, 7 gynoecium bicarpellary, syncarpous, ovary superior, single ovule; style, single stigma, white or red flower. Flowers appear during summer.	**40**
7	**Fruit**	An indehiscent dry utricle enclosed within bracteoles, persistent, and perianth.	**31**

Parts of the Plant -

[A] Leaves

[B]Achyranthesaspera

[C]Stem

[D] Seeds

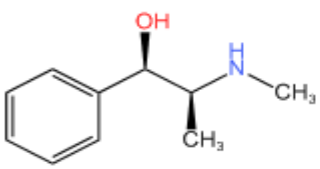
[E] Flower

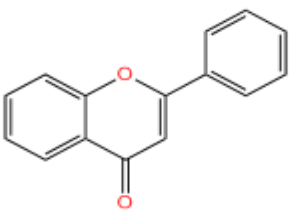
[F] Root

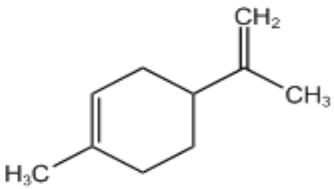
Geographical distribution:

Achyranthes aspera Linn. (family Amaranthaceae), a genus of herbs or small shrubs, is distributed throughout the tropical and subtropical regions. It is an erect, annual herb, commonly found in India, Baluchistan, Ceylon, Tropical Asia, Africa, Australia and America.[13] 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.[14] Frequently found in tropical and warmer regions as weed.[15]Different parts of the plant are used in treating wounds and ringworm in East Africa leaf extracts of *A. aspera* collected from two different geographical locations (Ciaat, Eritrea and Ukulinga, South Africa) were evaluated for antibacterial, antifungal, anthelmintic activities. the plant characterized for functional phenolic acids as well as protein binding capacity.[16]

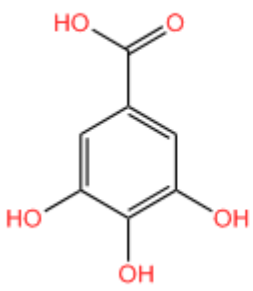
Phytochemicals:-



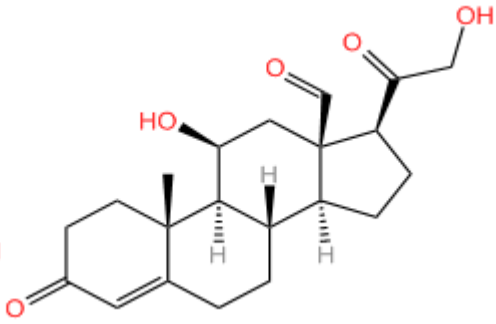




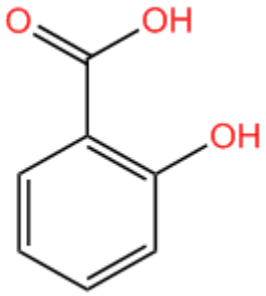
Alkaloid flavonoids terpenoids



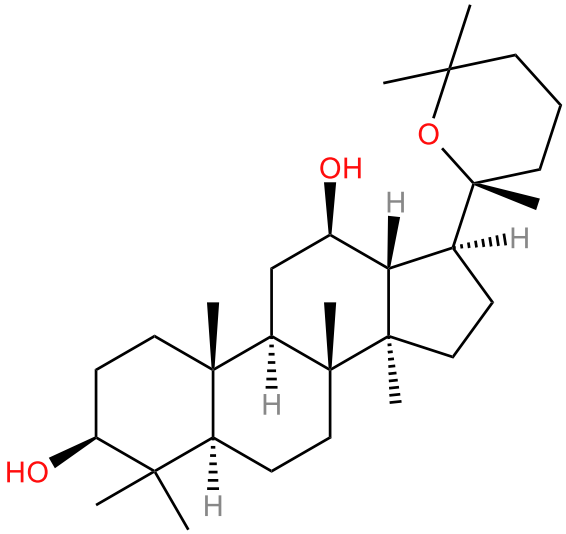
Tannins



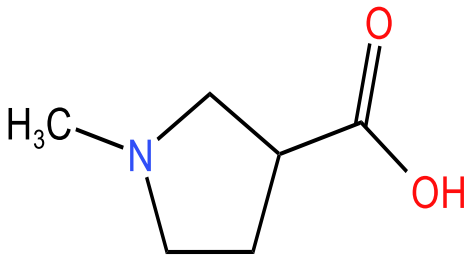
steroid



salicylic acid



Saponin



Salicilic acid

S.No.	Phytoconstituent	chemical	activity	Ref.
1.	Tannins	Gallotannins, Ellagitannins, Complex Tannins,	Antitumor, Antimicrobial, antiviral activity wound-healing effects astringent	[41] [42]
2.	Phenols	Caffeic acid, ferulic acid, quinic acid and salicylic acid	Antioxidants Anti-inflammatry, Anti-allergic,	[34]
3.	Saponins	Saponins, Achyranthineandoleanolic	antimicrobial, anti-inflammatory, and immune-modulatory activities	[43]
4.	Alkaloids	betaine, ecdysterone, ecdysone, and achyranthine.	Anti-inflammatry, analgesic / antimicrobial, antimalarial, anti-hyperglycemic, and anti-cancerous agents	[44]
5.	Terpenes	monoterpenoids, iridoids, sesquiterpene diterpenoids, triterpenoid cardenolides and phytosterols,	anti-inflammatory and antioxidant properties	[45]

		carotenoids.		
6.	Steroids	Ketosteroid	Regulate immune responses	[46]
7.	Flavonoids	Quercetin, Rutin, Kaempferol, And Apigenin.	Antioxidants Anti-inflammatry, antimicrobial,	[34]

models in albino male rats.[13]Anti-inflammatory activity of A. aspera could be attributed to presence of alkaloids saponins and oleanolic acid which previously has been shown to possess anti-inflammatory properties. [21] Antiinflammatory activity of tannins extracted from seedling leaf tissue and callus culture extracts of Achyranthes aspera L. were determined using Carrageenan induced paw edemamodel.[22]

Wound healing activity: Wound healing potential of tannins extracts of Achyranthes aspera were evaluated using four models in rabbits i.e. excision, incision, dead space and burnwound.[22] The wound healing activity was studied using two wound models, excision wound model and incision wound model. Phytochemical screening revealed the presence of tannins in to the plant that contributes in wound healing effect.[23]

Antioxidant activity- Aqueous and ethanol extracts of the leaves showed free radical scavenging activity in a dose-dependent manner. The antioxidant enzymes (superoxide dismutase and catalase) are known to quench radicals and, thus, prevent the damage of cells caused by free radicals. The results indicate that the plant may possess potent antioxidant activity by inhibiting lipid peroxidation and increase SOD and catalaseactivity.[24]Flavonoids are well known for their antioxidant potential.[25]

Antidiabetic Activity- The ethanolic extract of the leaves of A. aspera validates its use as a hypoglycemic drug. It can be used safely for the treatment of diabetes type two. [26]An alcoholic extract of the whole plant has also been reported to produce hypoglycaemia in albino rats. [27]Glibenclamide is a sulfonylurea derivative and commonly used in themanagement of diabetes mellitus type II; it causes hypoglycemia by stimulating beta cells of pancreas and increasing release of insulin and inhibiting glucagon secretion.[26]

Immunomodulatory Activity- Immunostimulatory properties of Achyranthes aspera on mice have been reported. [28] The immunostimulant activates the immune system in a non-specific way and thus provides resistance against a variety of pathogens.[29]seeds and leaves of *A.aspera* enhanced the growth of rohu, induced the immune system and prevented tissue from oxidative damage.[30]Achyranthes aspera extracts increased phagocytosis, which helps in clearing pathogens. And alsoit increased levels of IgG and IgM antibodies.[31]

Mechanism of action

Activity	**chemical**	**MOA**	**Ref.**
Anti-inflammatory	presence of flavonoids, alkaloids, and saponins	(1)due to the inhibition of release of serotonin and histamine from mast cells (2)inhibition of the cyclooxygenase pathway	21
antimicrobial activity		(1)By interference in synthesis of cell wall of bacteria and fungi (2) by interference in cytoplamsmic membrane (3) protein synthesis process	47
Antioxidant Activity	vitamins E and C	(1) By scavenge free radical formation	48
antidiabetic activity	alkaloids, saponin and tannin	(1)by stimulating beta cells of pancreas (2)increasingrelease of insulin (3)inhibiting glucagon secretion	26
Immune-modulatory	Saponins, Achyranthineandoleanolic	(1) by increasing phagocytosis (2) increased levels of IgG and IgM antibodies.	31

Conclusion

The present study's findings indicate that Achyranthesaspera L. extract has strong antibacterial and antioxidant qualities. Its therapeutic qualities are greatly enhanced by the presence of several kinds of phytocompounds, such as phenols, flavonoids, saponins, alkaloids, etc. There are several types of phytochemicals found in different portions of the medicinal plant Achyranthes aspera L. This herb has long been used to cure a wide range of illnesses, which date from to the Vedic period.Its investigation to identify the active ingredients which provide plants their biological activity, describe those ingredients, and clarify the precise mode of action through which they produce their antibacterial, anti-inflammatory, and other properties.

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