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AN IN DEPTH REVIEW OF ACHYRANTHES ASPERA LINN. WITH SPECIAL REFERENCE TO NIGHANTU

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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. *Achyranthes aspera* has been used as traditional medicine from ancient times. It grows in abundance and has flowers at the top, deflexed with spinous bracteoles and pointed perianth which make it difficult to handle. The whole plant is used for making various medicines. Various parts of the plant contain important chemicals like- roots contain Ecdysone, ecdysterone, inokosterone, oleanolic acid and glycoside, seeds contain sapnins A & B, fruits contain Saponin C & D, Oleanolic acid and various important alkaloids like Achyranthine and Betaine. It has various proven medicinal effects like Diuretic, Spasmolytic, Hypoglycaemic, Anti-microbial, Vasodilator activity and so on. Its main properties are presence of Tikta and Katu rasa, Laghu, Ruksha and Tikshna guna, Katu vipak and Ushna virya. It has kapha-vata shamak, Dipana, Pachana, Rochana, Krimighna, Lekhana, Sothhara, Vedana sthapan, Mutrala and various other properties. It has been mentioned in various Samhitas and Nighantus like- Charak Samhita, Susruta Samhita, Bhavaprakash, Madanpal Nighantu, Saligram Nighantu etc for its various medicinal uses.

KEYWORDS: Anti-microbial, Hypoglycaemic, Samhitas, Nighantus.

INTRODUCTION

Medicinal plants play a very important role in the health care of human beings. The plant kingdom has played a key role in the world wide maintenance of health. World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species.[1] According to the WHO more than 80% of the world's population relies on traditional herbal medicine for their primary health care.[2] In the present era of drug development and discovery of newer drug molecules many plant products are evaluated on the basis of their traditional uses. The secondary metabolites of the plants are the major sources of pharmaceutical, food additives and fragrances.[3] the curative properties of medicinal plants are mainly due to the presence of various complex chemical substances of different compositions which occur as secondary metabolites.[4] The most important of these bioactive constituents are alkaloids, tannins, flavonoids and phenolic compounds which are responsible for protecting the plants for microorganisms, insects and other natural pests. Achyranthes aspera Linn. belongs to the family Amaranthaceae. It is annual, stiff erect herb and found commonly as a weed throughout India which has various important medicinal uses. The plant possesses activities like- purgative, laxative, Anti-microbial, Hepato-protective, Anti-allergic and so on.

Taxonomic classification[6]

Class: - Dicotyledons

Subclass: - Monochlamydeae

Series: - Curvembryeae

Classical names

Apamarga, Aghātā, Śikhari, Pratyakpuspā, Adhahšalya. Kharamanjari, Durgraha, Markatī, Kṣāramadhya, Kşavaka, Mārga, Mayüraka.

Vernacular name[7]

- Sanskrit: - Mayura, Mayuraka, Pratyakpuspa, Kharamanjar, Sikhari
- Bengali: - Apamg
- English: - Prickly Chaff Flower
- Gujrati: - Aghedo
- Hindi: - Chirchita, Latjira
- Kannada: - Uttarani

- Malayalam: - Katalati
- Marathi: - Aghada
- Punjabi: - Puthakanda
- Tamil: - Nayuruvi
- Telugu: - Uttarenu
- Urdu: - Chirchita

Namrupa vijnana[8]

१. अपामार्गः (भा०)-अपाकृत्य दोषान् शरीरं मार्जयति शोध यतीति, यथोक्तं शौनकीयाथर्ववेदे-'अपामार्ग त्वयावयं सर्व तदपमृज्महे' इति (शौ० ४/१७/७).

२. अधःशल्यः (भा०)-कण्टकिपुष्पाणामधोमुखत्वात् ।

३. आघाट: (कै०)-आ समन्ताद् घाट: संघातो ऽस्य, 'घट संघाते'।

४. क्षवकः (रा०)-क्षवथुकरः, अपामार्गतण्डुलानां शिरोविरेचकत्वात् ।

५. क्षारमध्यः (कै.)-क्षारो मध्ये गात्रेऽस्य, ओषधेः क्षारप्रधानत्वात् ।

६.खरमञ्जरी (भा०)-कण्टकित्वात् खरस्पर्शा पुष्पमञ्जरी ।

७. दुर्ग्रहा (भा०)-कण्टकित्वाद् ग्रहीतुं कष्टा ।

८. प्रत्यक्पुष्पा (च०)-प्रत्यचि अधोमुखानि पुष्पाण्यस्य ।

९. मयूरक: (भा०)-मयूर इव विषघ्नः; अथवा मीनाति हिनस्ति रोगान्, 'मी हिंसायाम्।

१०.मार्गः (कै०)-मजियति मार्गान् स्रोतांसीति ।

११.शिखरी (भा०) शिखरे पुष्पमञ्जरीत्वात् ।

Apāmārga (Achyranthes aspera Linn.) grows in abundance (āghātā) and has flowers at the top (śikhari), deflexed (pratyakpuspā) with spinous bracteoles and pointed perianth (adhahšalya. kharamanjari) which make it difficult to handle (durgraha). Leaves have close appressed hairs beneath (markatī). The plant is pedominantly alkaline (kṣāramadhya). It induces sneezing (kşavaka), cleanses channels (mārga, apāmārga) particularly head and eliminates poison and other disorders (mayüraka).

Literature review

Table no. 1:- Categorization of apamarga in samhitas.

Drug	Varga/Gana in Charak Samhita	Varga/Gana in Sushruta Samhita
Apamarga	Irovirechan mahakasaya Imighna mahakasaya Manapaga mahakasaya	Rkadi varga

Table no. 2:- Categorization of apamarga in nighantus.

Sr. no.	Text	Varga / gana
1	Bhavaprakash nighantu	Uduchyadi varga
2	Madanpal nighantu	Bhayadi varga
3	Kaidev nighantu	Usadhi varga
4	Saligram nighantu	Uduchyadi varga
5	Raj nighantu	Atahvadi varga
6	Priya nighantu	Atapushpadi varga
7	Dhavantari nighantu	Uduchyadi varga
8	Nighantu adarsha	Pamargadi varga

Table no. 3:- Showing synonyms as per different nighantus.

Sr. No.	Synonyms	DN	RN	MPN	BPN	KN	SN	PN	NA
1	Sikhari	+	+	+	+	+	-	-	+
2	Kinihi	+	+	+	+	+	+	-	+
3	Kharamanjari	+	+	+	+	+	+	-	+
4	Adhasalya	+	+	+	+	+	-	+	+
5	Saikharika	+	+	+	-	+	+	-	-
6	Pratyekpuspi	+	+	+	-	+	-	-	+
7	Mayuraka	+	+	+	+	+	+	-	+
8	Kharamadhya	-	-	-	-	+	-	-	-
9	Durgraha	+	+	-	+	+	-	-	-
10	Durbhigraha	+	+	-	-	+	-	-	-
11	Aghatha	-	-	-	-	+	-	-	-
12	Marga	-	-	-	-	+	-	-	-
13	Apamarga	+	+	-	+	-	+	+	+
14	Kandakantha	-	+	-	-	-	-	-	-
15	Markathi	+	+	-	+	-	-	-	-
16	Vasira	+	+	-	-	-	-	-	-
17	Kanthi	+	+	-	-	-	-	-	-
18	Parakpuspi	+	+	-	-	-	-	-	-
19	Markatapippali	+	+	-	-	-	-	-	-
20	Katu	-	+	-	-	-	-	-	-
21	Nandi	-	+	-	-	-	-	-	-
22	Panktikantaka	-	+	-	-	-	-	-	-
23	Kubja	-	+	-	-	-	-	-	-
24	Manjarika	-	+	-	-	-	-	-	-
25	Ksayaka	-	+	-	-	-	-	-	-
26	Malakantaka	-	+	-	-	-	-	-	-

27	Dhamargab	-	+	-	-	-	-	-	-
28	Pratyekparni	-	-	-	-	-	+	-	-
29	Keshaparni	-	-	-	-	-	+	-	-
30	Pratyekpuspa	-	-	-	-	-	-	+	-

"+" denotes same name was mentioned in various Nighantu. "-" denotes this name was not mentioned.

(DN- Dhanvantari Nighantu, MPN- Madanpal Nighantu, RN- Raj Nighantu, KN- Kaiyadev Nighantu, BPN-Bhav Prakash Nighantu, SN- Saligram Nighantu, NA- Nighantu Adarsh, PN- Priyo Nighantu).

Summarising the Synonyms mentioned by the various Nighantukaras it can be concluded that Dhanvantari nighantu 15, Raj nighantu 24 synonyms, Madanpal nighantu 7, Bhavprakash 8, Kaidev nighantu 12, Shaligram nighantu 7, Priya nighantu 3, Nighantu adarsha 7 synonyms are mentioned. Most number of Synonyms was mentioned by **"Raj nighantu".**

Table no. 4: Showing Rasa, Guna, Virya and Vipaka of Apamarga according to various nighantus.

Rasapanchak		**Text**							
		Dn	**Rn**	**Mpn**	**Bpn**	**Kn**	**Sn**	**Pn**	**Na**
Rasa	Madhur	-	-	-	-	-	-	-	-
	Amla	-	-	-	-	-	-	-	-
	Lavan	-	-	-	-	-	-	-	-
	Katu	+	+	-	+	+	+		+
	Tikta	+	+	-	+	+	+	+	+
	Kasaya	-	-	-	-	-	-	-	-
Guna	Ushna	+	+	+	-	-	-	-	-
	Sara	-	-	+	-	-	-	+	-
	Tikshna	-	-	+	+	+	+	+	-
Vipak	Katu	-	-	-	-	-	-	-	+
Virya	Ushna	-	-	-	-	+	-	-	+

"+" *" denotes same Rasa, Guna, Virya & Vipak was mentioned in various Nighantu. "-" denotes this Rasa, Guna, Virya & Vipak was not mentioned.*

(DN- Dhanvantari Nighantu, MPN- Madanpal Nighantu, RN- Raj Nighantu, KN- Kaiyadev Nighantu, BPN-Bhav Prakash Nighantu, SN- Saligram Nighantu, PN- Priyo Nighantu, NA- Nighantu Adarsha.)

Summarising the Rasapanchak mentioned by the various Nighantukaras it can be concluded that Apamarga has Katu, Tikta rasa, Sara, Tikshna, Ushna gunas, Ushna virya and Katu Vipaka.

Botanical description

Apamarga consists of dried whole plant of *Achyranthes aspera* Linn. (Fam. Amaranthaceae); a stiff, erect, 0.3-0.9 m high herb, found commonly as a weed throughout India up to 900 m.[7]

Root – Cylindrical tap root, slightly ribbed, 0.1-1.0 cm in thickness, gradually tapering, rough due to presence of some root scars, secondary and tertiary roots present, yellowish-brown; odour, not distinct.

Stem - 0.3 - 0.5 cm in cut pieces, yellowish-brown, erect, branched, cylindrical, hairy, solid, hollow when dry.

Leaf - Simple, subsessile, exstipulate, opposite, decussate, wavy margin, obovate, slightly acuminate and pubescent due to the presence of thick coat of long simple hairs.

Flower - Arranged in inflorescence of long spikes, greenish-white, numerous, sessile, bracteate with two bracteoles, one spine lipped, bisexual, actinomorphic, hypogynous; perianth segments 5,free, membranous, contorted or quincuncial, stamens 5, opposite, the perianth lobes, connate forming a membranous tube-like structure, alternating with truncate and fimbriate staminodes, filament short; anther, two celled, dorsifixed; gynoecium bicarpellary, syncarpous; ovary superior, unilocular with single ovule; style, single; stigma, capitate.

Fruit - An indehiscent dry utricle enclosed within persistent, perianth and bracteoles.

Seed - Sub-cylindric, truncate at the apex, round at the base, endospermic, brown.[9]

Fig.1

Fig.2

Fig.1- https://www.healthbenefitstimes.com/devils-horsewhip/

Fig.2-https://www.alibaba.com/product-detail/Apamarga-Panchang-Chirchita-Whole Plant_10000000885867.html

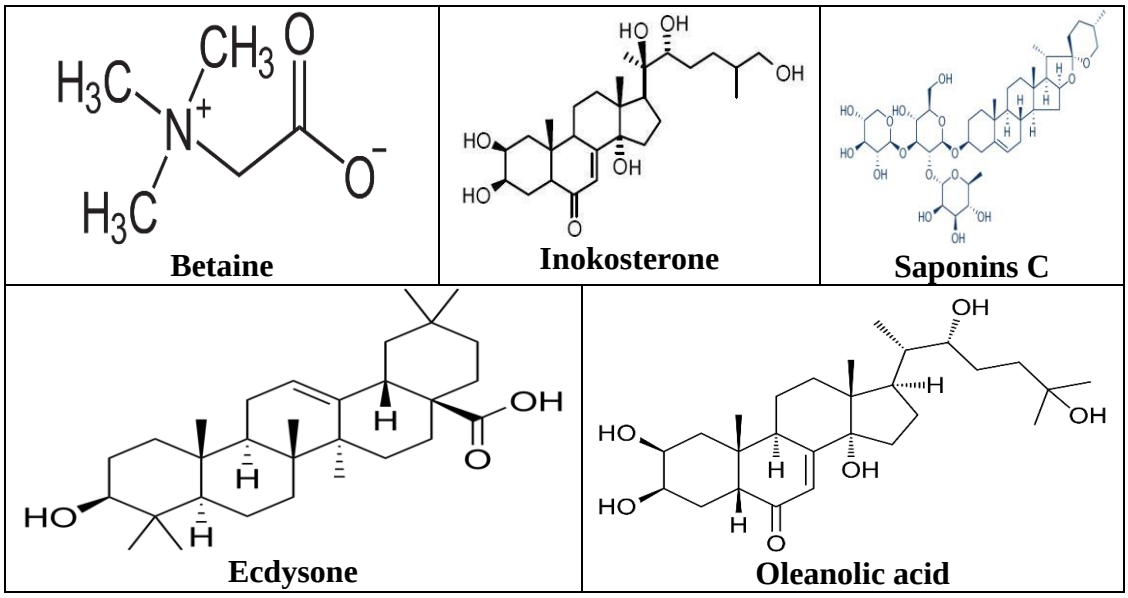
Distribution

Throughout India, upto an altitude of 2100 m and in the South Andaman Islands.[9]

Part used: Root, leaf, whole plant.[10]

Chemical constituents

Ecdysone, ecdysterone, inokosterone, oleanolic acid and glycoside from roots, saponin, A and B from seeds along with hentrincontane; two new saponins C and D and oleanolic acid based saponins from fruit, alkaloids achyranthine and betaine from the whole plant are reported.



Action and Uses

1. It is used in abdominal pain, nausea, various skin disorders.
2. It is used with Mulethi, Gokshur, Patha in urinary tract disorders.
3. In kaphaja vikaras Apamarga kshar is used.
4. Its Kshar with Pippali, Kupilu, Atish is used in Kaphaja vikaras with ghrita and madhu.
5. The whole plant or its rots are used in form of lepa in snake bite, dog bite, scorpion bite etc.[5]

Ayurvedic properties[10]

Rasa: Katu, Tikta

Guna: Laghu, Ruksha, Tikshna

Vipak: Katu

Virya: Ushna

Karma

- **Dosakarma:** Kapha-vata shamak, Kaphapitta samsodha.
- **Sharirakarma:** Dipan, Pachan, Rochan, Pittasarak, Krimighna, Lekhan, Soth hara, Vedana sthapan, Vishaghna, Swedajanan, Kusthaghna, Kandughna, Twakdosa hara, Hridya, Rakta sodhak, Rakta vardhak, Mutrala, Ashmarinasan. Shirovirechana, Vishtambhi, Kaphanissaraka, Mootramlatanashana, Ashmarinashana, Katupaushtika.
- **Vyadhikarma:** Aruchi, Agimandya, Chardi, Udar roga, Sula, Adhman, Arsa, Pitta ashmari, Krimi roga, Hridroga, Pandu, Kustha, Charma roga, Vasti sotha, Kasa, Shwasa, Vrishchikadansha, Sarpadansha, Karnashoola, Pama, Raktavikara, Gandamala, Amavata, Shotha, Raktamlata, Vastishotha, Vrikkashotha, Ashmari, Charmaroga, Varnavikara, Daurbalya.[9]

Dosage: Juice- 10-20ml; Root powder- 3-6 gm; Seeds- 3 gm; Kshar (water soluble extract of ash)- ½ - 2 gm.[9]

Important formulations

Agastya haritaki, Kaphaketu rasa, Apamargakshara taila, Apamarga taila, Apamargadi vati, Gulmakalanal rasa, Agnimukha rasa, Mahashankha vati.[9]

Pharmacological activities

Diuretic, spasmolytic, hypoglycaemic, antimicrobial, antibiotic, antifungal, antiimplantation, abortifacient, hypotensive, purgative, vasodilator, cardiac depressant[9] Gastroprotective, Antipyretic, Antioxidant, Antibacterial, Cardiovascular, Antiobesity, Diuretic activity.[11]

Some of these pharmacological activities are described below on the basis of various research works that have been conducted.

Gastroprotective activity

Gastroprotective effect of *A. aspera* leaf was evaluated by analysis of antiulcer activity of ethanolic extracts of *A. aspera* leaf (EEAA). The anti-ulcer assays were performed on pylorus ligation and chronic ethanol induced ulcer model and the effects of the EEAA on gastric

content volume, pH, free acidity, total acidity and ulcer index were evaluated. They found out that the percentage of ulcer protection (59.55 % & 35.58) was significantly higher in groups treated with the high dose of EEAA (600 mg/Kg), it also reduced the volume of gastric juice and total acidity whereas gastric pH was increased significantly. The results of this study clearly indicated that significant gastroprotective activity of EEAA may be due to presence of phyto-constituents like flavonoids, saponins and tannins.[12]

Antipyretic activity

Goli *et al.* studied the anti-pyretic activity of methanol extracts of Achyranthes aspera Linn, leaves using experimental animal models. The extracts were screened for alkaloids, steroids, proteins, flavanoids, saponins, mucilage, carbohydrates, tannins, fats and oils. Anti-pyretic activity was evaluated using the brewer's yeast-induced pyrexia in rats. The extracts in dose levels of 100 and 200 mg/kg orally were used for anti-pyretic studies. The methanol extracts of leaves of Achyranthes aspera Linn produced significant ($P<0.01$) anti-pyretic activity. The 200mg/kg extracts has shown a good anti-pyretic effect ($P<0.01$) with all the doses used when compared to the control group. The results obtained indicate that the crude leaf extracts of *Achyranthes aspera* Linn possess potent anti-pyretic activity by supporting the folkloric usage of the plant to treat various diseases.[13]

Antioxidant activity

Pandey *et al.* reported that in 50% ethanolic extract of the leaves of *A. aspera* the free radical scavenging activity of the extract was concentration dependent and IC50 was observed at a concentration of 62.24µg/ml for DPPH free radical scavenging activity and 68.32µg/ml for hydroxyl radical scavenging activity. The extract showed significant total antioxidant activity and reducing power.[14] Antioxidant activities of Hexane and Chloroform extracts of *Achyranthes aspera* for different parts of the plant was evaluated by Beaulah *et al.* they found out that the antioxidant activity varied from parts to parts and it increased as the time and the concentration increased and the order was: root > stem > inflorescences > leaf in hexane extract and in Chloroform extract, the stem showed high radical scavenging potential and it almost closer to standard Ascorbic acid. The Inflorescence exhibited a higher activity (82 %) and the order of activity was: Stem> Inflorescences > leaf. Root did not show any antioxidant activity and this may be due to the interference of individual chemical components present in the chloroform extract.[15]

Antibacterial activity

Pandey *et al.* studied the antibacterial activity of ethanoilc extracts of *A. aspera* leaves (AALE) against four bacterial strains viz. *S. aureus*, *M. luteus*, *P. aeruginosa*, *E. coli* and they found out that (AALE) showed effective antibacterial activity against all four bacterial strains. Highest activity was observed against *S. aureus* and lowest activity was observed against *E. coli*. The extract inhibited the growth of *S. aureus* at a concentration of 1 mg/ml, thus to calculate the MIC, the antibacterial effect of extract was observed at 0.25, 0.5 and 0.75 mg /ml. AALE was found to inhibit the growth of *S. aureus* at 0.75 mg/ml which was hence recorded as the MIC. Similarly, the effect of AALE against *M. luteus* was observed at 0.2, 0.4, 0.6 and 0.8 mg/ml, the growth was inhibited at 0.8 mg/ml. AALE did not inhibit the growth of Gram-negative *E. coli* up to a concentration of 2 mg/ml, however the extract was effective at a concentration of 3 mg/ml. Thus, the effect of extract on growth inhibition of *E. coli* was observed at varying concentrations (2.25, 2.5 and 2.75 mg/ml). The minimum inhibitory concentration was recorded at 2.75 mg/ml. The MIC of extract against *P. aeruginosa* was observed at a concentration of 0.8 mg/ml.[14]

Aziz *et al*, 2005 has been isolated 3-Acetoxy-6 benzoyloxyapangamide from an ethyl acetate extract of the stem of *Achyranthes aspera*. The extract shows mild antibacterial activity against *Bacillus cereus.*[16]

Cardiovascular activity

Neogi *et al.* found out that a water-soluble alkaloid, Achyranthine isolated from *Achyranthes aspera*, was able to decreased blood pressure and heart rate, dilated blood vessels, and increased the rate and amplitude of respiration in dogs and frogs.[17]

Ant obesity activity

A.K. Khanna *et al*. (1992) investigated the alcoholic extract of *A. aspera*, at 100 mg/kg dose lowered serum cholesterol (TC), phospholipid (PL). Triglyceride (TG) and total lipids (TL) levels by 60, 51, 33 and 53% respectively in triton induced hyperlipidaemic rats.[18]

Rani *et al.* evaluated the ant obesity effect of ethanol extract of *Achyranthes aspera* Linn. seed (EAA) by employing *in vitro* and *in vivo* models. The inhibitory activity of EAA on pancreatic amylase and lipase was measured. The *in vivo* pancreatic lipase activity was evaluated by measurement of plasma triacylglycerol levels after oral administration of EAA along with lipid emulsion to Swiss albino mice. The EAA inhibited pancreatic amylase and

lipase activity *in vitro* and elevations of plasma triacylglycerol level in mice. Furthermore, the ant obesity effect of EAA (900 mg/kg) was assessed in mice fed a high-fat diet with or without EAA for 6 weeks. EAA significantly suppressed the increase in body, *retroperitoneal adipose* tissue, liver weights, and serum parameters, namely; total cholesterol, total triglyceride, and LDL-cholesterol level. The anti-obesity effects of EAA in high-fat-diet-treated mice may be partly mediated through delaying the intestinal absorption of dietary fat by inhibiting pancreatic amylase and lipase activity.[19]

Diuretic activity

Aqueous and ethanolic extracts of the *A. aspera* leaves were tested for diuretic activity in rats. The parameters studied on individual rats were body weight before and after test period, total urine volume, urine concentration of Na+, K+ and Cl- by taking Furosemide as reference diuretic. *A. aspera* leaves extract showed increase in urine volume, cation and anion excretion.[20]

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