A REVIEW ARTICLE ON PHYTOCHEMICAL AND PHARMACOLOGICAL PROFILES OF APAMARGA (ACHYRANTHES ASPERA LINN)

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ABSTRACT

Apamarga (Achyranthes aspera Linn.) is a perennial herb occurs naturally throughout India. It is commonly known as Chaff Tree, Prickly- chaff Flower, Rough-chaff Tree. As this is having Laghu, Ruksha, Tikshna Guna, Katu, Tikta, Rasa, Katu Vipaka and Ushna Virya. By the virtue of above property this is Kaphavatashamaka and Kaphapittasanshodhana. Achyranthes aspera contains a number of bioactive chemicals, including tannin, glucoside and saponin. Its ash contains potash mainly. It helps to purify blood. It is an effective anti-inflammatory medicine and recommended for shirovirechana in the treatment of various diseases as mentioned in classical texts of Indian medicine. The present review is therefore, an effort to give a detailed focus on its botanical details, phytochemistry, pharmacodynamics, therapeutic importance and its pharmacological studies.

Keywords: Ayurveda, Apamarga, Achyranthes aspera, Shirovirechana, Vedanasthapana

INTRODUCTION

Apamarga (Achyranthes aspera Linn) Family: Amaranthaceae is an erect stiff, annual-perennial herb, often will woody base, occurs naturally throughout India. Plant is found common in waste places roadsides, hedges, gardens, fields or farms, fore edges, forest clearings and other places. It is commonly known as Chaff Tree, Prickly- chaff Flower, Rough-chaff Tree. (Fig. 1) It contains tannin, glucoside and saponin. The plant (whole herb) and seeds contain alkaline Substance specially potash. The plant possesses various medicinal properties useful as pungent, laxative, anti-dermatosis, wound healer, blood purifier, poison antidote and cholagogue drug, and also for other activities, useful in doopsy, piles, boils, eruptions of skin and other diseases.

Figure 1

A. aspera. (A) Roots. (B) Inflorescence.
History
On comprehensive review of Ayurvedic classics it was found that Apamarga is described in Charaka Samhita, Nighantus and Chikitsagranthas. In Charaka Samhita, it is described as shirovirechana(C.Su.25), also used as apamargakshara taila in parshvashula(C.Ci.13/171). Madhuka-shara and seeds of shigru or apamarga are used as pressed snuff (S.Ci.18/23). In Kaiyadeva Nighantu, its properties and uses are described1. In Bhavaprakash Nighantu, it’s properties and uses are described2. In Raj Nighantu, it’s properties and uses described as vranakanduvishaghna3. It is also mentioned in Chikitsa Granthas like Chakradatta, it is described in sadyovrana(CD.44/52), vishamajvara (CD.1/229), apamargakshara taila is used in karnavyadhi (CD.57/25). Bhavamishra, in his section Bhavaprakash, madhyamakhanda mentions indication of apamarga in vishuchika(BP.6/110,114), kushtharoga (BP.54/128), karnaroga (BP.64/38). Apamargataila (RM.26/7) and apamargadalalepa in shastrakshata(VM.16/120).

Botanical classification
Streblus asper Lour belongs to the family Moraceae.

Kingdom: Planate
Unranked: Angiosperms
Unranked: Eudicots
Unranked: Core eudicots
Order: Caryophyllales
Family: Amaranthaceae
Genus: Achyranthes
Species: Aspera

Part used: Whole Plant, Leaves, Spikes, Roots, Seeds Doses Fresh juice 5-10 ml., Decoction 10-15 ml., Seeds powder 3 gm.

Specific formulations: Apamarga Ksara, Apamarga Ksara Taila.

Vernacular Names
Sanskrit names: Pratykpusa, Sikhari, Khamanjari, Kitini, Adhahsalya, Mayuraka.
Hindi: Chirchita, Chichrha, Latjira, Apamarg
English: Chaff Tree, Prickly- chaff Flower, Rough-chaff Tree.
Bengali: Apang
Gujarati: Aghedo
Tamil: Najurivi
Telugu: Apamargam
Arabian: Alkum
Persian: Kharevajgun

Pharmacodynamics
Rasa : Katu, Tikta
Guna : Laghu, Ruksha, Tikshna
Virya : Ushna
Vipaka : Katu
Doshakarma : Kaphavatasmaka, Kaphapittasamsodhaka

Chemical composition
Saponin A was identified as D-Glucuronic Acid and saponins B was identified as β-Dgalactopyranosyl ester of D-Glucuronic Acid. Along with these constituents certain other constituents were also isolated like oleanolic acid, amino acids and hentriacontane. The seeds also contain chemical constituents like 10-tricosanone, 10-octacosanone & 4-tritriacontane.4,5. The studies of R.D. Rameshwar & N. Akito (2007) revealed three oleonolic acid glycosides from the seeds of Achyranthes aspera which were identified as α-L-rhamnopyranosyl-(1 4)-(β-Dglucopyranosyluronic acid)-(1 3)-oleanolic acid, α-L-rhamnopyranosyl-(1 4)-(β-Dglucopyranosyluronic acid)-(1 3) oleanolic acid-28-O-β-D-glucopyranoside and α-Lrhamnopyranosyl-(1 4)-(β-D-glucopyranosyluronic acid)-(1 3) oleanolic acid-28-O-β-D-glucopyranosyluronic acid-(1 4)β-D-
Banerji et al. (1996) isolated various compounds from Achyranthes aspera. The identification of the fractions was confirmed by DSC, UV, IR, CD, 1H and 13C NMR, MS and quantification by HPLC. N. C. Neogi et al. (1970) reported Achyranthes aspera root extracts by chromatography on silica gel column, followed by elution with CHCl3-MeOH (4:1). A. Banerji et al. (1971) also isolated ecdysterone from Achyranthes aspera root extracts by extraction, isolation and purification of 20-hydroxyecdysone from Achyranthes aspera and its characterization by DSC, UV, IR, CD, 1H and 13C NMR, MS and quantification by HPLC. A. S. Chauhan et al. (2002) isolated a new cyclic chain aliphatic fatty acid (I) was also isolated from seeds of the plant. H.N. Khaustgir et al. (1958) isolated oleanolic acid from the roots of Achyranthes aspera. The identifications were elucidated as Saponins 1-III, 20-hydroxyecdysone, and quercetin-3-O-β-D-galactoside, were isolated from the methanol extract of the aerial parts of Achyranthes aspera. Their structures were established on the basis of NMR spectroscopic analysis; the complete 1H and 13C assignments of the compounds were achieved by means of 2D NMR studies. G. Michl et al. (2000) reported two new bisdesmosidic triterpenoid saponins were isolated, besides the three known saponins from the Methanolic extract of the aerial parts of Achyranthes aspera. Their structures were elucidated as β-D-glucopyranosylβ-[O-α-L-...
Rhamnopyranosyl-(1→3)-O-β-D-glucopyranuronosyl)machaerinate, β-D-glucopyranosyl3β-[O-β-Dgalactopyranosyl-(1→2)-O-α-Dglucopyranuronosyl]machaerinate. The other saponins were identified as β-D-glucopyranosyl-3β-[O-α-L-rhamnopyranosyl-(1→3)-O-β-D-glucopyranuronosyl]oleanolate, β-D-glucopyranosyl3β-[O-β-D-galactopyranosyl-(1→2)-O-β-D-glucopyranuronosyl]oleanolate, β-D-glucopyranosyl 3β-[O-β-D-glucopyranuronosyl]oleanolate.

R.D. Rameshwar (2007) isolated chemical compounds of the volatile oil from Achyranthes aspera leaves, growing in Dehra Dun were analyzed by G.C. M.S. Seven compounds viz., phenzoquinone, hydroquinone, spathulenol, nerol, α-ionone, asarone and eugenol constituting 63.05% of the oil were identified. Hydroquinone (57.7%) was found to be the chief constituent.

**Therapeutic uses**

The dried plant is given to children for colic and also as anastringent in gonorrhoea. Plant is crushed in water and boiled, and solution is given in treating pneumonia. The infusion of roots of plant is given as a mild as tringent. Plant's infusion is applied to the wounds caused, by Acacia (Babula) thorns in the forests as per forest-tribal practices, used in as acute stage of coughs a rheumatism. The seeds and leaves are considered emetic and are useful in hydrophobia. The juice of leaves is given in dysentery and diarrhoea.

The flowering spikes made into pills with a little sugar is popular preventive medicine for persons bitten by rabid dogs and this kind of herbal therapy is prevalent in certain rural areas. The ash of the whole plant (alkalies of kshara) is prepared by burning of herb and it contains potash in a large quantity and the same is used in treatment of coughs and asthma. The ash is mixed with sesamum oil (Tila taila) and used externally over wounds, ulcers and on warts of penis (male genital) and also other parts of body. The ash of whole plant (Apamarga) is mixed and prepared with sesame oil (Apamarga Ksara taila) and dropped into ear as an effective remedy for ear complaints. The herb is commonly used as a de purative, astringent, diuretic and pectoral remedy. The roots are given in puerperal, pulmonary, syphilitic and rheumatical troubles. It is also used in ophthalmia, dropsy and various cutaneous complaints.

An infusion of the roots is used as an emetic for pains in the chest not due to cough. The steam coming from boiling the whole herb is inhaled and also used it as a hot bath for checking acute chills and this kind of fomentation causes sweating and relieving chills and fever temperature. Whole plant or almost every part of the herb are recommended as a good remedy in treatment of snake-bite and scorpion-sting. Roots of the plants are pounded with black pepper and given orally with water in cases of snake bite for checking venomus poison. A paste of fresh leaves in topically applied over in-sect. bites. The herb is used in various forms against the scorpion-sting as well as snake bite and whole plant or its particular parts are frequently administered internally as well as externally both. This carries classical (textual) and traditional background. The plant is also esteemed to apply in magico-medical therapy (Tantra-mantra cikitsa) against the scorpion-bite other than two major modes oral and topical usage of drug. For the instance, a fresh plant is plucked and repeatedly touched downwards for extracting out the poison from scorpion-
bite point under traditional belief of specific herbal effect (prabhavayakarmas).

The plant is also considered as an anti-appetizer with special reference. The seeds are boiled in milk and given in cases of over or excessive appetite (Bhasmaka and atyagni), though plant has normally appetizer property. The herb is sometimes claimed to help control appetite (kshudhanyantraka or nasaka). A paste of the roots is applied in ophthalmia and opacity of the cornea in eye complaints. An infusion of the roots is a mild astringent and it is used for bowel complaints, night blindness, skin diseases and other complaints; it is also given in cases of menorrhagia, piles and inflammation of in ten organs. The juice of leaves or plant is used in large doses hasten labour pains or may cause abortion. The ash of the seed containing a high proportion of potash and therefore the ash is an important constituent alkaline medicines and caustic pastes; and the ash is a acid. It is recommended in respiraotry ailments and other vario

The mixture of ash made of whole plant and time its weight of water is allowed to stand for 24 hours; a the residue obtained by evaporating the supernatant liquid; and it is finally used as a powder in colic, cough, asthma and several other ailments with honey or any other adjuvant as required in treatment. The calcinated powder is also give in splenic disorders.

The spikes of herb is rubbed or chewed to help the tooth and gums healthy as a dentifice application. The leaves are warmed up little over heat and juice is extracted; the expressed juice is topically applied over fresh cuts and bleeding for checking it as a styptic and coagulant remedy; the fresh leaves pasts is also applied for the pur-
pose of treating wounds. The water obtained from washing rice (tandulodaka) is will mixed by seeds and it is orally used in bleeding pile or haemorrhoids. The leaves of herb are used to check vaginal pain and leaves are locally applied in vagina for relieving pain. The leaves, branch, root and spikes are combine and put into water for boiling to prepare decoction which orally given in cases of asthma. The herb is one of the highly medicinally potent and common drug in Indian medicine and prevalent as a yak able plant

**Pharmacological Properties**

**Spermicidal Activity**

D. Paul et al. (2010) studied effects of various extracts from the roots of *Achyranthes aspera* and reported spermicidal activity in human and rat sperm.

**Antiparasitic Activity**

A. A. Zahir et al. (2009) reported that the ethyl acetate extracts of *A. aspera* shows antiparasitic activity (dried leaf, flower and seed extract) against the larvae of cattle tick *Rhipicephalus* (Boophilus) *microplus* (Canestrini, 1887) (Acari: Ixodidae), sheep internal parasite *Paramphistomum cervi*.

**Hypoglyceamic Activity**

M.S. Akhtar & J. Iqbal (1991) studied the aqueous and methanolic extracts of the powdered whole plant, which shows hypoglyceamic activity. Blood glucose levels of normal and Alloxan induced diabetic rabbits were determined after oral administration of various doses.

**Cancer Chemo preventive Activity**

A. Chakraborthy et al. (2002) reported that the methanolic extracts of leaves, alkaloid, nonalkaloid and saponin fractions shows cancer chemo preventive action on Epstein-Barr virus early antigen activation induced by tumor promoter 12-O-
tetradecanoylphorbol-13-acetate in Raji cells\textsuperscript{32}.

**Hepatoprotective Activity**
A.R. Bafna & S.H. 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\textsuperscript{33}.

**Analgesic and antipyretic activity**
Sutar N.G. et al. (2008) reported methanolic extract of leaves for analgesic and antipyretic activities by using hot plate and brewer’s yeast induced methods using aspirin as a standard drug\textsuperscript{34}.

**Anti-inflammatory and anti-arthritis activity**
S.Vijaya Kumar et al. (2009) studied the alcoholic extract of the roots of *Achyranthes aspera*, which shows anti-inflammatory activity in Wistar rats using carrageenan-induced paw edema method and cotton pellet granuloma test\textsuperscript{35}.

**Antimicrobial Activity**
M.T.J. Khan et al. (2010) reported that the ethanol and chloroform extracts of seeds of *Achyranthes aspera* shows mild to moderate antibiotic activity against *B. subtilis*, *E. coli* and *P. aeruginosa*\textsuperscript{36}.

**Anti-oxidant Activity**
P. Tahiliani & A. Kar (2000) studied various extracts of the leaves for anti-oxidant activity\textsuperscript{37}.

**Nephroprotective Activity**
T. Jayakumar et al. (2009) reported the methanolic extract of the whole plant of *Achyranthes aspera* shows nephroprotective activity against lead acetate induced nephrotoxicity in male albino rats\textsuperscript{38}.

**Anti-depressant Activity**
C.C. 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\textsuperscript{39}.

**Diuretic Activity**
S.S. Gupta et al. (1972) reported a saponin isolated from the seeds of *Achyranthes aspera* which shows significant diuretic effect in adult male albino rats\textsuperscript{40}.

**Bronchoprotective Activity**
B.R. Goyal et al. (2007) reported ethanolic extract of *Achyranthes aspera* shows bronchoprotective effect in toluene diisocyanate (TDI) induced occupational asthma in Wistar rats. The total and differential leucocytes were counted in blood and bronchoalveolar (BAL) fluid\textsuperscript{41}.

**Cardiovascular Activity**
A. K. Ram et al. (1971) studied perfusion of isolated rat heart with adrenaline bitartrate or the saponin of *Achyranthes aspera* increased the activity of phosphorylase a but had no effect on the total phosphorylase activity\textsuperscript{42}.

**Anti-allergic Activity**
S.B. 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\textsuperscript{43}.

**Wound Healing Activity**
S. Edwin et al. (2008) investigated the ethanolic and aqueous extracts of leaves of *Achyranthes aspera* for wound healing activity\textsuperscript{44}.

**Immunomodulatory Activity**
R. Chakrabarti & R.Y. Vasudeva reported that *Achyranthes aspera* show immunostimulant action in Catla catla\textsuperscript{45}.

**Hypolipidemic 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 hyperlipidemic rats.46

**DISCUSSION AND CONCLUSION**

On comprehensive review of Ayurvedic classics it was found that *Apamarga* is described in *Charaka Samhita, Sushruta Samhita*. Some synonyms of *apamarga* like Pratykpuspa, Sikhari, Kharamanjari, Kitihi, Adhahsalya, Mayuraka are described in various *Nighantu*. *Apamarga* (*Achyranthes aspera* Linn.) is commonly known as Chaff Tree, Prickly-chaff Flower, Rough-chaff Tree. As this is having Laghu, Ruksa, Tikshna Guna, Katu, Tikta, Rasa, Katu Vipaka and Ushna Virya. By the virtue of above property this is Kaphavatashamaka and Kaphapittasanshodhana. Its phytochemical, therapeutic uses and pharmacological studies well described.

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