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A review on therapeutic benefits of *Achyranthes aspera*

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Abstract
Achyranthes aspera Linn (Amaranthaceae), commonly known as Apamarga, is a commonly available plant in India. It is traditionally known as Latjira, and Prickly chaff. Different constituents are find in different part of the *Achyranthes aspera* (e.g. Saponins A and B, amino acids, hentriacontane, hormones ecdysterone and Petrol extract of shoot 17-pentatriacontanol). Some alkaloids and fatty acids are also indicates. Therefore its use in the treatment of different type of acute and chronic disease. Whole plants of *Achyranthes aspera* have pharmacological activity.

Keywords: therapeutic, benefits, hentriacontane, *Achyranthes aspera*

Introduction
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. One of the many plants which are being evaluated for their therapeutic efficacies is *Achyranthes aspera* which is commonly known as Latjeera (Hindi) & Rough Chaff tree (English). It is an erect or procumbent, annual or perennial herb, 1-2m in height, often with a woody base, commonly found as a weed of way sides, on roadsides Although it has many medicinal properties, it is particularly used spermicidal, antipyretic & as a cardiovascular agent.

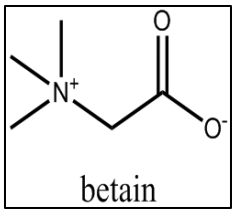
Geographical Source
It is found on road sides, field boundaries and waste places as a weed throughout India up to an altitude of 2100 m and in South Andaman Islands. The plant is also widespread in Baluchistan, Ceylon, Tropical Asia, Africa, Australia and America.

Morphology
Achyranthes aspera L. (Latjeera) is an erect or procumbent, annual or perennial herb of about 1-2 meter in height, often with a woody base. Stems angular, ribbed, simple or branched from the base, often with tinged purple colour [8], branches terete or absolutely quadrangular, striate, pubescent, leaves thick, 3.8 - 6.3 × 22.5 - 4.5 cm, ovate – elliptic or obviate –rounded, finely and softly pubescent on both sides, entire, petiolate, petiole 6 – 20 mm long, flowers greenish white, numerous in auxiliary or terminal spikes up to 75 cm long, seeds subcylindric, truncate at the apex, rounded at the base, reddish brown.

Taxonomic classification
Kingdom: Plantae
Subkingdom: Tracheobinota
Super Division: Spermatophyta
Division: Mangoliophyta
Class: Mangoliophsida
Subclass: Caryophyllidae
Order: Caryophyllales
Family: Amaranthaceae
Genus: *Achyranthes*
Species: *Aspera*

Chemistry
Varuna *et al*. isolated two new compounds, 27-cyclohaxylhepta-cosan-7-0l and16-hydroxy-26-methylheptacosan-2 one. Compounds in the seeds of *A. aspera* are the saponins A and B.

They are glycosides of oleanolic acid. The carbohydrate components are the sugars D-glucose, Lrhamnose, Dglucuronic acid (Saponin A). Saponin B is the b-Dgalactopyranosyl ester of Saponin A. The content of free oleanolic acid in *A. aspera* roots is 0.54%. Ecdysterone, a phyto ecdysone, was yielded and characterized by its colour and special chemical reactions. Contents (g/kg) were: 0.25 (seeds), 0.09 (roots), 0.04 (stem,) **(**leaves). The pronounced insect moulting hormonal activity of this extract from the roots has been found due to the presence of ecdysterone. In an investigation for alkaloids only one indication was found in *A. aspera* stems. But this was assessed only by color reactions and not with modern techniques. Therefore this result can be neglected. It is in contradiction to the general characteristics of the family Amaranthaceae to which *A. aspera* belongs. Principal Constituents Betaine and Achyranthine are the principal alkaloids, identified from the whole plant.



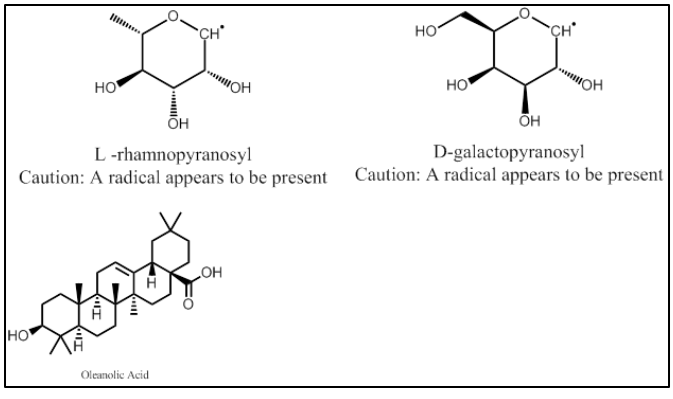
Chemical investigations of the seeds of *Achyranthes aspera* by V. Hariharan & S. Rangaswami (1970) [14] and M. Ali (1993**)** reported the isolation & identification of Saponins A and B.

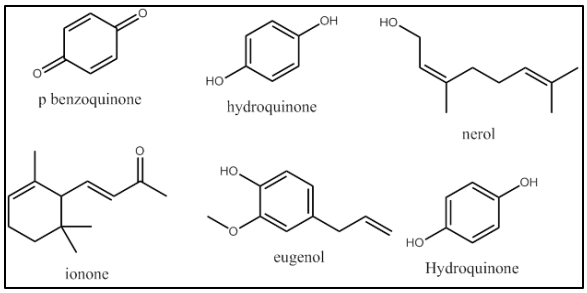
Saponin A was identified as D-Glucuronic Acid and saponins B was identified as β Dgalactopyranosyl ester of D-Glucuronic Acid. Along with these constituents certain other constituents were also isolated like oleanolic acid, amino acids and hentriacontane. The seeds also contain chemical constituents like 10-tricosanone, 10-octacosanone & 4-tritriacontanone. 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-D glucopyranosyluronic acid)-(1,3)-oleanolic acid, α-L-rhamnopyranosyl-(1,4)-(β-D glucopyranosyluronic 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-Dglucopyranosyl-(1,4)-β-D- glucopyranoside. A.S. Chauhan *et al*. (2002s) isolated a new cyclic chain aliphatic fatty acid (I) was also isolated from seeds of the plant. H.N. Khastgir *et al*. (1958) isolated sapogenin along with oleanolic acid from the seeds. A. Banerji *et al*. (1970) [4] isolated ecdysterone from the methanolic extract of roots of *Achyranthes aspera*. R. Ikan *et al*. (1971) also isolated ecdysterone from *Achyranthes aspera* root extracts by chromatography on silica gel column, followed by elution with CHCl3-MeOH (4:1).

A. Banerji *et al*. (1970) [4] and A.K. Batta & S. Rangaswami (1973) [5] isolated ecdysone from the roots of *Achyranthes aspera*. H.N. Khastgir *et al*. (1958) isolated oleanolic acid from glycosidic fraction of the roots. S.K. Sharma *et al*. (2006) [34] from the ethanolic extracts of the roots isolated a new aliphatic acid and identified as n-hexacos-14-enoic acid from the roots of *Achyranthes aspera*. This compound is reported for the first time from any natural and synthetic source. Certain other were also isolated and identified as strigmasta-5, 22-dien-3-β-ol, trans-13-docasenoic acid, n-hexacosanyl n-decaniate, n-hexacos-17-enoic acid and n-hexacos-11-enoic acid. Strigmasta-5, 22-dien-3-β-ol is a phytosterol, was obtained as a colorless crystalline mass from petroleum ether: benzene 75:25 elute. It responded positively to Liebermann Burchard test for sterols. A.K. Batta & S. Rangaswami (1973) [5] also isolated dihydroxy ketones from the shoots as 36, 37- dihydroxyhenpentacontan-4-one and Triacontanol. Triacontanol was also isolated by T.N. Misra *et al*. (1991) along with 36, 47-dihydroxyhenpentacontan-4-one. T.G. Misra *et al*. (1993) reported certain long chain compounds from the shoots like 27-cyclohexylheptacosan-7-ol and 16-hydroxy-26-methylheptacosan-2-one. Y. Gariballa *et al*. (1983) [11] isolated an aliphatic alcohol, 17-pentatriacontanol from the shoots [30]. T.N. Misra *et al*. (1996) isolated various compounds like tetracontanol-2 (C40H82O, melting point (76-77 ºC), 4-methoxyheptatriacont-1-en-10-ol (C38H76O) and β-sitosterol. A. Banerji *et al*. (1971) isolated ecdysterone from the whole plant [32]. K.S. Laddha (2005) *et al*. reported 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 N. C. Neogi *et al*. (1970) reported Achyranthine a water soluble alkaloid which possess pharmacological actions like dilation of the blood vessels, lowering of the blood pressure, depression of the heart and increase the rate and amplitude of respiration. V. K. Kapoor & H. Singh (1966) reported betaine (C5H11NO2) (m.p. 292 ºC) from the whole plant which is also a water soluble alkaloid. The identity of betaine was confirmed by mixed m.p. detection of the HCl-salt, oxalate and picrate derivatives and compared with those of an authentic sample.

V. Seshadri *et al*. (1981) isolated two constituents from the fruits and were identified as Saponins C and D. M. Ali (1993) isolated various compounds from the stem, Pentatriaontane, 6-pentatriacontanone, Hexatriacontane and Tritriacontane.

O. Kunert *et al*. (2000) reported three bisdesmosidic saponins (I-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. 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*., p benzoquinone, 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 benefits

Mandar *et al*, 2011 showed the ethanol extract of whole plant on various Hematological (i.e. RBC, WBC count, Hb%, clotting time, O2 carrying capacity) and biochemical parameters (i.e. blood sugar level, lipid profile) in alloxan induced diabetic rats and concluded that *Achyranthes aspera* has haematinic, hypoglycemic and antihyperlipidemic activity which can complement in treatment of diabetic complications. Ethyl acetate extracts of whole plant (dried leaf, flower and seed extract) showed antiparasitic activity against the larvae of cattle tick *Rhipicephalus microplus*, sheep internal parasite *Paramphistomum cervi*. The methanolic extract of the whole plant showed nephroprotective activity against lead acetate induced nephrotoxicity in male albino rats. The juice of the plant is used to treat opthalmia and dysentery.

Uma *et al*, 2010 evaluated the antinociceptive activity of ethanolic extract of *A. Aspera* (EEAA) and to find the phytochemical responsible for this activity with possible mode of its activity. The aqueous extract of the entire plant is hepatoprotective. The hydroalcohalic extract stimulates cell mediated immune system by increasing phagocytic function. Krishnakumari and Priya, 2006 evaluated the antihyperlipidemic effect of aqueous extract of *Achyranthes aspera* in experimental rats fed with diet containing sesame oil. Sandhya kumari, *et al*, 2002 reported ethanolic extract of *A.aspera* caused induction of reproduction in male rat. Extracts of *A. aspera* possess antioxidant properties and could serve as free radical inhibitors or scavenger or acting possibly as primary antioxidants. The decline in the hepatic marker shows the hepatoprotective properties against chemically (NDEA and CCl4) induced hepatocellular carcinoma.

Prasad and Pathak, 2011 studied *Achyranthes aspera* (Ash) on reproductive fitness on *Drosophila melanogaster* using larval and adult feeding. Goyal *et al*, 2008 studied the bronchoprotective effect of ethanolic extract in toluene diisocyanate (TDI) induced occupational asthma in wistar rats. Apart from this whole plant also used for the treatment of bronchial infection, blindness, rheumatism, cough, diuretic in renal dropsy, beriberi, pneumonia.

Bhattarai, 1994 observed abortifacient activity of benzene extract of the stem bark in the rat. The ethanolic extract of stem inhibited the growth of *Bacillus subtilis* and *Staphylococcus aureus* bacterial strains. Aziz *et al*, 2005 isolated 3-Acetoxy-6-benzoyloxyapan-gamide from an ethyl acetate extract of the stem of *Achyranthes aspera*. The extract was found to show antibacterial activity against *Bacillus cereus*. Bafna and Mishra, 2004 reported hepatoprotective activity of methanolic extract of the aerial parts on rifampicin induced hepatotoxicity in albino rats which decreases levels of serum glutamic pyruvic transaminase (SGPT), serum glutamic oxaloacetic transaminase (SGOT), Alkaline phosphatase (ALP) and total bilirubin.

Misra *et al*, 1992 [24] reported antifungal activity of shoots against *Asperigillus carneus* which is due to 17-pentatriacontanol as a chief constituent isolated from essential oil of the shoots of plant. Patil *et al*, 2012 studied *in vitro* antibacterial potential of dry stem extracts against dental caries causing microbes. The ethanol and methanol extract of stem showed antimicrobial activity against *Escherichia coli* and also reported secondary metabolites as flavonoid and glucoside. Shendkar *et al*, 2012 has been prepared activated carbon from stem of *Achyranthes aspera* by chemical treatment (by X-ray fluorescence spectroscopy). Activated carbon is used in gas purification, gold purification, metal extraction, water purification, medicine, sewage treatment, air filters, as an efficient catalyst and many other applications.

Shendkar *et al*, 2012 showed the presence of total thirteen amino acids in different mobile phases. Elumalai *et al*, 2009 evaluated antifungal activities from aqueous, ethanol and methanol extracts. The methanolic extract of the leaves showed antifertility activities such as abortifacient, estrogenesity, pituitary weight, ovarian hormone level and lipids profile in female rats, hypoglycaemic effect, analgesic antipyretic and diuretic activities, anti-depressant effects and anti-tumor activity.

Bagavan *et al*, 2008 [1] first reported mosquito larvicidal activity of the saponin from the ethyl acetate extract and studied the acetone, chloroform, ethyl acetate, hexane and methanol leaf extracts against larvae of *Aedes aegypti* and *Culex quinquefasciatus*. The ethanol crude extract inhibited the growth of *Bacillus subtilis* and *Staphylococcus aureus* bacterial strain.

Adnyana *et al*, 2008 reported that the alkaloid fraction of *Achyranthes aspera* leaf induced apoptosis breast cancer cell through p pathways i.e. leaf is used to treat cancer, particularly breast and cervix cancer. Apart from this leaves are also used for the treatment of syphilitic sores, bowel complaint, pile, stomache, skin eruption, early stages of diarrhea, dysentery, antiperiodic, Gonorrhoea, asthma, cure strained back, mitigate pain from bite of wasps and also recommended in several Women's diseases.

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