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Achyranthes aspera-An important medicinal plant: A review

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ABSTRACT

Achyranthes aspera (Amaranthaceae) is an important medicinal herb found as a weed throughout India. Though almost all of its parts are used in traditional systems of medicines, seeds, roots and shoots are the most important parts which are used medicinally. The present article gives an account of updated information on its phytochemical and pharmacological properties. The review reveals that wide numbers of phytochemical constituents have been isolated from the plant which possesses activities like antiperiodic, diuretic, purgative, laxative, antiasthmatic, hepatoprotective, anti-allergic and various other important medicinal properties. The crushed plant is used in pneumonia and infusion of the root is used as mild astringent in bowel complaints. Decoction of powdered leaves with honey or sugar candy is useful in early stages of diarrhoea and dysentery. For the last few decades or so, extensive research work has been done to prove its biological activities and pharmacology of its extracts. Saponins, oleonolic acid, dihydroxy ketones, alkaloids, long chain compounds and many other chemical constituents have been isolated.

Key Words: *Achyranthes aspera*, Latjeera, Medicinal properties, chemical constituents, pharmacological activities.

INTRODUCTION

Knowledge of herbs has been handed down from generation to generation for thousands of years [1]. 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 [2]. 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 [3].

According to the WHO more than 80 % of the world's population relies on traditional herbal medicine for their primary health care [4]. Plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plants [5]. 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 [6].

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 waysides, on roadsides [7, 8, 9]. Although it has many medicinal properties, it is particularly used spermicidal [41], antipyretic [52] & as a cardiovascular agent [34].

Taxonomic classification

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

Botanical description:

Synonyms

Latin	-	*Achyranthes aspera*
Sanskrit	-	Aghata
Hindi	-	Latjira, Chirchira
Gujarati	-	Safad Aghedo
Tamil	-	Shiru-kadaladi
Telugu	-	Uttaraene
Malayalam	-	Kadaladi
Punjabi	-	Kutri
Unani	-	Chirchitaa
Ayurvedic	-	Apaamaarga, Chirchitaa, Shikhari, Shaikharika
Persian	-	Khare-vazhun
Arabian	-	Atkumah
French	-	Achyranth a feuilles rudes, collant, gendarme
Spanish	-	Mosotillo, rabo de gato, rabo de chango, rabo de raton

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 [8, 10]. 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 [9], leaves thick [8], 3.8 - 6.3 × 22.5 - 4.5 cm [9], ovate – elliptic or obovate – rounded [8], finely and softly pubescent on both sides, entire, petiolate, petiole 6 – 20 mm long [9], flowers greenish white, numerous in axillary or terminal spikes up to 75 cm long, seeds subcylindric, truncate at the apex, rounded at the base, reddish brown.

Traditional Uses

Traditionally, the plant is used in asthma and cough. It is pungent, antiphlegmatic, antiperiodic, diuretic, purgative and laxative, useful in oedema, dropsy and piles, boils and eruptions of skin etc. Crushed plant is boiled in water and is used in pneumonia. Infusion of the root is a mild astringent in bowel complaints. The flowering spikes or seeds, ground and made into a paste with water, are used as external application for bites of poisonous snakes and reptiles, used in night blindness and cutaneous diseases [11]. For snake bites the ground root is given with water until the patient vomits and regains consciousness. Inhaling the fume of *Achyranthes aspera* mixed with *Smilax ovalifolia* roots is suggested to improve appetite and to cure various types of gastric disorders [12]. It is useful in haemorrhoids, leaves and seeds are emetic, hydrophobia, carminative, resolve swelling, digestive and expel phlegm. Ash of the plant is applied externally for ulcers and warts. The crushed leaves rubbed on aching back to cure strained back [13]. A fresh piece of root is used as tooth brush. Paste of the roots in water is used in ophthalmia and opacities of the cornea. Paste of fresh leaves is used for allaying pain from bite of wasps [10]. The plant is useful in liver complaints, rheumatism, scabies and other skin diseases. It also possesses tranquillizing properties [14, 15].

Phytochemistry

Chemical investigations of the seeds of *Achyranthes aspera* by V. Hariharan & S. Rangaswami (1970) and M. Ali (1993**)** reported the isolation & identification of Saponins A and B [16, 18]. Saponin A was identified as D-Glucuronic Acid and saponins B was identified as β-D-galactopyranosyl 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 [17, 18].

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-L-rhamnopyranosyl-(1→4)-(β-D- glucopyranosyluronic acid)-(1→3)-oleanolic acid-28-O-β-D-glucopyranosyl-(1→4)-β-D- glucopyranoside [19].

A.S. Chauhan *et al*. (2002) isolated a new cyclic chain aliphatic fatty acid (I) was also isolated from seeds of the plant [20]. H.N. Khastgir *et al*. (1958) isolated sapogenin along with oleanolic acid from the seeds [21].

A. Banerji *et al*. (1970) isolated ecdysterone from the methanolic extract of roots of *Achyranthes aspera* [22]. R. Ikan *et al* (1971) also isolated ecdysterone from *Achyranthes aspera* root extracts by chromatography on silica gel column, followed by elution with $CHCl_3$-MeOH (4:1) [23]. A. Banerji *et al*. (1970) and A.K. Batta & S. Rangaswami (1973) isolated ecdysone from the roots of *Achyranthes aspera* [22, 24, 25]. H.N. Khastgir *et al*. (1958) isolated oleanolic acid from glycosidic fraction of the roots [25, 26].

S.K. Sharma et al. (2009) 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 colourless crystalline mass from petroleum ether: benzene 75:25 elute. It responded positively to Liebermann Burchard test for sterols [27].

A.K. Batta & S. Rangaswami (1973) also isolated dihydroxy ketones from the shoots as 36, 37-dihydroxyhenpentacontan-4-one and Triacontanol [24]. Triacontanol was also isolated by T.N. Misra *et al*. (1991) along with 36, 47-dihydroxyhenpentacontan-4-one [17, 28].

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 [29].

Y. Gariballa *et al*. (1983) isolated an aliphatic alcohol, 17-pentatriacontanol from the shoots [30]. T.N. Misra *et al*. (1996) isolated various compounds like tetracontanol-2 ($C_{40}H_{82}O$, melting point 76-77°C), 4-methoxyheptatriacont-1-en-10-ol ($C_{38}H_{76}O$) and β-sitosterol [31].

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, ^{1}H and ^{13}C NMR, MS and quantification by HPLC [33].

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 [8, 34].

V. K. Kapoor & H. Singh (1966) reported betaine ($C_5H_{11}NO_2$) (m.p. 292°C) from the whole plant which is also a water soluble alkaloid [8, 35]. 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 [36, 37]. M. Ali (1993) isolated various compounds from the stem, Pentatriaontane, 6-pentatriacontanone, Hexatriacontane and Tritriacontane [17, 18].

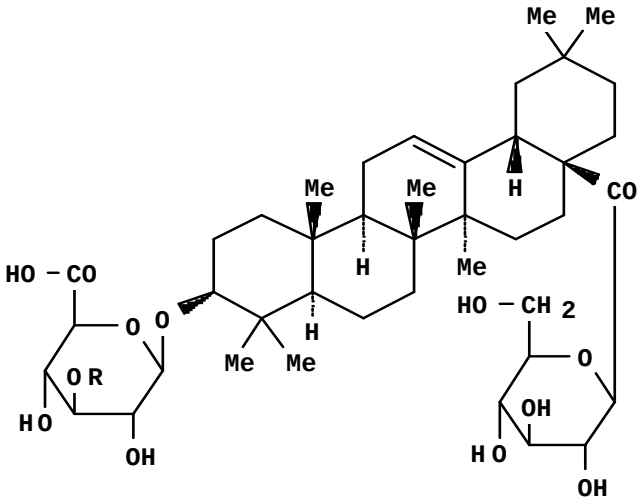
O. Kunert *et al*. (2000) reported three bisdesmosidic saponins (I-III), 20-hydroxyecdysone, and

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 ^{1}H and ^{13}C assignments of the compounds were achieved by means of 2D NMR studies [38].

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-glucopyranosyl3β-[O-α-L-rhamnopyranosyl-(1→3)-O-β-D-glucopyranuronosyloxy]machaerinate, β-D-glucopyranosyl3β-[O-β-D-galactopyranosyl-(1→2)-O-α-Dglucopyranuronosyloxy]machaerinate.

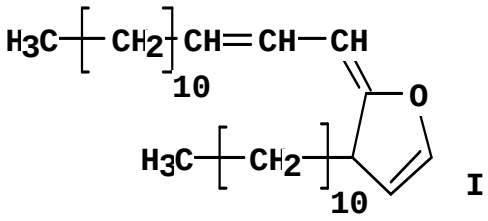
The other saponins were identified as β- D-glucopyranosyl-3β[O-α-L-rhamnopyranosyl-[1→3)-O-β-D-glucopyranuronosyloxy]oleanolate, β-D-glucopyranosyl3-β-[O-β-D-galactopyranosyl (1→2)-O-β-D-glucopyranuronosyloxy] oleanolate, β-D- glucopyranosyl 3β-[O-β-D-glucopyranuronosyloxy] oleanolate [39].

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 [40].

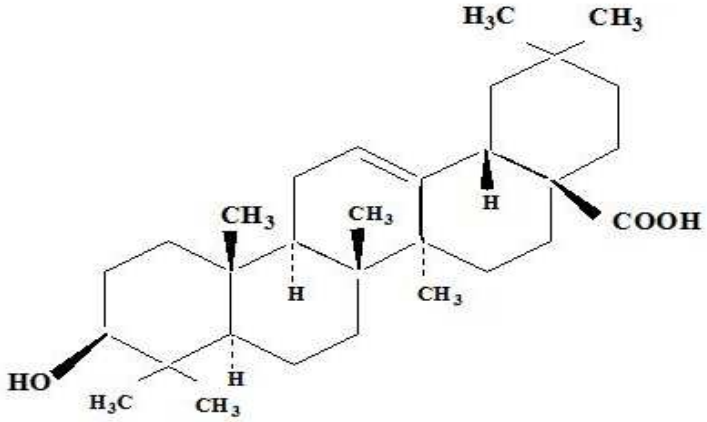


I R= α-L-rhamnopyranosyl
II R= β-D-galactopyranosyl
III R=H

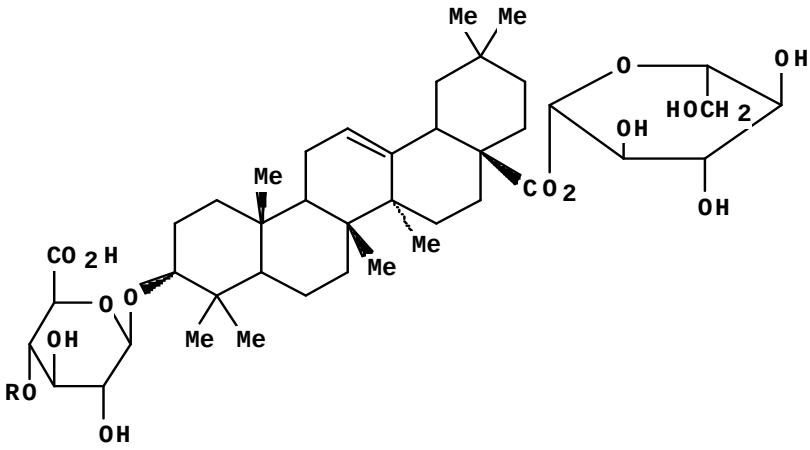
Bisdesmosidic Saponins (I-III)



Cyclic Chain Aliphatic Fatty Acid



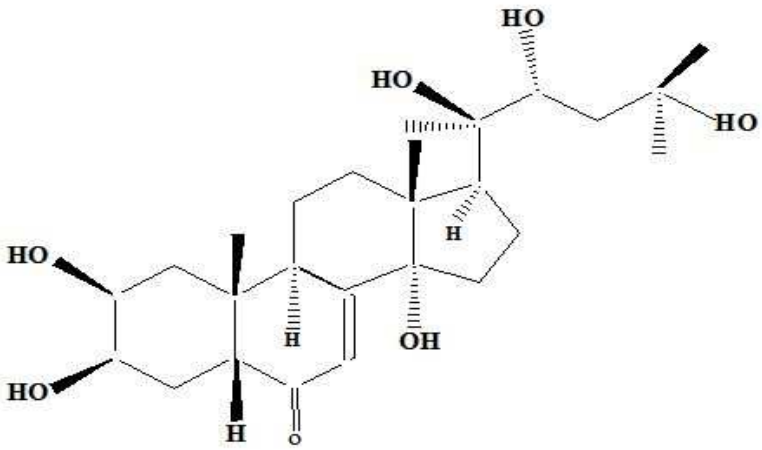
Oleanolic Acid



I, R= α-L-rhamnopyranosyl

II, R= α-L-rhamnopyranosyl-(1 ⟶ 4)- β-D-glycopyranosyl

SAPONINS C (I) & D (II)



ECDYSTERONE

Structures of some phytoconstituents isolated from *Achyranthes aspera*

Pharmacological actions

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. The hydroethanolic, n-hexane and chloroform extracts were found to be most effective for sperm immobilization, sperm viability, acrosome status, 5'-nucleotidase activity and nuclear chromatin decondensation [41].

N. Vasudeva & S.K. Sharma (2006) reported the ethanolic extract of the root of *Achyranthes aspera* shows post coital antifertility activity in female albino rats. The said extract exhibited 83.3% anti-implantation activity when given orally at 200 mg/kg body weight [42].

W. Shibeshi *et al*. (2006) studied effects of methanolic extract of the leaves and reported for anti-fertility activities such as abortifacient, estrogenesity, pituitary weight, and ovarian hormone level and lipids profile in female rats. The abortifacient effect of the methanolic extract of the leaves of *Achyranthes aspera* was determined by counting the dead fetuses *in vivo*. Effect on estrogenesity was assessed by taking the ratio of the uterine weight to body weight. The ratio of the pituitary weight to body weight was also calculated. The effect of the extract on the level of ovarian hormones and lipid profile were evaluated using electrochemiluminescence immunoassay [43].

A. Pakrashi & N. Bhattacharya (1977) reported that benzene extract of the whole plant shows abortifacient activity in mice [44]. D.Paul *et al*. (2006) reported 50% ethanolic extract of the leaf of *Stephania hernandifolia* and the root of *Achyranthes aspera* shows effect on sperm motility and function in a ratio of 1:3 by weight at different concentrations [45]. V. Wadhwa *et al*. (1986) reported n-butanol fraction of aerial parts also shows contraceptive and hormonal properties [46].

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: lxodidae), sheep internal parasite *Paramphistomum cervi* [47].

A. Bagavan *et al*. (2008) studied the acetone, chloroform, ethyl acetate, hexane and methanol leaf extracts of *Achyranthes aspera* against the early fourth-instar larvae of *Aedes aegypti* L and *Culex quinquefasciatus* Say. The larval mortality was observed after 24 h exposure. All extracts showed moderate larvicidal effects; however, the highest larval mortality was found in the ethyl acetate extract of *A. aspera*. In the present study, bioassay-guided fractionation of *A. aspera* led to the separation and identification of a saponin as a potential mosquito larvicidal compound, with LC50 value of 18.20 and 27.24 ppm against *A. aegypti* and *C. quinquefasciatus*, respectively. ^{1}H NMR, ^{13}C NMR and mass spectral data confirmed the identification of the active compound. This is the first report on the mosquito larvicidal activity of the saponin from the ethyl acetate extract of *A. aspera* [48].

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 [49].

Cancer Chemo preventive Activity

A. Chakraborty *et al*. (2002) reported that the methanolic extracts of leaves, alkaloid, non-alkaloid 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 [50].

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 [51].

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. [52]. F.A. Mehta *et al*. (2009) studied the leaves and seeds of *Achyranthes aspera* which shows analgesic activity. Both leaves and seeds show analgesic activity in mice using acetic acid induced writhing response and hot plate method [53]. H. Kumar *et al*. (2009) reported the hydro alcoholic extract of the roots and leaves of *Achyranthes aspera* shows centrally acting analgesic activity in adult male albino rats using tail flick, hot plate and acetic acid induced writhing method for peripherally acting analgesic activity using aspirin as standard drug. The doses administered were 200 mg/kg and 400 mg/kg. The animal that administered a dose of 400 mg/kg leaf extract has shown the maximum analgesic activity [54]. Neogi N *et al*. (1970) reported that achyranthine a water soluble alkaloid had a slight antipyretic activity in rats [34].

Anti-inflammatory and anti-arthritic 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 [55].

The alcoholic extracts of leaves and seeds show anti-inflammatory activity in rats using carrageenan-induced paw edema method and formalin model [53].

T. Vetrichelvan & M. Jegadeesan (2003) reported the alcohol extract of *Achyranthes aspera* was tested on carrageenin-induced hind paw oedema and cotton pellet granuloma models in albino male rats. The paw volume was measured plethysmometrically at 0, 1, 2, 3, 4 and 5 h and diclofenac sodium was used as a standard drug. The alcohol extract (375 and 500 mg/kg) showed the maximum inhibition of oedema of 65.38% and 72.37%, respectively, at the end of 3 h with carrageenan-induced rat paw oedema. Using a chronic test, the extract exhibited a 40.03% and 45.32% reduction in granuloma weight [56]. A.B. Gokhale *et al*. (2002) reported the ethanolic extracts of the *Achyranthes aspera* at the doses of 50, 100 and 200 mg/kg were screened for their effect on acute and chronic inflammation induced in mice and rats using carrageenan and Freund's complete adjuvant model. *A. aspera* inhibited these inflammatory responses at doses of 100-200 mg/kg [57].

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 [58]. S.H.K.R. Prasad *et al*. (2009) studied the various extracts of the leaves and callus of the plant also shows antimicrobial activity [59].

P. Saravanan *et al*. (2008) reported the solvent leaf extracts were tested for antibacterial and antifungal activities against *E. coli, P. aeruginosa, P. vulgaris, S. aureus, Klebsiella* species [60]. T.N. Misra *et al*. (1992) reported 17-pentatriacontanol as a chief constituent isolated from essential oil of the shoots of plant, the oil shows antifungal activity against *Asperigillus carneus* [61].

S. Sharma *et al*. (2006) studied the alcoholic extract which shows the presence of the triterpenoid saponin with dose dependent inhibitory activity against *Staphylococcus aureus*, a bacteria causing skin disease in human beings. Minimum inhibitory concentration was found to be highest (0.15 mg) for purified fraction. The identification of the compound on spectral analysis gave a triterpenoidal saponin purified fraction [62].

M. Manjula *et al*. (2009) studied the extracts of *Achyranthes aspera* for antibacterial activity against various pathogenic strains such as *Escherichia coli, Pseudomonas aeruginosa, Citrobacter* species, *Bacillus subtilis* and *Micrococcus* species using disk diffusion and well plate method. Phytochemical characterization of *Achyranthes aspera* extracts was done by thin layer chromatography (TLC) techniques and other phytochemical analysis. It was found that extracts of *Achyranthes aspera* shows the maximum inhibition of *E. coli* (17 mm) followed by *Pseudomonas* species (14 mm), *Citrobacter* species (12 mm), *Bacillus* species (12 mm) and *Micrococcus* species (12 mm). *Achyranthes aspera* shows predominant inhibition against gram negative bacteria at a higher concentration of 50µg/ml. In the well plate method the inhibition zone ranges from 7 to 19 mm against pathogenic strains thus by increasing the concentration of extracts. From the TLC analysis it shows that formation of color and the RF value indicate the presence of different phytochemicals in the sample. The samples of *Achyranthes aspera* were found to contain alkaloids and tannins [63].

Anti-oxidant Activity

P. Tahiliani & A. Kar (2000) studied various extracts of the leaves for anti-oxidant activity [64]. D.S. Gayathri *et al*. (2009) also reported antioxidant activity on leaves and roots [65].

T. Malarvili & N. Gomathi (2009) reported antioxidant activity on seeds of the plant [66]. *Achyranthes aspera* is well documented for the presence of phytoactive constituents. Reduction in rate of lipid peroxidation and enhancement in free radical scavenging activity of the herbal seed powder is due to presence of phytoactive constituent.

S. Edwin *et al*. (2008) reported free radical scavenging activity of the ethanolic and aqueous extracts. Both extracts were assessed using two methods, DPPH radical scavenging activity, and superoxide scavenging activity. The plant exhibited good antioxidant effect by preventing the formation of free radicals in the two models studied [67].

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 [68].

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 [69].

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 [70]. Achyranthine (5 mg/kg, orally) had diuretic activity in rats [34].

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. Liver homogenate was utilized for assessment of oxidative stress and lung histological examination was performed to investigate the inflammatory status of airway. The results suggest that *Achyranthes aspera* treated rats did not show any airway abnormality [71].

Cardiovascular Activity
Achyranthine, a water-soluble alkaloid isolated from *Achyranthes aspera*, decreased blood pressure and heart rate, dilated blood vessels, and increased the rate and amplitude of respiration in dogs and frogs. The contractile effect of the alkaloid at 0.5 mg/ml on frog rectus abdominal muscle was less than that of acetylcholine (0.1 mg/ml), and its spasmogenic effect was not blocked by tubocurarine [34].

S.S. Gupta *et al*. (1972) studied a mixture of saponins isolated from the seeds of *Achyranthes aspera* increased the force of contraction of the isolated frog, guinea pig and rabbit heart. The stimulant effect of the lower doses (1-50 µg) was blocked by pronethalol and partly by mepyramine. At higher saponin doses, the effect was not blocked by pronethalol. The saponins also increased the tone of the hypodynamic heart and the force of contraction of the failing papillary muscle [72]. 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 [73].

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. Thus the antiallergic activity of *A. aspera* may be due to nonpolar constituents. The phytochemical screening of petroleum ether extract shows the presence of steroids. Literature shows the presence of steroids like β-sitosterol, ecdysone and ecdysterone. Thus these steroids present in the plant may be responsible for the antiallergic activity [74].

Wound Healing Activity
S. Edwin *et al*. (2008) investigated the ethanolic and aqueous extracts of leaves of *Achyranthes aspera* for wound healing activity. The wound healing activity was studied using two wound models, excision wound model and incision wound model [75].

Immunomodulatory Activity
R. Chakrabarti & R.Y. Vasudeva reported that *Achyranthes aspera* show immuno-stimulant

action in Catla catla. *Achyranthes* has significantly ($P < 0.05$) enhanced the BSA-specific antibody titers than the untreated control group throughout the study period. The efficiency of antigen clearance was also enhanced [76].

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. The chronic administration of this drug at the same doses to normal rats for 30 days, lowered serum TC, PL, TG and TL by 56, 62, 68 and 67% respectively followed by significant reduction in the levels of hepatic lipids. The faecal excretion of cholic acid and deoxycholic acid increased by 24 and 40% respectively under the action of this drug. The possible mechanism of action of cholesterol lowering activity of *A. aspera* may be due to rapid excretion of bile acids causing low absorption of cholesterol [77].

CONCLUSION

The herbals occupied a distinct place in the life right from the primitive period till date and provided information on the use of plants or plant products and products as medicine [78]. The use of medicinal plants in the management of various illnesses is due to their phytochemical constituents and dates back antiquity [79].

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 ecdysterone, achyranthine, betaine, pentatriaontane, 6-pentatriacontanone, hexatriacontane and tritriacontane. The plant shows many pharmacological activities like spermicidal, anti-allergic, cardiovascular, nephroprotective, antiparasitic, hypoglyceamic, analgesic and antipyretic. Many traditional uses are also reported like antiperiodic, purgative and laxative, in various types of gastric disorders and in body pain which are being studied till today and further research has to be done. Thus, *Achyranthes aspera* is quite promising as a multipurpose medicinal agent so further clinical trials should be performed to prove its efficacy.

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REFERENCES

[1] D. Bown. *Encyclopaedia of Herbs.* The Royal Horticulture Society, Dorling Kindersley Ltd., 14.
[2] P.K. Mukherjee. *Quality control of herbal drugs.* Business Horizon Pharmaceutical Publishers, **2008,** 13.
[3] M.M. Pandey, S. Rastogi, A.K. Rawat. *The Internet Journal of Alternative Medicine,* **2008,** 6(1): 1-10.
[4] Vijayan Arun, V.B. Liju, John J.V. Reena, B. Parthipan, C. Renuka. *Indian Journal of Traditional Knowledge,* **2007,** 6(4), 589-594.

[5] Y. Tijani, M. O. Uguru, O. A. Salawu. *African Journal of Biotechnology*, **2008,** 7(6), 696-700.
[6] P.C. Pande, Lalit Tiwari, H.C. Pande. *Indian Journal of Traditional Knowledge*, **2007,** 6(3), 444-458.
[7] Jitendra B. Jain, Sheetal C. Kumane, S Bhattacharya. *Indian Journal of Traditional Knowledge*. **2006**, 5(2), 237-242.
[8]Anonymous. *The Wealth of India* - Raw Materials, Council of Scientific & Industrial Research, New Delhi, **2005,** 55-57.
[9]R. Zafar. *Medicinal Plants of India*. CBS publishers & distributors, **2009,** 1-15.
[10] R.K. Gupta. *Medicinal & Aromatic Plants*. CBS publishers & distributors, **2010,** 190.
[11] K.M. Nadkarni. *Indian Materia Medica*. Bombay Popular Prakashan, **2009,** Vol.I, 21.
[12] N.K. Bhattaraj. *Fitoterapia* **(1992),** 63(6), 497-506
[13] V.K.Singh, Z.A. Ali, S.T.H. Zaidi. *Fitoterapia* **(1996),** 67(2), 129-139.
[14] C.P. Khare. *Indian medicinal plants*. Springer, **2007,** 11-13.
[15] Anonymous. *The Wealth of India* - Raw Materials, Council of Scientific & Industrial Research (CSIR), New Delhi, **2007,** 17-18.
[16] V. Hariharan, S. Rangaswami. *Phytochemistry*, **1970,** 9, 409-414.
[17] Ram P. Rastogi, B.N. Mehrotra. *Compendium of Indian Medicinal plants*. Central Drug Research Institute, Lucknow and National institute of science communication and information resources, New Delhi, Vol.V, **2004,** 7-8, 11.
[18] M. Ali. *Oriental Journal of Chemistry*, **1993,** 9(1), 84-85.
[19] R.D. Rameshwar, N. Akito. *Natural Product Communications*, **2007,** 2(7), 727-730.
[20] A.S. Chauhan, G. S. Rawat, C. P. Singh. *Asian Journal of Chemistry*, **2002,** 14(2), 1059-1061.
[21] H.N. Khastgir, S. K. Sen Gupta, P. Sen Gupta. *Journal of the Indian Chemical Society*, **1958,** 35, 693-694.
[22] A. Banerji, M.S. Chadha. *Phytochemistry*, **1970,** 9(7), 1671.
[23] R. Ikan, U. Ravid, D. Trosset, E., Shulman. *Experientia*, **1971,** 27(5), 504-505.
[24] A.K. Batta, S. Rangaswami. *Phytochemistry*, **1973,** 12(1), 214-216.
[25] Ram P. Rastogi, B.N. Mehrotra. *Compendium of Indian Medicinal plants*. Central Drug Research Institute, Lucknow and National institute of Science Communication and Information Resources, New Delhi, Vol.II, **2004,** 8.
[26] H.N. Khastgir, P.S. Gupta. *Journal of the Indian Chemical Society*, **1958,** 35, 529-530.
[27] S.K. Sharma, N. Vasudeva, M. Ali. *Indian Journal of Chemistry - Section B Organic and Medicinal Chemistry*, **2009,** 48(8), 1164-1169.
[28] T.N. Misra, R.S. Singh, H.S. Pandey, C. Prasad. *Phytochemistry*, **1991,** 30(6), 2076-2078.
[29] T.G. Misra, R.S. Singh, H.S. Pandey. *Phytochemistry*, **1993,** 33(1), 221-223.
[30] Y. Gariballa, G.M. Iskander, El Beit Daw. *Fitoterapia*, **1983,** 54, 269-272.
[31] 31.T.N. Misra, R.S. Singh, H.S. Pandey , C. Prasad, S. Singh. *Indian Journal of Chemistry - Section B Organic and Medicinal Chemistry*, **1996,** 35B(6), 637-639.
[32] A. Banerji, G.J. Chintalwar, N.K. Joshi. *Phytochemistry*, **1971,** 10(9), 2225-2226.
[33] K. S. Laddha, D. Ghosh. *Natural Products*, **2005,** 1(1-2), 1-4.
[34] N. C. Neogi, R. D. Garg, R. S. Rathor. *Indian Journal of Pharmacy*, **1970,** 32(2), 43-46.
[35] V. K. Kapoor, H. Singh. *Indian Journal of Chemistry*, **1966,** 4(10), 461.
[36] Ram P. Rastogi, B.N. Mehrotra. Compendium of Indian Medicinal plants" Central Drug Research Institute, Lucknow and National Institute of Science Communication and Information Resources, New Delhi, Vol.III, **2004,** 10.

[37] V. Seshadri, A. K. Batta, S. Rangaswami. *Indian Journal of Chemistry - Section B Organic Chemistry Including Medicinal Chemistry*, **1981,** 20B(9), 773-775.

[38] O. Kunert, E. Haslinger, M.G. Schmid, J. Reiner, F. Bucar, E. Mulatu, D. Abebe, A. Debella. *Monatshefte fur Chemie*, **2000,** 131(2), 195-204.
[39] G. Michl, D. Abebe, F. Bucar, A. Debella, O. Kunert, M.G. Schmid, E. Mulatu, E. Haslinger. *Helvetica Chimica Acta*, **2000,** 83(2), 359-363.
[40] R.D. Rameshwar. *Indian Perfumer*, **2007,** 51(1), 33-34.
[41] D. Paul, D. De, K.M. Ali, K. Chatterjee, D.K. Nandi, D. Ghosh. *Contraception*, **2010,** 81(4), 355-361.
[42] N.Vasudeva, S.K. Sharma. *Journal of Ethnopharmacology*, **2006,** 107(2), 179-181.
[43] W. Shibeshi, E. Makonnen L. Zerihun, A. Debella. *African Health Science*, **2006,** 6(2), 108-112.
[44] A. Pakrashi, N. Bhattacharya. *Indian Journal of Experimental Biology*, **1977,** 15(10), 856-858.
[45] D. Paul, S. Bera, D. Jana, R. Maiti, D. Ghosh. *Contraception*, **2006,** 73(3), 284-288.
[46] V. Wadhwa, M.M. Singh, D.N. Gupta, C. Singh, V.P. Kamboj. *Planta medica*, **1986,** 52(3), 231-233.
[47] A.A. Zahir, A.A. Rahuman, C. Kamaraj, A. Bagavan, G. Elango, A. Sangaran, B.S. Kumar. *Parasitology Research*, **2009,** 105(2), 453-461.
[48] A. Bagavan, A.A. Rahuman, C. Kamaraj, K. Geetha. *Parasitology research*, **2008,** 103(1), 223-229.
[49] M.S. Akhtar, J. Iqbal. *Journal of Ethnopharmacology*, **1991,** 31(1), 49-57.
[50] A. Chakraborty, A. Brantner, T. Mukainaka, Y. Nobukuni, M. Kuchide, T. Konoshima, Tokuda H., Nishino H. *Cancer letter*, **2002,** 177(1), 1-5.
[51] A.R. Bafna, S.H. Mishra. *Ars Pharmaceutica*, **2004,** 45(4), 343-351.
[52] N.G. Sutar, U.N. Sutar, Y.P. Sharma, I.K. Shaikh, S.S. Kshirsagar. *Biosciences Biotechnology Research Asia*, **2008,** 5(2), 841-844.
[53] F.A. Mehta, B.G. Patel, S.S. Pandya, K.B. Ahir, S.B. Patel. *Pharmacologyonline*, **2009,** 3, 978-985.
[54] H. Kumar, D. Singh, S.K.S. Kushwaha, A.K. Gupta. *Der Pharmacia Lettre*, **2009,** 1(2), 193-198.
[55] S.Vijaya Kumar, P. Sankar, R. Varatharajan. *Pharmaceutical Biology*, **2009,** 47(10), 973-975.
[56] T. Vetrichelvan, M. Jegadeesan. *Phytotherapy research*, **2003,** 17(1), 77-79.
[57] A.B. Gokhale, A.S. Damre, K.R. Kulkami, M. Saraf. *Phytomedicine*, **2002,** 9(5), 433-437.
[58] M.T.J. Khan, K. Ahmad, M.N. Alvi, Noor-Ul-Amin, B. Mansoor, M. Asif Saeed, F.Z. Khan, M .Jamshaid. *Pakistan Journal of Zoology*, **2010,** 42(1), 93-97.
[59] S.H.K.R. Prasad, N.L. Swapna, K. Anthonamma, Rajasekhar D. Madanprasad. *Biosciences Biotechnology Research Asia*, **2009,** 6(2), 887-891.
[60] P. Saravanan, V. Ramasamy, T. Shivakumar. *Asian Journal of Chemistry*, **2008,** 20(1), 823-825.
[61] T.N. Misra, R.S. Singh, H.S Pandey, C. Prasad, B.P. Singh, *Phytochemistry*, **1992,** 31(5), 1811-1812.
[62] S. Sharma, P. N. Shrivastava, R. C. Saxena. *Asian Journal of Chemistry*, **2006,** 18(4), 2766-2770.
[63] M. Manjula, V. Indira, P. Dhasarathan. *Asian Journal of Microbiology, Biotechnology & Environmental Sciences*, **2009,** 11(2), 365-368.
[64] P. Tahiliani, A. Kar. *Journal of Ethnopharmacology*, **2000,** 71(3), 527-532.

[65] D.S. Gayathri, A. Archanah, P. Abiramasundari, V. Priya, K. Uma, T. Abirami. *Indian Journal of Nutrition and Dietetics*, **2009,** 46(12), 485-490.
[66] T. Malarvili, N. Gomathi. *Biosciences Biotechnology Research Asia,* **2009,** 6(2), 659-664.
[67] S. Edwin, E. Jarald, D.L. Edwin, A. Jain, H. Kinger, K.R. Dutt, A.A. Raj. *Pharmaceutical Biology*, **2008,** 46(12), 824-828.
[68] T. Jayakumar, M.P. Sridhar, T.R. Bharathprasad, M. Ilayaraja, S. Govindasamy, M.P. Balasubramanian. *Journal of Health Science*, **2009,** 55(5), 701-708.
[69] C.C. Barua, A. Talukdar, S.A. Begum, B. Buragohain, J.D. Roy, R.S. Borah, M. Lahkar. *Pharmacologyonline*, **2009,** 2, 587-594.
[70] S.S. Gupta, S.C.L. Verma, A.K. Ram, R.M. Tripathi. *Ind.J.Pharmac.*, **1972,** 4(4), 208-214.
[71] B.R. Goyal, S.G. Mahajan, R.G. Mali, R.K. Goyal, A.A. Mehta. *Global Journal of Pharmacology*, **2007,** 1(1), 6-12.
[72] S.S. Gupta, A.W. Bhagwat, A.K. Ram. *Indian Journal of Medical Research (1913-1988)*, **1972,** 60(3), 462-471.
[73] A. K. Ram, A. W. Bhagwat, S. S. Gupta. *Indian Journal of Physiology and Pharmacology*, **1971,** 15(3), 107-110.
[74] S.B. Datir, A.B. Ganjare, S.A. Nirmal, S.B. Bhawar, D.K. Bharati, M.J. Patil. *Pharmacologyonline*, **2009**, 921-925.
[75] S. Edwin, E. Jarald, D.L. Edwin, A. Jain, H. Kinger, K.R. Dutt, A.A. Raj. *Pharmaceutical Biology*, **2008,** 46(12), 824-828.
[76] R. Chakrabarti, R.Y. Vasudeva. *International Immunopharmacology*, **2006,** 6(5), 782-790.
[77] A.K. Khanna, R. Chander, C. Singh, A.K. Srivastava, N.K. Kapoor. *Indian Journal of Experimental Biology*, **1992,** 30(2), 128-130.
[78] B.Saikia. Indian Journal of Traditional Knowledge, **2006,** 5(4), 529-530.
[79] N. Chahlia. *Journal of medicinal plants research*, **2009**, 3(6), 481-484.