

## PHYTOCHEMICAL CONSTITUENTS AND PHARMACOLOGICAL USES OF MEDICINAL PLANT *ACHYRANTHES ASPERA*: A REVIEW

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### ABSTRACT

*Achyranthes aspera* is the important medicinal herb found as weed throughout tropical region of Nepal. It belongs to the family *amaranthaceae*. It is known as dattiwani in nepali, Apamarg in Sanskrit, prickly chaff flower in English and Naayuruvi in tamil. The medicinal plants are used for treatment of various diseases because of their safety and effectiveness. 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 major chemical constituents are carbohydrates, protein, glycosides, alkaloids, tannins, saponins, flavonoids, lignin etc. 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 plant is used in indigenous system of medicine as emenagogue, antiarthritic, antifertility, laxative, ecobolic, abortifacient, and anti-helminthic, aphrodisiac, antiviral, anti-plasmodic, and antihypertensive, anticoagulant, diuretic and anti-tumor. It is also useful to treat cough, renal dropsy, fistula, scrofula, skin rash, nasal, infection, chronic malaria, impotence, fever, asthma, piles and snake bites. This plant is astringent, digestive, diuretic, laxative, purgative and stomachic. The juice of the plant is used in the treatment of boils, diarrhea, dysentery, hemorrhoids, rheumatic pains, itches and skin eruption. The methanolic extraction gives more yields than the alcohol and petroleum ether.

**Keywords:** *Achyranthes aspera*, antiasthmatic, hepatoprotective, emenagogue, ecobolic.

### INTRODUCTION

Nepal, a Himalayan country, represents one of the world's richest pockets in plant diversity.<sup>[1]</sup> 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. <sup>[2]</sup> The plants are potential source of medicines since ancient times. Medicinal plants play an important role in the development of potent therapeutic agents. 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 disease <sup>[3]</sup>

#### Scientific classification <sup>[4]</sup>

Kingdom	- Plantae
Subkingdom	- Tracheobionta
Unranked	- Angiosperms
Super division	- Spermatophyta
Division	- Magnoliophyta
Class	- Magnoliopsida
Subclass	- Caryophyllidae
Order	- Caryophyllales
Family	- Amaranthaceae
Genus	- Achyranthes
Species	- Aspera

**Plant description:** Growth form: perennial hair herb up to 1.2 m tall.

**Foliage:** 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.

**Stem:** Stems are 4 sided and covered in short hairs.

**Flow:** Flowers are arranged in a 10-30 cm long spike inflorescence which is initially erect, but later bends backwards after the flowers bloom.

**Fruits:** Dry, indehiscent fruit known as a utricle is bladder- like and covered by loose, papery tissue. Each egg-shaped fruit (2.5-3mm long) contains 1 brown, egg-shaped seed (2mm long). <sup>[5]</sup>

#### Distribution

Achyranthes is an herb found as weed throughout tropical region of Nepal. It was reported as an invasive alien species in northern Bangladesh. <sup>[6]</sup>



**Figure: 1: Achyranthes aspera tender part with inflorescence**

### Chemical constituent

Preliminary chemical examination of the seeds of *Achyranthes aspera* which were identified as  $\alpha$ -L-rhamnopyranosyl-(1<sub>4</sub>)-(β-D-glucopyranosyluronic acid)-(1<sub>3</sub>)-oleanolic acid,  $\alpha$ -L-rhamnopyranosyl-(1<sub>4</sub>)-(β-D-glucopyranosyluronic acid)-(1<sub>3</sub>)-oleanolic acid-28-O-β-D-glucopyranoside and  $\alpha$ -L-rhamnopyranosyl-(1<sub>4</sub>)-(β-D-glucopyranosyluronic acid)-(1<sub>3</sub>)-oleanolic acid-28-O-β-D-glucopyranosyl-(1<sub>4</sub>)-β-D-glucopyranoside.<sup>6</sup> Betaine, achyranthine, hentriacontane, ecdysterone, achyranthes saponins A,B,C,D are the major chemical constituents found in *Apamarg*.<sup>[7]</sup>

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., pbenzoquinone, hydroquinone, spathulenol, nerol,  $\alpha$ -ionone, asarone and eugenol constituting 63.05% of the oil was identified. Hydroquinone (57.7%) was found to be the chief constituent.<sup>[8]</sup>

Aziz. *et. al.* (2005), isolated 3-Acetoxy-6-benzoyloxyapangamide from an ethyl acetate extract of the stem of *Achyranthes aspera*. The structure of the isolated compound was established by modern spectroscopic techniques.<sup>[9]</sup>

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-D-glucopyranuronosyloxy]machaerinate. The other saponins were identified as β-D-

glucopyranosyl-3 $\beta$ [O- $\alpha$ -L-rhamnopyranosyl-[1 $\rightarrow$ 3)- O- $\beta$ -D-glucopyranuronosyloxy] oleanolate,  $\beta$ -D-glucopyranosyl3- $\beta$ -[O- $\beta$ -D-galactopyranosyl (1 $\rightarrow$ 2)-O- $\beta$ -D-glucopyranuronosyloxy] oleanolate,  $\beta$ -D- glucopyranosyl 3 $\beta$ -[O- $\beta$ -Dglucopyranuronosyloxy] oleanolate.<sup>[10]</sup>

A.S. Chauhan et al. (2002) isolated a new cyclic chain aliphatic fatty acid (I) was also isolated from seeds of the plant.<sup>[11]</sup>

H.N. Khastgir et al. (1958) isolated sapogenin along with oleanolic acid from the seeds.<sup>[12]</sup>

A. Banerji et al. (1970) isolated ecdysterone from the methanolic extract of roots of *Achyranthes aspera*.<sup>[13]</sup>

R. Ikan et al (1971) also isolated ecdysterone from *Achyranthes aspera* root extracts by chromatography on silica gel column, followed by elution with CHCl<sub>3</sub>-MeOH (4:1).<sup>[14]</sup>

A.Banerji et al. (1970) and A.K. Batta & S. Rangaswami (1973) isolated ecdysone from the roots of *Achyranthes aspera*.<sup>[13, 15, 16]</sup>

H.N. Khastgir et al. (1958) isolated oleanolic acid from glycosidic fraction of the roots.<sup>[17]</sup>

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- $\beta$ -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- $\beta$ -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.<sup>[18]</sup>

A.K. Batta & S. Rangaswami (1973) also isolated dihydroxy ketones from the shoots as 36, 37- dihydroxyhenpentacontan-4-one and Triacontanol<sup>15</sup>. Triacontanol was also isolated by T.N.

Misra et al. (1991) along with 36, 47-dihydroxyhenpentacontan-4-one.<sup>[19, 20]</sup>

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.<sup>[21]</sup>

Y. Gariballa et al. (1983) isolated an aliphatic alcohol, 17-pentatriacontanol from the shoots.<sup>[22]</sup>

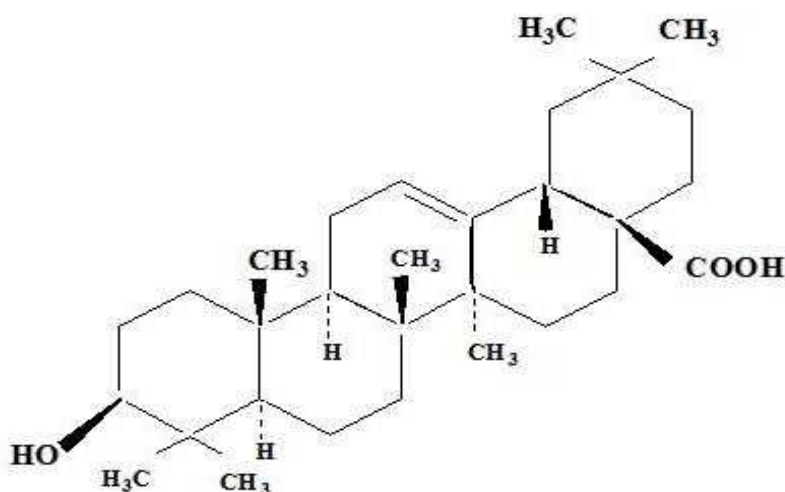
T.N. Misra et al. (1996) isolated various compounds like tetracontanol-2 (C<sub>40</sub>H<sub>82</sub>O, melting point 76-77°C), 4-methoxyheptatriacont-1-en-10-ol (C<sub>38</sub>H<sub>76</sub>O) and  $\beta$ -sitosterol.<sup>[23]</sup>

A. Banerji et al. (1971) isolated ecdysterone from the whole plant.<sup>24</sup> 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, <sup>1</sup>H and <sup>13</sup>C NMR, MS and quantification by HPLC.<sup>[25]</sup>

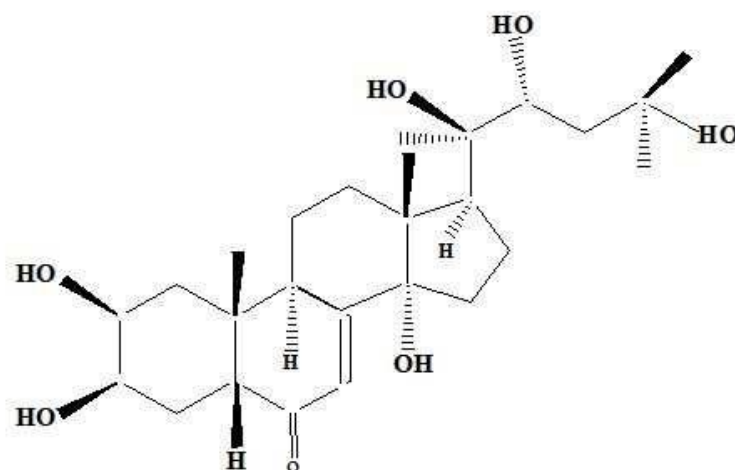
V. K. Kapoor & H. Singh (1966) reported betaine (C<sub>5</sub>H<sub>11</sub>NO<sub>2</sub>) (m.p. 292°C) from the whole plant which is also a water soluble alkaloid. The identity of betaine was confirmed by mixed m.p. detection of the HCl-salt, oxalate and picrate derivatives and compared with those of an authentic sample.<sup>[26, 27]</sup>

V. Seshadri et al. (1981) isolated two constituents from the fruits and were identified as Saponins C and D.<sup>[28,29]</sup> M. Ali (1993) isolated various compounds from the stem, Pentatriacontane, 6-pentatriacontanone, Hexatriacontane and Tritriacontane.<sup>[16, 30]</sup>

O. Kunert. et al. (2000) reported three bisdesmosidic saponins (I-III), 20-hydroxyecdysone, and quercetin-3-O- $\beta$ -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 <sup>1</sup>H and <sup>[13]</sup> C assignments of the compounds were achieved by means of 2D NMR studies.<sup>[31]</sup>



### Oleanolic Acid



## MEDICINAL USE

### Thrombolytic activity

Rishikesh et al (2013) reported that plant extracts of *Achyranthes aspera* shows the thrombolytic activity in human moderately. <sup>[32]</sup>

### Anti-oxidant Activity

Priya et al. (2010) reported antioxidant activity of stem of *Achyranthes aspera* on methanolic extracts. <sup>[33]</sup>

Alagar et al (2014) reported that crude plant extracts showed potent antioxidant activities against the tested methods. <sup>[34]</sup>

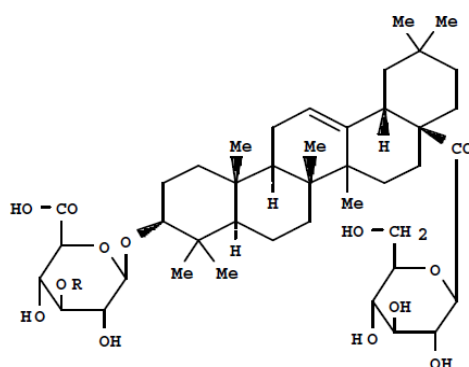
P. Tahiliani & A. Kar (2000) studied various extracts of the leaves for anti-oxidant activity. [35]

D.S. Gayathri et al. (2009) also reported antioxidant activity on leaves and roots. [36]

T. Malarvili & N. Gomathi (2009) reported antioxidant activity on seeds of the plant. [37]

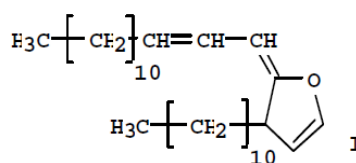
*Achyranthes aspera* is well documented for the presence of phytoactive constituents. Reduction in rate of lipid peroxidation and enhancement in free radical scavenging activity of the herbal seed powder is due to presence of phytoactive constituent.

## ECDYSTERONE



- I R=  $\alpha$ -L-rhamnopyranosyl  
 II R=  $\beta$ -D-galactopyranosyl  
 III R=H

Bisdesmosidic Saponins (I-III)



Cyclic Chain Aliphatic Fatty Acid

Structures of some phytoconstituents isolated from *Achyranthes aspera* [3]

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. [38]

**Antimicrobial Activity**

S.R. Neeta et al (2011) studied the methanolic extracts of *Achyranthes aspera* against the various bacteria species were found susceptible to organism at higher concentration. <sup>[39]</sup>

S. Narendhiran et.al (2014) reported the various extracts of *Achyranthes aspera* tested for antibacterial activity against some bacteria are *E.coli*, *P. mirabilis*, *S. typhi*, *E.aerogenes* and antifungal activity against some fungus like *Aspergillusniger*, *Dreshleraturcica*, *Aspergillusflavus*, *Fusariumverticillioides*. It shows mild activity. <sup>[40]</sup>

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*. <sup>[41]</sup>

S.H.K.R. Prasad et al. (2009) studied the various extracts of the leaves and callus of the plant also shows antimicrobial activity. <sup>[42]</sup>

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*, and *Klebsiella* species. <sup>[43]</sup>

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*. <sup>[44]</sup>

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. <sup>[45]</sup>

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. <sup>[46]</sup>

### 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. <sup>[47]</sup>

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. <sup>[48]</sup>

W. Shibeshi et al. (2006) studied effects of methanolic extract of the leaves and reported for antifertility activities such as abortifacient, estrogenicity, 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 estrogenicity 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 electrochemoluminescence immunoassay. <sup>[49]</sup>

A. Pakrashi & N. Bhattacharya (1977) reported that benzene extract of the whole plant shows abortifacient activity in mice. <sup>[50]</sup>

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.<sup>51</sup> V. Wadhwa et al. (1986) reported n-butanol fraction of aerial parts also shows contraceptive and hormonal properties. <sup>[52]</sup>

### 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*.<sup>[53]</sup>

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. <sup>1</sup>H NMR, <sup>13</sup>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*.<sup>[54]</sup>

### Hypoglycemic Activity

M.S. Akhtar & J. Iqbal (1991) studied the aqueous and methanolic extracts of the powdered whole plant, which shows hypoglycemic activity. Blood glucose levels of normal and Alloxan induced diabetic rabbits were determined after oral administration of various doses.<sup>[55]</sup>

Vidhya et al. (2012) reported that the extracts of *achyranthes aspera* lower the blood glucose level in dose dependent manner. This investigation evaluates the ant diabetic efficacy of this plant.<sup>[56]</sup>

### 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 by tumor promoter 12-O-tetradecanoylphorbol-13-acetate in Raji cells.<sup>[57]</sup>

### 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. <sup>[58]</sup>

**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. <sup>[59]</sup>

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. <sup>[60]</sup>

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. <sup>[61]</sup> Neogi N et al. (1970) reported that achyranthine a water soluble alkaloid had a slight antipyretic activity in rats. <sup>[62]</sup>

#### **Anti-inflammatory and anti-arthritis activity**

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. <sup>[63]</sup>

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. <sup>[64]</sup> The alcoholic extracts of leaves and seeds show anti-inflammatory activity in rats using carrageenan-induced paw edema method and formalin model. <sup>[65]</sup>

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. <sup>[66]</sup>

### **Nephroprotective Activity**

T.Chanderdeep et.al ( 2011) studied indicate that the aqueous extracts *achyranthes aspera* roots prevented urolithiasis induced with ethylene glycol and reduced the growth of calcium oxalate stones. The extract was effective in reducing the renal tissue injury, decreasing the crystal size and thus facilitating easy expulsion and restoring normal kidney architecture in rats. <sup>[67]</sup>

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. <sup>[68]</sup>

### **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. <sup>[69]</sup>

### **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. <sup>[70]</sup> *Achyranthine* (5 mg/kg, orally) had diuretic activity in rats. <sup>[62]</sup>

Saurabh Srivastav et al (2011) reported the methanolic extracts of whole plant of *achyranthes aspera* showed high diuretic effect in male rats. <sup>[71]</sup>

### **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. <sup>[72]</sup>

### 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. <sup>[62]</sup>

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. <sup>[73]</sup>

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. <sup>[74]</sup>

### 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  $\beta$ -sitosterol, ecdysone and ecdysterone. Thus these steroids present in the plant may be responsible for the antiallergic activity. <sup>[75]</sup>

### 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. <sup>[76]</sup>

### 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. <sup>[77]</sup>

### Hypolipidemic Activity

Venkatalakshmi P (2012) reported that *Achyranthes aspera* aqueous extracts showed Hypolipidemic effect on High fat diet induced atherogenic rats. <sup>[78]</sup>

A.K. Khanna et al. (1992) investigated the alcoholic extract of *A. aspera*, at 100 mg/kg dose lowered serum cholesterol (TC), phospholipids (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 the 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. <sup>[79]</sup>

### CONCLUSION

The review reveals that wide numbers of phytochemical constituents have been isolated from the plant. *Achyranthes aspera* also possesses activities like antiperiodic, diuretic, purgative, laxative, antiasthmatic, hepatoprotective, anti-allergic, antifertility, laxative, abortifacient, anti-helminthic, aphrodisiac, antiviral, anti-plasmodic, hypoglycemic, antihypertensive, anticoagulant, anticancer and various other important medicinal properties.

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