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Euphorbia Prostrata : A plant review

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ABSTRACT

Medicinal plants are the best source to obtain different drugs, about 80% of people in industrialized countries uses traditional medicines for their health benefit. *Euphorbia prostrata* Ait (Euphorbiaceae) is a reputed drug in the Indian system of medicine and used in treatment of many diseases of skin, digestive system, antiasthmatic, antidiabetic, haemorrhoids *etc*. it is also used traditionally as snake bite remedy. *Euphorbia prostrata* contains alkaloids, glycosides, terpenoids, saponins, tannins, steroids, flavonides, phenolics and phenolic acids, carbohydrates, monosaccharides. The reported activities of *Euphorbia prostrata* are Anti-inflammatory ,Anti oxident activity, Anthelmentic, Anti-salmonella, Antihyperglycemic and hypolipidemic, Analgesic, Hepatoprotective, Gastroprotective, Anti-bacterial and Anti-fungal activities. However, in-depth studies are needed on the clinical use of *Euphorbia prostrata* against human diseases. Besides, detailed toxicological analysis is also to be performed for its safe and efficacious use in preclinical and clinical studies as a health-promoting herb.

INTRODUCTION

Euphorbia prostrata Ait (Euphorbiaceae) is small annual herb found all over India especially in foot hills of Himalayas. [1] It is native to the West Indies and certain parts of South America and also widely naturalized in many other parts of the world. The two varities found are red and green. These are branched *prostrata* with many stems spreading from the roots, slender upto 20cm long, leaves green but occasionally purplish red. It grows on sand, trampled ruderal areas, railroad tracts, near roads and between in gardens and fields. It flowers from mid june to september.[2] It is a reputed drug in the Indian system of medicine and used in treatment of many diseases of skin, digestive system, antiasthmatic, antidiabetic, haemorrhoids etc. it is also used traditionally as snake bite remedy.[1] Extracts of the plant have been studied and marketed in India as a treatment for hemorrhoids.[15] The present review encompasses the various pharmacological activities of *Euphorbia prostrata* that have been reported in the last two decades with notes on its traditional uses, phytochemistry, clinical and toxicological aspects.

VERNACULAR NAMES:

English:- Equirity

Hindi:- Lal dudhi

Kannada:- Akkegida

Tamil:- Amman pacharisi

Malayalam:- Nelapalai

Telugu:- Nanabala

Sanskrit:- Nagarjuni

MICROSCOPIC CHARACTERS:

T.S. of the root shows the presence of the cork cells, cortex, endodermis, phloem, medulary rays and xylem; the stem shows the presence of multicellular trichome, epidermis, cortex , cuticle, endodermis, pericycle, phloem, latex canal, xylem and pith; the leaf reveal the presence of multicellular, multiseriate glandular hairs, epidermis, vascular bundles, stomata anomocytic and anisocytic,[6] upper and lower stomatal index is 11.7-18.7 and 17.6-26.3 respectively, vein islet number is found to be 2-5 and

PLANT PROFILE

Fig : The picture of Euphorbia prostrata

TAXANOMY [16]

Kingdom	Plantae
Subkingdom	Viridiplantae
Infrakingdom	Streptophyta
Superdivision	Embryophyta
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Mangnoliopsida
Superorder	Rosanae
Order	Malpighiales
Family	Euphorbiaceae
Genus	*Euphorbia*
Species	*Euphorbia prostrata*

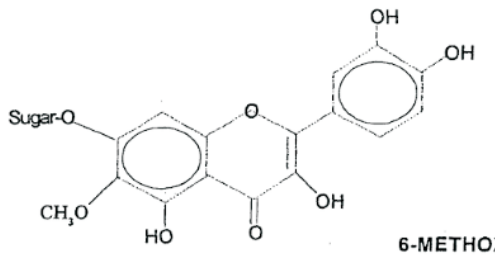
BOTONICAL DESCRIPTION : [3,4,5]

Characters	Root	Stem	Leaf
Length	8 to 12 cm	17 to 20 cm	2.5 to 5 mm
Breadth	0.2 to 0.4 cm	0.3 to 0.5 cm	2 to 4 mm
Colour	Pale yellowish downwards, creamish from inner side	Green or purple tint from outside, creamish from inner side	Green ,purplish red
Branching	One primary long vertical root, some secondary root at stem base	Branched	Opposite, petiole short, margin serrulate
Fracture	Tough	Fibrous	Fibrous

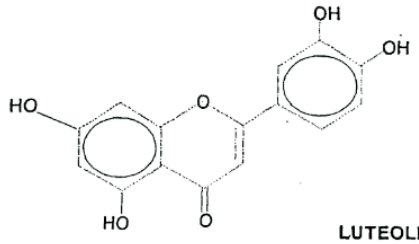
vein termination number is found to be 5-13.[7,8]

PHYTOCONSTITUENTS:

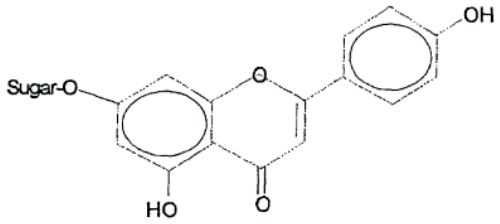
Euphorbia prostrata conatins alkaloids, glycosides, terpenoids, saponins, tannins, steroids, flavonides, phenolics and phenolic acids, carbohydrates, monosaccharides.[8] From different fractions of extracts of the dried leaves a range of hydrolyzable ellagitannins were isolated, including prostratins A, B and C, euphorbins G and H, tellimagradin I and II, and rugosins A, D, E and G. Flavonoids isolated from the aerial parts include: kaempferol, cosmosiin (apigenin-7-glucoside), rhamnetin-3-galactoside, quercetin, lutiolin, 6-methoxy-quercetin glycosides and quercetin-3-rhamnoside. Other constituents of the aerial parts include the sterols β-amyrine acetate, β-sitosterol, campesterol, stigmasterol and cholesterol. The aerial parts also contain the terpene alcohol β-terpineol, gallic acid, corilagin, 1,2,3-tri-O-galloyl-D-glucose, geraniin, and various amino acids, including n-valeramide and N,N-dimethyl-4-benzoxybutylamine. From the roots a myricylic alcohol and two triterpenes, taraxerol and tirucallol, have been isolated.[9]



6-METHOXY-QUERCETIN GLYCOSIDE



LUTEOLIN



APIGENIN GLYCOSIDE

TRADITIONAL USES:

All parts of *Euphorbia prostrata* are widely used in African traditional medicine and many other parts of India. leaf decoction is drunk to treat threatened abortion, plants are inserted into the vagina to treat female sterility and painful menstruation.Ground leaves in water are administered against difficult childbirth.other uses like amoebic dysentery, inflammations, headache, insect bites, fungal infection, gonorrhoeadiarrhoea, dysentery, stomach-ache, bleeding hemorrhoids, treatment of piles, analgesic, skin diseases, antiasthmatic, and antidiabetic. [9,10]

PHARMACOLOGICAL STUDIES:

ANTI-INFLAMMATORYACTIVITY:[11]

Anti-inflammatory studies were conducted in rats on an ethanol extratct of whole plant *Euphorbia prostrata* and its partitioned fractions. The ethyl acetate fraction in an oral dose of 200mg/kg, inhibited 76% of acute carrageenan-induced paw edema. A fraction,labelled as KSE-23, isolated from the ethyl acetate fraction inhibited 57% of pedal edema at a dose of 8mg/kg. acute inflammatory studies of fractions using histamine and bradykinin-induced pedal edema indicated a selective inhibition of histamine-induced edema, suggesting suppression of the first phase of the acute inflammatory reaction.

ANTIOXIDANT ACTIVITY:[8]

Euphorbia prostrata was tested at accumulative concentrations i.e. 10, 20, 40, 60, 80 and 100 mg/kg. The maximum antioxidant effect was observed with ethyl acetate fraction followed by methnolic, chloroform, ethanolic extract and n-hexane fraction. The percent free radicals scavenging effect of ethyl acetate fraction was 60.44, 80.80, 89.21, 88.60, 91.60 and 97.10 at the tested concentrations of 10, 20, 40, 60, 80 and 100 mg/kg respectively. Testing methanolic fraction against DPPH induced oxidation at the same concentration produced 55.2, 78.43, 84.40, 87.00, 92.54 and 96.88% free radicals scavenging action. Chloroform fraction was also proved good antioxidant and caused maximum inhibition of free radicals (90.55%) at tested dose of 100 mg/kg. The outstanding antioxidant effect (80.55%, at 100 mg/kg) of crude ethanolic extract cannot be ignored as compared to moderate effect of n-hexane fraction.

ANTHELMENTIC ACTIVITY:[12]

The anthelmentic assay was carried out on adult Indian earthworm, *Pheretima posthuma*, due to its anatomical and physiological resemblance with the intestinal roundworm parasite of human beings. The worms were divided into eight groups containing six in each group. Preparations containing 50ml of aqueous and ethanolic of *Euphorbia prostrata* extracts with four different concentrations (40, 50, 75, and 100 mg/ml) were prepared,respectively,in distilled water for the study. The control (distilled water) and reference standard (piperazine citrate 10mg/ml) were also prepared. Time of paralysis was noted when no movement was observed except when the worms were shaken vigorously. Time of death of worms was recorded after ascertaining that the worms neither moved when shaken vigorously nor when dipped in warm water. Both extracts of the plants showed potent anthelmentic activity when compared to standard drug

ANTI-SALMONELLAACTIVITY:[13]

The *Euphorbia prostrata* extract had a significant effect on the number of viable *Salmonella typhimurium* recovered from faeces, and could stop salmonellosis after 8 and 10 days of treatment for male and female rats, respectively, with non-toxic doses. However, the biochemical and histopathological analyses revealed that at relatively high doses (≥ 73.48 mg/kg for female and ≥ 122.71 mg/kg for male) the extract could induce liver damage, as illustrated by a rise of serum transaminases' levels and significant inflammation of the parenchyma and portal vein. Side

effects were also observed on the kidneys, as shown by both serum and urinary creatinine, and urinary proteins.

SHIGELLA DYSENTERIAE ACTIVITY:[14]

The aqueous ethanol extract of *E. prostrata* was not toxic. In vitro, the minimal inhibitory and minimal bactericidal concentrations of the extract were 3,500 and 12,000 µg/ml, respectively. In vivo, diarrhea went along with increase in faeces frequency ($P < 0.01$ by the 3^{-rd}_day), increase in the bacterial population to a maximum on the 2^{-nd}_day after infection ($P < 0.01$). The death rate in diarrheic control group was 100% by day 6. *E. prostrata* extracts (20 and 40 mg/kg), like norfloxacin, reduced the bacterial growth ($P < 0.01$), so that by the 6^{-th}_day Sd1 density was <100 and no death was recorded. There was a significant ($P < 0.01$) reduction in faeces frequencies. The extract exhibited notable ($P < 0.01$) inhibition of intestinal propulsion

ANTIHYPERGLYCEMIC AND HYPOLIPIDEMIC ACTIVITY:[17]

The evalution of antihyperglycemic and hypolipidemic effect of whole plant of *Euphorbia prostrata* (Family: Euphorbiaceae) in order to validate its traditional use in diabetes, bynative people of Cholistan desert, Pakistan. Whole plant (methanolic extract) of *Euphorbia prostrata* (EP) (250 and 500 mg/Kg/day, per oral for 14 days) was evaluated in alloxan induced diabetic rabbits (150 mg/Kg., i/p.) by serum biochemical parameters. Glibenclamide(5 mg/Kg/day, p.o. for 14 days) was used as standard antidiabetic drug. Alloxan induced diabetic groups had elevated levels of fasting blood glucose, cholesterol and triglyceride levels when compared with control group. EP extract (both doses of 250 and 500 mg/Kg)exhibited antidiabetic effect by significant reduction of fasting blood glucose levels. 500mg/Kg dose of EP produced more significant ($P < 0.05$) results as compared to 250 mg/Kg dose. Serum cholesterol and triglyceride levels were also lowered down at the end of study.Therefore, outcome of the present study validate the traditional claims on antihyperglycemic effects of *Euphorbia prostrata*.

ANALGESIC ACTIVITY:[18]

The study was conducted to determine the analgesic efficacy of ethyl acetate and hexane crude extract from *Euphorbia prostrata*. The phytochemical screening of hexane and ethyl acetate was done. The study also evaluated the analgesic properties of hexane and ethyl acetate crude extracts from *E. prostrata*. Tail Immersion Model with albino rats was adopted for the investigation. Crude extracts at doses of 250, 500 and 1000mg/kg body weight were administered orally and their activity compared with diclofenac (positive control) and tween solution (negative control). Phytochemical screening showed that major phytochemical in *E. prostrata* plant had mid polar properties. Results for both the hexane and ethyl acetate crude extracts showed a significant increase in Pain Reaction Time (PRT) at the dose level of 1000 mg/kg. These results were statistically authentic as realized from minimal standard deviation of 0.158 and 0.058 for diclofenac and ethyl acetate extract respectively with a t-test value of 24.99 at $\alpha = 0.005$ level of significance. This confirmed the efficacy of both hexane and ethyl acetate extracts therefore inference that *E. prostrata* exhibits analgesic activity and is a potential lead candidate for drug discovery.

HEPATOPROTECTIVE ACTIVITY[19]

The study was aimed at investigating hepatoprotective activity of aqueous methanolic extract of *Euphorbia prostrata* against paracetamol and carbon tetrachloride induced hepatotoxicity in mice, using silymarin as a standard drug. Hepatoprotective effects were accessed by investigating serum marker enzymes (aspartate transaminase, alanine transaminase, alkaline phosphatase), total bilirubin, albumin and total protein as well as histopathological analysis. *Euphorbia prostrata* exhibited significant reduction in serum marker enzymes at 250 mg/kg and 500 mg/kg doses. Moreover, histopathological studies also supported biochemical estimation. It could be concluded that aqueous methanolic extract of *Euphorbia prostrata* possesses hepatoprotective potential against carbon tetrachloride and paracetamol induced hepatic injury which might to due to anti-oxidant activity displayed by flavonoids and polyphenolics.

GASTROPROTECTIVE ACTIVITY[20]

The study was planned to estimate the gastroprotective activity of *Euphorbia prostrata* plant against aspirin induced gastric ulcers in male adult albino rabbits. The ulcer was induced by oral administration of aspirin in all groups except normal control group. Gastric contents were used to estimate total acid output, gastric volume and gastric pH. Results showed that there was a significant decrease in gastric volume, total acid output, ulcer score and ulcer index in groups treated with extract of *E. prostrata* and it enhanced the pH of gastric mucosa. Blood samples were collected and serum was used for the estimation of total oxidant status (TOS), total antioxidant capacity (TAC), malondialdehyde (MDA) and catalase (CAT). Results suggested that *E. prostrata* extract significantly ($P<0.05$) enhanced the TAC and CAT activity comparable to synthetic antiulcer drug cimetidine while it caused a significant ($P<0.05$) reduction in TOS and MDA levels. Results of this study revealed that extract of *E. prostrata* at 10, 20 and 40mg/kg showed gastric protection of 33.79%, 53.15% and 70.66% respectively. Cimetidine was used as a synthetic antiulcer drug in the study, which showed 72.85% gastric protection. From the above mentioned results it was demonstrated that *E. prostrata* extract at dose rate of 40 mg/kg showed gastroprotective activity similar as cimetidine.

ANTI-BACTERIAL AND ANTI-FUNGAL ACTIVITY [21]

The study was conducted to characterize antimicrobial activities of *Euphorbia prostrata*_and *Pelargonium graveolens* extract alone and in combination with Mn-Ni@Fe3O4-NPs & Mn: Fe (OH)3-NPs on the DNA cleavage of *E. coli*_and also *Bacillus subtilis, Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus, Aspergillus oryzae,*__and *Candida albicans*. The effects of antimicrobial activities on above scenarios were evaluated using disc diffusion, MIC, MBC, and *E. coli*_DNA electrophoresis methods. The results showed that the effects of antibacterial assay values of *Euphorbia prostrata*_& Mn: Fe(OH)3 was 21.00 mm for *E. coli*_and while it was 19.5 mm for *Euphorbia prostrata*__& Mn-Ni@Fe3O4 against *Pseudomonas aeruginosa*_at a concentration of 100mg/mL. The highest level of DNA cleavage was seen in mixed of *Euphorbia prostrata*_& Mn: Fe(OH)3 nanoparticles. In conclusion, the combination of *Euphorbia prostrata*__and *Pelargonium graveolens*_extracts with nanostructures showed synergic effects on eliminating the bacteria via DNA destruction and others mechanisms. Moreover, the synergistic effect of nanoparticles with plant extracts seems to bring about new choices for the treatment of infectious diseases.

CONCLUSION

The plant *Euphorbia prostrata* widely used in traditional system of medicine in various parts of Africa. Extracts of the plant have been studied and marketed in India as a treatment for hemorrhoids. the plant commonly called as sandmate in english, rich in flavonoids like apigenin-7-glucoside, quercetin, lutiolin and tannins like prostratins A,B and C, euphorbins G and H. The plant extract have been widely studied for their various pharmacological activities like Anti-inflammatory ,Antioxident, Anthelmentic, Anti-salmonella, Atihyperglycemic and hypolipidemic ,Analgesic, Hepatoprotective, Gastroprotective activity. The plant also has Anti-bacterial and Anti-fungal activities. Various studies have been conducted on *Euphorbia prostrata*. Sandmate is a very important medicinal plant,which can be applies in different phases of medicament which is demonstrated by its function in the traditional practices as well as several modern works. Several experiments have been taken away to explore the pharmacological activities and the pharmaceutical industries are countless. Hence, further detailed and systematic study must be taken out, which can provide better knowledge and understanding the pharmacological importance of this plant.

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