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***Cynodon dactylon* (L.) Pers.: A Valuable Medicinal Plant**

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ABSTRACT

Cynodon dactylon (L.) Pers. is a perennial grass. The plant is a rich source of metabolites such as proteins, carbohydrates, mineral constituents, β -sitosterol, flavanoids, alkaloids, glycosides and triterpenoides. The plant has been long used in the traditional medicines to treat various ailments such as anasarca, cancer, convulsions, cough, cramps, diarrhea, dropsy, dysentery, epilepsy, headache, hemorrhage, hypertension, hysteria, measles, rubella, snakebite, sores, stones, tumors, urogenital disorders, warts and wounds. The plant shows biological activities such as antiviral and antimicrobial properties. This study provides a comprehensive detail of the pharmacognostical characteristics, biological effects and medicinal uses of *Cynodon dactylon*. A review of some important patents on *Cynodon dactylon* is presented.

Key words: *Cynodon dactylon*, medicinal plant, extract, pharmacological activity, patent

INTRODUCTION

The mother earth is endowed with a rich wealth of medicinal plants. They are important sources of new chemical substances that have beneficial therapeutic effects (Nagori and Solanki, 2011). Medicinal plants are the source of many potent and powerful drugs. They present a healthier and safer alternate to the synthetic drugs (Rai *et al.*, 2007). Different parts of medicinal plants like root, stem, flower, fruit, seed etc. are used to obtain pharmacologically active constituents. Medicinal activities of plants can be attributed to the secondary metabolites such as alkaloids, flavonoids, glycosides, tannins and terpenoids present in these plants. Medicinal plants are found useful in the treatment of variety of health problems such as bacterial infections (Solanki, 2010a), peptic ulcers (Solanki, 2010b), inflammation (Shah *et al.*, 2011), arthritis (Patwardhan *et al.*, 2010) etc.

Cynodon dactylon (L.) Pers. is a perennial grass that has a variety of medicinal properties (Singh *et al.*, 2009). It is cultivated throughout the tropics and subtropics. Whole herb and its root stalk are used for medicinal use (Kritikar and Basu, 1980).

SYNONYMS AND RELIGIOUS HISTORY

Cynodon dactylon belongs to the family Poaceae. It is also known as Durva grass, Bermuda grass, Dog's Tooth grass, Bahama grass, Devil's grass, Couch grass, Indian Doab, Scotch grass, Dhuh, Doob and Durba in different parts of the world (Oudhia, 2003). Durva is a Sanskrit word that means, which is cut or eaten by the animals. It is the most sacred plant of India next to tulsi. Hindus worship the God Ganesha with the leaves durva religiously.

PHARMACOGNOSTICAL CHARACTERISTICS

Cynodon dactylon is a rapid growing perennial grass. The plant has creeping runner or stolons. It roots at nodes forming a dense tuft on the surface of the soil. The runners are sometimes 20 cm long. The leaves are variable in size, from 2.5-20 cm long, 0.5-1 cm broad, flat or sometimes folded or convolute, tapering towards the apex. The flowers are green or brinjal in color and the fruit grains are tiny and grayish in color (Bhandari, 1990). According to the Ayurvedic Pharmacopoeia, the plant is pungent and bitter in nature with characteristic fragrance and has cold potency. According to Unani system of medicine, the plant posses sharp hot taste with good odor.

ECOLOGY AND CULTIVATION

Cynodon dactylon is found abundant as weed along the roadsides, in lawns and can readily take possession of any uncultivated area. In winter, the grass becomes dormant and turns brown in colour. Growth is promoted by full sun and retarded by full shade. Plant readily propagated by cuttings and rooting. It can spread very quickly from the rooted runners, which grow more than 7.5 cm day⁻¹. Planting is best done in wet weather to ensure quick sprouting. It gives a complete ground cover in 4-8 weeks when sprigged 30-45 cm apart (Huxley, 1992).

PRINCIPAL CONSTITUENTS

The plant contains crude proteins, carbohydrates, mineral constituents, oxides of magnesium, phosphorous, calcium, sodium and potassium. The whole plant affords β -sitosterol, flavanoids, alkaloids, glycosides and triterpenoides. Other compounds like vitamin C, carotene, fats, palmitic acid etc. are also reported. Green grass contains (on dry matter basis) 10.47% crude protein, 28.17% fiber and 11.75% of total ash (Paranjpe, 2001).

TRADITIONAL USES

Doob is used as a folk remedy for anasarca, calculus, cancer, carbuncles, convulsions, cough, cramps, cystitis, diarrhea, dropsy, dysentery, epilepsy, hemorrhoids, leucoderma, headache, hemorrhage, hypertension, hysteria, bronchitis, asthma, tumors, measles, rubella, snakebite, sores, stones, tumors, urogenital disorders, warts, wounds, eye disorders and weak vision. It is also useful against pains, inflammations, toothache and grippe in children. The expressed juice of plant act as astringent and is applied to bleeding cuts and wounds to stop bleeding (Chopra *et al.*, 1999).

The paste made of the plant mixed with honey is used in epitaxis. Oral administration of the juice of the plant with honey 2-3 times a day for few days effective treats menorrhagia. Local application in the form of paste of the plant extract upon the lower abdomen reduces severe bleeding in vagina. A decoction of *Cynodon dactylon* mixed with sugar is useful in the problem of urine retention.

According to Ayurvedic system of medicine it acts as an appetizer, anthelmintic, antipyretic, alexiteric agent. Durvadi kvatha, Durvadya ghrta, Durvadya taila and Durvadi yoga are some classical Ayurvedic preparations of the plant. According to Unani system of medicine, *Cynodon dactylon* is used as a laxative, coolant, expectorant, carminative and as a brain and heart tonic. In Homoeopathic systems of medicine, it is used to treat all types of bleeding and skin troubles.

PHARMACOLOGICAL ACTIVITIES

Antidiabetic: An investigation showed that the aqueous extract of *Cynodon dactylon* has high antidiabetic potential along with significant hypoglycemic and hypolipidemic effects (Singh *et al.*,

2007). A range of doses, viz., 250, 500 and 1000 mg kg⁻¹ b.wt. of aqueous extract of *Cynodon dactylon* were evaluated and the dose of 500 mg kg⁻¹ was identified as the most effective dose to lower the blood glucose level. The Total Cholesterol Level (TCL), Low Density Lipoprotein (LDL) and triglyceride level (TGL) were also found to decrease by 35, 77 and 29% respectively in severely diabetic rats whereas high density lipoprotein level (HDL) was found to be increased by 18%. From the study it was concluded that *Cynodon dactylon* aqueous extract shows remarkable effects on blood glucose level and marked improvement on hyperlipidemia due to diabetes.

In another experiment the ethanolic extract of *Cynodon dactylon* at doses of 250, 500 and 750 mg kg⁻¹ b.wt. were administered orally to normal as well as streptozotocin-induced diabetic rats so as to study its glycemic potential (Singh *et al.*, 2008). The effect was also studied on serum lipid profile of severely diabetic rats. The dose of 500 mg kg⁻¹ b.wt. was identified as the most effective dose as it lowered the blood glucose levels of normal by 42.12% and of diabetic by 43.42% during fasting blood glucose and glucose tolerance test respectively. Total cholesterol, low density lipoprotein and triglyceride levels were also decreased by 32.94, 64.06 and 48.46%, respectively in severely diabetic rats whereas cardioprotective high density lipoprotein was found to increase by 16.45%.

In an experiment conducted by Jarald *et al.* (2008) aqueous extract and non polysaccharide fraction of *Cynodon dactylon* were tested for antihyperglycemic activity in rats. Both the test substances were found to exhibit significant antihyperglycemic activity. Only the non polysaccharide fraction was found to produce hypoglycemia in fasted normal rats.

Mahesh and Brahatheeswaran (2007) demonstrated anti-hyperglycemic activities of aqueous and ethanolic extracts of *Cynodon dactylon* in streptozotocin-induced diabetic rats. The parameters studied were fasting blood glucose levels, serum lipid levels, total hemoglobin and glycosylated hemoglobin. The extracts showed potent anti-hyperglycemic activity.

Antioxidant: The enzymic and non enzymic antioxidant effects of the protein fraction of *Cynodon dactylon* were determined in Ehrlich's Lymphoma Ascite (ELA) transplanted swiss albino mice (Santhi *et al.*, 2010). The study showed an enhanced enzymic antioxidants levels (69.18, 4.11 and 49.39 units mg⁻¹ protein) and non enzymic antioxidants level (5.63, 5.20 µg g⁻¹ protein and 3.43 nmoles g⁻¹ protein) in the test animals. It proved the protective action of the plant against the free radical damage caused by ELA tumor cells.

Antidiarrheal: In an investigation hexane, dichloromethane, ethyl acetate and methanol extracts of *Cynodon dactylon* whole plant were tested in albino rats for antidiarrheal activity on castor oil induced diarrhea (Babu *et al.*, 2009). Gastro intestinal motility by charcoal meal and entero pooling models were also examined in albino rats. Methanolic extract exhibited considerable reduction in inhibition of castor oil induced diarrhea and also showed a significant decrease in gastrointestinal motility. These results indicate that the plant possess good antidiarrheal property.

Immunomodulatory: Immunomodulatory activity of the *Cynodon dactylon* protein fraction was evaluated in healthy swiss albino mice (Santhi and Annapoorani, 2010). The protein fraction was administered by intra peritoneal route. Immunomodulatory activity was assessed by testing humoral and cellular immune responses to the antigenic challenges with sheep RBCs and by neutrophil adhesion test. A significant increase in the test parameters viz., neutrophil test, haemagglutinating antibody titre and delayed type hypersensitivity response was observed.

Antiulcer: Alcoholic extract of *Cynodon dactylon* was screened for antiulcer activity in albino rats at dose level of 200, 400 and 600 mg kg⁻¹ b.wt. (Patil *et al.*, 2005). The extract at 400 mg kg⁻¹ and 600 mg kg⁻¹ showed significant (>0.001) antiulcer activity as compared to the standard drug, ranitidine. This activity may be due to the presence of flavonoids.

Antiarrhythmic: The antiarrhythmic activity of *Cynodon dactylon* against ischemia/reperfusion induced arrhythmias were investigated in isolated rat heart (Najafi *et al.*, 2008). During ischemia, the extract produced a marked reduction in the number, duration and incidences of ventricular tachycardia at 25 and 50 µg mL⁻¹ (p<0.001 and p<0.01, respectively). Total number of ischemic ventricular ectopic beats were lowered by 25-100 µg mL⁻¹ (p<0.001, p<0.001 and p<0.05, respectively). At the reperfusion phase, *Cynodon dactylon* (25 and 50 µg mL⁻¹) decreased the incidence of ventricular tachycardia from 100% (control) to 13 and 33% (p<0.001 and p<0.05), respectively.

CNS depressant: The ethanolic extracts of aerial parts of *Cynodon dactylon* were evaluated for Central Nervous System (CNS) activities in mice (Pal, 2008). The extract caused significant depression in general behavioral profiles in mice. It significantly potentiated the sleeping time in mice induced by standard hypnotics viz., pentobarbitone sodium, diazepam and meprobamate in a dose dependant manner. It also showed a significant increase in analgesic property by potentiating the analgesia induced by morphine and pethidine in mice.

Hepatoprotective: The evaluation of hepatoprotective activity of ethanolic extract of *Cynodon dactylon* was done against CCl₄ induced hepatotoxicity in wistar rat model (Surendra *et al.*, 2008). The extract was given at a dose level of 100, 250 and 500 mg kg⁻¹, p.o. for one week. Silymarin (100 mg kg⁻¹, p.o.) was used as a reference drug. *Cynodon dactylon* at a dose of 500 mg kg⁻¹ showed a reduction in the SGPT, SGOT and ALP levels to 57.01±0.2 (96.80%), 61.28±0.2 (94.93%), 110.69±0.2 (99.64%) IU L⁻¹, respectively. There was a significant increase in serum bilirubin (total (102%), direct (101%)), triglycerides (98.38%) and cholesterol levels (96.48%) after CCl₄, which was reversed by coadministration of *Cynodon dactylon* or Silymarin.

Cardioprotective: The effects of hydroalcoholic extract of *Cynodon dactylon* rhizomes on cardiac contractility in normal hearts and on cardiac functions in right-heart failure in rats were studied (Garjani *et al.*, 2009). The treated rats showed very less signs of fatigue, peripheral cyanosis and dyspnea. The survival rate was high in the extract treated groups (90%). Administration of *Cynodon dactylon* in monocrotaline-injected rats led to profound improvement in cardiac functions as demonstrated by decreased right ventricular end diastolic pressure and elevated mean arterial pressure.

REVIEW OF SOME PATENTS RELATING TO *CYNODON DACTYLON*

Patent reviews provide latest technical knowledge in a particular subject area. Such reviews help both the researchers and manufacturers. On the one hand these reviews help in identifying new research areas and on the other hand they help in the designing of alternative products and methods to avoid falling in patent infringement litigation (Nagori and Mathur, 2008, 2009). A review of some patents relating with the uses of *Cynodon dactylon* is done here.

Capsules containing the active principle of an allergen and process for their preparation: Capsules useful in asthma or allergic rhinitis were formulated and patented by Melillo (1987). These capsules are administered through an inhaler tube or nasal spray, containing a finely subdivided powder mixture of *Cynodon dactylon*. It showed no bronchoconstrictive or irritating action on the nasal mucous membrane and was more effective than allergens administered in the solution form.

Composition for treating white spot syndrome virus (WSSV) infected tiger shrimp penaeus monodon and a process for preparation thereof: A patent was granted to the composition which was found useful as prophylactic and therapeutic agent in the management of viral and bacterial diseases of aquatic animals (Desai *et al.*, 2002). A process for preparation of such composition was also described. The composition contains extracts of plants *Lantena camera*, *Aegle marmelos*, *Ocimum sanctum*, *Mimosa pudica*, *Cynodon dactylon*, *Curcuma longa* and *Allium sativum*, optionally in combination with a pharmaceutically acceptable carrier, diluents or excipients.

Novel protein capable of inhibiting anthrax toxin activity: Arora *et al.* (2005) invented a novel protein capable of inhibiting anthrax toxin activity. The protein was isolated from the pollen grains of a grass genus from the group consisting of Imperata, Lolium, Phleum and Cynodon. It causes inhibition of the cleavage of protective antigen of Bacillus anthracis, which helps in the inhibition of activity of anthrax toxin.

Variants of group 1 allergens from poaceae having reduced allergenicity and maintained T-cell reactivity: The invention relates to the preparation and use of variants of the group 1 allergens of the poaceae, characterised by reduced IgE reactivity when compared with the known wild-type allergens and by maintained reactivity with T-lymphocytes (Fiebig *et al.*, 2008). These variants are useful in the immunotherapy (hyposensitisation) of patients having grass pollen allergy.

Anti-adipocyte fatty acid-binding protein (Ap2), anti-5-lipoxygenase-activating protein and anti-cysteinyl leukotriene receptor herbal compositions: A patent was granted to (Gokaraju, 2009) for the herbal composition consisting of a mixture of extracts of *Boswellia serrata* and *Cynodon dactylon*. This composition was found useful in the treatment of asthma, allergic rhinitis, hay fever, skin diseases, type-1 hypersensitivity and mild allergies.

Process for preparation of herbal hair treatment compositions and a product thereof: A patent was granted (Barua and Barua, 2008) for the process to prepare an herbal composition comprising of certain plants like *Cinchona officinalies*, *Azadirachta indica*, *Sesamum indica* and *Cynodon dactylon*. The composition is useful in the treatment of different kinds of common hair diseases such as dandruff, baldness and graying.

CONCLUSION

The plant *Cynodon dactylon* shows a wide variety of medicinal activities. The usefulness of the plant has been demonstrated in various diseases like diabetes, ulcer, cardiac arrhythmia and diarrhea. Detailed information is provided on the plant's botanical and medicinal properties and

patents in this review. It is hoped that it would serve as a useful tool for the researchers for proper evaluation of the plant and for the development of new, safer, potent and cost effective drugs in future.

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