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A details study on *Cynodondactylon*

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Abstract

Herbal plants are huge sources of secondary metabolites, they are responsible to prevent the different disease, treatment of diseases and maintain the healthy life. The study of diseases and their treatment are important part of our ancient time worldwide. Herbal medicine prepare different part of plant are used.It has great medicinal importance like to demulcent, astringent and diuretic, dropsy, anasarca, chronic diarrhea, dysentery, vomiting, biliousness, burning sensation, hallucinations, menorrhagia, fever, leprosy and other skin diseasesetc.The knowledge of medicinal plants must have been accumulated in the course of several centuries but it is our bad luck that proper phytocognostical and pharmacological evaluation of most of these plants have not done till now. Keeping this view, details studies on *Cynodon dactylon* (Family- Poaceae) along with phytocognostical & pharmacological study have done. It is a extremely vital plant as a gift of the nature for living beings. It is administer by every kind of herbivorous animals for their food. In traditional medicinal system it is used in different predicament as well as it possesses different significant pharmacological activities. Also it is used for holistic purpose by human being.

Keywords: *Cynodon dactylon;* Poaceae; Durba; Fuel production

1. Introduction

Under the family Poaceae, *Cynodon dactylon*, is evergreen long-lived perennial creeper, is a very important plant as a gift of the nature for living beings. It is used for holistic purposes by human; administered by all type of herbivorous animals for their major food. In traditional medicinal system it is used in different troubles as well as it possesses different important pharmacological activities. It also possesses therapeutic uses in Ayurvedic and Siddha system of medicine. It is commonly known as Bermuda grass or couch grass. It is widely distributed in warm climates all over the world up to 45º north and south altitude. They are reproduces by subterranean rhizomes, stolons and seeds [Anonymous 2001; Balkrishna 2008; Farsani et al 2012; Horowitz 1972; Pal 2008, 2009; Ram et al. 2009]. A details theoretical survey regarding botanical description, traditional uses, chemical components, biological study was done in this paper.

1.1. Taxonomical position

- Kingdom : Plantae – plants
- Subkingdom : Viridaeplantae - green plants
- Division : Tracheophyta - vascular plants
- Subdivision : Spermatophytina - seed plants
- Infra division : Angiospermae - flowering plants
- Class : Magnoliopsida
- Super-order : Lilianae - monocots
- Order : Poales

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- Family : Poaceae - graminées, grasses
- Genus : *Cynodon* Rich. - Bermudagrass
- Species : *Cynodon dactylon* (L.) Pers. [Anonymous 2009]

1.2. Vernacular names

- Hindi: Doob, Durba
- Sanskrit: Amari, Amrita, Anuvallikka, Durva
- English: Bermuda grass, Creeping Cynodon
- Arabic: Ushna
- Assamese: Ushb
- Bengali: Doorba, Doobala
- Guajarati: Durba, Hariyali
- Kannada: Garikar-Hallu, Garike
- Malayalam: Karuk, Karukappullu
- Tamil: Arukampillu
- Telegu: Dhoricha, GoriaGuddi [Anonymous 2001; Balkrishna 2008]

2. Botanical description

Structure: It is spreading, prostrate herbaceous graminoid. Long-lived perennial plants are wiry in nature; form like mat by means of stolons and scaly rhizomes, and can develop into a dense turf.

Roots: The cream colored root is fibrous, cylinder, up to 4 mm thick arise from nodes on the extensive stout rhizomes; minute hair-like roots arise from the main roots. Rhizomes are hard and scaly.

Stems: It is slender in shape, prostrated, leafy, up to 1.0 mm thick, very smooth in nature and yellowish green in color, mostly creeping and stoloniferous, upright when young. The stolons have short internodes, producing erect, wiry inflorescences at the nodes.

Branching: It occurs at culm nodes; plant is highly branched.

Leaves: It is 2-10 cm long and 1.25-3 mm wide, narrowly linear or lanceolate. Soft and smooth leaf is finely acute more or less glaucous, usually conspicuously distichous in the barren shoots and at the base of the stems. Sheath is light, glabrous or sometimes bearded with a very fine ciliate rim.

Inflorescence: Inflorescence of several slender spicate branches digitate at culm apex; contains 3-7 divergent spikes of 2-7 cm long and 1-2 mm wide. Spikelets are sessile, appressed, numerous, continuous, in two rows along one side of slender, somewhat present at triangular rachis.

Seeds: Oval shaped seeds are straw, orange red, or reddish brown colored, are free within lemma and palea [Anonymous 2001; Halvorson and Guertin 2003].

Figure 1 *Cynodon dactylon* leaves

3. Microscopical Description

Root: On transverse section mature root showed piliferous layer or epiblema which composed of single layer of thin-walled, radially elongated to cubical cells. Hypodermis was found to be composed of 1-2 layered, thin-walled irregular shaped cells. Cortex was differentiated into two different zones consisting of 1-2 layers of smaller, polygonal, thin-walled, lignified sclerenchymatous cells and 4-6 layers of bigger, thin-walled, elongated parenchymatous cells. Endodermis was quite distinct, single layered with thick-walled, tangentially elongated cells. 1-2 layers of thin-walled sclerenchymatous cells composed pericycle. Vascular bundles were consisted of xylem and phloem which were arranged in a ring on different radials. Centre of the root was occupied by wide pith, which composed of oval to rounded thick-walled parenchymatous cells containing numerous simple, round to oval or angular starch grains measuring 4-16 μ in diameter [Anonymous 2001].

Stem: It was oval in shape with a little depression on one side. Cuticularised epidermis showed single layered, having lignified walls. Hypodermis was made of 1 or 2 layers of sclerenchymatous cells. Cortex was composed of 3-5 layers of round to oval shaped thin walled parenchyatus cells. Pericycle was present in the form of continuous ring of 2-5 layers of sclerenchymatous fibres. Vascular bundle was collateral, closed and scattered throughout the ground mass of parenchyma, each surrounded by sclerenchymatous sheath. Starch grains were found to be simple and compound in nature having 2-4 components, within cortex and ground tissue; simple grains measured 4-16 μm in diameter [Anonymous 2001].

Leaf: Lamina showed nearly square to oval shaped epidermis having irregularly cutinized outer wall. Mesophyll cells were not differentiated into palisade and spongy parenchyma. Row of vascular bundles was looking nearly similar, except the median bundle which was larger. Bundle sheath is single and consists of thin-walled chloroplast containing parenchyma cells [Anonymous 2001]. Stomatal complex is 15-16.25 μm long, 11.25-12.5 μm wide for abaxial side and 23.75-25 μm long and 12.5-17.5 μm wide for axial side. Guard cells are dumb bell shaped, and subsidiary cells are low to high dome shaped for both sides. Both sides contain numerous saddle shaped silica bodies [Ahmad et al. 2012].

3.1. Traditional uses

The plant has several uses in the traditional system. Fresh juice of the whole plant is demulcent, astringent and diuretic. It is also used in cases of dropsy, anasarca, chronic diarrhea and dysentery. Cold infusion of the plant is used with milk to stop bleeding in piles. The plant is useful in scorpion string [Chopra et al. 1956; Nadkarni 1954]. It is also used in vomiting, biliousness, burning sensation, hallucinations, menorrhagia, fever, leprosy and other skin diseases [Anonymous 2001].

In headache, equal amount of the plant and gram is grinded with water to form paste. It is applied on forehead. Extract of the whole plant helps to cure excessive flow in the menstrual cycle or prolonged cycle. The leaves gives relief from pain also cures excessive pus formation in eyes. Juice made from mixture of the plant with pomegranate flowers helps to control nasal bleeding due to tridosa. Decoction of the plant if it is used as gargles helps for curing boils in mouth. Mixture of aerial part of the plant with black pepper helps more urination to reduce ascites and swelling of the body. The plant extract also strengthens the uterus and fetus which helps in leucorrhoea and other vaginal disorders. The plant also mixed with curd in bleeding piles in form of paste. Mixture of aerial part of the plant and turmeric is applied over eczema and itching of skin. It also used in malaria fever [Balkrishna 2008]. It is also utilized by the dogs for vomiting against indigestion for food poisoning and other indigestible materials [Kandwal and Sharma 2011]. Rhizome of the plant also used in urinary diseases and gastrointestinal disorder in different part of Italy [Guarrera 2005]. Decoction of the whole plant also used in hypertension by different tribal peoples in Morocco [Tahraoui et al. 2007].

3.2. Other uses

Ethanol also produced from the plant can be utilized for fuel production [Xu et al. 2011].

4. Pharmacological activity

4.1. Hepatoprotective Activity

The animal (Wister rats) received three different doses of an ethanolic extract made from the top portions of Cynodon dactylon: 100 mg/kg, 250 mg/kg, and 500 mg/kg. It was found that the extract from Cynodon dactylon successfully lowers the increased levels of cholesterol and bilirubin in the serum it also prevent decrease in ascorbic acid excretion

through their urine. It is determine that the extract's effectiveness might be associated with its capacity to preserve the hepatocyte cell membranes' structural integrity, thus guaranteeing the liver's regular operation. (V, 2008)

4.2. Antioxidant activity

The in vitro antioxidant capacity of the ethyl acetate extract from the upper portion of the plant was significantly higher, as assessed by the colorimetric assessment of non-enzymatic haemoglobin glycosylation. The oral administration of Cynodon dactylon aqueous extract to diabetic rats with diabetes-induced oxidative stress resulted in a significant reduction in lipid peroxide (LPO) levels and antioxidant enzyme activity. The ethyl acetate fraction of Cynodon dactylon was used to test enzymatic and non-enzymatic antioxidants in Ehrlich's lymphoma ascites (ELA). (Ashokkumar, 2013)

4.3. Anticancer activity

The anticancer effect of *C. dactylon* extract was tested in Swiss albino mice infected with Ehrlich ascites carcinoma (EAC) cells, with three doses (100, 200, and 400 mg/kg body weight) administered orally over ten days.An ethanolic extract of *C. dactylon* at 0.625 mg/ml demonstrated 52.6% anticancer efficacy against HT-29 human colon cancer cells. Methanolic extracts of *C. dactylon* leaves illustrated significant anticancer and hepatoprotective effects in Swiss albino mice produced by intraperitoneal injection of EAC (1× 106 cells/mouse) (Marappan, 2012). The study revealed that the methanolic extract of Cynodon dactylon had significant qualities that can help fight tumours and protect the liver.

4.4. Antidiabetic activity

The researchers examined multiple doses of an aqueous extract of Cynodon dactylon, including doses of 250, 500, and 1000 mg per kilogramme of body weight, in diabetic rats and they discovered that the 500 mg/kg dose, when delivered orally, was the most helpful in treating diabetes (Rai, Jaiswal, Rai, Sharma, & Watal, 2010). The blood sugar levels is decresed C.dactylon in normal rats by approximately 31% four hours after being administered (Singh, Kesari, Gupta, Jaiswal, & Watal, 2007). When diabetic rats were given the aqueous and non-polysaccharide fraction of Cynodon dactylon, they showed a substantial reduction in high blood sugar levels and a decrease in glucose, urea, serum cholesterol, serum triglyceride, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and urea levels (Jarald, Joshi, & Jain, 2008).

4.5. Anti-inflammatory activity

The anti-inflammatory activities of *Cynodon dactylon* aqueous extracts were tested at various dosage levels using carrageenan, serotonin dextran, and histamine-induced edema in the paws of rats. The oral dosages of 200, 400, and 600 mg per kilogram of body weight produced significant anti-inflammatory effects in all of the experimental animals (Garg & Paliwal, 2011). The anti-inflammatory benefits displayed in the models, 50% of Ethanolic extract Cynodon dactylon administered at doses of 300 and 600 mg per kilogram (Dhande , 2013). In carrageenan-induced swelling in rat paws, the chloroform-methanol extract of Cynodon dactylon suppressed inflammation significantly at dosages of 125, 250, and 500 mg per kilogram for both immediate and long-term models. These effects were comparable to those of the well-known anti-inflammatory drug indomethacin and also shows that Cynodon dactylon, chloroform-methanol extract displayed anti-inflammatory activity (Yogesh, Kidchadi, Muchandi, & Gopalakrishna, 2013).

4.6. Immunomodulatory activity

A daily dose of 70 l of ethyl acetate fraction of Cynodon dactylon poly phenols showed a substantial ability to reverse the immunosuppressive effects of pyrogallol in Balb/c mice (K M, S, & Kaliyaperumal , 2011). *C. dactylon* protein fraction has significant potential as a powerful immunostimulant for pig albino mice (S & Santhi, 2010). When challenged with antigens, oral administration of Cynodon juice at doses of 250 and 500 mg/kg to Balb/c mice resulted in a dose-dependent and significant increase in amount and presence of antibody in blood. Both the haemagglutination antibody and plaque forming cell assays revealed this effect.Besides fresh juice of *C. dactylon* was shown to protect human DNA against doxorubicin-induced DNA damage at doses of 50, 100, and 200 mg of total phenols per kilogramme of body weight (K, M, & Reddy, 2009).

4.7. Antibacterial activity

The Muller-Hinton agar medium was prepared and sterilised in an autoclave and 15 pressure for 30 minutes. Following that, the prepared medium was placed aseptically into previously sterilised glass Petri plates. Using the spread plate approach, a 0.1 ml aliquot of a 24-hour-old bacterial culture was injected into the Muller-Hinton agar medium and evenly disseminated around the plate. Using sterile forceps, test extract-loaded discs and their corresponding solvents, as well as conventional antibiotic discs, were precisely positioned on the agar surface, providing enough spacing between each disc.For 30 minutes, the plates were kept at room temperature to allow the extract to diffuse into the

medium. Following that, the plates were incubated at 37°C for 24 hours to test the antibacterial activity of the Cyanodon dactylon solvent extraction. Positive control discs with 30 mcg/disc Chloramphenicol antibiotic discs were used, whereas negative control discs with the relevant solvent (10µl) were used. The diameter of the inhibitory zone was measured and documented after incubation(Murray, Baron, Pfaller, Tenover, & Yolken, 1995)(R., M. H., K., & K. G., 2010).Cyanodon dactylon leaf extracts, including ethanolic, butanolic, and methanolic extracts, displayed broad antibacterial activity. The butanolic, ethanolic, and methanolic extracts reduced the development of pathogenic bacteria by roughly 90%, 70%, and 70%, respectively, in this investigation. The presence of active chemicals within these extracts was related to their various antibacterial properties. Polar chemicals such as saponins may be among these active compounds(Singh & Gupta, 2008).The majority of the examined extracts were shown to be more sensitive to gram-negative bacteria than gram-positive bacteria. Among gram-positive bacteria, B. subtilis and S. pyogens were sensitive to Abelmoschus esculentus fruit butanolic and methanolic extracts. S. aureus and S. pyogens, on the other hand, were sensitive to the ethanolic extract.

4.8. Anticonvulsant activity

The maximal electroshock seizure (MES) and pentylenetetrazol (PTZ) models were used in the investigation to investigate the anticonvulsant activity of an ethanolic extract. Seizures were generated in mice using an electroconvulsiometer and a pair of ear clip electrodes to give a 50mA electroshock for 0.2 seconds (Kumar, Madaan, & Sharma, 2008). And the animals were then given 200, 400, or 600 mg/kg of the extract orally. A control group got 25 mg/kg phenytoin intraperitoneally (Manigauha, Patel, Monga, & Ali, 2009). The mice were examined for MES-induced seizure reaction after 30 minutes.Clonic-tonic convulsions were generated in the PTZ model with an 80 mg/kg PTZ injection. The extract was given to the test animals at varied doses, while phenytoin was given to a control group. PTZ was injected 60 minutes after extract administration, and the occurrence of HLTE and seizure duration were documented. Animals that did not have HLTE within the time restriction were judged safe (Tirupathi, Krishna, Kumar, Rao, & Mohan, 2009). All data were statistically analysed using the Student's t-test, with a significance level of p0.05 considered. The purpose of the study was to compare the possible anticonvulsant effects of the ethanolic extract to control groups in both MES and PTZ seizure models.

4.9. Diuretic Activity

The results showed that furosemide caused significant diuresis and electrolyte excretion in the first few hours. The plant extracts increased urine output and electrolyte excretion significantly, especially at 0.250 g/kg for Erica multiflora and 0.500 g/kg for Cynodon dactylon. Surprisingly, the diuretic impact did not appear to be related to the plants' potassium (K+) concentration. Urinary pH remained relatively stable for both plant extracts throughout the investigation. Even at a high dose of 10 g/kg, no mortality were reported in animals given Erica multiflora. At 4.5 g/kg, Cynodon dactylon resulted in a 50% death rate (LD50). (Sadki, Hacht, Souliman, & Atmani, 2010)

4.10. Antidiarrheal

Cynodon dactylon whole plant extracts were tested for antidiarrheal activity using hexane, dichloromethane, ethyl acetate, and methanol extracts. To test the possible antidiarrheal benefits of the described extracts, albino rats were given castor oil-induced diarrhoea.22In albino rats, gastrointestinal motility was measured using charcoal meal and entero-pooling models. The methanolic extract significantly reduced the inhibition of castor oil-induced diarrhoea and significantly decreased gastrointestinal motility. These data imply that the herb has antidiarrheal effects.

4.11. Antiviral activity

Cynodon dactylon has been shown to have substantial antiviral efficacy against WSSV, as well as antiviral activity against the human vaccinia virus (Dhar, Dhar, Dhawan, Mehrotra, & Ray, 1968). *C. dactylon* plant extract was incorporated into artificial pellet feed at 1% and 2% concentrations. Shrimp fed WSSV-infected shrimp meat were subjected to an experimental challenge. At the end of the experiment, WSSV infection was confirmed using PCR, bioassay, and Western blot analysis. The current study found that *C. dactylon* plant extract was extremely effective at preventing WSSV infection, with no mortality and no evidence of WSD at 2% and a 40% mortality rate at 1% in black tiger shrimp P. monodon. (Balasubramanian, Sarathi, Venkatesan, Thomas, & Hameed, 2008)

4.12. Antiulcer activity

The antiulcer potential of Cynodon dactylon alcoholic extract was tested in albino rats at dose levels of 200, 400, and 600 mg kg1 body weight. When compared to the standard medicine, ranitidine, the extract displayed considerable antiulcer action at 400 mg kg1 and 600 mg kg1, with statistical significance (p 0.001). The presence of flavonoids could explain the observed action. (Patil, Jalalpure, Prakash, & Kokate, 2005)

4.13. Antiarrhythmic activity

In isolated rat hearts, the antiarrhythmic efficacy of Cynodon dactylon against ischemia/reperfusion-induced arrhythmias was investigated. The findings imply that *C. dactylon* protects against I/R-induced arrhythmias in isolated rat hearts, most likely by increasing myocardial contractility and thereby improving hemodynamic parameters. (Nafaji, Nazemiyeh, Garjani, & Gharekhani, 2008)

4.14. CNS depressant

In mice, ethanol extracts of Cynodon dactylon aerial parts were tested for actions influencing the Central Nervous System (CNS) (Pal & Pandab, 2010). The extract significantly reduced overall behavioural activity in mice. In mice induced by common hypnotics such as pentobarbitone sodium, diazepam, and meprobamate, it successfully prolonged sleep duration in a dose-dependent manner. Furthermore, it displayed a significant improvement in analgesic effects in mice by increasing the analgesia induced by morphine and pethidine.

4.15. Cardioprotective activity

The effects of a hydroalcoholic extract produced from Cynodon dactylon rhizomes on cardiac contractility in healthy hearts and cardiac functions in rats with right-heart failure were studied. The extract caused only minor signs of weariness, peripheral cyanosis, and dyspnea in the rats. Survival rates were much higher in the extract-treated groups (90%). Cynodon dactylon administration to rats injected with monocrotaline resulted in considerable enhancement of cardiac functions, as demonstrated by lower right ventricular end-diastolic pressure and higher mean arterial pressure. According to the findings of this study, *C. dactylon* has a strong protective effect on right heart failure, which can be related to its positive inotropic action and enhancement of cardiac functions. (Garjani, Afrooziyan, Nazemiyeh, Najafi, Kharazmika, & Maleki-Dizaji, 2009)

4.16. Antihyperlipedemic activity

Hyperlipidemia, or elevated lipid levels, is commonly acknowledged to have a substantial role in the development of atherosclerosis. It is commonly recognised as a risk factor for cardiovascular disease (CVD) and myocardial infarction. Reducing the prevalence of hyperlipidemic disorders is regarded as an important therapeutic strategy(Ali, Al-Qattan, Al-Enezi, & Mustafa, 2000). The current study attempted to evaluate the hypolipidemic features of Cynodon dactylon.The entire fresh plant was washed with water and then air-dried in the shade for 3 to 5 days. 500 grammes of dried plant material were macerated with ethanol (80% v/v) and allowed to stand at room temperature (28-30°C) for 48 hours. The resultant extraction was filtered, and the filtrate was evaporated to dryness at 50°C under reduced pressure, yielding 15.6% w/w (dry weight). The dried extract was kept at 4°C until it was used. The ethanol extract of Cynodon dactylon obtained was stored at -20°C until further usage(Garg & Paliwal, Anticonvulsant activity of ethanolic extract of Cynodon dactylon, 2011). After an overnight fast, the rats were killed with sodium pentobarbitone at a dose of 40 mg/kg body weight. Blood samples were drawn directly from the heart using 23G needles and 3-ml syringes, and then placed in EDTA containers (Sigma Chemicals, Gillingham, Dorset, UK). Plasma was separated within 10 minutes by centrifugation at 3000 rpm (relative centrifugal force, approximately 1,500 g). The plasma was separated and stored at -80°C in microcentrifuge tubes until analysis. Triglycerides (TG) were analysed using spectrophotometric techniques(Kaplan & Szabo, 1983).The GPO-POD method was used to calculate triglycerides (TG), the CHOD-PAP method was used to calculate total cholesterol (TC), and kits were used to analyse high-density lipoprotein (HDL). This study's findings support Cynodon dactylon's lipid-lowering effects in rats on a high-cholesterol diet. The active ingredients of *C. dactylon* may help to lower the serum lipid profile.

4.17. Larvacidal activity

Dried leaves (500g), flowers (400g), and seeds (550g) were mechanically pulverised and independently extracted in a soxhlet apparatus with hexane, chloroform, ethyl acetate, acetone, and methanol. The extracts were concentrated and kept in a safe place. To make a stock solution, one gramme of crude extract was dissolved in acetone. Using dechlorinated tap water, several concentrations (1000 - 3.125g/mL) were generated from this stock solution. In the final test solution, polysorbate 80 (0.05%) was utilised as an emulsifier. Acetone, dechlorinated tap water, and polysorbate 80 were used as controls. Dr. V. Rajagopal collected and identified Anopheles vagus, Aedes subalbatus, and Culex vishnui larvae from varied settings. These larvae were cultivated in trays with tap water during a light-dark cycle at 272°C and 75%-85% humidity. Brewer's yeast, dog biscuits, and pond algae were fed to them. Pupae were placed in cups until adult mosquitoes appeared. On the sixth day, adults were housed in glass cages, given a 10% sugar solution, and given a blood meal. For egg-laying, glass petri dishes with filter paper and water were provided (C, A, Rahuman, Zahir, G, & Pandiyan, 2009). The preliminary screening evaluates the larvicidal properties of common plants. At 1,000 g/mL, extracts of A. precatorius, C. bonplandianum, *C. dactylon*, M. paradisiaca, and S. aromaticum were evaluated against larvae (An. vagus,

Ar. subalbatus, and Cx. vishnui). All extracts had moderate larvicidal activity. Extracts from specific plant sections, in particular, demonstrated high larval mortality against each species. A. precatorius seed extracts, for example, influenced An. vagus (LC50: 19.31-191.58 g/mL), Ar. subalbatus (LC50: 21.67-167.19 g/mL), and Cx. vishnui (LC50: 103.36-149.56 g/mL). Other plant leaf and flower extracts had a noticeable effect on certain larval species. (A & Rahaman, 2011)

5. Conclusion

A details study of the *Cynodon dactylon* under Poaceae family study concluded that it different extracts possesses the various pharmacological properties likeantioxidant activity, analgesic properties, anti-convulsant activity, anthelmintic activity, Hepatoprotective effect. Phytochemical screening will also help the presence of compounds, which is responsible for the medicinal importance of the plant. Although the different extract of the plant has numerous pharmacological importance but medicinal application and clinical application can be made only after extensive research on its bio-activity, mechanism of action, pharmacotherapeutics and extensive safety studies. It also require to research on pharmacognostical, phytochemical and pharmacological aspect. However research going on it would be easier to develop new drugs after extensive studies on mechanism of action & pharmacological effects. It is expected that it may find application as a novel drug in the future to control various diseases.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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