

Cynodondactylon: A Review of Pharmacological Activities

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Abstract

Review Article

The annual weedy grass *Cynodondactylon* (L.) Pers. Belonging to the family *Poaceae* is one of the tenth fortunate plants in ayurveda's 'Dasapushpam' and 'Navgaraha' groups. *Cynodondactylon* (L.) Pers. has a wide range of therapeutic uses. The species is a natural resource because it grows as a weed. An overview on *Cynodondactylon* (L.) Pers. is undertaken with the goal of providing all the relevant information regarding this grass. The review includes botanical classification, various other species of this grass, chemical classification, pharmacological activities, various dosage forms, ethnobotanical uses, patent registered, vernacular names around the world, cultivators around the world, macroscopy, microscopy of the grass.

Keywords: *Cynodondactylon* (L.) Pers., pharmacological activities, dasapushpam, Navagraha plant, patents, ethnobotanical, macroscopy, microscopy, chemical classification.

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1. INTRODUCTION

A vast array of therapeutic plants can be found on the planet. Many weeds in our environment are frequently quite effective medicinal plants that can help with a variety of significant health issues (Paul et al., 2012). Traditional knowledge system that use herbs or plant product therapies on a big scale include ayurvedic and siddha, Chinese medicines in China and unanimesicines in Islamic countries. Medicinal herbs are used to make a variety of potent and powerful medications. They are less dangerous alternative to manufactured drugs. Phytochemical components can be extracted from a variety of sources, like roots, stems, leaf, fruits, bark etc. medicinal plants physiologically active chemicals serve a significant role in drug development (Rai et al., 2007). Furthermore, extracts of medicinal plants can be used to treat a variety of health issues. *C. dactylon* (L.) Pers. is an annual grass with wide range of therapeutic benefits. It is grown all over the world. The entire plant is utilized for the medicinal purpose. It has lot of untapped medicinal, ornamental, and other potential. Aside from its important, the species is resource that must be researched. *C. dactylon* (L.) Pers. can be utilized as a beneficial tool for researchers to properly evaluate the plant in order to discover hidden areas and their practical clinical applications,

which can be used for the benefits of humanity (Solanki, 2010). The cultivars of this grass are Coastal, Coastcross-1, Tifton78, Tifton 68, Hardie, Oklan, Brazos, NK 37, Sunturf, Tifway 2, Tifgreen, Tifgreen 328, Tifdwarf, Floradwarf, Gn-1, MS-Choice, MS-Express, MS-Pride, Numex Sahara, Sultan, Yuma, Blue-Munda etc (Paul et al., 2011). The entire plant parts are used for preparation in various therapeutic preparations (Kritikar and Basu, 1980). Taxonomical classification of *C. dactylon* (L.) Pers. is given in the Table-1. Variety of species of *C. dactylon* (L.) Pers., is given in the Table-2. Vernacular names of *C. dactylonis* given in the Table 3.

Table 1: Taxonomical classification of *C. dactylon* (L.) Pers.

1	Kingdom	Plantae
2	Subkingdom	Tracheobionta
3	Super division	Spermatophyte,
4	Division	Magneliophyta
5	Class	Liliopsida
6	Subclass	Commelinidae
7	Order	Cyperales
8	Family	Poaceae
9	Genus	Cynodon
10	Species	Cynodondactylon

Table 2: Variety of species of *C. dactylon* (L.) Pers.

S. NO	Species Of <i>Cynodon Dactylon</i> (The Plant List 2021)
1	<i>Cynodondactylon</i> var. <i>affinis</i>
2	<i>Cynodondactylon</i> (L) Pers.
3	<i>Cynodondactylon</i> var. <i>arcuatus</i>
4	<i>Cynodondactylon</i> subsp. <i>arcuatus</i>
5	<i>Cynodondactylon</i> var. <i>aridus</i>
6	<i>Cynodondactylon</i> var. <i>biflorus</i>
7	<i>Cynodondactylon</i> var. <i>coursii</i>
8	<i>Cynodondactylon</i> var. <i>dactylon</i>
9	<i>Cynodondactylon</i> var. <i>densus</i>
10	<i>Cynodondactylon</i> var. <i>elegans</i>
11	<i>Cynodondactylon</i> subsp. <i>glabratus</i>
12	<i>Cynodondactylon</i> var. <i>hirutissimus</i>
13	<i>Cynodondactylon</i> var. <i>intermedius</i>
14	<i>Cynodondactylon</i> var. <i>longiglumis</i>
15	<i>Cynodondactylon</i> f. <i>major</i>
16	<i>Cynodondactylon</i> var. <i>maritimus</i>
17	<i>Cynodondactylon</i> subsp. <i>nipponicus</i>
18	<i>Cynodondactylon</i> var. <i>nipponicus</i>
19	<i>Cynodondactylon</i> var. <i>parviglumis</i>
20	<i>Cynodondactylon</i> var. <i>pilosus</i>
21	<i>Cynodondactylon</i> var. <i>polevansii</i>
22	<i>Cynodondactylon</i> var. <i>pulchellus</i>
23	<i>Cynodondactylon</i> var. <i>sarmentosus</i>
24	<i>Cynodondactylon</i> var. <i>septentrionalis</i>
25	<i>Cynodondactylon</i> var. <i>stellatus</i>
26	<i>Cynodondactylon</i> f. <i>villosus</i>
27	<i>Cynodondactylon</i> var. <i>villosus</i>
28	<i>Cynodondactylon</i> f. <i>viviparus</i>

Table 3: Vernacular names of *C. dactylon* (Paul et al., 2012; Kawad-Kawad)

S. NO	LANGUAGE NAME IN INDIA	VERNECULAR NAME
1	Sanskrit	Bhargavi, doorway, granthi, sveta
2	Hindi	Doorva, doob,
3	Tamil	Arugu, aruvam-pillu, mooyar-pul, arugampuli
4	Bengali	Durba
5	Kannada	Ambate-hullu, garikae
6	Malayalam	Karuka-pulli
7	Marathi	Doorva, harayali
8	Punjabi	Dub, kabbar, talla
9	Telugu	Garika, gerike, haryali
10	Urdu	Ghass
11	Pushtu	Kabal
B.	OTHER COUNTRIES NAME	VERNECULAR NAME
1	VIETNAM	Cochi, coong
2	Thailand	Ya-phraek
3	Spanish	Chepica brave, gramillablanca, pate de perdiz
4	Portuguese	Capin-bermuda
5	Nepal	Motiemolulu, dubo
6	Myanmar	Maye-sa-myet
7	Malaysia	Rumputminyak
8	Israel	Yablith
9	Indonesia	Jukutkakawatan, rumput Bermuda, rumputgrinting, gigrinling
10	Hawaii	Manienie
11	German	Hundezahngras, B
12	French	Chiendentdactyle, Chiendent pied-de-poule, grand Chiendent
13	Fiji	Kabuta
14	Cambodia	Smaoanchien
15	African	Kweekgrass

2. Macroscopical Properties

C. dactylon has lanceolate leaves with 2-10 cm length and 1,2-3 mm in breadth. The occurrence of panicles with one perfect floret distinguishes the flowers. The glumes are lanceolate and reach a 2mm length. The lower glumes are shorter than top ones. Anther is 1-1.5 mm long and yellow in color. Styles are purple color. Roots are fibrous and cylinder with

thickness of 2-4 mm. stem is soft and golden green color (Parihar and Sharma, 2021; Lewis and Lewis, 1977; Duke, 1981; Amrita *et al.*, 2012; Ayurvedic pharmacopoeia). The microscopical properties of *C. dactylonis* mention in the Table 4. Table-5 contain all the chemical constituents found in the *C. dactylon* grass.

Table 4: Microscopical properties of *C. dactylon* (Shendye and Gurav, 2014)

S.NO.	PLANT PARTS	MICROSCOPICAL PROPERTIES
1	Stem	The stem has an oval shape. It demonstrates the presence of cells in a single layer. Hypodermis is made from sclerenchymatous cells. Cortex is made from 3-5 round/oval layers of thin walled parenchymatous cells. Pericycle is made from 2-5 continuous ring and layers of sclerenchymatous fibres seen in endodermis. Vascular bundles are closed and dispersed throughout parenchyma ground mass, enclosed by sclerenchymatous sheath. The lumen of medullary ray is thin and pointy. Simple and complicated starch grains are present. They can be found in both the cortex and the ground tissues.
2	Root	A single layer of thin walled, radially extended to cubical cells makes up the piliferous layer in mature roots. One or two layer of thin walled horizontally extended cells make up the hypodermis. The cortex is divided into 2 parts. Lignified sclerenchymatous zone and 4-6 layer parenchymatous zone. Endodermis is made up of tangentially elongated single-layered cells. Vascular bundles are made up of ring of xylem and phloem. The pith is at the heart of the city.
3	Leaves	The epidermis of leaf margin is square to oval, with an uneven outer wall. The bulliform cells on dorsal side are clusters and lie at the base of a groove in between the veins, they have thin walls and lack chlorophyll and reach deep inside the mesophyll. Palisade and spongy parenchyma of mesophyll are not distinguished. The mesophyll is broken by one or two thin walled colorless cells extending from bundle sheath to thin walled parenchymatous cells at upper and lower epidermis. Except for the median bundle, vascular bundles are arranged in row.
4	Powder	Short, lignified vessels having thick walls and sharp fibres. The presence of paracytic stomata can be seen in the powder. Elongated and rectangular cells make up the epidermis. The powder has simple and complicated starch grains with 4-6 mm diameter.

Table 5: Chemical constituents present in the *C. dactylon* grass

1	NAME OF CHEMICAL COMPOUND ISOLATED FROM WHOLE PLANT VIA HYDROALCHOLIC EXTRACT	Hexadecenoic acid, ethyl ester, linoleic acid, ethyl ester d-mannose, 3H-pyrazol-3-one, 2,4,5-trimethyl, 4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, methanol, benzoic acid, 2-hydroxy-methyl ester, benzofuran, 2,3-dihydro, 2-furancarboxaldehyde, 5-hydroxymethyl, 2-methoxy-4-vinylphenol, decanoic acid, ethyl ester, d-mannose, 3-Tert-butyl-4-hydroxyanisole, Ae-tumerone, tumerone, curlone, tricyclo[6.3.0.0(1,5)]undec-2-en-4-one, 2,3,5,9-tetramethyl, tetramethyl-2-hexadecen-1-ol, hexadecenoic acid ethyl ester, phytol, octadecadienoic acid ethyl ester, linoleic acid ethyl ester (Shabi <i>et al.</i> , 2010; Chandel and Kumar, 2015; Kumar <i>et al.</i> , 2011; Paranipe, 2011).
2	NAME OF CHEMICAL COMPOUND ISOLATED FROM PHENOLIC FRACTION	propanoic acid, 2-oxo-furfural, 2H-pyran-2-one, 5,6-dihydro, pantolactone, pentanoic acid, 4-oxo-furfural, levoglucosenone, hexanediamide, N,N'-dibenzoyloxy, 3-hydroxy-1-methylpyridinium hydroxide, 2-furancarbox-aldehyde, 5-methyl, propanedioic acid, phenyl, hydroquinone, phthalic acid, 1,3-benzenediol, 5-chloro-benzaldehyde, 3-(chloroacetoxy)-4-methoxy, ethenone, 1-(4-hydroxy-3-methoxyphenyl), 1,6-anhydro- α -D-glucospyranose, vanillic acid, 1-(2-Hydroxy-4,5-dimethoxyphenyl)ethenone, syringic acid, pyrrolidine-2-one, N-(2,4-dimethylcyclopent-3-enoyl), cinnamic acid, 4-hydroxy-3-methoxy, dimethoxy-bicyclo[3.3.1]nona-2,4dione (Dande and Khan 2012; Abhishek and Thaku, 2012; Annapurna <i>et al.</i> , 2013; Jolly and Narayanan, 2000).
3	CHEMICAL COMPOUNDS FOUND IN THE LEAVES OF <i>C. DACTYLON</i> USING GC-MS	Glycerine, 4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, thymol, conhydrin, 1,2-cyclopentanediol, 3-methyl, benzenepropanol, 4-hydroxy- α -methyl-R-ethyl, α -d-glucopyranoside, 3,7,11,15-tetramethyl-2-hexadecen-1-ol, n-hexadecanoic acid, ethyl ester, phytol, linolic acid ethyl ester, 9,12-octadecadienoyl chloride, octadecanoic acid, ethyl ester, pentanal, 2-methyl, hexadecanoic acid, 1-(cyclopropyl-nitro-methyl)-cyclopentanol, 2-propenamide, N-[2-(dimethylamino)ethyl]-hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester, didodecyl phthalate, 13-tetradec-11-yn-1-ol, 10-undecyn-1-ol, squalene, 9,12-octadecadienoic acid, phenylmethyl ester, diazoprogesterone (Chandel and Kumar, 2015).
4	OTHERS	Flavonoids, alkaloids, glycosides, terpenoids, triterpenoids steroids, saponins, tannins, resins, phytosterols, reducing sugars, carbohydrates, proteins, volatile oils, fixed oils (Sanifi, 2016).

3. Pharmacological activities of *C.dactylon*

The grass is has many pharmacological activities like antidiabetic activity, hyperlipidemic activity, anti-cancer activity, antimicrobial activity, antifungal activity, antiviral activity, antihypertensive activity, antibacterial activity, antitumor activity, anti-

epilepsy activity, anti-infertility activity, antiulcer activity, antioxidant activity, antipyretic activity, anti-inflammatory activity etc. Pharmacological activities of *C.dactylon* are mention in Table 5. Ethnobotanical uses are given in Table 6.

Table 6: Pharmacological activities of *C.dactylon*

S.NO.	Pharmacological activity	Extract name	Experimental study	References
1	Antidiabetic	Ethanollic extract of defatted <i>C.dactylon</i>	Streptozotocin-induced diabetic rats	Singh <i>et al.</i> , 2008
2	Antidiabetic	Methanolic extract	Produced steep decline in blood glucose levels in diabetic rats	Singh <i>et al.</i> , 2008; Karthik and Ravi, 2011
3	Hyperlipidemia	Leaves extract of <i>C.dactylon</i>	Reduce the Hyperlipidemia risk in diabetic rats	Kawad-Kawaran
4	Antimicrobial	<i>C.dactylon</i> and <i>C.bonducella</i> extract	Effective against Pseudomonas species	Suresh <i>et al.</i> , 2008
5	Anti-inflammatory/ Chondroprotective	Aqueous extract of <i>C.dactylon</i>	Carrageenam, serotonin, histamin, and dextraninduced rat paw edema and cotton pellet technique	Dhande, 2013
6	Diuretic	Aqueous extract of roots of <i>C.dactylon</i>	Increased excretion of Na, K, Cl	Shivalinge <i>et al.</i> , 2009
7	Chemo preventive/ antiproliferative	Methanolic extract of <i>C.dactylon</i>	Colon carcinogenesis in rats	Albert, 2010
8	Anti-ulcer	Alcoholic extract of <i>C.dactylon</i>	Against pylorus ligated and indomethacin induced gastric ulcer in albino rats	Pati <i>et al.</i> , 2005
9	Antioxidant/ Ehelich's lymphoma ascites	EA fraction of <i>C.dactylon</i>	Showed increased levels of enzymic and non-enzymic antioxidants, in Ehelich's lymphoma ascites mice	Sardha <i>et al.</i> , 2011
10	Bronchodilatory	Chloroform extract of <i>C.dactylon</i>	Against acetylcholine induced bronchospasm in guinea pigs	Patil <i>et al.</i> , 2013
11	Curative on STZ-induces Hepatic injury	Ethanollic extract of <i>C.dactylon</i>	Extract show curative effect on STZ-induced diabetic wistar rats	Singh <i>et al.</i> , 2009
12	Immunomodulatory	<i>C.dactylon</i> proteins fraction	Mice immunized with sheep RBC	Mangathayaru <i>et al.</i> , 2009
13	Wound healing	Gel preparation of aqueous and alcoholic extracts of <i>C.dactylon</i>	Shows Wound healing in wister rats	Thakre <i>et al.</i> , 2011
14	Anticonvulsant	Ethanollic extract of <i>C.dactylon</i>	Induced convulsion in mouse	Garg and paliwal <i>et al.</i> , 2008
15	Antiemetic effect	Crude aqueous rhizome extract of <i>C.dactylon</i>	Shows Antiemetic effect in various emetogenic models in comparison with metoclopramide, domperidone and chlorpromazine	Kawad-Kawaran
16	Anti-nephrolithiatic	Hydroalcoholic extract of roots of <i>C.dactylon</i>	Showed reduction of Calcium oxalate calculi in rats	Mousa <i>et al.</i> , 2011
17	Hypotensive effect	Aqueous extract of aerial parts of <i>C.dactylon</i>	Hypertensive rats reduce mean arterial pressure in rats	Kawad-Kawaran
18	Antiparkinson's effect /Rotenone-induce parkinson's disease	Aqueous extract of <i>C.dactylon</i>	Rats induced by rotenone (2mg/kg s.c.)	Kawad-Kawaran
19	Angiogenic effect	Aqueous extract of rhizomes of <i>C.dactylon</i>	Showed inhibiton on VEGF expressions in Human Umbilical Vein Endothelial cells (HUVECs) and angiogenesis in carrageenan induced air-pouch model in rats	Kawad-Kawaran
20	Alfa amylase inhibitory activity	Ethyle acetate extract of piper betle and <i>C.dactylon</i>	Showed Alfa amylase inhibitory activity in different models	Kawad-Kawaran
21	Anti-pyretic and antimicrobial activity	Ethanollic and methanolic extract of <i>C.dactylon</i>	Showed good inhibition on bacterial and fungal strains	Garg and khosa, 2008
22	Anticancer activity	Silver nanoparticles of	Showed dose dependent 23cytotoxicity	Kawad-Kawaran

S.NO.	Pharmacological activity	Extract name	Experimental study	References
		leaf extract of <i>C.dactylon</i>	against HepG2 cells	
23	Antimicrobial activity	Silver nanoparticles of leaf extract of <i>C.dactylon</i>	Concentration dependent antimicrobial activity against E.Coli, S.aureus, M.luteus, and S.typhimurium 53	Suresh <i>et al.</i> , 2008
24	Cardiac effect 48	Phenolic extract of <i>C.dactylon</i>	Showed cardioprotective activity using isolated frog heart perfusion method	Shabi <i>et al.</i> , 2012
25	Antitumor 46	Methanolic extract of leaves of <i>C.dactylon</i>	Showed activity against Ehrlich ascitic lymphoma in Swiss albino mice	Kawad-Kawaran
26	Anti-infertility 45	Aqueous extract of whole plant <i>C.dactylon</i>	Showed activity on reproductive organ weight and estrous cycle in female rats	Kawad-Kawaran
27	Anti- epilepsy and antidepressant 44	Ethanollic extract of <i>C.dactylon</i>	Showed Anti- epilepsy and antidepressant activity in various models	Kawad-Kawaran

Table 7: Ethnobotanical uses (Rajakumar and Shivanna, 2009; Aikia *et al.*, 2006; Agharkar, 1991, Kawad-Kawaran)

S.NO.	ETHANOBOTANICAL	USES
1	AYURVEDIC SYSTEM	Appetizer, anthelmintic, skin related diseases, psoriasis, herpes, allergies, rashes, hemorrhoids, restore normal color of the skin, wound healing, reduce itching, menorrhagia, irregular menstrual cycle, habitual abortion, strengthens the uterus, use in urinary tract infection, cooling effect, reduce inflammation of mucus layer of bladder in cystitis
2	UNANI SYSTEM	Laxative, emetic, carminative, coolant, heart tonic, use in grippe in children, pain, expectorant, brain tonic, emmenagogue, inflammation
3	TRADITIONAL SYSTEM	Diarrhea, dysentery, wounds, hemorrhages, hyperdipsia, cancer, epilepsy, cough, warts, snakebites, calculus, dropsy, sores, carbuncle, cramps, eye diseases, dandruff, fever, measles, leukoderma, hysteria, bronchitis
4	Morocco	Treatment of kidney stone

4. Formulations of *C.dactylon* in Ayurveda

There are many formulations made by the *C.dactylon* in Ayurveda and other system of medicines for example-durvadikwatha, durvadyaghrta, durvadyataila, durvadi yoga are some name of

formulations used to treat diseases. Table-7 gives the uses of all formulations of *C.dactylon*. Table-8 gives the information about brief description of patents registered on the *C.dactylon* work.

Table-8: Dosage forms uses (Ninad and Shailendra, 2014)

S. NO	DOSAGE FORM	USES
1	Decoction	Diuretic, syphilis, dropsy, vesical calculus, stop bleeding of piles, stop irritation in urinary organs
2	Crushed leaves	On wounds to stop bleeding, anti-inflammatory
3	Root infusion	Treatment of sarsaparilla, cure bleeding of piles
4	Juice	Fresh cuts and wounds, demulcent, astringent, dropsy, anasarca, catarrhal ophthalmia, secondary syphilis, chronic diarrhea, dysentery
5	Paste	Headaches, toothaches, reduce bleeding in vagina
6	Paste+Honey	Epitaxis
7	Juice + Honey	Menorrhagia
8	Decoction +Sugar	Beneficial in urine retention problem

Table 9: Patent registered on the *C.dactylon* and their owners references

S.NO.	PATENT FORMULATION NAME	NOVELTY	PATENT OWNER REFERENCES
1	Proteins isolated from pollen grains of <i>C.dactylon</i>	Showed inhibitory activity against anthrax toxins	Arora <i>et al.</i> , 2005
2	Preparation of Variants of group 1 allergens of poaceae family i.e <i>C.dactylon</i>	Useful in immunotherapy.	Fiebig <i>et al.</i> , 2008
3	Herbal composition of <i>C.dactylon</i> with six other plants	Used in the treatment for viral and bacterial disorders of aquatic animals	Desai <i>et al.</i> , 2002
4	Extract of <i>C.dactylon</i> and <i>Boswellia serrate</i>	Beneficial in asthma, skin disorders, type-1 hypersensitivity, mild allergies	Gokaraju, 2009
5	Capsules of <i>C.dactylon</i>	These capsules are more better than solution forms which are used in the treatment of broncho constrictive and does not cause irritating action on bronchial mucosa	Meillo, 1987

5. CONCLUSION

In ethnomedicinal practices and traditional medicinal systems, *Cynodondactylon* plays an important role. It can help with wide range of illnesses and ailments. Because the species is weedy grass that does not require cultivation, it can easily be explored for human benefits in its natural habitat. Researchers from all over the world have studied the pharmacological and pharmacological properties of this grass. As a result more research work is still needed on this grass, like validation, standardization, therapeutic effects and phytochemical investigation.

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