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A COMPREHENSIVE REVIEW OF *CYNODON DACTYLON*: BOTANICAL CHARACTERISTICS, PHYTOCHEMISTRY, AND MEDICINAL SIGNIFICANCE

Vikki *, Pankaj Kumar Shankhdhar, Pushpendra Kannoja, Suraj Giri Goswami and Rohit Kumar Bijauliya

BIU College of Pharmacy, Bareilly International University, Rohilkhand Medical College and Hospital Campus, Pilibhit Bypass road, Bareilly - 243006, Uttar Pradesh, India.

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Correspondence to Author:

Vikki

Research Scholar,
BIU College of Pharmacy,
Bareilly International University,
Rohilkhand Medical College and
Hospital Campus, Pilibhit Bypass
road, Bareilly - 243006, Uttar
Pradesh, India.

E-mail: vikkynaurya123@gmail.com

ABSTRACT: *Cynodon dactylon* (L.) Pers., commonly known as Durva or Doob grass, is a widely distributed perennial grass belonging to the family Poaceae and holds significant importance in traditional medicine systems such as Ayurveda, Unani, Siddha, and Homoeopathy. This review compiles and analyzes its botanical characteristics, phytochemical composition, and pharmacological activities. The plant is rich in bioactive constituents including flavonoids, phenolics, alkaloids, glycosides, tannins, and essential minerals, which contribute to its diverse therapeutic potential. Extensive ethnomedicinal use includes treatment of bleeding disorders, diabetes, inflammation, infections, and urinary ailments. Scientific studies have validated its pharmacological properties such as antidiabetic, antimicrobial, anti-inflammatory, antioxidant, anti-ulcer, diuretic, analgesic, and hepatoprotective activities. Various experimental models have demonstrated its efficacy in regulating glucose metabolism, improving cardiovascular function, and promoting wound healing. The presence of multiple phytoconstituents supports its broad-spectrum biological activities. This review highlights the correlation between traditional knowledge and modern pharmacological findings, emphasizing the therapeutic importance of *Cynodon dactylon* as a promising source for drug development and herbal formulation research.

INTRODUCTION: The World Health Organization estimates that around 80% of people worldwide rely on herbal remedies for their basic medical requirements. Worldwide, traditional and ethnomedical traditions employ about 35,000 plant species^{1, 2, 3}. *Cynodon dactylon* (L.) Pers., sometimes referred to as Durva, Bermuda grass, or Doob grass, is one of the many medicinal plants found in India and is widely used in traditional medical systems including Ayurveda, Unani, Siddha, Nepalese, and Chinese medicine.

Durva is a member of the Poaceae family and is made up of the dried complete plant^{4, 5}. This graceful, perennial creeping grass is widely distributed in India and many other tropical and subtropical areas of the world. *Cynodon dactylon* is distinguished by its vast network of rhizomes and stolons, which allow for quick vegetative proliferation and exceptional environmental adaptation^{6, 7}.

It is one of the most extensively distributed grass species in the world due to its hardiness, drought tolerance, and capacity to flourish in poor soils. Every portion of the plant has historically been used medicinally. Durva is prized in Ayurveda for its cooling, astringent, and haemostatic qualities. It is frequently used to treat wounds, skin conditions, urinary tract issues, and bleeding disorders⁸.

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Numerous bioactive components, including as flavonoids, alkaloids, glycosides, terpenoids, tannins, phenolic compounds, and vital minerals, have been identified by phytochemical studies⁹⁻¹¹. The many pharmacological effects of the plant are thought to be influenced by these chemicals. *Cynodon dactylon* has been shown in research to have antibacterial, antioxidant, anti-inflammatory, antidiabetic, hepatoprotective, wound-healing, and immunomodulatory properties¹²⁻¹⁶. Many of its traditional applications are supported scientifically by these discoveries. *Cynodon dactylon* is still a major focus of phytochemical and pharmacological research aimed at creating strong plant-based medications because of its widespread availability, safety profile, and therapeutic promise.

Taxonomy: *Cynodon dactylon* belongs to the kingdom Plantae and is classified under the division Magnoliophyta. It is placed in the class Liliopsida and belongs to the order Poales. The plant is a member of the family Poaceae, which includes grasses and cereal plants. Its genus is *Cynodon*, and the scientific name of the species is *Cynodon dactylon* (L.) Pers⁸.

Common Names: *Cynodon dactylon* is known by different common names in various languages and regions. In English, it is commonly called Bermuda grass or Bahama grass. In Hindi, it is known as Doob grass or Durva, while in Sanskrit it is referred to as Durva. The plant is called Arugampul in Tamil, Garika in Telugu, Karuka in Malayalam, and Garikehullu in Kannada⁸.

Habitat and Geographical Distribution: Common habitats for *Cynodon dactylon* include wastelands, open grasslands, roadsides, agricultural fields, riverbanks, and lawns. The plant is extremely resilient to drought, salt, and mild floods, and it grows well in warm areas¹⁷. Originally from Africa and Eurasia, it is now extensively found in North and South America, Europe, Australia, China, India, and Africa. The species is widespread throughout the world's tropical and subtropical climates. Although it can withstand extreme climatic circumstances because of its remarkable adaptability, it grows best in well-drained soils with sufficient sunshine¹⁸.

Botanical Description: A perennial creeping grass, doob grass is found in many tropical and

subtropical areas. It has a gritty, rather abrasive texture and a pale green colour. The plant's amazing flexibility and survival are attributed to its three primary structural components: roots, stems, and leaves. The creeping growth behaviour of Doob grass is its greatest distinguishing characteristic¹⁴.

Through rhizomes (underground stems) and stolons (above-ground runners), it spreads quickly. The plant may create a dense, carpet-like mat over the ground by developing adventitious roots whenever a node on the creeping stem comes into contact with the soil. It is extremely tenacious and challenging to eliminate once established because it spreads effectively both on the surface and through its subterranean root system²⁰.

Root System:

- Extensive, deep, and fibrous root system.
- Enables the plant to survive harsh environmental conditions, especially drought.
- Roots can penetrate 120–150 cm (47–59 inches) into the soil.
- Most of the root biomass is concentrated within the upper 60 cm (24 inches) of soil.
- Efficiently absorbs moisture and nutrients, even from poor or dry soils.

Leaves:

- Gray-green in color.
- Short and narrow in shape.
- Typically 3–10 cm (1–4 inches) long.
- Slightly rough along the edges.
- Arranged alternately on the stems.

Stem:

- Slender and slightly flattened.
- Grows to a height of 0.1–0.4 m (0.3–1.3 feet).
- Supports the leaves and inflorescences.

Inflorescence:

- Produces small flower clusters.
- Flowers are often purplish in color.
- Adds a subtle ornamental appearance to the plant.

Organoleptic Characteristics:

- Odour: Odourless.
- Taste: Mildly sweet and mucilaginous.

Special Characteristics:

- Highly resilient and adaptable.
- Exhibits rapid growth and excellent regenerative capacity.
- One of the most successful and widely adapted grass species in the world^{16, 21}.

**FIG. 1: CYNODON DACTYLON**

Ethnomedicinal Uses: In traditional healing systems, *Cynodon dactylon*, also known as doob grass, is a common medicinal plant used to treat a wide range of illnesses, such as diarrhoea, bronchitis, anasarca, urinary stones, dropsy, haemorrhage, cough, headache, and numerous urogenital problems. Asthma, hypertension, epilepsy, tumours, and skin diseases including leucoderma and sores are also treated with it. The plant possesses significant analgesic, haemostatic, and anti-inflammatory qualities. The freshly extracted juice is frequently applied topically to wounds and cuts that are bleeding in order to halt the bleeding and encourage healing. It functions as a natural astringent.

- To successfully reduce bleeding in situations of nosebleeds (epistaxis), a paste produced from the plant is sometimes combined with honey and applied.
- To assist control heavy menstrual bleeding (menorrhagia), oral ingestion of *Cynodon dactylon* juice, frequently mixed with honey, is historically advised two to three times daily for a few days.
- It has long been thought that applying a plant paste or extract topically to the lower abdomen might lessen uterine haemorrhage and treat diseases of the reproductive system.
- The plant's diuretic and calming effects on the urinary system are demonstrated by the use of a decoction made from it, often combined with sugar, in traditional medicine to treat urinary retention and enhance urine flow.
- In Ayurvedic, Unani, and Homoeopathic systems, the plant is highly valued: Ayurveda describes it as an appetizer, antipyretic, anthelmintic, and blood purifier; Unani medicine attributes laxative, coolant, expectorant, carminative, and cardiotoxic properties; while Homoeopathy uses it primarily for bleeding disorders and various skin conditions²²⁻²⁴.

Phytochemistry: Doob grass, or *Cynodon dactylon*, has a substantial nutritional value in addition to a rich and diverse phytochemical profile. Its biochemical richness is indicated by the about 28.17% enzymes, 11.79% ash, and 10.47% proteins it contains. Essential minerals that support physiological and metabolic processes in living systems, including calcium (0.77%), phosphorus (0.58%), manganese (0.34%), sodium (0.23%), and potassium (2.08%), make up the ash portion. Its nutritional significance is demonstrated by the fact that, in dried grass form, it comprises around 36.16% carbs and 6.04% proteins per 400 grams^{25, 26}.

Several phenolic phytotoxins, such as ferulic acid, syringic acid, p-coumaric acid, vanillic acid, para-hydroxybenzoic acid, and ortho-hydroxy phenylacetic acid, have been found using phytochemical screening. These substances are

well-known for their biological protective and antioxidant properties. The phytochemical composition of *C. dactylon* varies depending on the solvent extract: ethanolic extracts demonstrate the presence of alkaloids, flavonoids, and glycosides, whereas aqueous extracts mostly include flavonoids and glycosides.

The plant's nutritional and medicinal potential is further enhanced by bioactive substances including

vitamin C, β -carotene, lipids, and palmitic acid. Glycerin (38.49%), 9,12-octadecadienoyl chloride (15.61%), hexadecanoic acid ethyl ester (9.50%), ethyl-D-glucopyranoside (8.42%), linoleic acid ethyl ester (5.32%), and phytol (4.89%) were among the other significant substances found in the leaves by GC-MS analysis. Together, these components add to *Cynodon dactylon's* extensive pharmacological potential²⁷⁻³⁰.

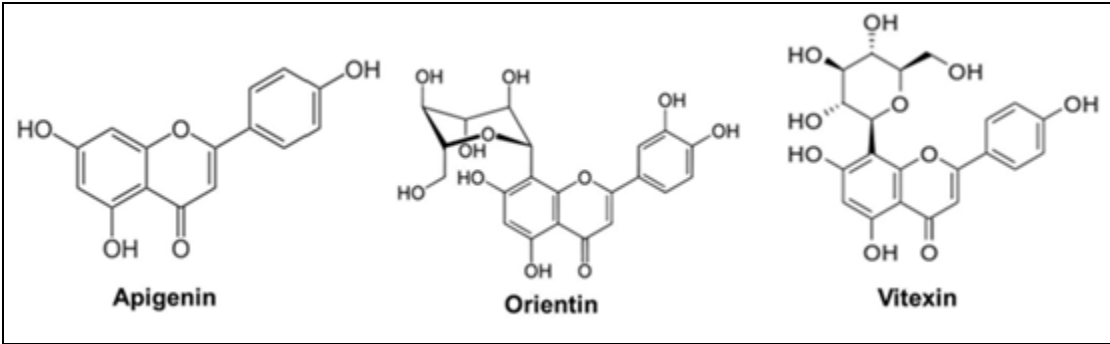


FIG. 2: CHEMICAL CONSTITUENTS OF *C. DACTYLON*³³

Pharmacological Properties of *Cynodon dactylon*: As previously stated, *C. dactylon* is a great source for its exceptional nutraceutical qualities. Numerous scientists and researchers have conducted analytical analyses and tests using the

parts and extracts of *C. dactylon* on animals since animal sources are readily available, easy to maintain, acceptable, and highly adaptive to various conditions.

TABLE 1: PHARMACOLOGICAL ACTION OF *CYNODON DACTYLON*

S. no.	Plant Extract / Part Used	Chemical Constituents	Mechanism of Action / Pharmacological Activity	References
1	Aqueous / ethanolic extract (whole plant, roots, stems)	Flavonoids, phenolics, alkaloids, tannins	Hypoglycaemic effect; improves insulin-like action, reduces glucose absorption and oxidative stress	[31–36]
2	Rhizome hydro-alcoholic extract	Saponins, glycosides	Enhances myocardial contractility, improves cardiac output, reduces congestion	[37–38]
3	Whole plant extract	Polyphenols, flavonoids	Anti-arrhythmic effect by stabilizing cardiac ion channels and reducing ischemia-reperfusion injury	[39–40]
4	Leaf extract (aqueous / alcoholic)	Flavonoids, terpenoids	Antimicrobial activity by disrupting microbial cell wall and inhibiting growth of pathogens	[41–43]
5	Ethanolic extract (aerial parts)	Tannins, flavonoids	Anti-ulcer effect via mucosal protection, reduced gastric acid secretion, enhanced mucus production	[44–45]
6	Aqueous extract (whole plant)	Minerals, flavonoids	Diuretic action by increasing electrolyte (Na ⁺ , K ⁺ , Cl ⁻) excretion and urine volume	[46–47]
7	Ethanolic extract (aerial parts)	Alkaloids, flavonoids	CNS activity: anticonvulsant and sedative effects via modulation of neurotransmitters (catecholamines, amino acids)	[48–48]
8	Alcoholic / aqueous leaf extract	Flavonoids, tannins	Wound healing by increasing collagen synthesis, protein content, and antioxidant defense	[49–50]
9	Hydro-alcoholic extract (aerial parts)	Phenolics, flavonoids	Antioxidant activity through free radical scavenging (DPPH, ABTS, superoxide inhibition)	[51]
10	Aqueous-ethanolic extract	Saponins, phenolics	Anti-nephrolithiasis by reducing calcium oxalate crystallization and improving renal function	[52–53]
11	Ethanolic extract (whole plant)	Flavonoids, glycosides	Analgesic and anti-inflammatory effects by inhibition of prostaglandin synthesis and oxidative mediators	[44–56]

12	Aqueous extract	Alkaloids, flavonoids	Antipyretic activity via suppression of prostaglandin-mediated fever response	[57]
13	Methanolic extract	Tannins, flavonoids	Anti-diarrhoeal effect by reducing intestinal motility and fluid secretion	[58]
14	Plant extract (oral administration)	Bioactive polyphenols	Antiviral activity against viral replication and host cell attachment inhibition	[59, 60]

CONCLUSION: *Cynodon dactylon* is a highly valuable medicinal plant with wide geographical distribution and strong ethnomedicinal relevance. The present review highlights its rich phytochemical profile, including flavonoids, phenolics, alkaloids, and glycosides, which are responsible for its diverse pharmacological activities. Scientific evidence supports its traditional uses in treating diabetes, inflammation, microbial infections, gastrointestinal disorders, and wound healing. Experimental studies further confirm its antioxidant, antidiabetic, anti-inflammatory, and cardioprotective potential. The correlation between traditional knowledge systems and modern pharmacological validation strengthens its therapeutic credibility. However, further clinical studies, toxicity profiling, and standardized extraction methods are required to fully establish its safety and efficacy in humans. Overall, *Cynodon dactylon* represents a promising natural resource for the development of novel herbal drugs and warrants continued scientific exploration for future pharmaceutical applications.

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