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Cynodondactylon: A Systematic Review on Antioxidant and Antimicrobial properties

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Abstract
Herbal products are known for its medicinal value. Though there many studies carried on several, still antioxidant activity and antimicrobial activity of certain plants have still have their space in research.In this review we want to explain about antioxidant and antimicrobial activity of *cynadondactylon* according to literature review we found that durva is a natural weed with some beneficial property for good health and is traditionally used for worshiping the three blades that are known as Shiv, Shakti and Ganesh. *Cynodondactylon*plays prime position in ethanomedicinal practices in India, taken as forage crop as medicinal herb in various culture with in the country. These plantscontains a wide range of secondary metabolites with medicinal effects such as cyanidin, luteolin, and apigenin. According to literature survey it is found that this plant contains alkaloids, flavonoids, terpinoids, quninones, reducing sugar,coumarins, polyphenols, and saponins. It is often used in tropical, subtropical, warm-temperate, and dry climates as a warm-season grass for forage and ecological restoration. By this literature survey we will potential review on this two activity.
Keywords: herbal products; *Cynodondactylon*; antioxidant activity; antimicrobial activity.

1.Introduction

Since the prehistoric era, it has been seen that in the Ayurvedic system, *Cynodondactylon*grass has medicinal properties with effective therapeutic activity. Its common name is taken from Sanskrit terms, and it is also known as Bermuda grass, couch grass, and scutch grass. For most, it is used as the traditional as religious practices in India. Durva is also used as immune booster because researches have shown that it can increase the immunological power of an indivisuals body. *Cynodondactylon* is a perennial herbaceous grass with well-developed rhizomes and stolons. According to the Ayurvedic system, *C. dactylon*is pungent, bitter, fragrant, an appetiser, vulnerary, anthelmintic, antipyretic, and somehow also used in leucoderma, bronchitis, piles, asthma, and tumors [1]. It is growing naturally and can be found on roadsides, open grasslands, and backyards, where it is easily spotted and identified.The majority of the soils used for growing *C. dactylon*are lateritic, nutrient-poor, and favorably high in iron oxide. Sedimentary soils can be found in the current study region along thestreams and rivers. There are many types of rocks present which generally include schist andgneisses with sandstones, granite intrusion, laterite,shells, limestone and basaltic lava, with bauxite [2].

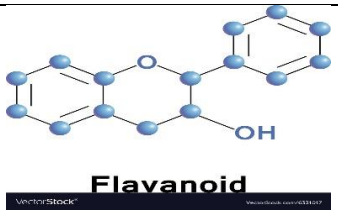
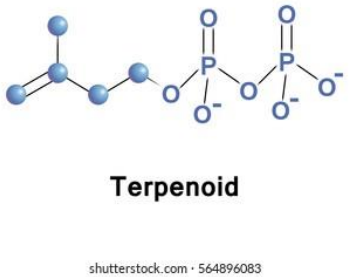
C. dactylon is a fast-growing grass. Leaves are narrow and linear and have a green colour. Erect stems can grow up to 30 cm. The seeds produce 2–6 spikes at theapaxof the stem; the spikes are 2–5 cm long. The grass contains a deep root system, which grows up to 2 metres deep. It spreads through seed and rhizomes. *C. dactylon is* cultivated in warm weather in those areas which remains uncultivated area. In India, the colour of the grass changes to brown during the winter season.In full sun, the grass is growing well, but in full shade, it is retarded. It grows at a very fast rate and remains durable,as a result it becomesfavourable and suitable for outdoor sports fields because it recovers quickly when damaged. It is a popular grass in on slightly hot condition climates, particularly in areas where its endurance to heat and dryness allows it to thrive where few other grasses can.


Fig 1.– Plants of *Cynodondactylon*in India

2. Phytochemical constituents

Recent research revealed that the Durva whole plant consists of alkaloids, flavonoids, terpinoids, quninones, reducing sugar, coumarins, polyphenols, and saponins[3][21], as well as vitamin C, selenium, arundoin, friedelin B-carotene, beta-sitosterol carotene, palmitic acid, triterpenoids and Mineral, constituent oxides of sodium, phosphorus, calcium, magnesium, and potassium; due to which it shows antioxidant, anti-microbial, anti-diabetic, and anti-cancer activity [4].

Table 1.Chemicals and their structure, properties and biological activity

Chemical	Structure	Property	Biological activity
Flavonids		Melting point – 236.5 – 237.8 ºC, Boiling point – 273.2- 352.4ºF	Anticancer, Antioxidant, Anti-inflammatory and Antiviral [5].
terpinoids		Melting point- 95ºC Boiling point- 156ºC	Antiviral, Antibacterial, Antimalarial, Anti-inflammatory, Hypoglycemic activities, Anti-cancer activities[6].

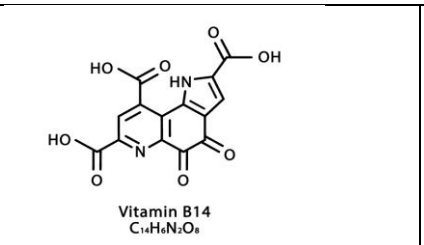
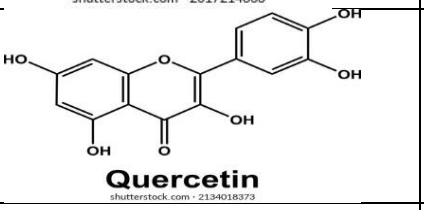
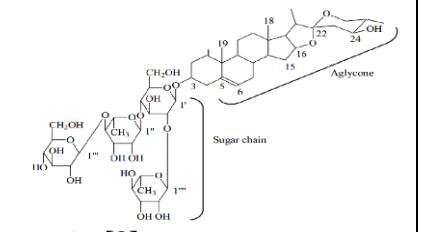
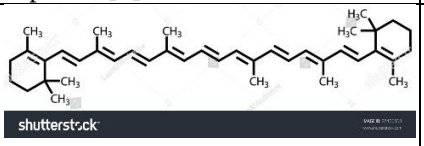
Quninones		Melts at 177°Cand Boils at 496 °C	Antimalarial, a muscle relaxant and a non-narcotic analgesic
Coumarins		Boilingpoint 299~301degC, Melting point 69~71 OC. Colorless crystalline solid	Anticoagulant activity along with anti-inflammatory action and anticancerous action, antibacterial along with Anti-hyperglycaemic[7].
Polyphenols		Boiling point 181.9°C, Freezing point 40.9°C	Anticancer, Antioxidant, Anti-inflammatory , Anti-microbial and Anti-cariogenic[8].
Saponins	 saponins[9]	Boiling point 158℃ Melting point 101.9℃	Surface-active or detergent
B-carotene		Melting point 183°C,Boiling point 654.7 °C	Stimulate immunological response, boost RNA creation, and promote resistance to infection and inflammation [10].

Table 2. Importance of Minerals and Vitamin C in human body

Minerals	**Importance**
Vitamin C	Antioxidant vitamin C increases the formation of IV collagen in endothelial cells and encourages proliferation of endothelial cells [11]. Control and maintain the condition of cells, protects the body's immune system, arteries and veins, the epidermis and bone strength at a certain level.
Sodium(Na)	Transmit signals from the nerves, relax and contract muscles, as well as maintain an adequate amount of nutrients and the water.

Phosphorus(P)	Construction of teeth and skeleton The production of protein by the human body is also necessary for the development, upkeep, and healing of living cells and organs.
Calcium(Ca)	For human body's muscles to contract and nervous system to transmit signals from one area of your brain to another.
Magnesium(Mg)	Governing arterial pressure, glucose levels, muscular and neuron activity, and producing the genetic material, bone, and protein.
Potassium(K)	enhances the functioning of enzymes known as antioxidants and employs the enzymes of antioxidants to fight against the harmful effects of free radicals on cells.

3.Therapeutic uses

It is reported many types of synthesized drugs have antifungal and antimicrobial activities, leads to major dose dependent toxicological effects. To counter this, nowadays many pharmaceutical industries are switching to herbal medicine. The modern scientific evolution and studies have proved anti-oxidant and anti-microbial activity.

4.Antioxidant activity

Substances known as antioxidants shield our bodies against the harmful effects of reactive strain. Whenever the human body's capacity to eliminate reactive oxygen molecules and the formation of them are beyond equilibrium, a condition called oxidative stress. Regular bodily functions and surroundings like pollution and ultraviolet (UV) rays produce ROS[12]. The build-up of ROS can contribute toA number of health problems, such as as cancer, cardiovascular disease, and issues with the immune system. The antioxidants found in plants, such as CynodonDactylon, can aid in defending our bodies against the damaging impacts of oxidative stress on cells. Antioxidants work by neutralizing ROS and helping to reduce inflammation and prevent cell damage. They can also contribute to shielding the human body against the consequences of aging, improve cognitive function, and support healthy vision. CynodonDactylon is a grass species native to India and Southeast Asia [13]. This plant is a rich source of powerful antioxidants, including flavonoids, phenolic acids, and saponins. Studies have shown that CynodonDactylon has the potential to lessen the impact of oxidative stress and prevent the human system from radicals negative consequences. Furthermore, this plant has been shown to have anti-inflammatory, anti-bacterial, and anti-fungal properties [14]. In conclusion, CynodonDactylon is a powerful source of antioxidants that can aid in defending our bodies against the damaging impacts of oxidative stress on cells. This plant has the potential to reduce inflammation, protect against cell damage, and support healthy vision and cognitive function.

It is a grass species that is widely used in traditional medicine across the world. Recent scientific research has shown that it has a powerful antioxidant potential, which could have numerous health benefits. Oxidative damage is an important variable in the growth of severe ailments like diabetes, cancer, and cardiovascular disease. Antioxidants are substances that help to neutralize these free radicals and reduce oxidative stress. Studies have shown that *Cynodondactylon* contains a number of different compounds with antioxidant properties, such as flavonoids, tannins, and phenolic acids [15]. A study published in the journal Pharmaceutical Biology found that *Cynodondactylon* extracts have strong antioxidant activity, as measured by the scavenging of free radicals. The researchers concluded that *Cynodondactylon* could be used to treat oxidative stress-related diseases. Another study published in the journal BMC Complementary and Alternative Medicine examined the effects of *Cynodondactylon* on the oxidative damage of red blood cells [16]. The researchers found that *Cynodondactylon* extract was able to reduce lipid peroxidation, a marker of oxidative damage, in a dose-dependent manner. The results of these

studies suggest that *Cynodondactylon* has a powerful antioxidant potential that could be beneficial in preventing and treating a variety of illnesses. To completely comprehend the mechanics, more study is necessary behind *Cynodondactylon* antioxidant activity and its potential therapeutic uses [17].

5.Antimicrobial activity

*C. dactylon*has shown many good pharmacokinetic effects, such as antioxidant activity and antimicrobial activity. When the plant is isolated for a period of time and extracted to generate several phytochemicals, it has been discovered that when applied, *C. dactylon* reduces oxidative stress and kills some specific and specific bacteria that contaminate the body especially in the skin [18]. If the microbes remain untreated, it can lead to a harmful infection that damages the skin in a serious way. When the minerals and vitamins combine with other pharmaceutical agents, it also leads to the formation of new substances that can be used to create different dosage forms, which are also used in the cosmetic industries, which have specialization and expertise in creating tropical agents. Other phytochemicals like flavonoids, terpinoids, saponins, and also the oxides of various alkaline metals as well as alkaline earth metals or minerals lead to the creation of antioxidant compounds, which are used for the purification and clininance of blood as well as other blood components of the body [19].

Studies have collectively demonstrated the plant's potential as an antimicrobial agent against a range of microorganisms. One study published in the journal "Journal of Ethnopharmacology" investigated the antimicrobial activity of Cynodondactylon extracts against various bacteria and fungi. The results revealed significant inhibitory effects against both Gram-positive and Gram-negative bacteria, including pathogens such as Staphylococcus aureus, Escherichia coli, and Salmonella typhi. The extracts also shown efficacy as an antifungal towards Aspergillusniger and Candida albicans.. The researchers It has been suggested that its presence of may be responsible for Cynodondactylon's antibacterial action,bioactive compounds like alkaloids, flavonoids, and tannins.

In another study published in "Evidence-Based Complementary and Alternative Medicine," Cynodondactylon extracts were tested against drug-resistant strains of bacteria. The extracts demonstrated potent antimicrobial effects against Methicillin-resistant Staphylococcus aureus (MRSA) and multidrug-resistant Escherichia coli. The researchers suggested that the plant extracts could potentially serve as a source of novel antimicrobial compounds to combat drug-resistant infections.

Furthermore, a study published in the "Asian Pacific Journal of Tropical Biomedicine" investigated the antimicrobial potential of Cynodondactylon essential oil. The results showed significant antibacterial activity against both Gram-positive and Gram-negative bacteria, including pathogens like Staphylococcus aureus and Pseudomonas aeruginosa. The essential oil also exhibited antifungal effects against Candida albicans. The researchers attributed the antimicrobial properties of Cynodondactylon essential oil to its chemical composition, which includes terpenes, phenols, and aldehydes.

These studies collectively support the antimicrobial potential of Cynodondactylon against a wide range of microorganisms, including drug-resistant strains. The presence of bioactive compounds and essential oil components in Cynodondactylon contributes to its observed antimicrobial effects. However, further research is needed to understand the specific mechanisms of action and to isolate and identify the active compounds responsible for the antimicrobial properties of Cynodondactylon. Such knowledge could lead to the development of new antimicrobial agents or the incorporation of Cynodondactylon into complementary treatment strategies for infectious diseases.

6.Conclusion:

In conclusion, the review article provides a comprehensive overview of the antioxidant and antimicrobial activities of Durva (Cynodondactylon). The findings from various studies discussed in the review highlight the potential of Durva as a valuable natural resource with promising therapeutic applications. Durva extracts and essential oils have demonstrated significant antioxidant properties, attributed to the presence of bioactive compounds such as flavonoids, phenols, and alkaloids. These antioxidants have

shown the ability to scavenge free radicals and protect against oxidative stress-related diseases.Furthermore, Durva has exhibited noteworthy antimicrobial activity against a broad spectrum of microorganisms, including both Gram-positive and Gram-negative bacteria as well as fungi. The antimicrobial effects have been observed against drug-sensitive and drug-resistant strains, indicating the potential of Durva as an alternative or adjunct antimicrobial agent. The presence of diverse bioactive compounds in Durva, such as alkaloids and terpenes, likely contributes to its antimicrobial efficacy.While the review highlights the significant antioxidant and antimicrobial activities of Durva, it also emphasizes the need for further research. Future studies should focus on identifying and isolating specific bioactive compounds responsible for these effects and elucidating their mechanisms of action. Additionally, investigations into the potential synergistic effects of Durva in combination with conventional antimicrobial agents are warranted. Overall, the collective evidence presented in this review supports the notion that Durva possesses notable antioxidant and antimicrobial properties. Exploiting these characteristics could lead to the development of natural antioxidants and antimicrobial agents derived from Durva, which could find applications in various therapeutic areas, including oxidative stress-related disorders and infectious diseases. Continued research on Durva's bioactive components and their effects will provide valuable insights into its potential as a source of novel antioxidants and antimicrobial agents in the field of natural medicine.

Reference

[1] DAS MC, Shilpi S, Chandra S. Overview of Cynodondactylon (Doob Grass) in modern medicine as antidiabetic herb. Journal of Drug Delivery and Therapeutics. 2013 Nov 14;3(6):117-

[2] Kumari P. Sahu, P. K. Soni, M. Y. &Awasthi, P. (2014). Impact of Partheniumhysterophorus L. invasion on species diversity of cultivated fields of Bilaspur (CG) India. Agricultural Sciences, 2014.

[3] Pandey A, Mishra HS. Therapeutic potential of durva (cynodondactylon l. pers.): review study. IJLSR. 2019;5(9):138-42.

[4] Reshu V, Tarun V, Satbir S, Geeta M, Girish M. Hidden potential of doob grass-an Indian traditional drug. Res Pharm Health Sci. 2018;4:478-82.

[5] Ullah A, Munir S, Badshah SL, Khan N, Ghani L, Poulson BG, Emwas AH, Jaremko M. Important Flavonoids and Their Role as a Therapeutic Agent. Molecules. 2020 Nov 11;25(22):5243. doi: 10.3390/molecules25225243. PMID: 33187049; PMCID: PMC7697716.

[6] Masyita A, Mustika Sari R, DwiAstuti A, Yasir B, RahmaRumata N, Emran TB, Nainu F, Simal-Gandara J. Terpenes and terpenoids as main bioactive compounds of essential oils, their roles in human health and potential application as natural food preservatives. Food Chem X. 2022 Jan 19;13:100217. doi: 10.1016/j.fochx.2022.100217. PMID: 35498985; PMCID: PMC9039924.

[7] Srikrishna, D., Godugu, C., &Dubey, P. K. (2018). A review on pharmacological properties of coumarins. Mini reviews in medicinal chemistry, 18(2), 113-141.

[8] Li AN, Li S, Zhang YJ, Xu XR, Chen YM, Li HB. Resources and biological activities of natural polyphenols. Nutrients. 2014 Dec 22;6(12):6020-47. doi: 10.3390/nu6126020. PMID: 25533011; PMCID: PMC4277013.

[9] El Aziz, M. M. A., Ashour, A. S., &Melad, A. G. (2019). A review on saponins from medicinal plants: chemistry, isolation, and determination. J. Nanomed. Res, 8(1), 282-288.

[10] National Center for Biotechnology Information (2023). PubChem Compound Summary for CID 5280489, Beta-Carotene. Retrieved April 10, 2023 from https://pubchem.ncbi.nlm.nih.gov/compound/Beta-Carotene

[11] Chambial S, Dwivedi S, Shukla KK, John PJ, Sharma P. Vitamin C in disease prevention and cure: an overview. Indian J ClinBiochem. 2013 Oct;28(4):314-28. doi: 10.1007/s12291-013-0375-3. Epub 2013 Sep 1. PMID: 24426232; PMCID: PMC3783921.

[12] Pattanashetti LA, Patil BM, Hegde HV, Kangle RP. Potential ameliorative effect of Cynodondactylon (L.) pers on scopolamine-induced amnesia in rats: Restoration of cholinergic and antioxidant pathways. Indian Journal of Pharmacology. 2021 Jan;53(1):50.

[13] FUNG VA, GOBILIK J, DAVID D. Effects of Fertilizer Application and Successive Harvesting on Clipping Yield, Phytochemical Contents and Antioxidant Activity of Cynodondactylon (L.) Pers. NotulaeScientiaBiologicae. 2018 Mar 27;10(1):130-6.

[14] Rajeshkumar RR, Kumar BK, Parasuraman P, Panneerselvam T, Sundar K, Ammunje DN, Pandian SR, Murugesan S, Kabilan SJ, Kunjiappan S. Graph theoretical network analysis, in silico exploration, and validation of bioactive compounds from Cynodondactylon as potential neuroprotective agents against α-synuclein. BioImpacts. 2022 Oct 30;12(6):487-99.

[15] Farouk S, Al-Amri SM. Exogenous melatonin-mediated modulation of arsenic tolerance with improved accretion of secondary metabolite production, activating antioxidant capacity and improved chloroplast ultrastructure in rosemary herb. Ecotoxicology and Environmental Safety. 2019 Sep 30;180:333-47.

[16] Kumar S, Shachi K. Hypoglycemic Medicinal Effects of CynodonDactylon in Alloxan Induced Diabetic Albino Rats. AdvEndoc and Daib: AEAD. 2020;110.

[17] Amini Z, Salehi H, Chehrazi M, Etemadi M, Xiang M. miRNAs and their target genes play a critical role in response to heat stress in Cynodondactylon (L.) Pers. Molecular Biotechnology. 2023 Mar 13:1-4.

[18] David AD, Gupta S, Singh SN, Moses AS. Antimicrobial activity of Cynodondactylon against MDR bacteria. Journal of Pharmacognosy and Phytochemistry. 2020;9(2):34-6.

[19] Usman H, Kaigama AU, Ibisagba OO, Fulata AM, Ahmed IA. Phytoconstituents evaluation and antimicrobial efficacy of the crude flavonoids and saponinsrootbark extracts of Terminaliaavicennioides and Ficuspolita. Journal of Herbmed pharmacology. 2018 Mar 20;7(2):106-11.

[20] Behravan M, Panahi AH, Naghizadeh A, Ziaee M, Mahdavi R, Mirzapour A. Facile green synthesis of silver nanoparticles using Berberis vulgaris leaf and root aqueous extract and its antibacterial activity. International journal of biological macromolecules. 2019 Mar 1;124:148-54

[21] Al-Snafi AE. Chemical constituents and pharmacological effects of Cynodondactylon-A review. IOSR Journal of Pharmacy. 2016;6(7):17-31.

[22] Al-Snafi AE. Chemical constituents and pharmacological effects of Cynodondactylon-A review. IOSR Journal of Pharmacy. 2016;6(7):17-31.

[23] Gogoi J, Dutta P. Cynodondactylon Pers.: A Review on Forage Crop and Medicinal Herb. Journal of Pharmaceutical Research International. 2021 Dec 15:344-50.

[24] Sharifi-Rad J, Cruz-Martins N, López-Jornet P, Lopez EP, Harun N, Yeskaliyeva B, Beyatli A, Sytar O, Shaheen S, Sharopov F, Taheri Y, Docea AO, Calina D, Cho WC. Natural Coumarins: Exploring the Pharmacological Complexity and Underlying Molecular Mechanisms. Oxid Med Cell Longev. 2021 Aug 23;2021:6492346. doi: 10.1155/2021/6492346. PMID: 34531939; PMCID: PMC8440074.