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Review on *Cynodon dactylon*

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Abstract: Through an overview of the many pharmacognostic and pharmacological activities of Cynodon dactylon, as well as information on its chemical ingredients, traditional usage, and pharmacognostic characteristics, this study aims to compile the most recent results available.
Keywords: Cynodon dactylon, Hepato protective, Anti-ulcer, Anti-oxidant

I. INTRODUCTION

Medicinal plants are crucial in the creation of substitute medications that don't have the negative side effects of synthetic medications [1]. Both conventional and contemporary medicines are derived from plants and natural ingredients, which are also commonly employed in the manufacturing of pharmaceuticals for commercial use. Approximately 25% of prescription medications administered globally are derived from herbs, according to credible and scientific research [2]. Plant extracts, secondary metabolites, and essential oils are recognized as compounds with antioxidant and antibacterial qualities that have few or no harmful effects. These substances are crucial in the treatment of several illnesses [2, 3]. Actually, plants are constantly producing phytochemicals, which are secondary metabolites with enormous biological potential that are the foundation of modern drug development [4]. As documented in the literature, the World Health Organization estimates that around 80% of the world's population, particularly in Latin America, Africa, Asia, and the Middle East, depends on herbs for their basic healthcare requirements [5]. These herbs have few negative effects, and pharmaceutical corporations have lately invested millions of dollars in pharmaceutical plants to manufacture natural medications made from extracted herbs [5, 6]. The following are the primary justifications for utilizing therapeutic herbs: They (i) more closely align with the patient's beliefs, and (ii) allay worries about the adverse consequences of synthetic drugs.

The following are the main justifications for using medicinal herbs: (i) they more closely align with the patient's ideology; (ii) they allay worries about the negative effects of synthetic medications; (iii) they are more reasonably priced; (iv) they meet the need for more individualized care; and (v) they make health information more accessible to a wider audience. Numerous pharmacological uses of plant extracts and the chemicals extracted from them have been documented in a sizable body of literature [7]. Exploiting the biological potential of medicinal plants offers a great chance to create new therapeutic options [8, 9]. Bioactive plant extracts hold great potential as a source of several medications. Two examples of plant-based antibiotics are berberine (Berberis) and quinine (Cinchona). thanks to the country's diverse climate, India is home to a wide variety of wild bioactive plants, including *Cynodon dactylon* (family: Poaceae), which are extremely effective against bacteria (Escherichia coli and Staphylococcus aureus) [10]. As a result, it is feasible to obtain herbal extracts in large quantities for industrial use. This perennial grass is utilized as a medicinal herb, fodder, and to help green up arid areas. *C. dactylon (L.)* Pers. spreads swiftly due to the rapid growth of its roots. It is mostly found in farms, open areas and parks, road shoulders, and cereal fields. Plants are propagated by rhizomes and seeds. Rhizomes *of C. dactylon (L.)* Pers. can grow in hard soils between roots of other crop plants to create new plants after crop seeds germinate and plants are established in the field [11]. Flavonoids, alkaloids, glycosides, terpenoids, triterpenoid esters, saponins, tannins, resins, phytosterols, reducing sugars, carbohydrates, proteins, volatile oils, and fixed oils are all present in *C. dactylon* (L.) Pers., according to photochemical investigations [12]. The Unani medical system describes C. dactylon as having a pleasant smell and a hot, harsh flavor. The plant's rhizomes and aerial portions contain diuretic, antidiabetic, antibacterial, antimicrobial, antioxidant, and wound-healing properties in addition to cardioprotective properties [13]. Traditional healers employ *C. dactylon* to treat biliousness, itching, diarrhea, gonorrhea, conjunctivitis, anuria, and stomachaches. It also purifies the blood. A review of the literature also indicates that rats' CNS functions were studied using dried extracts of C. dactylon aerial parts. This plant also serves as an analgesic and antipyretic, an antibiotic, an antiviral, an antipsychotic, an antigonorrheal infection fighter, an antiulcer, an antihypertensive, an antihysteric, and a hypoglycemic agent [14, 15]. Methanolic extract of *C. dactylon* reduces the amount of lipid peroxides, according to studies conducted on laboratory animals. Additionally, it was discovered that the COLO 320 DM cells, a colon cancer cell line, and the levels of antioxidant enzymes were all positively affected by the methanolic extract of *C. dactylon.*

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The therapeutic and antibacterial qualities of C. dactylon (L.) Pers. have not been extensively studied [13–15], and more research is needed to validate these qualities. This work evaluated the antioxidant and antibacterial characteristics of the methanolic extract of the rhizomes of *C. dactylon* (L.) Pers., a native of Iran, and identified for the first time its chemical contents.

II. TAXONOMICAL CLASSIFICATION

Kingdom-Plantae
Division-Magneliophyta
Class-Liliopsida
Order-Cyperales
Family-Poaceae
Genus-Cynodon
Species-*Cynodon dactylon*
Common name: *Cynodon dactylon* is also known as Durva grass, Bermuda grass, Dog's Tooth grass, Indian Doab, Scutch grass, Bahama grass, Devil's grass, Couch grass, Dhub, doob and durba in different parts of the world.
Different vernacular names around the world:-
Africa: Kweekgras
Bangladesh: Durba
Cambodia: Smao Anchien
Canada: Ambate-Hullu, Graikae
Fiji: Kabuta
Franch : Chiendent Dactyle, Chiendent Pied-DePoule, Grand Chiendent
Germany: Hundezahngras
Hawaii: Manienie
India: Doob, Durva, Haryali, Kabbar, KarukaOulli, Talla.
Indonesia: Jukut Kakawatan, Gigirinling, Rumput Bermuda, Rumput Grinting, Sukit
Israel: Yablith
Laos : Hnha:z, Phe:d
Malaysia: Rumput Minyak
Myanmar: Mye-Sa-Myet
Nepal; Motie molulu, Dubo
Philippine: Kawad-kawad, Bakbaka, Kapot-kapot
Portugal: Capim-Bermuda
Spain: Chepica Brave, Came De Niño, Pate De ,Perdiz, Gramilla Blanca
Suriname: Griming, Tigriston
Thailand: Ya-Phraek
Vietnam: Cochi, Coong
Geographical source:
Although it is believed that *C. dactylon* originated in Africa, it is now found around the world in tropical and subtropical areas, including Asia, the Caribbean, North, Central, and South America, as well as islands in the Pacific Ocean.

III. MORPHOLOGY

C. dactylon is a perennial creeper with slender, wiry stems (culms). The leaves are delicate, sharp, narrowly linear or not split, and measure 2–10 cm by 1.25–3 mm. It has six green or purple spikes that branch off of a thin ascending peduncle. The grain length is 1.05 mm. August through October is when flowers and fruits are produced (also throughout the year). Additional features are listed below.
Root: *C. dactylon* has a fibrous, cylindrical root that can grow up to 4 mm in thickness. From the main roots, smaller, hair-like roots emerge that are cream in color.
Stem: wilted, horizontal, jointed, leafy, and up to 1 mm thick
very smooth, with a greenish yellow hue.
Leaf: slender, 2 to 10 cm long and 1.25 to 3 mm broad

either unbroken or split, sharply pointed and somewhat opaque, typically glaringly opaque in the bare branches and at the base of the stem; thinly coated, sometimes bearded, ligule a exquisitely ciliated rim [16–20].

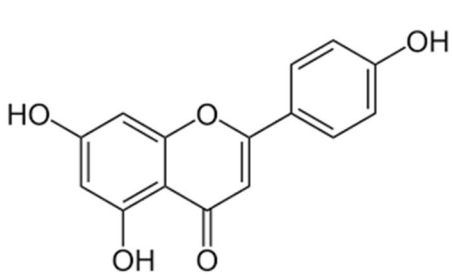
Figure 1: Images of *Cynodon dactylon*

IV. PHYTOCHEMISTRY

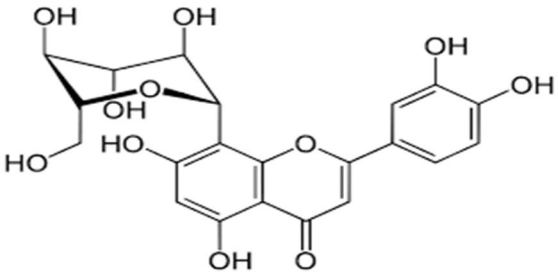
Chemical constituents: Various phytochemical analyses explored that the plant contained flavanoids, alkaloids, glycosides, terpenoides, triterpenoids steroids, saponins, tannins, resins, phytosterols, reducing sugars, carbohydrates, proteins, volatile oils and fixed oils[21-25].

Quantitative estimation of phytoconstituents showed glycosides reached 12.2 %, tannins 6.3%, alkaloids 0.1%, resins 1.0%, free reducing sugar 10% and total reducing sugar 12% [26]. From nutritional analysis it has been explored that each 100 g contained (on a zero-moisture basis) 11.6 g protein, 2.1 g fat, 75.9 g total carbohydrate, 25.9 g fiber, 10.4 g ash, 530 mg Ca, 220 mg P, 112.0 mg Fe, 1630 mg K, 28 µg betacarotene equivalent [27]. A total of 20 compounds were identified from the hydroalcoholic extract of the whole parts of C. dactylon. Hexadecanoic acid, ethyl ester linolenic acid, ethylester d-mannose were the major components of the hydroalcoholic extract, and hexadecanoic acid ethyl ester was the most abundant one (17.49%). However, the isolated compounds were included: 3H-pyrazol-3-one, 2,4-dihydro2,4,5-trimethyl 2.2112%, 4H-pyran-4-one, dihydroxy-6-methyl3.2157%, menthol 1.1807%, benzoic acid, 2-hydroxy-, methyl ester 2.0455%, benzofuran, 2,3- dihydro 0.9639%, 2-furancarboxaldehyde, 5-(hydroxymethyl)- 2.3088%, 2-methoxy-4-vinylphenol 3.2348%, decanoic acid, ethyl ester 2.4063%, d-mannose 11.4820%, 3-Tert-butyl-4-hydroxyanisole 0.9040%, Artumerone 5.7431%, tumerone1.9123%, curlone 4.2422%, tricycle [6.3.0.0(1,5)] undec-2-en-4-one, 2,3,5,9- tetramethyl2.89 14%, 3,7,11,15-Tetramethyl-2-hexadecen-1- ol 10.3540%, hexadecanoic acid ethyl ester 17.4905%, phytol 5.2078%, 9,12-octadecadienoic acid ethyl ester 6.9257%, linolenic acid ethyl ester 11.2885% and octadecanoic acid ethyl ester 3.9916%. On the other hand, 22 compounds were identified from the phenolic fraction of the whole parts of C. dactylon.

Hydroquinone was the most abundant one (69.49%). The isolated compounds were included: propanoic acid, 2-oxo 1.5939%, furfural 6.0224%, 2H-pyran-2-one, 5,6- dihydro 1.3323%, pantolactone 0.8977%, pentanoic acid, 4- oxo 0.7289%, levoglucosenone 2.7253%, hexanediamide, N,N'-dibenzoyloxy 0.9019%, 3-hydroxy-1-methylpyridinium hydroxide 1.4121%, 2-furancarbox-aldehyde, 5- methyl 1.5718%, propanedioic acid, phenyl1.8379%, hydroquinone 69.4771%, phthalic anhydride 1.3128%, 1,3-benzenediol, 5- chloro 1.1284%, benzaldehyde, 3-(chloroacetoxy)- 4- methoxy 0.8016%, ethanone, 1-(4-hydroxy-3-methoxyphenyl)- 0.5183%, 1,6-anhydro-á-D-glucopyranose (levoglucosan) 1.0982%, vanillic acid 1.2001%, 1-(2- Hydroxy-4,5-dimethoxyphenyl)-ethanone 0.3610%, Syringic acid 1.1154%, pyrrolidin-2-one, N-(2,4- dimethylcyclopent3-enoyl)-, cis 1.8603%, cinnamic acid, 4-hydroxy-3- methoxy 1.2345% [23]. A total of 24 compounds were isolated from C. dactylon leaves using GC-MS analysis, these included: glycerin 38.49%, 4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6- methyl- 2.16%, thymol 1.15%, conhydrin 0.79%, 1,2- cyclopentanediol, 3-methyl- 1.65%, benzenepropanol, 4- hydroxy-à-methyl-, (R)- 0.36%, ethyl à-d-glucopyranoside 8.42%, 3,7,11,15-tetramethyl-2-hexadecen-1-ol 2.01%, nhexadecanoic acid1.01%, hexadecanoic acid, ethyl ester 9.50%, phytol 4.89%, linoleic acid ethyl ester 5.32%, 9,12- octadecadienoyl chloride, (Z,Z)- 15.61%, octadecanoic acid, ethyl ester 0.72%, pentanal, 2-methyl- 0.58%, 1- (cyclopropyl-nitro-methyl)-cyclopentanol 0.29%, 2- propenamide, N-[2-(dimethylamino)ethyl]- 0.36%, hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester 0.43%, didodecyl phthalate 0.29%, 13-tetradece-11-yn-1-ol 1.01%, 10-undecyn-1-ol 0.43%, Squalene 1.94%, 9,12- octadecadienoic acid (Z,Z)-, phenylmethyl ester 1.15% and diazoprogesterone 1.44% . The presence of many flavonoids including apigenin, luteolin, 6-C-pentosyl-8-Chexosyl apigenin and 6-C-hexosyl-8-C-pentosyl luteolin have identified by HPLC–ESI MS[28].



APIGENIN



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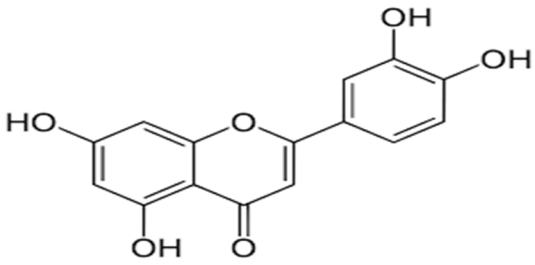
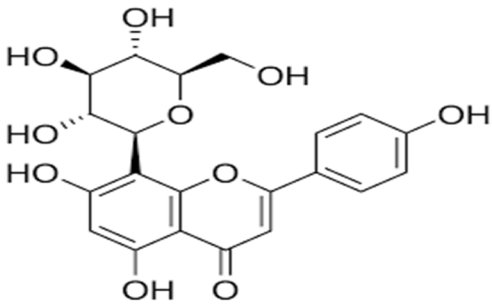
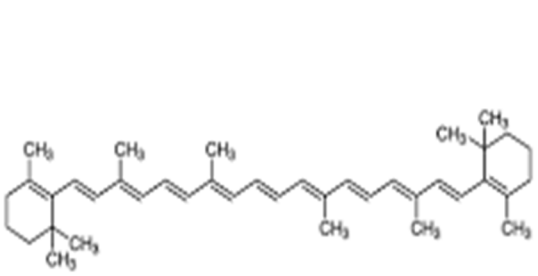


LUTEOLIN

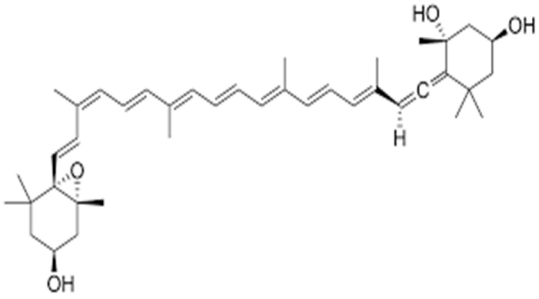


VITEXIN

Flavonoids constituents from *Cynodon dactylon*[29].

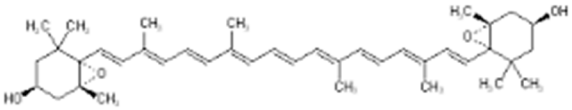


a) BETA CAROTENE



b)NEOXANTHIN

b)



c)VIOLAXANTHIN

Carotenoid constituents (A to C) from *Cynodondactylon*[29]. Researchers concluded that carbohydrates, flavonoids, phenols and tannins were found to be present in *Cynodon dactylon*.

V. PHARMACOLOGICAL ACTIVITY

A. CNS Activity:

Pal Dilip Kumar examined the CNS activity of the mouse aerial sections of *Cynodon dactylon* (L.) Pers. Mice were used to assess the CNS activity of dried extracts from the aerial portions of Cynodon dactylon (L.) Pers. (Graminae). It was discovered that mice's overall behavioral profiles were significantly depressed by the ethanolic extract of aerial parts of *C. dactylon* (EECD). In mice put to sleep with common hypnotics such as pentobarbitone sodium, diazepam, and meprobamate, EECD substantially and dose-dependently increased the amount of time the mice slept [30].

B. Antidiabetic Activity

Assessment of the antidiabatic potential of *Cynodon dactylon* extract in streptozotocin-diabetic rats was the work of Singh SK et al. It was also investigated how the repeated oral treatment of an aqueous extract affected the diabetic rats' blood lipid profile. A range of dosages, including 250, 500, and 1000 mg/kg body weight of *Cynodon dactylon* aqueous extract, were assessed; the highest efficacious dose was found to be 500 mg/kg body weight. In normal rats, it decreases blood glucose levels by around 31% after 4 hours of treatment. When the mildly diabetic rats were given the same dosage of 500 mg/kg body weight, their glucose levels fell by 23% in less than an hour during the glucose tolerance test (GTT). The effects of this dosage are nearly identical to those of the conventional medication tolbutamide (250 mg/kg bw). Moreover, 500 mg/kg b.wt was given daily to severely diabetic rats for 14 days, and a noteworthy 59% decrease in fasting blood glucose levels was seen [31].

C. Antiulcer Activity

The antiulcer effects of an alcoholic extract of *Cynodon dactylon* were investigated in rats by Patil MB et al. In albino rats with pylorus ligated and Indomethacin-induced stomach ulcer models, an alcoholic extract of *Cynodon dactylon* was assessed for the first identification of phytoconstituents and tested at 200, 400, and 600 mg/kg body weight administered orally. Findings with ISSN: 0975-8585 indicated the presence of proteins and flavonoids. Owing to the presence of flavonoids, alcoholic extracts at 400 and 600 mg/kg demonstrated considerable (>0.001) antiulcer action, similar to the prescribed medication ranitidine [32].

D. Antiarrhythmic Activity

The effects of *Cynodon dactylon* hydroalcoholic extract on arrhythmias produced by ischemia/reperfusion were investigated by Najafi M et al. At 25 and 50µg/ml ($p<0.001$ and $p<0.01$, respectively), the extract significantly reduced the frequency, duration, and incidences of ventricular tachycardia (VT) during ischemia. There was a 25–100 µg/ml reduction in the overall number of ischemia-induced ventricular ectopic beats (VEBs) ($p<0.001$ and $p<0.05$, respectively). *Cynodon dactylon* (25 and 50 µg/ml) reduced the incidence of VT at the reperfusion phase from 100% (control) to 13 and 33% ($p<0,001$ and $p<0.05$), respectively. At the same dose, there was a reduction in the duration, number, and overall incidence of VF ($p<0.05$ for all). Reversible VF length was significantly reduced by perfusion of the extract (25–100 µg/ml), from 218± 99 sec to 0 sec, 0 sec, and 10 ± 5 sec ($p<0.01$, $p<0.01$, and $p<0.05$), respectively. Furthermore, the number of total VEBs was reduced by *Cynodon dactylon* (25 and 50 µg/ml) from 349±73 to 35±17 ($p<0.001$) and 66±26 ($p<0.01$) [32–34].

E. Analgesic And Anti-Pyretic Activity

The analgesic and antipyretic properties of an aqueous extract of *Cynodon dactylon* were investigated by Garg VK and Khosa RL. *Cynodon dactylon* whole plants are traditionally used to cure inflammatory and painful disorders. *Cynodon dactylon* aqueous extract's analgesic and antipyretic properties were investigated at various dosages utilizing the hot plate, acetic acid-induced writhing, and yeast-induced hyperthermia methods. In every model examined, *Cynodon dactylon* demonstrated notable analgesic and antipyretic properties. It was discovered that the 600 mg/kg dose of the aqueous extract significantly reduced rectal temperature in a manner comparable to that of the common medication, paracetamol.Mice were used to perform the writhing test and use the hot plate method to assess the analgesic effect of the plant's aqueous extract. When acetic acid is used to create writhing syndrome, it librates endogenous chemicals that subsequently activate the pain nerve terminals, causing algesia. The fact that the aqueous extract of *Cynodon dactylon* exhibited analgesic efficacy in both of the animals under investigation suggests that there may be two components at play here, one acting centrally and the other through a peripheral pathway[35].

F. Diuretic And Antimicrobial Activity

The diuretic and antimicrobial properties of *Cynodon dactylon* essential oil were investigated by Artizzu N. et al. When compared to the standard medication, the essential oil of *Cynodon dactylon* significantly increases urine volume output in rats and exhibits diuretic action at a dosage of 150 mg/kg body weight [36–37].

G. Snake Bite Therapy

A survey of the medicinal plants in Chengapattu district, Tamilnadu, India, that have antisnake venom properties was conducted by Selvanayagam ZE et al. According to a report conducted in Tamilnadu's Chengapattu area, *Cynodon dactylon* is quite helpful in treating snakebite, and the plant extract's antisnake venom is also very effective [38].

H. Hepato Protective Activity

The protective effect of *Cynodon dactylon* against STZ-induced hepatic damage in rats was investigated by Singh SK et al. The purpose of this study was to examine the potential hepatoprotective benefits of *Cynodon dactylon* aqueous extract, which is a popular traditional therapy for diabetes mellitus in India. Streptozotocin (STZ, 50 mg/kg) was injected intraperitoneally into male Albino Wister rats weighing 180–220 g in order to cause experimental diabetes. The following parameters were measured before and after the 14-day course of treatment: total protein (TP), creatinine (CRTN), serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), urine sugar (US), and total hemoglobin (Hb). Several biochemical parameters were nearly balanced when an aqueous extract of *Cynodon dactylon* suspended in distilled water was taken orally once a day at a concentration of 500 mg/kg.(39).

I. Diuretic Activity

The diuretic activity of an extract from the root stalk of *Cynodon dactylon* in albino rats was investigated by Shivalinge Gowda KP et colleagues. In order to assess the diuretic efficacy of *Cynodon dactylon*, an aqueous extract that is utilized in Indian traditional folk medicine to treat a variety of illnesses and ailments, this study was conducted. Rats in experiments can be used to measure the diuretic effect of oral administration of the *Cynodon dactylon* root stalk aqueous extract at doses of 100 mg, 250 mg, 500 mg, and 750 mg/kg body weight[40].

J. Anti Convulsive Property

Finding brain biogenic amines in mice treated with *Cyperus rotundus and Cynodon dactylon* was the focus of Pal Dilip Kumar's research. A significant defense against convulsions brought on by chemoconvulsive drugs in mice was demonstrated by the ethanol extracts of the aerial portions of *Cynodon dactylon* (EECD) and the roots and rhizomes of *Cyperus rotundus* (EECR). In mice given processed extract treatment, the amount of catecholamines was markedly elevated. The processed extract significantly reduced the amount of catecholamines in the mice's brains and changed the amount of amino acids in their brains, according to the study's findings [41–45].

K. Immunomodulatory And Dna Protective Activities

The assessment of the immunomodulatory and DNA protecting properties of *Cynodon dactylon* shoots was the focus of the work of Mangathayarua K. et al.

The phenolic content of fresh *Cynodon dactylon* juice, with a solid content of 1.46% (w/w), was 47±0.33 mg/kg GAE. The juice was shown to protect human DNA against doxorubicin-induced DNA damage at doses of 50, 100, and 200 mg total solids/kg body weight in DNA spectral studies. Specifically, the ratio of absorbance of DNA at 260 and 280 nm in samples pretreated with the juice was 1.66, 1.53, and 1.63, respectively, while it was 1.37 for DNA treated with doxorubicin alone. This shows that the samples treated with *Cynodon dactylon* have pure nucleic acid. Juice given orally to mice at 250 and 500 mg/kg enhanced their humoral antibody response to antigen challenge; this was demonstrated by a dose-dependent, statistically significant rise in antibody titer in the plaque-forming cell test and the haemagglutination antibody assay [46–47].

L. Chemo Preventive Effect

The study conducted by Baskar AA. et al. examined the chemopreventive activity of *Cynodon dactylon* (L.) Pers. extract against colon carcinogenesis produced by DMH in experimental mice. Evaluating Cynodon dactylon's chemopreventive properties was the goal of the current investigation. The 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay, nitric oxide radical scavenging activity (NO−), and MTT assay were used to examine the antioxidant, antiproliferative, and apoptotic potentials of the plant on four cancer cell lines (COLO 320 DM, MCH-7, AGS, and A549) as well as a normal cell line (VERO). The plant extract's ability to prevent chemotherapy in vivo in colon cancers generated by DMH was investigated. At lower doses, it was discovered that the methanolic extract of *Cynodon dactylon* was antiproliferative, antioxidative, and caused apoptotic cell death in COLO 320 DM cells [48].

M. Anti-Inflammatory Activity

In Ayurveda, *Cynodon dactylon* is one of the ten lucky plants that make up the Dasapushpam group. In India, *Cynodon dactylon* L. has historically been used to treat a wide range of chronic inflammatory illnesses. The current research assessed *Cynodon dactylon's* ability to prevent rats suffering from adjuvant-induced arthritis. An intradermal injection of Freund's adjuvant, in its whole, into the right hind paw caused arthritis and consequent joint inflammation. Myeloperoxidase, nitrite, C-reactive protein, and ceruloplasmin levels—inflammatory mediators—were shown to have significantly increased. An increase in lipid peroxidation, as shown by the higher levels of thiobarbituric acid reactive substances, and a marked decrease in the activity of catalase, superoxide dismutase, glutathione peroxidase, and glutathione, vitamin C, and E, were linked to oxidative stress. When an adjuvant injection was given to arthritic rats, the inflammatory response and oxidative stress were significantly reduced, and the arthritic alterations were ameliorated to almost normal levels. *Cynodon dactylon* (20 mg/kg) body weight was then given orally to the rats. Therefore, results unequivocally show that extract from *Cynodon dactylon* has a promising anti-arthritic effect.

N. Antioxidant Activity

Using four cancer cell lines (COLO 320 DM, MCH-7, AGS, and A549) and a normal cell line (VERO), the antioxidant, antiproliferative, and apoptotic potentials of the plant were examined using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) test, nitric oxide radical scavenging activity (NO(-)), and MTT assay[49–51].

VI. CONCLUSION

Because this adaptable medicinal plant is the only source of many different kinds of chemical compounds, further research is required to take advantage of their therapeutic potential to treat illnesses. This is because the plant *Cynodon dactylon* has greater concentrations of phenolic, tocopherol, and antioxidant chemicals.

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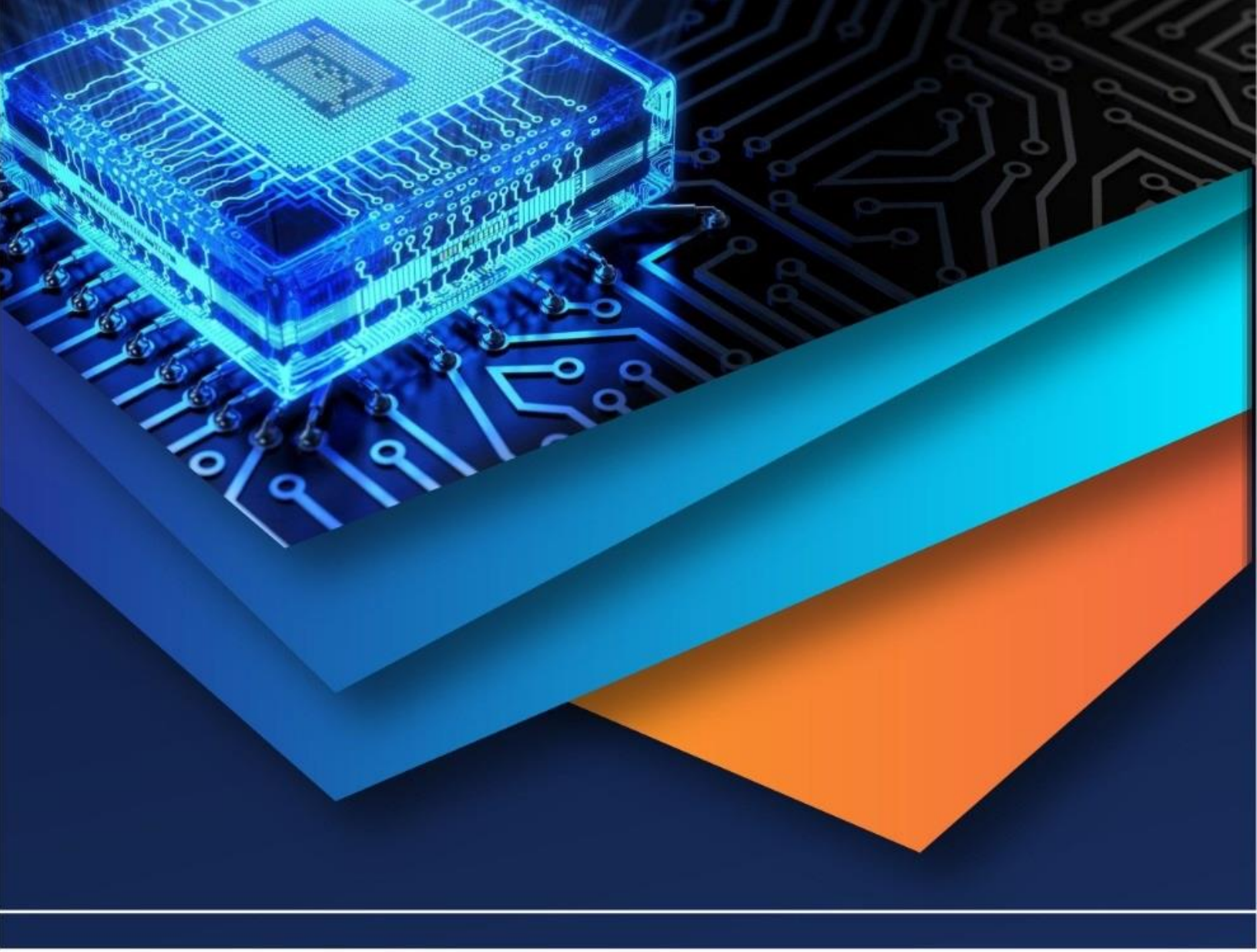

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