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PHARMACOGNOSTICAL EVALUATION AND ANTIOXIDANT ACTIVITY OF *FICUS BENGHALENSIS* AND *CYNODON DACTYLON*

Rakesh Kumar Nagar and Naresh Kalra

ABSTRACT

This study presents a comparative pharmacognostic evaluation of *Ficus benghalensis* and *Cynodon dactylon* leaves through morphological, microscopic, physicochemical, and phytochemical analyses. Microscopic observations revealed distinct anatomical features: *Ficus benghalensis* exhibited paracytic stomata, trichomes, and calcium oxalate crystals, while *Cynodon dactylon* showed dumbbell-shaped guard cells and silica bodies characteristic of the Poaceae family. Physicochemical parameters, including ash values and foaming index, confirmed the quality of both leaf powders. Ethanol extracts demonstrated semisolid consistency and contained alkaloids, flavonoids, and saponins; *Ficus benghalensis* additionally showed glycosides, tannins, and phenolics. Antioxidant activity assessed via DPPH and ABTS assays revealed notable free radical scavenging potential, with *Cynodon dactylon* showing slightly stronger efficacy. These findings support the traditional medicinal use of both plants and highlight their potential for further pharmacological and therapeutic applications.

Key words: *Ficus benghalensis, Cynodon dactylon,* Antioxidant activity, DPPH and ABTS.

1 INTRODUCTION

Medicinal plants have long served as a cornerstone of traditional healthcare systems, offering a rich reservoir of bioactive compounds with therapeutic potential[1]. Among these, *Ficus benghalensis* (Banyan tree) and *Cynodon dactylon* (Durva grass) hold prominent positions in Ayurvedic and folk medicine due to their diverse pharmacological properties[2].

Ficus benghalensis, revered for its astringent, anti-inflammatory and wound-healing attributes, is traditionally used in the treatment of diabetes, diarrhea, and skin disorders[3]. Its latex, bark, and leaves are known to contain flavonoids, tannins, and phenolic compounds that contribute to its medicinal efficacy[4]. On the other hand, *Cynodon dactylon*, a ubiquitous grass species, is celebrated for its antioxidant, antimicrobial, and hepatoprotective activities[5]. Rich in alkaloids, glycosides, and polyphenols, it has been employed in managing conditions ranging from fever to urinary tract infections[6].

This study aims to perform a comprehensive pharmacognostical evaluation of both plants, encompassing macroscopic, microscopic, and physicochemical analyses, to establish quality standards and authenticate their identity. Furthermore, the antioxidant potential of their extracts will be assessed using *in-vitro* assays, providing insight into their capacity to neutralize free radicals and mitigate oxidative stress a key contributor to chronic diseases

Such as cancer, cardiovascular disorders, and neurodegeneration[7].

By integrating traditional knowledge with modern scientific validation, this research seeks to reinforce the therapeutic relevance of *Ficus benghalensis* and *Cynodon dactylon*, paving the way for their potential inclusion in evidence-based herbal formulations.

2 MATERIALS AND METHODS

2.1 Plant Materials

The leaves of *Ficus benghalensis* **and *Cynodon dactylon*** were collected locally from Rajasthan, in the month of February. They were separated, washed thoroughly with tap water and shade dried.

The plants were authenticated by Head of office, Botanical Survey of India, Ministry of Environment, Forest and Climate Change, Jodhpur, Rajasthan via Ref. No. A.12012/Tech./2024-25(Pl.ld.)/525 12-B/834/2025 date: 06.11.20254 by comparing morphological features of crude drug sample.

2.2 Chemicals

The 2,2-diphenyl-1-picrylhydrazyl and ABTS radical (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)) were purchased from Himedia.

2.3 Extraction Procedure

Extraction of leaves powder of *Ficus benghalensis* and *Cynodon dactylon* were done by Soxhlet extraction method. soxhlet apparatus was used for successive solvent extraction as petroleum ether was used for de-fating of the waxy materials present in powders. When clear petroleum ether was obtained then separated the extract and leaf powder and dry to evaporate solvent then again filled in apparatus for extraction with pure ethanol then after clear ethanol extraction. This procedure followed with both plant leaves powders. Prepared extracts were Ethanolic extract of *Ficus benghalensis* leaves (EEFB) and Ethanolic extract of *Cynodon dactylon* leaves (EECD)[8].

2.4 Macroscopic Characteristics of Extracts of *Ficus Benghalensis* and *Cynodon Dactylon*

Macroscopic characters e.g. color, odor, test, apperence etc. was observed[9].

2.5 Qualitative Phytochemical Analysis of Crude Extracts

The crude extract obtained by solvent extraction was subjected to various qualitative tests to detect presence of common chemical constituents as: Alkaloids, Glycosides, Carbohydrates, Phytosterols, Saponins, Tannins, Flavonoids Proteins etc[10].

2.6 Free Radical Scavenging by DPPH Scavenging Method

Free radical scavenging activity of samples was measured using the 2,2-diphenyl-1-picrylhydrazyl (DPPH). Briefly, 1.0 ml of sample solution with different concentrations (0.1, 0.2, 0.3, 0.4, 0.5 and 0.6 mg/ml) was added to a 4 ml of 0.004% methanolic solution of DPPH. The absorbance was read at 517 nm after 30 min incubation at room temperature in the dark. Ascorbic acid was used as a standard[11]. The DPPH radical-scavenging activity was calculated according to the following equation:

$$\text{DPPH scavenging activity } (\%) = 1 - \frac{Ai - Aj}{Ac} \text{ X } 100$$

Where, Ac was the absorbance of DPPH solution without sample (2 ml DPPH + 2 ml of 95% methanol); Ai was the absorbance of the test sample mixed with DPPH solution (2 ml sample + 2ml DPPH) and Aj was the absorbance of the sample without DPPH solution (2 ml sample + 2 ml of 95% ethanol).

2.7 Reducing Power by ABTS Radical Scavenging Method

The ABTS radical (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)) scavenging activity was carried out based on the method of Gan and Latiff with some modifications. Briefly, $ABTS^{+}$ was produced directly by reacting 7 mM ABTS solution with 2.45 mM potassium persulfate and allowing the mixture to stand for 16 h at room temperature in the dark. Prior to beginning the assay, the ABTS solution was diluted with methanol. One milliliter of sample solution with different concentrations (0.1, 0.2, 0.3, 0.4, 0.5 and 0.6 mg/ml) was added to 2 ml of the ABTS solution mixed solution was observed at 734 nm. The sample absorbance was read at 734 nm after 30 min incubation at room temperature. Ascorbic acid was used as a standard[12]. The ABTS radical-scavenging activity was calculated according to the following equation:

$$\text{ABTS + scavenging activity}(\%) = 1 - \frac{A2 - A1}{A0} \text{ X } 100$$

Where, A0 was defined as the absorbance of control at 734 nm, and A1 and A2 were defined as the absorbance of the sample without the $ABTS^+$ solution and with added $ABTS^+$ solution, respectively.

3 RESULT AND DISCUSSION

3.1 Morphological Study of *Ficus Bbenghalensis and Cynodon Dactylon* Leaves

The leaves of *Ficus benghalensis* and *Cynodon dactylon* were examined for their morphological characteristics, and the observations are summarized in **table below.** Distinct differences in color, texture, shape, and venation patterns highlight the unique structural adaptations of each species.

The leaves of *Ficus benghalensis* are large, leathery, and broadly ovate to elliptical in shape, with entire margins and a rounded to cordate base. They exhibit a dark green coloration on the upper surface and a lighter shade beneath. The venation is conspicuous, with a thick midrib and well-developed lateral veins, giving the leaf a robust appearance. The petiole is short and thick, ranging between 2–5 cm, supporting leaves that measure 10–20 cm in length and 6–12 cm in width.

In contrast, *Cynodon dactylon* leaves are much smaller and slender, typically linear to lanceolate with narrow pointed tip. They are smooth or slightly hairy in texture, with parallel venation characteristic of monocot species. Leaves are alternately arranged on nodes and lack a true petiole, instead clasping the stem at the base. Their dimensions are modest, with lengths ranging from 2–10 cm and widths between 2–5 mm. Leaves possess a mild grassy odor and a taste that is slightly astringent yet sweet.

3.2 Microscopic analysis of Ficus Benghalensis Leaves

Microscopic analysis of *Ficus benghalensis* (Indian Banyan) leaves reveals a fascinating array of anatomical features that support its medicinal and ecological functions: Upper epidermis was single-layered, covered with a thick cuticle cells are polygonal and tightly packed. Lower epidermis was also single-layered but may contain more stomata and thin cuticles. Stomata were mostly are paracytic type and distributed on the lower epidermis. Glandular and non-glandular trichomes observed. Collateral and closed vascular bundles were surrounded by bundle sheath cells. Xylem and Phloem were Well-developed, with xylem vessels showing thick lignified walls. Calcium oxalate crystals were scattered in mesophyll and parenchyma cells which were rosette and prism-shaped crystals.

Table 1: Morphological parameters of leaves of *F. benghalensis* and *C. dactylon*

Parameter	*Ficus benghalensis*	*Cynodon dactylon*
Color	Dark green on upper side and light green on back	Green to dark green
Odor	No odor	Grassy
Taste	No taste	Mild astringent and sweet
Leaves shape	Broadly ovate to elliptical	Linear with narrow tip
Margin	Entire (smooth)	Smooth
Apex	Acute to obtuse	Acute to pointed
Base	Rounded to cordate	Encircling the stem
Venation	Thick midrib and lateral veins	Parallel
Texture	Leathery touch	Smooth or slightly hairy
Arrangement of leaf on stem	Alternatively arranged	Alternatively arranged on nodes
Petiole	Thick and short, 2-5cm in length	Absent true petiole
Length	10 - 20 cm	2-10 cm
Width	6- 12 cm	2-5 mm
Leaf shape	Broadly ovate to elliptical	Linear to lanceolate

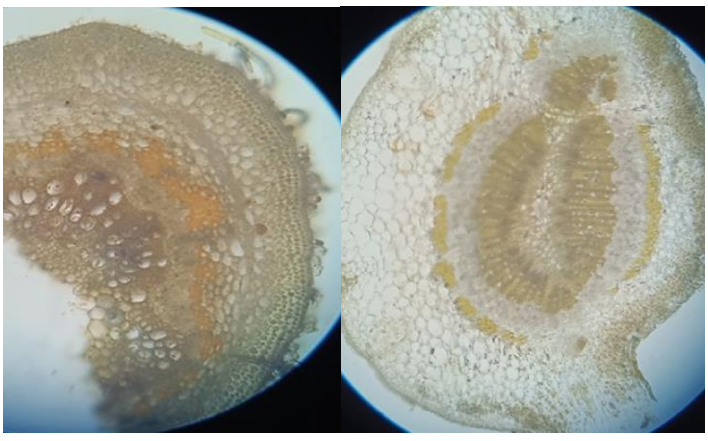

Figure 1: Transverse section of *Ficus benghalensis* leaves

3.3 Microscopic Analysis of *Cynodon Dactylon* Leaves

Microscopic analysis of *Cynodon dactylon*, reveals several diagnostic features that help in its identification and pharmacognostic evaluation. Upper and lower epidermises were single-layered, composed of rectangular cells with thick cuticles contained silica bodies. Dumbbell-shaped guard cells stomata is a hallmark of *Poaceae* family. Vascular bundles arranged collateral and closed and scattered throughout the leaf cross-section. Xylems were thick walled with spiral and annular thickenings. Phloems have thin-walled sieve tubes and companion cells. Vascular bundle were surrounded by lignified cells.

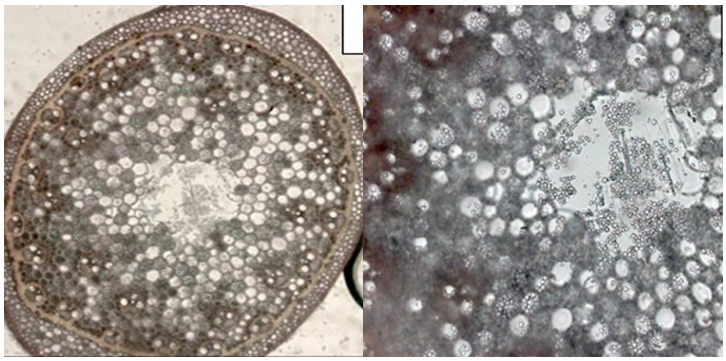

Figure 2: Transverse section of *Cynodon dactylon* leaves

3.4 Physiochemical Screening of Powder

Physicochemical screening of powders of *Ficus benghalensis and Cynodon dactylon* Leaves were performed and found as Loss on drying (8.29 and 6.23 %), Total ash value (9.83 and 11.51 %), Acid insoluble ash value (2.12 and 2.01 %), Water soluble ash value (4.25 and 5.01%) and Foaming index (15 and 16 ml), respectively.

Table 2: Physiochemical screening of Leaves powders of selected plants

S. No.	Parameters	*Ficus benghalensis*	*Cynodon dactylon*
1	Loss on drying (%)	8.29	6.23
2	Total ash value (%)	9.83	11.51
3	Acid insoluble ash value (%)	2.12	2.01
4	Water soluble ash value (%)	4.25	5.01
5	Foaming index	15 (ml)	16 (ml)

Physicochemical evaluation of crude plant powders provides essential information about their purity, quality, and suitability for pharmacological use. The powdered leaves of *Ficus benghalensis* and *Cynodon dactylon* were subjected to standard physicochemical screening, and the results are summarized in Table.

The loss on drying was found to be 8.29% for *Ficus benghalensis* and 6.23% for *Cynodon dactylon*. This parameter reflects the moisture content present in the samples, which is critical for determining stability and shelf life. Lower values indicate reduced susceptibility to microbial growth and degradation. The total ash value, representing the total amount of inorganic matter, was 9.83% for *Ficus benghalensis* and 11.51% for *Cynodon dactylon*. A higher ash value suggests the presence of more mineral constituents or possible extraneous matter. The acid-insoluble ash value, which indicates the amount of siliceous matter such as sand or silica, was relatively low in both samples (2.12% and 2.01%, respectively). This confirms minimal contamination with earthy materials. The water-soluble ash value was 4.25% for *Ficus benghalensis* and 5.01% for *Cynodon dactylon*. This fraction represents the portion of inorganic matter soluble in water, often linked to the presence of water-soluble minerals. The foaming index was recorded as 15 ml for *Ficus benghalensis* and 16 ml for *Cynodon dactylon.* This parameter is associated with the presence of saponins, which contribute to foaming properties and may play a role in medicinal activity.

The physicochemical profile highlights that both plants possess acceptable moisture levels, moderate mineral content, and low siliceous contamination, confirming their quality for further pharmacological studies. The presence of saponins, indicated by the foaming index, suggests potential bioactive properties that may contribute to therapeutic applications.

3.5 Extraction of *Ficus benghalensis* and *Cynodon dactylon* Leaves

Ethanol extracts of *Ficus benghalensis* leaves were dark green in color with aromatic odor having pungent taste, semisolid greasy consistency. Ethanol extracts of *Cynodon dactylon* leaves were dark green in color with herbal odor having astringent taste, emisolid greasy consistency.

The ethanolic extracts of *Ficus benghalensis* (EEFB) and *Cynodon dactylon* (EECD) leaves were examined for their macroscopic properties, which provide preliminary insights into their physical nature and potential phytochemical composition.

The extract of *Ficus benghalensis* appeared dark green in color, with a distinct aromatic odor and a pungent taste. Its

consistency was semisolid and greasy, suggesting the presence of resinous or lipid-like constituents.

Similarly, the extract of *Cynodon dactylon* was also dark green, but it exhibited a herbal odor and an astringent taste. Like EEFB, it showed a semisolid greasy consistency, indicating comparable solvent-extractable phytoconstituents, though with subtle differences in sensory characteristics.

Table 3: Macroscopic character of extracts

S. No.	Parameters	EEFB	EECD
1	Color	Dark Green	Dark Green
2	Odor	Aromatic	Herbal
3	Taste	Pungent	Astringent
4	Physical Appearance	Semisolid	Semisolid
5	State	Greasy	Greasy

Both extracts share a dark green coloration and semisolid greasy consistency, reflecting the concentration of chlorophyll, lipophilic compounds, and secondary metabolites extracted by ethanol. However, the odor and taste profiles distinguish them: *Ficus benghalensis* extract is aromatic and pungent, while *Cynodon dactylon* extract is herbal and astringent. Sensory differences may be attributed to variations in phytochemical constituents such as alkaloids, flavonoids, tannins, and volatile oils.

3.6 Yields of Extracts

The yield of ethanol extract of *Ficus benghalensis* and *Cynodon dactylon* leaves were 14.3 % and 13.5 % respectively. The efficiency of extraction was determined by calculating the percentage yield of the ethanolic extracts obtained from the powdered leaves of *Ficus benghalensis* (EEFB) and *Cynodon dactylon* (EECD). The yield reflects the proportion of extractable phytoconstituents present in the raw material and serves as an important parameter for assessing extraction efficiency and reproducibility. The ethanolic extract of *Ficus benghalensis* leaves yielded 14.3%, while that of *Cynodon dactylon* leaves yielded 13.5%. These values indicate that both plants contain a substantial amount of ethanol-soluble bioactive compounds, with *Ficus benghalensis* showing a slightly higher extractive value compared to *Cynodon dactylon*.

Table 4: Percentage Yields of extracts

S. No.	Parameters	EEFB	EECD
1	Yield(%)	14.3%	13.5%

3.7 Phytochemical Screening of Extracts of *Ficus Benghalensis* and *Cynodon Dactylon* Leaves

Phytochemical screening of extracts of *Ficus benghalensis* and *Cynodon dactylon* leaves were revealed that the alkaloids, Flavonoids, Saponins were present in both extract while Glycosides, Steroids and Sterols, Tannins and Phenolics were present in extracts of *Ficus benghalensis* only.

Phytochemical analysis provides valuable insights into the presence of bioactive compounds that contribute to the medicinal properties of plants. The ethanolic extracts of *Ficus benghalensis* (EEFB) and *Cynodon dactylon* (EECD) leaves were subjected to standard qualitative tests, and the results are summarized in Table. The screening revealed that alkaloids, flavonoids, and saponins were present in both extracts, indicating a shared phytochemical profile that may account for overlapping therapeutic activities such as antimicrobial, antioxidant, and anti-inflammatory effects. Interestingly, glycosides, steroids and sterols, tannins, and phenolics were detected only in *Ficus benghalensis* extract. These compounds are often associated with cardiotonic, adaptogenic, and astringent properties, suggesting that *Ficus benghalensis* may possess a broader pharmacological spectrum compared to *Cynodon dactylon*. Carbohydrate tests showed a positive response only in Fehling's test for both extracts, while proteins and amino acids were absent in both.

Table 5: Phytochemical screening of extracts

Chemical Tests	EEFB	EECD
Alkaloids		
Dragendorff's Test	(+)	(+)
Mayer's Test	(+)	(+)
Hager's Test	(+)	(+)
Glycosides		
Legal Test	(+)	(+)
Baljet Test	(+)	(-)
Borntrager's Test	(+)	(-)
Carbohydrates		
Molisch's Test	(-)	(-)
Benedict's test	(-)	(-)
Fehling's Test	(+)	(+)
Steroids and Sterols		
Salkowski Test	(+)	(-)
Libermann-Burchard	(+)	(-)
Proteins and Amino Acids		
Biuret Test	(-)	(-)
Ninhydrin Test	(-)	(-)
Millon's Test	(-)	(-)

Tannins and Phenolics		
5%ferric chloride solution	(+)	(-)
10% aqueous $K_2Cr_2O_7$ solution	(+)	(-)
10% lead acetate solution	(+)	(+)
Flavonoids		
Shinoda's Test	(+)	(+)
Alkaline reagent test	(+)	(+)
Lead acetate test	(+)	(+)
Saponins		
Foam taste	(+)	(+)

The phytochemical profile highlights that both plants share common secondary metabolites such as alkaloids, flavonoids, and saponins, which are known to impart significant pharmacological activities. However, *Ficus benghalensis* demonstrates a richer phytochemical diversity with the presence of glycosides, steroids, sterols, tannins, and phenolics. These additional constituents may explain its traditional use in wound healing, anti-diabetic, and anti-inflammatory remedies. On the other hand, *Cynodon dactylon*, though comparatively simpler in phytochemical composition, still contains potent bioactive groups like flavonoids and saponins, supporting its use in folk medicine for fever, infections, and general health tonics.

3.8 Free Radical Scavenging by DPPH Scavenging Method

The DPPH method revealed that the IC_{50} value for extracts of *Ficus benghalensis* was (< 300 µg/ml) and *Cynodon dactylon* (< 200 µg/ml). The antioxidant potential of ethanolic extracts of *Ficus benghalensis* (EEFB) and *Cynodon dactylon* (EECD) leaves was evaluated using the DPPH free radical scavenging assay. This method is widely employed to assess the ability of plant extracts to donate hydrogen atoms or electrons, thereby neutralizing free radicals. The results revealed that the IC_{50} value (concentration required to inhibit 50% of DPPH radicals) for EEFB was < 300 µg/ml, while for EECD it was < 200 µg/ml. The lower IC_{50} value of *Cynodon dactylon* indicates stronger free radical scavenging activity compared to *Ficus benghalensis*. At increasing concentrations (100–600 µg/ml), both extracts demonstrated a dose-dependent rise in percentage inhibition of DPPH radicals. EECD consistently showed higher inhibition values than EEFB, and the blend of both extracts exhibited synergistic activity, producing inhibition values closer to those of the standard antioxidant, ascorbic acid.

3.8.1 EEFB (Ficus benghalensis)

Exhibited moderate antioxidant activity with inhibition increasing from ~31% at 100 µg/ml to ~82% at 600 µg/ml.

3.8.2 EECD (Cynodon dactylon)

Showed stronger activity, with inhibition rising from ~39% at 100 µg/ml to ~94% at 600 µg/ml, reflecting its lower IC_{50} value.

3.8.3 Extracts blend

Demonstrated enhanced activity compared to individual extracts, suggesting a synergistic effect of phytochemicals when combined.

3.8.4 Ascorbic acid (standard)

Produced the highest inhibition values, reaching ~98% at 600 µg/ml, validating the assay.

These findings confirm that both plants possess significant antioxidant potential, with *Cynodon dactylon* being comparatively more potent. The blend of extracts further enhances activity, indicating possible synergism between their phytoconstituents.

3.9 Free Radical Scavenging by ABTS Scavenging Method

The DPPH method revealed that the IC_{50} value for extracts of *Ficus benghalensis* was (< 400 µg/ml) and *Cynodon dactylon* (< 300 µg/ml). The antioxidant potential of ethanolic extracts of *Ficus benghalensis* (EEFB) and *Cynodon dactylon* (EECD) leaves was further evaluated using the ABTS radical cation decolorization assay. This method complements the DPPH assay by measuring the ability of antioxidants to quench $ABTS^+$ radicals, thereby reflecting both hydrophilic and lipophilic antioxidant capacities.

The results revealed that the IC_{50} value for EEFB was < 400 µg/ml, while for EECD it was < 300 µg/ml, indicating that *Cynodon dactylon* possesses comparatively stronger ABTS radical scavenging activity.

Both extracts demonstrated a dose-dependent increase in inhibition, with EECD consistently showing higher activity than EEFB. The blend of extracts exhibited synergistic effects, producing inhibition values greater than the individual extracts and approaching those of the standard antioxidant, ascorbic acid.

Table 6: Inhibition (%) of DPPH by leaves extract

Conc. (µg/ml)	% Inhibition of DPPH by			
	Ascorbic acid	EEFB	EECD	Extracts Blend
100	53.11± 0.19	31.71± 0.23	39.51± 1.12	42.82± 0.92
200	64.23± 0.72	41.61± 0.75	54.16± 0.46	56.28± 1.05
300	76.12± 0.92	56.32± 1.03	62.21± 0.29	65.28± 0.81
400	87.62± 1.21	63.63± 1.14	72.81± 1.12	76.13± 1.08
500	97.71± 1.27	72.41± 0.85	84.72± 0.58	86.92± 0.96
600	98.36± 0.61	81.83± 1.22	93.72± 0.64	96.28± 0.18

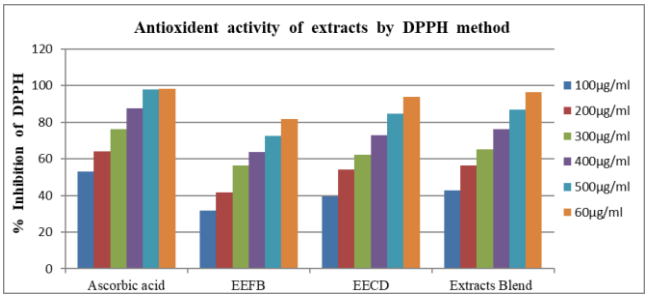

Figure 3: Antioxident activity of extracts by DPPH method

Table 7: Inhibition (%) of ABTS by leaves extract of *Ficus benghalensis*

Conc. (µg/ml)	% Inhibition of ABTS by			
	Ascorbic acid	EEFB	EECD	Extracts Blend
100	51.84± 0.64	29.24± 0.81	36.16± 0.74	39.18± 1.02
200	61.86± 1.03	37.15± 0.65	48.14± 0.79	52.19± 0.83
300	73.94± 0.69	46.44± 1.01	58.14± 1.31	62.16± 1.25
400	83.36± 1.04	59.71± 1.01	69.29± 0.95	74.18± 0.97
500	92.84± 0.74	72.51± 0.68	80.13± 1.13	85.53± 0.91
600	99.37± 1.14	88.58± 1.13	86.67± 0.82	91.28± 1.03

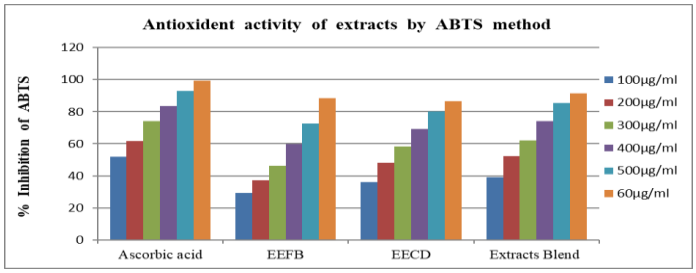

Figure 4: Antioxident activity of extracts by ABTS method

CONCLUSIONS

The comparative study of *Ficus benghalensis* and *Cynodon dactylon* leaves revealed distinct morphological and microscopic features that aid in their identification and pharmacognostic evaluation. *Ficus benghalensis* showed paracytic stomata, trichomes, and calcium oxalate crystals, while *Cynodon dactylon* exhibited dumbbell-shaped guard cells and silica bodies, typical of the Poaceae family. Physicochemical parameters were within acceptable limits, indicating good quality. Ethanol extracts of both plants were semisolid, dark green, and rich in alkaloids, flavonoids, and saponins. Notably, *Ficus benghalensis* also contained glycosides, tannins, and phenolics. Antioxidant assays demonstrated significant free radical scavenging activity, with *Cynodon dactylon* showing slightly stronger potency. These findings support the traditional medicinal use of both plants and highlight their potential for further pharmacological exploration.

CONFLICT OF INTERESTS

There are no any conflicts of interests.

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