IJPSR (2026), Volume 17, Issue 2 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 23 August 2025; received in revised form, 28 September 2025; accepted, 26 October 2025; published 01 February 2026

PHYTOCHEMICAL PROFILING AND ANTIOXIDANT ACTIVITY OF FRUIT, LEAF, AND BARK EXTRACTS FROM UNDERUTILIZED FICUS SPECIES (VIZ. *F. HISPIDA*, *F. SEMICORDATA*, AND *F. RACEMOSA*)

Sajna Sameekshya Hota and Pradeep Kumar Naik *

Department of Biotechnology and Bioinformatics, Sambalpur University, Jyoti Vihar, Sambalpur - 768019, Odisha, India.

Keywords:

F. hispida, F. semicordata, F. racemosa, Phytochemical analysis, Antioxidant activity, GC–MS profiling

Correspondence to Author:
Pradeep Kumar Naik

Professor,
Department of Biotechnology and Bioinformatics, Sambalpur University, Jyoti Vihar, Sambalpur - 768019, Odisha, India.

E-mail: pknaik1973@suniv.ac.in

ABSTRACT: The present study explored the phytochemical makeup, antioxidant potential, and chemical profile of three important Ficus species *viz. Ficus hispida, Ficus semicordata,* and *Ficus racemosa*. The goal of this study was to investigate the therapeutic potential of these species. Quantitative phytochemical analysis revealed notable levels of total phenolics, flavonoids, and tannins in all the species, with variations among the species contributing to the differences observed. An antioxidant activity study, including DPPH and ABTS radical scavenging, revealed strong antioxidant potential, closely linked to the phenolic and flavonoid contents, highlighting the ability of these compounds to quench free radicals. Gas chromatography–mass spectrometry (GC–MS) profiling revealed a wide range of bioactive compounds, such as fatty acids and their esters, terpenoids, long-chain hydrocarbons, glycosides, and phthalate derivatives. Key compounds such as n-hexadecanoic acid, oleic acid derivatives, phytol, squalene, and various alkyl esters were found. Many of these compounds are linked to antioxidant, anti-inflammatory, antimicrobial, and cholesterol-lowering effects. Differences in chemical profiles among the species offer insights into their unique medicinal uses. Overall, the findings confirm that *F. hispida*, *F. semicordata*, and *F. racemosa* have significant pharmacological potential, supporting their traditional uses and suggesting their potential for development into functional foods, nutraceuticals, and natural medicines.

INTRODUCTION: The genus Ficus (family: Moraceae) comprises a diverse range of over 800 species of woody trees, shrubs, and climbers distributed predominantly across tropical and subtropical regions [1].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.17(2).668-87

This article can be accessed online on www.ijpsr.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.17(2).668-87

Among these, *Ficus hispida*, *Ficus racemosa*, and *Ficus semicordata* are notable for their extensive ethnomedicinal usage, nutritional value, and phytochemical richness.

Despite being traditionally consumed and used for a variety of ailments, these species remain underrepresented in phytopharmacological research and commercial exploitation. India, being a centre of rich floristic diversity, is home to more than 50 species of Ficus, many of which remain underutilised despite their ethnomedicinal relevance.

Among these, *Ficus racemosa* (cluster fig), *Ficus hispida* (rough-leaved fig), and *Ficus semicordata* (drooping fig) are notable for their diverse phytochemical compositions and traditional use as both food and medicine. These species have been historically utilised in various forms fruits, bark, leaves, and latex for treating ailments such as diabetes, diarrhoea, inflammation, and liver disorders. However, their pharmacological properties have not been fully characterised through modern scientific validation, and their potential as components of functional foods remains largely unexplored.

Ficus hispida L. f. has been used in traditional medicine for the treatment of jaundice, ulcers, inflammation, and cardiovascular disorders [2]. Phytochemical investigations have revealed the presence of flavonoids, alkaloids, glycosides, and phenolic acids, which are believed to contribute to its bioactivities [3]. Similarly, *Ficus racemosa* L., commonly known as the cluster fig or "gular," is an important plant in the Ayurveda and Unani systems of medicine. Its bark, leaves, fruits, and latex are used to manage diabetes, diarrhoea, inflammation, and urinary disorders [4–5]. Studies have identified various bioactive compounds in *F. racemosa*, such as β-sitosterol, lupeol, bergapten, and racemosic acid [6]. *Ficus semicordata* Buch.-Ham. ex Sm., a lesser-known wild fig species, is distributed in the sub-Himalayan and northeastern regions of India. Traditionally, its fruits are consumed by indigenous communities, and decoctions of bark and leaves are used for liver ailments and wound healing [7]. Recent phytochemical screening has demonstrated the presence of tannins, flavonoids, and other polyphenolic compounds, which may contribute to its pharmacological potential [8].

Antioxidants derived from plants have attracted increasing interest because of their role in mitigating oxidative stress-related diseases, including cancer, cardiovascular disease, and neurodegenerative disorders [9]. Polyphenolic compounds such as flavonoids and phenolic acids, which are widely present in Ficus species, are known for their free radical scavenging ability and metal chelating properties [10]. Techniques such as DPPH, ABTS, and FRAP assays are commonly employed to assess the antioxidant activity of plant extracts [11–12].

Despite individual studies on each species, a comprehensive synthesis of their phytochemical profiles and antioxidant potential is lacking. This study, therefore, aims to collate and analyse existing research on the phytochemical constituents and antioxidant activities of *Ficus hispida*, *Ficus racemosa*, and *Ficus semicordata*. The objective of this study is to highlight the phytochemical composition of these underutilised fig species and encourage further research toward their valorisation in nutraceutical, functional food, and pharmaceutical applications.

MATERIALS AND METHODS:

Collection of Plant Materials and Their Processing: Fresh plant samples of *Ficus semicordata* Buch.-Ham. ex Sm. (Voucher specimen no- SU/COENPT-0095), *Ficus racemosa* L. (Voucher specimen no- SU/COENPT-0029), and *Ficus hispida* L.f. (Voucher specimen no- SU/COENPT-0027) were collected from the Nrusinghanath region of the Gandhamardhan hill range, which lies between the Bargarh and Balangir districts, a region known for its rich Phyto diversity. All three species were collected from forested areas surrounding the Western Odisha zone, where these species grow abundantly in wild and semi-cultivated conditions. The collected samples were taxonomically identified and authenticated by experts at the Regional Plant Resource Centre (RPRC), Bhubaneswar, and voucher samples were deposited for future reference. After collection, the plant materials, primarily the leaf, bark, and unripe fruit, were thoroughly washed with clean water to remove dust and surface contaminants. They were then shade-dried at ambient temperature for several days to retain phytochemical integrity. Once dried, the plant materials were ground into a coarse powder using a mechanical pulveriser equipped with a 1.5 mm mesh sieve and stored in airtight containers under dry, cool conditions until further use for extraction and phytochemical analysis.

Extraction of Bioactive Components: The coarse powdered plant materials of *Ficus semicordata*, *Ficus racemosa*, and *Ficus hispida* were subjected to solvent extraction using a Soxhlet apparatus. For each extraction, 20 grams of the dried powder was placed in a thimble and extracted sequentially with different solvents: absolute ethanol (ET100),

ethanol:water (50:50 v/v) (ET50), ethanol:water (70:30 v/v) (ET70), and distilled water (AQ). A volume of 250 mL of each solvent was used per extraction and added to a round-bottom flask fitted with the Soxhlet unit. The extraction process was carried out at a controlled temperature of 45 °C for 4–5 hours or until the siphoned solvent in the chamber turned clear, indicating the completion of extraction. The resulting extracts were filtered through Whatman No. 41 filter paper to remove any residual plant material. The filtrates were then concentrated under reduced pressure using a rotary evaporator. The semisolid concentrates obtained were further subjected to freeze–drying (lyophilization) to yield stable, dry powdered extracts, which were stored in airtight containers at 4 °C until further use for phytochemical and antioxidant analyses.

Qualitative Phytochemical Analysis: The qualitative analysis of phytochemicals was carried out for reducing sugars, tannins, saponins, flavonoids, phenols, alkaloids, and glycosides via standard methods [13]. The aqueous extracts of the samples were taken for preliminary phytochemical investigation.

Test for Alkaloids: Two millilitres of extract was mixed with a few millilitres of dilute hydrochloric acid (HCl) and filtered. A few drops of Hager's reagent (aqueous solution of picric acid) were added to the filtrate. A yellow precipitate indicates the presence of alkaloids.

Test for Glycosides: Two millilitres of extract was added to 1 ml of glacial acetic acid, ferric chloride ($FeCl_3$), or H_2SO_4. The green–blue colour indicates the presence of glycosides.

Test for Flavonoids: To 2 ml of extract, a few drops of NaOH solution were added, and a yellow colour solution formed. Then, a few ml of diluted hydrochloric (HCl) acid was added, which turned the yellow colour solution into a colourless solution, indicating the presence of flavonoids.

Test for Tannins: A small amount of extract was mixed with 2 ml of ferric chloride (FeCl3), and the colour change was recorded. The formation of a green, gray/dark blue colour indicates the presence of tannins.

Test for Saponins: The extract and distilled water were mixed in the same volume, and the mixture was shaken vigorously. The formation of a layer of foam indicates the presence of saponins.

Test for Phenols: To 2 ml of extract, 1 ml of ferric chloride ($FeCl_3$) solution was added. The deep blue–black color indicates the presence of phenols.

Test for Reducing Sugars (Fehling Test): Volumes of Fehling A and Fehling B were mixed, and 2ml of each mixture was added to the extract, which was gently boiled. A brick red precipitate at the bottom of the test tube indicated the presence of reducing sugars.

Estimation of Total Phenolic Content (TPC): The total phenolic content (TPC) of the fruits, seeds, and bark extracts was determined by the Folin–Ciocalteu colorimetric method as described by Singleton *et al* [14]. Standard gallic acid solution was prepared by dissolving 10 mg of standard gallic acid in 10 ml of methanol (1 mg/ml). Various concentrations of gallic acid solutions in methanol (10–100µg/ml) were prepared from the standard solution. For each concentration, 5ml of 10% Folin–Ciocalteu reagent (FCR) and 4ml of 7% Na_2CO_3 were added, resulting in a final volume of 10 ml. Thus, the obtained blue mixture was shaken well and incubated for 30 minutes at 40 °C in a water bath. The absorbance was subsequently measured at 760 nm against a blank. The FCR reagent oxidizes phenols in plant extracts and changes them into a dark blue color, which is then measured by a UV–visible spectrophotometer. All the experiments were carried out in triplicate, and the average absorbance values obtained at different concentrations of gallic acid were used to plot the calibration curve. The samples (100 µg/ml) were prepared in triplicate for each analysis, and the average value of the absorbance was used to plot the calibration curve to determine the level of phenolics in the extracts. The values are expressed in mg gallic acid equivalents (GAE) per gram of extract.

Determination of Total Flavonoid Content: The total flavonoid contents in the extracts were determined via an aluminium chloride colorimetric assay.

A stock solution (4 mg/ml) of quercetin was prepared by dissolving 4 mg of quercetin in 1 ml of methanol. This standard solution was diluted serially to make various concentrations of 100–1000 µg/ml solutions. One millilitre of quercetin at each concentration was added to a test tube containing 4 ml of distilled water. At the same time, 0.3 ml of 5% $NaNO_2$ was added to the test tube, and 0.3 ml of 10% $AlCl_3$ was added after 5 min. Then, 2 mL of 1 M NaOH was added to the mixture after 6 min. The volume of the mixture was adjusted to 10 ml by immediately adding 4.4 ml of distilled water. The total flavonoid content was expressed as quercetin equivalents *via* a linear equation based on the calibration curve. The samples (100 μg/ml) were prepared in triplicate for each analysis, and the average value of the absorbance was used to plot the calibration curve to determine the level of flavonoids in the extracts. The values are expressed in mg quercetin equivalents (QEs) per gram of extract.

Determination of Total Tannin Content: The tannin content was determined using the Folin–Ciocalteu method described by Govindappa *et al* [15]. Approximately 0.1 ml of the sample extract was added to a volumetric flask (10 ml) containing 7.5 ml of distilled water, 0.5 ml of Folin–Ciocalteu phenol reagent, and 1 ml of 35% sodium carbonate solution, which was subsequently diluted to 10 ml with distilled water. The mixture was shaken well and kept at room temperature for 30 min. A set of reference standard solutions of tannic acid (10–100 µg/ml) was prepared in the same manner as described earlier. The absorbances of the test and standard solutions were measured against the blank at 700 nm with a UV/visible spectrophotometer. The estimation of the tannin content was carried out in triplicate. The tannin content was expressed in terms of mg of tannic acid equivalents/g of extract.

Antioxidant Activity:

DPPH Scavenging Activity of Plant Extracts: The antioxidant activity of the methanolic extract was determined using the DPPH free radical scavenging assay as described by Nithianantham *et al* [16]. The oxidized form of DPPH has a profound violet hue when dissolved in methanol. An antioxidant molecule transfers an electron to DPPH, resulting in its reduction and color change from deep violet to yellow in its reduced state. Sample concentrations of 5, 10, 15, 20, 30, 50, 70, and 100 µg/ml were prepared, and 2 ml of DPPH Reagent was added. The DPPH solutions exhibit significant absorption at a wavelength of 517 nm, resulting in a distinct deep violet color. The assessment of DPPH free radical scavenging established the antioxidant capability of the test materials, indicating their efficacy in preventing, intercepting, and repairing damage in a biological system. The standard curve was constructed using five distinct concentrations of ascorbic acid (5, 10, 15, 20, 30, 50, 70, and 100 µg/ml). The results were quantified as the antioxidant capacity of the extracts at the 50% inhibitory concentration. The value was expressed as µg AAE (ascorbic acid equivalent).

ABTS+ Radical Scavenging Activity of the Plant Extracts: The $ABTS^+$ radical scavenging assay was performed following the method of Re et al.[12]A stable stock solution of the ABTS radical cation was prepared by combining 10 mM ABTS with potassium persulfate and allowing the reaction to occur at 37 °C for 16 hours in the absence of light. Sample concentrations of 5, 10, 15, 20, 30, 50, 70, and 100 µg/ml were prepared, and 3 ml of ABTS Reagent was added. The samples were kept in the dark for 30 minutes. The absorbance at 734 nm was then measured. The standard curve was constructed using five distinct concentrations of ascorbic acid (5, 10, 15, 20, 30, 50, 70, and 100 µg/ml). The results were quantified as the antioxidant capacity of the extracts at the 50% inhibitory concentration. The value was expressed as µg AAE (ascorbic acid equivalent).

Phytochemical Profiling by GC–MS: Phytochemical profiling of the plant extracts was carried out using a Shimadzu Gas Chromatography–Mass Spectrometry (GC–MS) system equipped with an autosampler and an electron ionization (EI) source. Separation was achieved on an Rxi-5Sil MS fused silica capillary column (30 m × 0.25 mm i.d., 0.25 µm film thickness). Helium (99.999% purity) was employed as the carrier gas at a constant flow rate of 1.0 mL/min. The oven temperature was programmed from 50 °C (held for 2 min) to 280 °C at a ramp rate of 10 °C/min, with a final hold for 10 min. The injector temperature was maintained at 250 °C in

split mode (split ratio of 1:10), and the injection volume was 1 µL of the prepared extract in analytical-grade solvent. Mass spectra were recorded in the range of m/z 40–650 with the ion source and interface temperatures set at 200 °C and 250 °C, respectively. The identification of compounds was accomplished by comparing the obtained mass spectra with reference spectra from the NIST and Wiley libraries, with further confirmation on the basis of retention indices. All analyses were performed in triplicate to ensure reproducibility of the results.

Statistical Analysis: All the experiments were performed in triplicate, and the results are presented as the means ± SDs. For statistical analysis, all the samples were compared *via* one-way ANOVA followed by Tukey's test *via* GraphPad Prism 5 software. Values less than $p < 0.05$ were considered significantly different.

RESULTS AND DISCUSSIONS: Phytochemical screening of *F. semicordata* bark revealed the presence of alkaloids, whereas the presence of reducing sugars was confirmed in the fruit. Analysis of the bark of *F. racemosa* revealed that the plant leaves and fruit contained reducing sugars and saponins, respectively. Fruit from *F. hispida* contains glycosides and alkaloids. Nearly every plant part tested positive for tannins, flavonoids, and phenols **Table 1.**

TABLE 1: QUALITATIVE PHYTOCHEMICAL ANALYSIS OF BARK, LEAVES, AND FRUIT OF *F. SEMICORDATA* (FS), *F. RACEMOSA* (FR), AND *F. HISPIDA* (FH)

Plant name	Plant part	Alkaloid	Tannin	Phenolic	Flavonoid	Glycoside	Saponin	Reducing sugar
FS	Bark	+	+	+	+	-	-	-
	Leaf	+	+	+	+	-	-	+
	Fruit	-	+	+	+	-	-	+
FR	Bark	-	+	+	+	-	+	-
	Leaf	-	+	+	+	-	-	+
	Fruit	-	+	+	+	-	-	+
FH	Bark	+	+	+	+	+	+	-
	Leaf	-	+	+	+	-	+	+
	Fruit	+	+	+	+	+	-	+

Polyphenols are among the most important types of compounds in medicine. Phenolic acids, flavonoids, and tannins are various phytochemical compounds that contribute to health benefits, such as reducing oxidative stress, providing protection against neurodegenerative diseases, and lowering the risk of cardiovascular diseases [17].

A phytochemical analysis of three selected Ficus species revealed a significant presence of secondary metabolites. *Ficus semicordata* presented the highest total phenolic content (TPC) and total flavonoid content (TFC) among the species.

In *F. semicordata*, the ET50 extract (ethanol:water, 50:50) had the highest TPC, whereas the ET70 extract (ethanol:water, 70:30) presented the highest TFC and total tannin content (TTC). Among the leaf extracts, ET70 also had the highest TPC and TFC, whereas ET100 (absolute ethanol) had the highest TTC. The fruit extracts of *F. semicordata* consistently presented high levels of TPC, TFC, and TTC in the ET70 extract. A similar pattern was observed for the fruit extracts of all three species, where the ET70 solvent system produced the highest concentrations of phytochemicals, indicating its effectiveness in extracting phenolic compounds.

In *Ficus hispida*, the bark extracts had the highest TPC and TFC among the ET70 extracts, while the highest TTC was found in the ET50 extract. The leaf extracts of *F. hispida* presented the highest TPC in the aqueous (AQ) extract, whereas ET100 presented the highest TFC and TTC.

For *Ficus racemosa*, both the bark and fruit extracts presented the highest levels of phytochemicals in the ET70 extract, whereas the ET100 leaf extract presented the highest TPC, TFC, and TTC. Overall, ET70 proved to be the most effective solvent system for extracting phenolic, flavonoid, and tannin compounds from various tissues of the three Ficus species **Table 2A-C** and **Fig. 1A-C**.

TABLE 2(A): QUANTITATIVE PHYTOCHEMICAL ANALYSIS AND ANTIOXIDANT ACTIVITY OF *F. SEMICORDATA* (FS) PLANT PARTS

FS Plant Part	Solvent extract	TPC (mg GAE/g of extract)	TFC (mg QE/g of extract)	TTC (mg TAE/g of extract)	IC_{50} (µg/mL AAE)	
					DPPH Assay	ABTS Assay
Bark	ET100	434.29±3.25	340.59±5.23	156.8±4.38	33.13±0.19	20.10±0.18
	ET70	449.57±2.66	349.49±14.67	181.65±12.74	12.76±0.67	7.96±0.95
	ET50	458.54±1.93	301.52±2.7	138.06±2.56	9.45±0.32	5.32±0.14
	AQ	256.08±1.32	60.81±8.4	70.44±4.67	30.69±0.63	25.63±0.44
Leaf	ET100	360.83±3.72	108.6±4.11	133.09±5.76	86.98±0.45	79.22±0.99
	ET70	379.01±2.43	135.12±1.24	68.27±3.44	30.72±0.28	14.51±0.63
	ET50	87.7±9.99	48.72±1.69	64.2±4.93	68.47±1.25	30.69±0.33
	AQ	62.18±3.39	49.23±1.91	60.98±2.06	66.56±0.46	35.69±0.48
Fruit	ET100	133.06±3.35	210.55±3.46	189.92±11.18	63.42±1.36	56.02±0.97
	ET70	135.28±4.48	231.62±6.27	224.73±8.75	29.43±0.29	16.71±0.52
	ET50	63.74±4.76	199.62±2.97	166.61±11.64	32.56±0.49	27.47±0.42
	AQ	51.56±5.81	86.51±7.07	129.18±14.01	33.18±0.19	23.76±0.12

TABLE 2(B): QUANTITATIVE PHYTOCHEMICAL ANALYSIS AND ANTIOXIDANT ACTIVITY OF *F. RACEMOSA* (FR) PLANT PARTS

FR Plant Part	Solvent extract	TPC (mg GAE/g of extract)	TFC (mg QE/g of extract)	TTC (mg TAE/g of extract)	IC_{50} (µg/mL AAE)	
					DPPH Assay	ABTS Assay
Bark	ET100	233.98±14.25	210.55±3.46	220.55±3.46	57.47±0.76	63.80±0.29
	ET70	250.58±6.97	236.23±6.39	246.23±6.19	17.76±0.51	18.10±0.19
	ET50	154.36±7.68	200.60±2.99	208.6±2.96	17.67±0.43	18.45±.38
	AQ	118.46±8.15	162.7±10.01	135.52±3.43	31.01±0.84	37.06±0.75
Leaf	ET100	59.58±4.84	71.4±3.34	71.4±3.34	73.41±0.41	84.22±0.10
	ET70	45.24±6.09	60.4±2.99	60.4±2.99	33.48±0.16	41.40±0.23
	ET50	98.18±12.87	53.05±1.34	53.05±1.34	35.77±0.26	43.40±1.01
	AQ	119.17±2.96	46.74±3.04	41.03±1.74	54.79±0.12	61.22±0.25
Fruit	ET100	53.66±1.60	92.06±2.87	92.06±2.87	96.57±0.31	84.04±0.69
	ET70	86.35±3.93	94.6±1.95	94.6±1.95	56.38±0.24	36.65±0.58
	ET50	28.05±5.78	61.18±4.89	61.18±4.89	51.65±0.41	37.60±0.28
	AQ	22.77±8.65	51.07±1.48	60.4±1.01	78.66±0.65	52.40±0.12

TABLE 2(C): QUANTITATIVE PHYTOCHEMICAL ANALYSIS AND ANTIOXIDANT ACTIVITY OF *F. HISPIDA* (FH) PLANT PARTS

FH Plant Part	Solvent extract	TPC (mg GAE/g of extract)	TFC (mg QE/g of extract)	TTC (mg TAE/g of extract)	IC_{50} (µg/mL AAE)	
					DPPH Assay	ABTS Assay
Bark	ET100	223.81±12.35	210.55±3.46	78.76±3.89	68.35±0.66	78.48±0.40
	ET70	262.57±6.41	231.62±6.27	122.17±1.92	34.67±0.51	43±0.76
	ET50	144.88±9.48	199.62±2.97	134.8±2.7	33.19±0.95	40.44±0.37
	AQ	95.93±6.16	86.51±7.07	99.02±4.53	45.73±0.47	58.69±0.32
Leaf	ET100	57.41±4.66	71.4±3.34	66.83±2.9	172.67±0.38	189.48±0.38
	ET70	42.17±5.10	57.84±2.86	63.74±2.28	101.71±0.87	121.54±0.27
	ET50	98.77±10.58	51.3±1.29	59.44±2.54	100.81±0.85	111.62±0.28
	AQ	106.61±8.63	37.42±1.29	54.2±2.07	122.22±0.73	144.82±3.39
Fruit	ET100	47.94±1.30	92.06±2.87	107.61±1.9	285.22±1.02	288.25±1.21
	ET70	88.97±3.78	97.84±2.01	95.34±7.42	68.04±0.62	67.92±0.76
	ET50	26.97±5.98	63.58±5.08	62.66±5	72.05±0.76	73.74±0.27
	AQ	17.31±1.23	53.31±1.34	48.08±3.76	84.55±0.59	122.53±1.16

The antioxidant activity is measured by the concentration-dependent increase in radical scavenging. A relatively high antioxidant activity result in a relatively low IC_{50} value (50% inhibition concentration). Among all the extracts, FS bark presented the highest antioxidant activity. The IC_{50} value of ascorbic acid was found to be 6.62±1.23, and all the crude samples presented antioxidant activity below 300 µg. In FS fruit and bark, the ET50 extract presented the highest antioxidant activity. The ET70 extract of the FS leaves showed good antioxidant activity. For FR fruits and leaves, ET70 had good antioxidant activity, whereas ET70 and ET50 both had significant antioxidant activity in the bark extract. Similarly, in the case of FH bark and fruit, ET70 had the most potent

antioxidant activity, and for the leaf extract, ET50 had the lowest IC_{50} value. All the values were significantly different from those of ascorbic acid **Table 2A-C and Fig. 2A-C**.

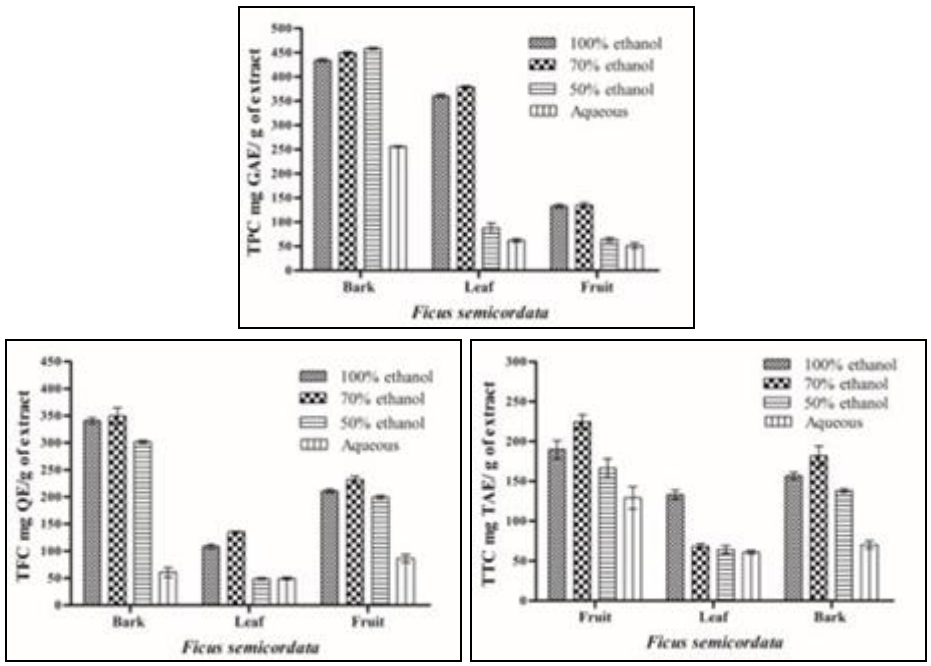


FIG. 1(A): QUANTITATIVE PHYTOCHEMICAL ANALYSIS VIEWING TPC, TFC, AND TTC VALUE OF *F. SEMICORDATA*

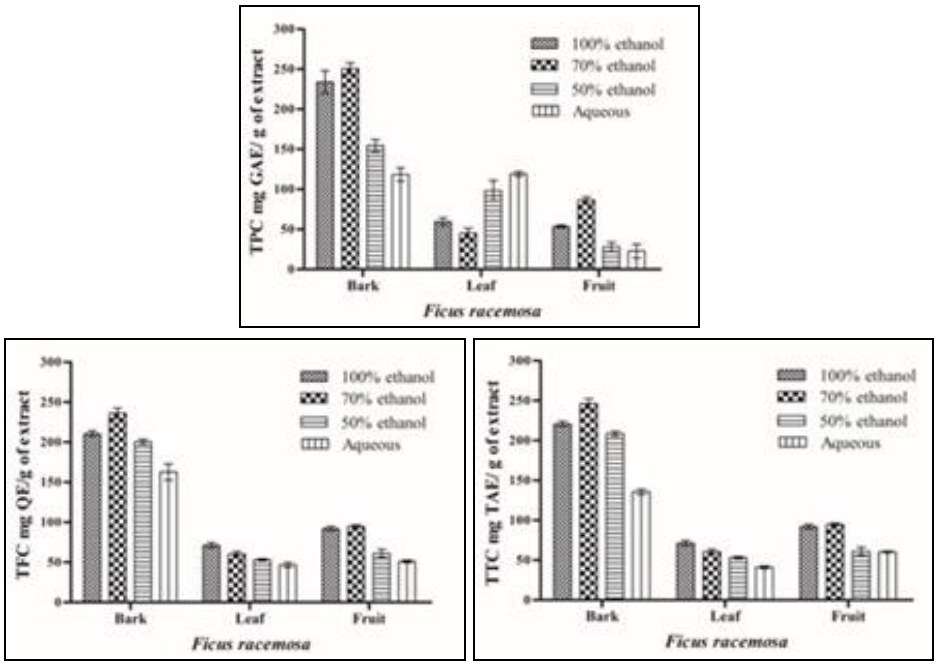
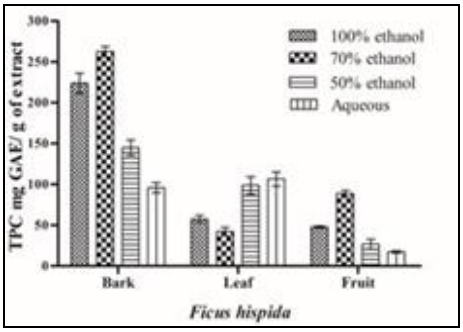


FIG. 1(B): QUANTITATIVE PHYTOCHEMICAL ANALYSIS VIEWING TPC, TFC, AND TTC VALUE OF *F. RACEMOSE*



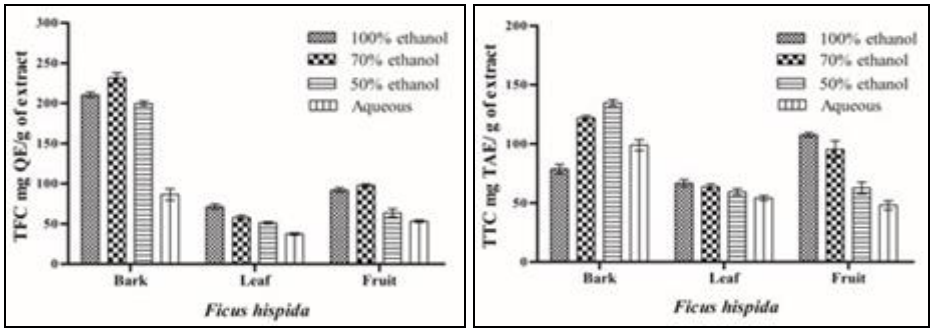


FIG. 1(C): QUANTITATIVE PHYTOCHEMICAL ANALYSIS VIEWING TPC, TFC, AND TTC VALUE OF *F. HISPIDA*

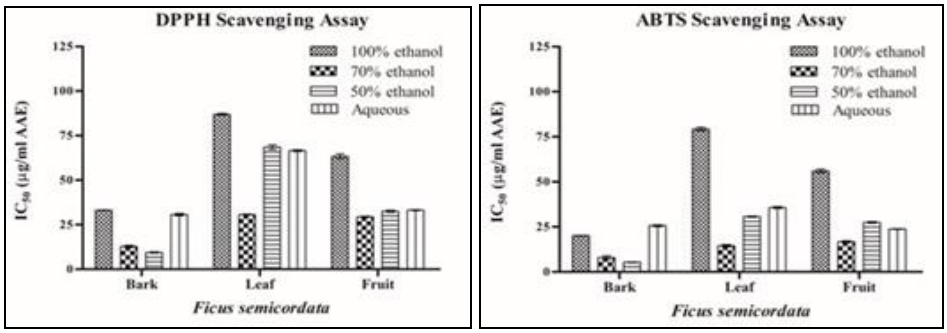


FIG. 2(A): ANTIOXIDANT ACTIVITY OF THE *F. SEMICORDATA* PLANT PARTS, INDICATING THE IC_{50} VALUE OF DPPH AND ABTS SCAVENGING ASSAY

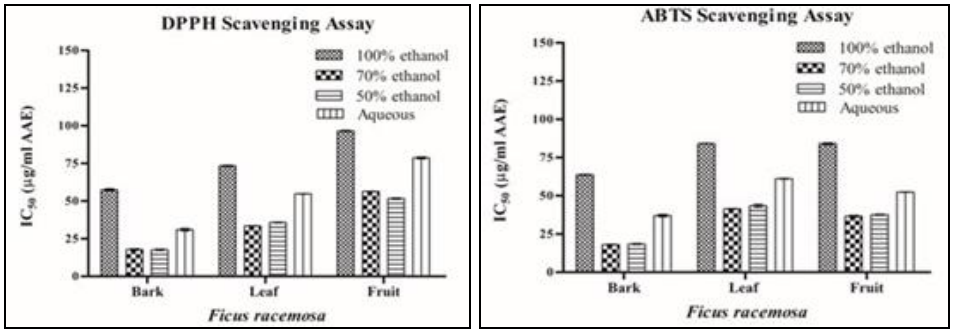


FIG. 2(B): ANTIOXIDANT ACTIVITY OF THE *F. RACEMOSA* PLANT PARTS, INDICATING THE IC_{50} VALUE OF DPPH AND ABTS SCAVENGING ASSAY

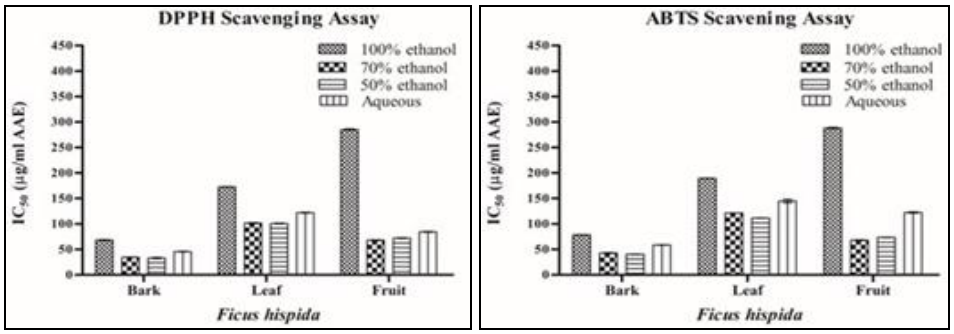


FIG. 2(C): ANTIOXIDANT ACTIVITY OF THE *F. HISPIDA* PLANT PARTS, INDICATING THE IC_{50} VALUE OF DPPH AND ABTS SCAVENGING ASSAY

Recent studies have shown that ethanol and hydroethanol extracts of *F. semicordata*, especially the 70% ethanol (ET70) extract, have strong antioxidant activity. This activity is closely related to their high total phenolic content (TPC) and total flavonoid content (TFC). Research also indicates that ethanol and hydroethanol extracts from the bark and fruits of *F. racemosa* have strong antioxidant potential, which is linked to their high total phenolic and flavonoid contents [18].

Similarly, ethanolic and hydroethanolic extracts of *F. hispida* have high total phenolic content (TPC) and total flavonoid content (TFC), which correlate with their antioxidant potential [19-20]. The antioxidant activity of these compounds is attributed mainly to bioactive compounds such as gallic acid, catechin, and quercetin derivatives. These compounds help neutralize reactive oxygen species (ROS) and reduce oxidative stress, which is associated with several degenerative diseases. Therefore, all three ficus species *F. semicordata*, *F. racemosa*, and *F. hispida* are valuable natural sources of antioxidants with potential uses in food, medicine, and health products.

GC–MS analysis of *Ficus semicordata* bark extract revealed a complex mixture of alcohols, alkanes, esters, phthalate derivatives, and fatty acids **Table 3.** This finding reflects its diverse phytochemical profile with possible biological importance. 2,3-Butanediol [S-(R, R)] and glycerin are sugar alcohols linked to antioxidant, moisturizing, and antimicrobial effects [21]. Hydrocarbons such as undecane and tridecane are often found in plant waxes. They help in repelling insects and have antibacterial properties [22]. 1H-2-Benzopyran-1-one, 3,4-dihydro-8-hydroxy-3-methyl-, which is a coumarin derivative, is recognized for its antioxidant, anti-inflammatory, and anticoagulant abilities. Multiple phthalate esters, such as dibutyl phthalate, phthalic acid ethyl 2-pentyl ester, bis (2-methylpropyl) ester, and cyclobutyl tridecyl ester, may be derived from natural processes and environmental sources. They frequently appear in plant extracts and show antimicrobial, insecticidal, and plasticizer-like activities [23]. Sulfurous acid esters, while uncommon in plants, suggest possible defensive or preservative functions. n-Hexadecanoic acid (palmitic acid) and its ester (hexadecanoic acid ethyl ester) are wellknown for their anti-inflammatory, antioxidant, and cholesterol-lowering effects [24]. GC–MS analysis of *Ficus semicordata* leaf extract revealed a diverse array of organic acids, hydrocarbons, esters, and aromatic compounds, indicating the presence of functionally diverse phytochemicals **Table 3**. 1,3,5-Cycloheptatriene, a conjugated cyclic hydrocarbon, may act as a precursor to bioactive aromatic compounds and is associated with antioxidant and anti-inflammatory properties in some plant extracts. Butanoic acid, 2-methyl-, methyl ester is a short-chain fatty acid ester known for its potential antimicrobial and flavour-modulating activities. The presence of undecane, a straight-chain alkane, supports its role in cuticular wax protection and insect-repellent functions [22]. Phthalic anhydride, although often synthetic, has been reported in natural matrices and may contribute to antibacterial properties [23]. Quinic acid, a key cyclohexane carboxylic acid, is a well-known antioxidant and anti-inflammatory compound widely present in plant leaves and is known to play a role in phenolic biosynthesis [25]. Diphenyl sulfone, a sulfone derivative, is less common in plant sources but has shown antimicrobial and anti-inflammatory properties in synthetic studies. 8-Methylnonanoic acid, a branched-chain fatty acid, may be involved in cell signalling or membrane stability and has reported antibacterial potential.

GC–MS profiling of *Ficus semicordata* fruit extract revealed a complex mixture of aliphatic hydrocarbons, fatty acid esters, phthalate derivatives, and oxygenated terpenes **Table 3**. This finding highlights the rich phytochemical profile of this fruit and its potential medicinal benefits. Compounds such as propane, 1,1,3-triethoxy-, propane, 1,1-diethoxy-2-methyl-, and 3,3-diethoxy-1-propanol are derived from sugars and acetals. These compounds are likely derived from carbohydrate metabolism and help with flavour, solubility, and antimicrobial effects. Hydrocarbons such as undecane, heneicosane, eicosane, and 2-methyloctacosane are linked to cuticular protection and may act as insect repellents and antibacterial agents [22].

Diethyl phthalate and several phthalic acid esters, including 7-bromoheptyl ethyl, ethyl 2-pentyl, and butyl isohexyl, are often found in plant extracts. These compounds might be derived from environmental factors or biological processes and are known for their antimicrobial and larvicidal effects [23]. Neophytadiene, a diterpene hydrocarbon, has strong anti-inflammatory, antioxidant, and anticancer properties [26]. Fatty acids such as n-hexadecanoic acid (palmitic acid), hexadecanoic acid ethyl ester, octadecanoic acid ethyl ester, and 9,12-octadecadienoic acid (Z, Z)- (linoleic acid) are recognized for their anti-inflammatory, cholesterol-lowering, and antioxidant effects [24]. The identification of 2H-pyran, 2-(2-heptadecynyloxy)

tetrahydro-, dichloroacetic acid, and tridec-2-ynyl ester suggested the presence of uncommon oxygenated and halogenated compounds that could play roles in bioactivity or signalling.

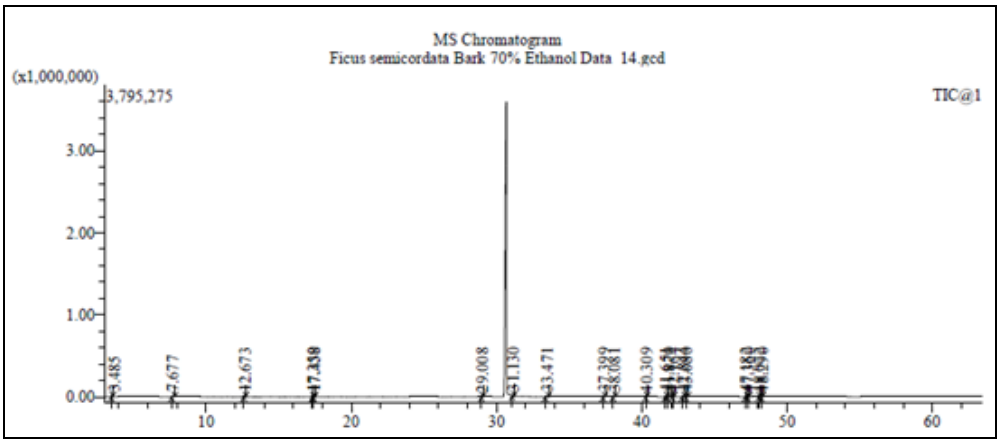


FIG. 3(A): GC-MS CHROMATOGRAM OF *F. SEMICORDATA* BARK

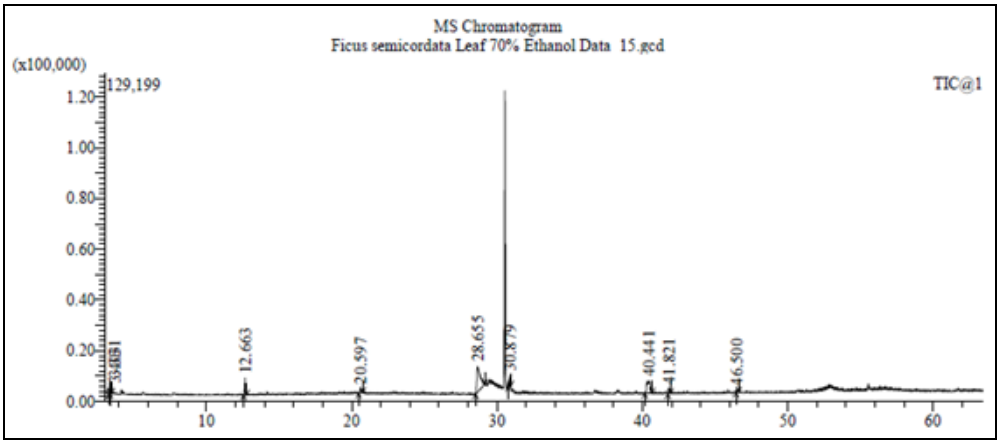


FIG. 3(B): GC-MS CHROMATOGRAM OF *F. SEMICORDATA* LEAF

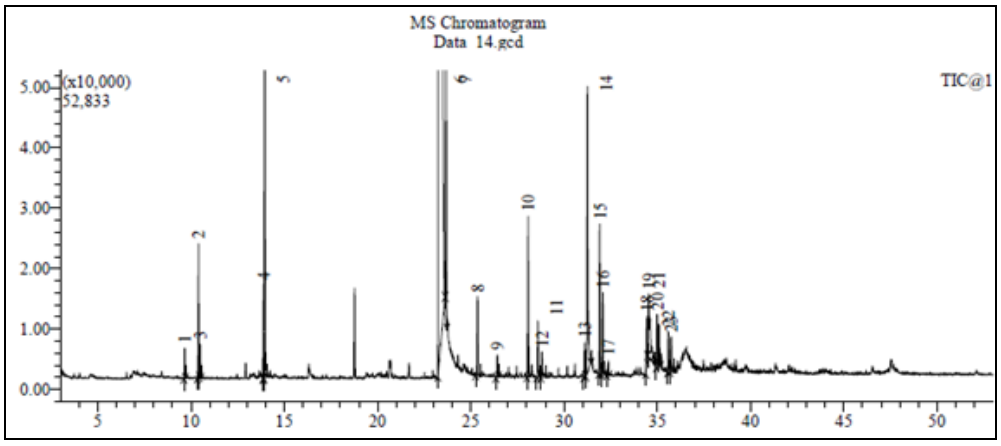
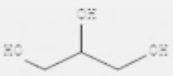
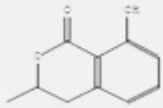
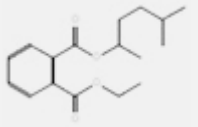
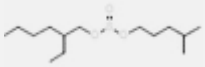
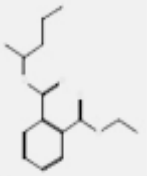
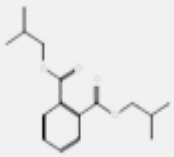
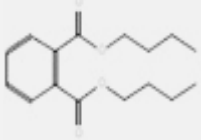
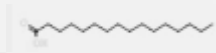
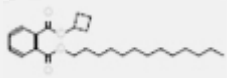
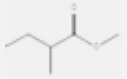
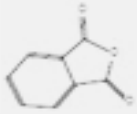
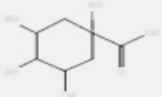
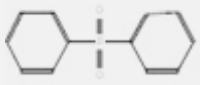
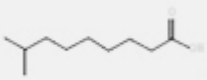
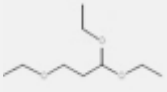
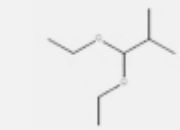
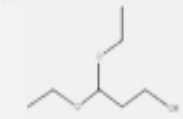
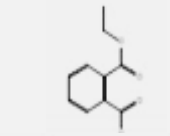
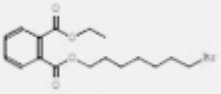
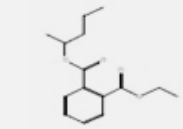
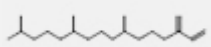
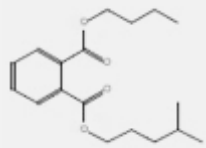
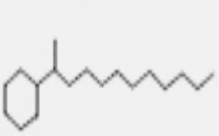
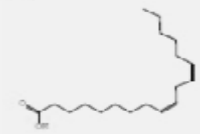
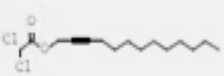
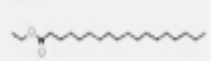


FIG. 3(C): GC-MS CHROMATOGRAM OF *F. SEMICORDATA* FRUIT

TABLE 3: PYTOCHEMICAL PROFILING OF THE BARK, LEAVES, AND FRUITS OF *F. SEMICORDATA* VIA GC–MS

Sample name FS	Compounds	Retention time	Molecular formula	MWg/mol	Area %	Structure
Bark	2,3-Butanediol, [S-(R*,R*)]-	3.485	C4H10O2	90	3.894	
	Glycerin	7.677	C3H8O3	92	12.280	

	Undecane	12.673	C11H24	156	5.977	
	1H-2-Benzopyran-1-one, 3,4-dihydro-8-hydroxy-3-methyl-	29.008	C10H10O3	178	2.682	
	Tridecane	31.130	C13H28	184	5.373	
	Phthalic acid, 5-methylhex-2-yl ethyl ester	33.471	C17H24O4	292	6.783	
	Sulfurous acid, 2-ethylhexyl isohexyl ester	37.399	C14H30O3S	278	5.092	
	Phthalic acid, ethyl 2-pentyl ester	38.081	C15H20O4	264	3.880	
	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	40.309	C16H22O4	278	2.382	
	Dibutyl phthalate	41.651	C16H22O4	278	6.922	
	n-Hexadecanoic acid	41.870	C16H32O2	256	7.117	
	Phthalic acid, cyclobutyl tridecyl ester	42.164	C25H38O4	402	1.358	
	Hexadecanoic acid, ethyl ester	42.844	C18H36O2	284	9.972	
Leaf	1,3,5-Cycloheptatriene	3.331	C7H8	92	2.761	
	Butanoic acid, 2-methyl-, methyl ester	3.403	C6H12O2	116	1.607	
	Undecane	12.663	C11H24	156	6.230	
	Phthalic anhydride	20.597	C8H4O3	148	3.309	
	Quinic acid	30.879	C7H12O6	192	4.079	
	Diphenyl sulfone	40.441	C12H10O2S	218	24.636	
	8-Methylnonanoic acid	41.821	C10H20O2	172	2.936	
Fruit	Propane, 1,1,3-triethoxy-	9.664	C9H20O3	176	0.029	

Propane, 1,1-diethoxy-2-methyl-	10.395	C8H18O2	146	0.123	
Undecane	10.487	C11H24	156	0.030	
3,3-Diethoxy-1-propanol	13.891	C7H16O3	148	0.355	
Heneicosane	23.671	C21H44	296	0.231	
Diethyl Phthalate	25.354	C12H14O4	222	97.636	
Phthalic acid, 7-bromoheptyl ethyl ester	26.419	C17H23BrO4	370	0.024	
Phthalic acid, ethyl 2-pentyl ester	28.599	C15H20O4	264	0.065	
Neophytadiene	28.818	C20H38	278	0.035	
Phthalic acid, butyl isohexyl ester	31.111	C18H26O4	306	0.034	
n-Hexadecanoic acid	31.251	C16H32O2	256	0.394	
Hexadecanoic acid, ethyl ester	31.910	C18H36O2	284	0.160	
Eicosane	32.078	C20H42	282	0.087	
Dodecane, 2-cyclohexyl-	32.355	C18H36	252	0.017	
9,12-Octadecadienoic acid (Z,Z)-	34.431	C18H32O2	280	0.056	
2H-Pyran, 2-(2-heptadecynyloxy) tetrahydro-	34.542	C22H40O2	336	0.181	
Dichloroacetic acid, tridec-2-ynyl ester	35.095	C15H24Cl2O2	306	0.050	
Octadecanoic acid, ethyl ester	35.594	C20H40O2	312	0.048	
Octacosane, 2-methyl-	35.740	C29H60	408	0.038	

GC–MS analysis of *Ficus racemosa* bark extract revealed a wide variety of phytochemicals **Table 4**. These include hydrocarbons, fatty acids, esters, phthalates, and terpenoids, highlighting its rich chemical profile. Alkanes such as undecane, tetradecane, hexadecane, and nonane derivatives are known to act as natural solvents. They may help plants defend against microbes by disrupting microbial membranes [27]. The presence of long-chain alkanes such asheneicosane and octacosane suggest that these compounds play a role in protective wax and moisture retention.

Fatty acid derivatives such as n-hexadecanoic acid (palmitic acid) and its ethyl ester are important for their anti-inflammatory, antioxidant, and antibacterial properties [28].

Neophytadiene, a diterpenoid hydrocarbon found in a sample, is a well-known bioactive compound with strong anti-inflammatory and antimicrobial effects [29]. The detection of phthalate derivatives such as diethyl phthalate and phthalic acid esters is both intriguing and concerning. These compounds may have antimicrobial potential, but they are also seen as possible environmental pollutants [30]. The presence of 3,3-diethoxy-1-propanol suggests the existence of ether-alcohols, which could contribute to fragrance or solvent-like properties. GC–MS analysis of *Ficus racemosa* leaf extracts revealed a variety of compounds, including sugar derivatives, polyols, esters, fatty acids, and alcohols **Table 4**.

This variety reflects the rich biochemical and therapeutic profile of the plant. Compounds related to carbohydrates, such as glyceraldehyde, dihydroxyacetone, glycerin, and 1,2,3-propanetriol 1-acetate, are metabolic intermediates linked to glycolysis and sugar metabolism. They are associated with antioxidant and antimicrobial activities [21]. Sorbitol, a sugar alcohol, serves as an osmo-protectant, helping plants tolerate stress. It also has mild laxative and anti-inflammatory effects in humans [31].

Propanoic acid and tri-/diethoxy propane derivatives Could represent modified sugar esters or metabolic byproducts related to stress or defence pathways. Diethyl phthalate, often seen as synthetic, is found naturally in plant extracts and may contribute to insecticidal and antimicrobial effects [23]. Lipid-related compounds such as n-hexadecanoic acid (palmitic acid) and phytol are known for their anti-inflammatory, antioxidant, and liver-protective properties [24, 32]. Furthermore, 3,7, 11,15-tetramethyl-2-hexadecen-1-ol, a precursor of vitamin E and chlorophyll derivatives, is connected to antimicrobial and anticancer activities. GC–MS profiling of *Ficus racemosa* fruit extract revealed a complex mixture of aliphatic aldehydes, hydrocarbons, esters, sugar derivatives, and fatty acids **Table 4.** This mixture reflects its rich phytochemical and therapeutic composition. Glyceraldehyde, 3,3-diethoxy-1-propanol, and propane, 1,1-diethoxy-2-methyl-, are carbohydrate-related compounds, suggesting the presence of sugar metabolism intermediates that may play antioxidant and antimicrobial roles [21].

Alkanes such as tetradecane, pentadecane, heneicosane, and eicosane typically occur in plant waxes and work as protective agents with antibacterial and insect-repellent properties [22]. The identification of diethyl phthalate, although often synthetic, may also come from natural sources, and it is recognised for its antimicrobial potential [23].

Fatty acids and their esters, including n-hexadecanoic acid, hexadecanoic acid ethyl ester, ethyl oleate, octadecanoic acid ethyl ester, and 6-octadecenoic acid methyl ester (Z-), are key lipophilic components with known anti-inflammatory, antioxidant, and heart-protective properties [24]. The presence of 7-tetradecenal (Z-), an unsaturated aldehyde, and 9-tricosene (Z-), a known insect pheromone, suggests possible ecological roles such as plant defence and helping with pollinator interactions.

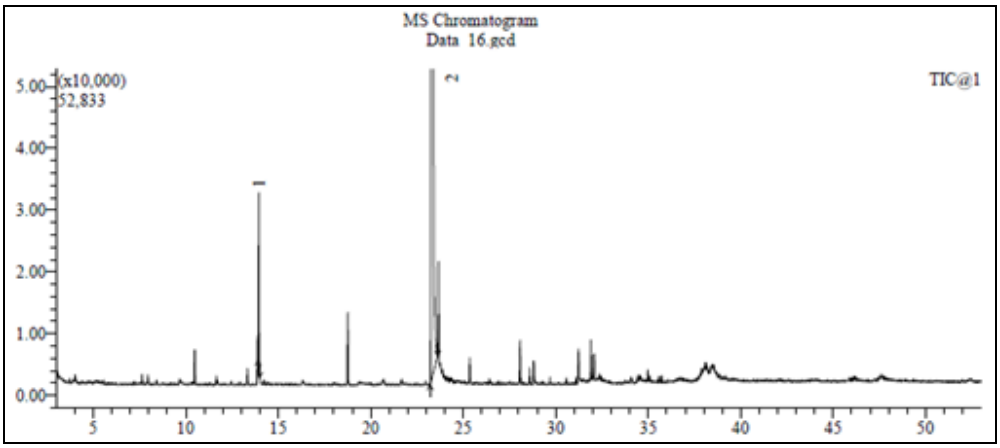


FIG. 4(A): GC-MS CHROMATOGRAM OF *F. RACEMOSA* BARK

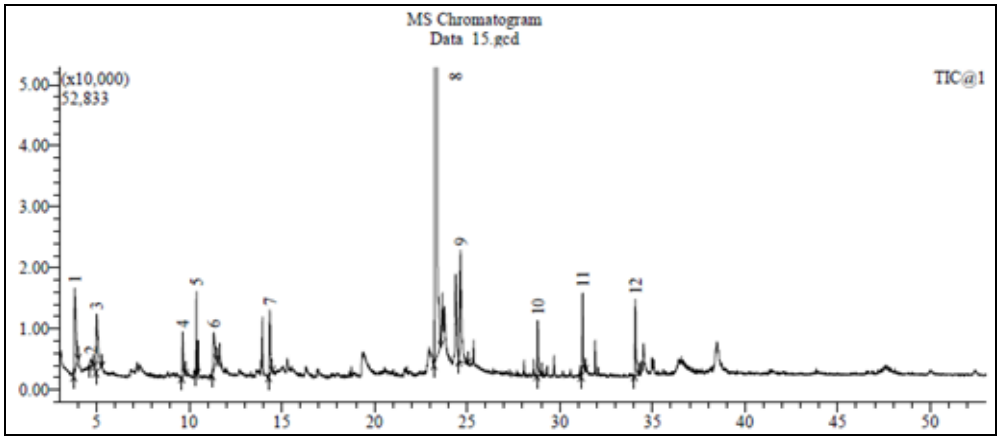


FIG. 4(B): GC-MS CHROMATOGRAM OF *F. RACEMOSA* LEAF

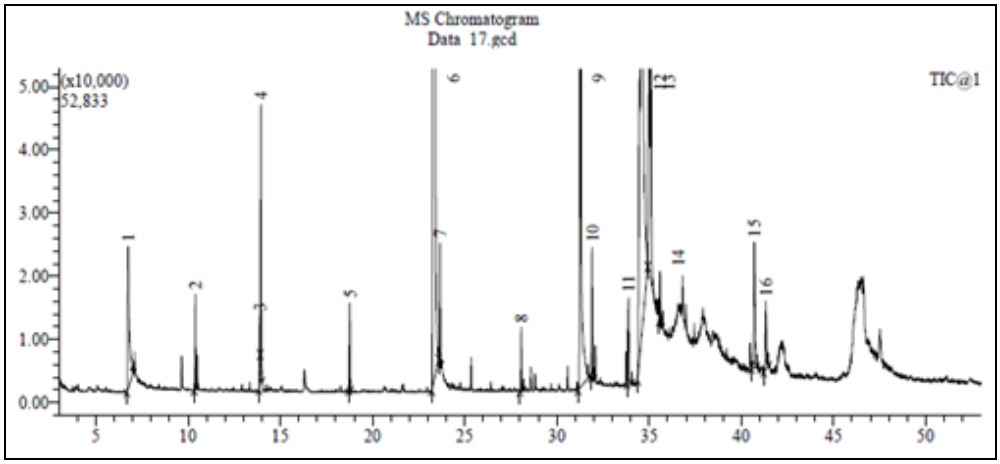
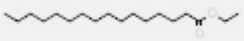
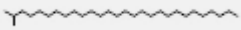
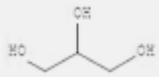
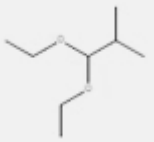
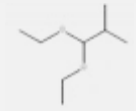
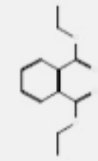
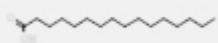
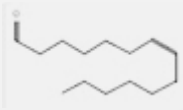
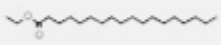
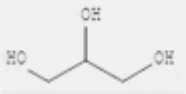
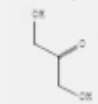
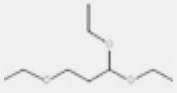
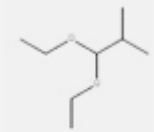
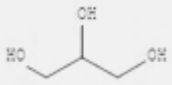
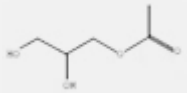
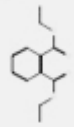
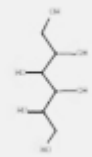
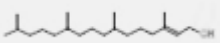
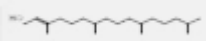


FIG. 4(C): GC-MS CHROMATOGRAM OF *F. RACEMOSA* FRUIT

TABLE 4: PHYTOCHEMICAL PROFILING OF *F. RACEMOSA* BARK, LEAVES, AND FRUITS VIA GC–MS

Sample name FR	Compounds	Retention time	Molecular formula	MW g/mol	Area %	Structure
Bark	Undecane	10.481	C11H24	156	0.076	
	Nonane, 3,7-dimethyl-	13.339	C11H24	156	0.035	
	3,3-Diethoxy-1-propanol	13.950	C7H16O3	148	0.381	
	Tetradecane	18.764	C14H30	198	0.187	
	Diethyl Phthalate	23.379	C12H14O4	222	98.577	
	Hexadecane	23.662	C16H34	226	0.238	
	Phthalic acid, ethyl pentyl ester	25.347	C15H20O4	264	0.059	
	Heneicosane	28.071	C21H44	296	0.110	
	Phthalic acid, ethyl 3-methylbutyl ester	28.597	C15H20O4	264	0.034	

	Neophytadiene	28.818	C20H38	278	0.071	
	n-Hexadecanoic acid	31.227	C16H32O2	256	0.088	
	Hexadecanoic acid, ethyl ester	31.908	C18H36O2	284	0.083	
	Octacosane, 2-methyl-	32.077	C29H60	408	0.060	
Fruit	Glyceraldehyde	6.746	C3H8O3	92	0.604	
	Propane, 1,1-diethoxy-2-methyl-	10.392	C8H18O2	146	0.149	
	3,3-Diethoxy-1-propanol	13.951	C7H16O3	148	0.392	
	Tetradecane	18.764	C14H30	198	0.146	
	Diethyl Phthalate	23.385	C12H14O4	222	84.839	
	Pentadecane	23.662	C15H32	212	0.206	
	Heneicosane	28.072	C21H44	296	0.112	
	n-Hexadecanoic acid	31.276	C16H32O2	256	2.525	
	Hexadecanoic acid, ethyl ester	31.909	C18H36O2	284	0.232	
	6-Octadecenoic acid, methyl ester, (Z)-	33.884	C19H36O2	296	0.245	
	7-Tetradecenal, (Z)-	34.604	C14H26O	210	7.946	
	Ethyl Oleate	35.091	C20H38O2	310	1.841	
	Octadecanoic acid, ethyl ester	35.591	C20H40O2	312	0.101	
	9-Tricosene, (Z)-	40.714	C23H46	322	0.392	
	Eicosane	41.330	C20H42	282	0.202	
Leaf	Glyceraldehyde	3.830	C3H6O3	90	0.613	
	Propanoic acid, 3-(acetylthio)-2-methyl-, (S)-	4.691	C6H10O3S	162	0.063	
	Dihydroxyacetone	5.009	C3H6O3	90	0.510	
	Propane, 1,1,3-triethoxy-	9.658	C9H20O3	176	0.188	

Propane, 1,1-diethoxy-2-methyl-	10.391	C8H18O2	146	0.226	
Glycerin	11.330	C3H8O3	92	0.306	
1,2,3-Propanetriol, 1-acetate	14.352	C5H10O4	134	0.297	
Diethyl Phthalate	23.365	C12H14O4	222	96.000	
Sorbitol	24.642	C6H14O6	182	0.905	
3,7,11,15-Tetramethyl-2-hexadecen-1-ol	28.817	C20H40O	296	0.219	
n-Hexadecanoic acid	31.233	C16H32O2	256	0.336	
Phytol	34.080	C20H40O	296	0.337	

GC–MS analysis of *Ficus hispida* bark revealed a variety of phytochemicals, including 3,3-diethoxy-1-propanol, diethyl phthalate, heneicosane, methyl isopropylidene – β – D - arabinoside, and n-hexadecanoic acid **Table 5**. Each of these factors contributes to the plant's medicinal properties. Diethyl phthalate, which is often synthetic, is found in several plant species and is linked to antimicrobial and insect-repelling effects [23].

Heneicosane is a long-chain alkane typically present in plant waxes. It helps create antimicrobial and protective barriers [22]. Methyl isopropylidene-β-D-arabinoside consists of sugar-based metabolites known for their antioxidant and anti-inflammatory benefits. n-Hexadecanoic acid, also known as palmitic acid, is a common fatty acid that has antibacterial, antioxidant, and cholesterol-lowering activities [24]. GC–MS analysis of *Ficus hispida* leaf extract revealed several sugar alcohols, aldehydes, esters, and fatty acid derivatives, indicating active metabolism **Table 5**. Compounds such as glyceraldehyde, dihydroxyacetone, and 1,2,3-propanetriol 1-acetate are related to carbohydrates. They often support glycolysis and energy metabolism while exhibiting antioxidant and antimicrobial effects [21]. Sorbitol, a polyol found in photosynthetic tissues, acts as an osmo-protectant. It may help plants resist stress and provide laxative effects in traditional medicine [31]. Diethyl phthalate, while generally synthetic, has been found in various plants and may also have antimicrobial and insect-repellent activity [23]. The presence of n-hexadecanoic acid and 7-tetradecenal, a fatty acid and unsaturated aldehyde, supports the anti-inflammatory and antioxidant potential of the leaf extract [24].

GC–MS analysis of *Ficus hispida* fruit extract revealed a rich mix of long-chain fatty acids, hydrocarbons, esters, and triterpenoids, suggesting its nutritional and therapeutic value **Table 5.** Although diethyl phthalate is often considered a synthetic contaminant, it is present in various traditional medicinal plants and may have antimicrobial and insect-repelling properties [23]. Hydrocarbons such as pentadecane, heneicosane, and 2-methyloctacosane are generally found in cuticular waxes. They contribute to antibacterial and insect-repelling functions [22]. Fatty acids and their methyl and ethyl esters, including n-hexadecanoic acid, methyl palmitate, methyl stearate, ethyl stearate, oleic acid, and ethyl oleate, are known for their anti-inflammatory, cholesterol-lowering, and antioxidant properties [24]. Notably, derivatives of 9,12-octadecadienoic acid and 11-octadecenoic acid also aid in lipid metabolism and support cardiovascular health. The detection of

eicosanoic acid ethyl ester revealed the presence of long-chain saturated fatty acids. Additionally, lup-20(29)-en-3-ol, acetate, or lupeol acetate, along with squalene both of which are triterpenes and natural antioxidants are significant bioactive compounds with documented anti-inflammatory, anticancer, and liver-protective effects [32].

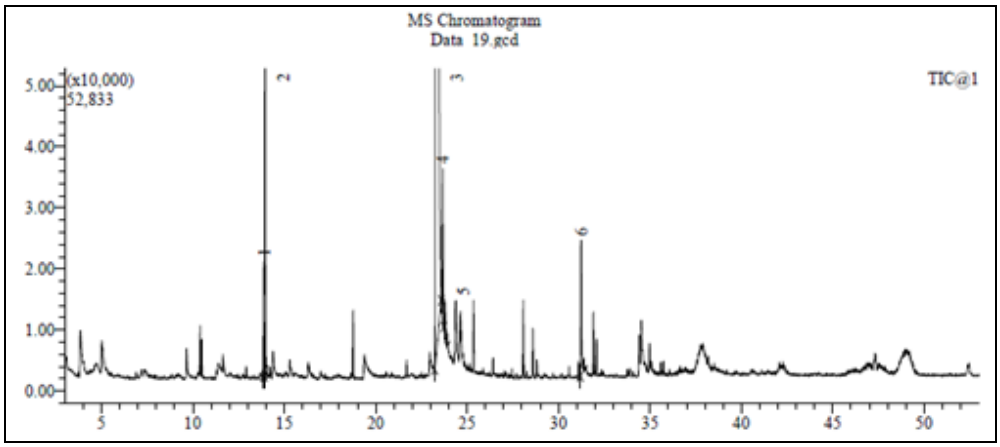


FIG. 5(A): GC-MS CHROMATOGRAM OF *F. HISPIDA* BARK

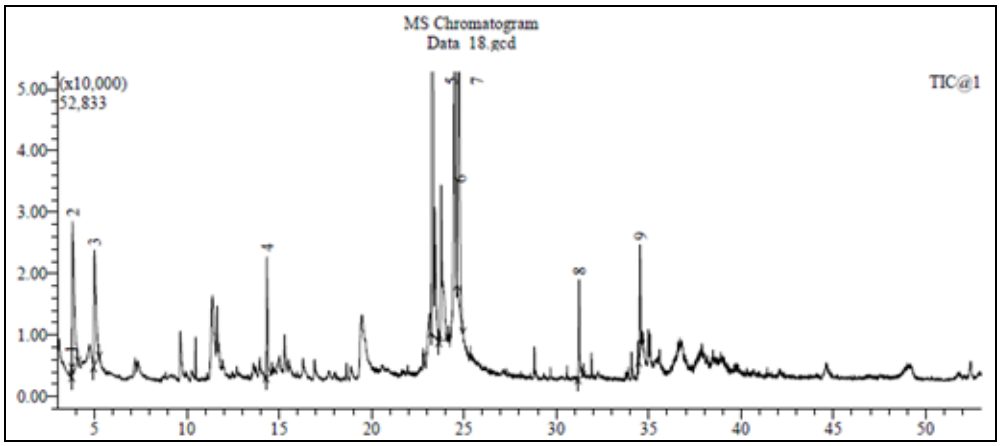


FIG. 5(B): GC-MS CHROMATOGRAM OF *F. HISPIDA* LEAF

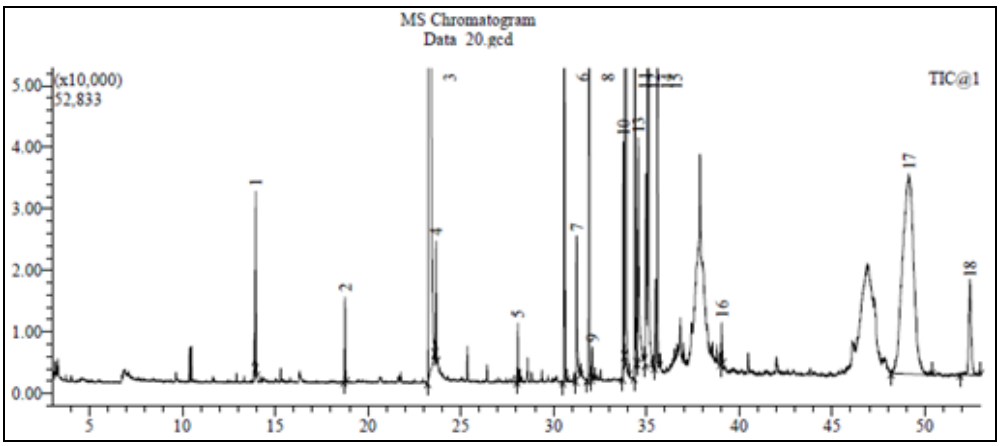
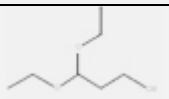
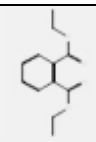
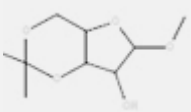
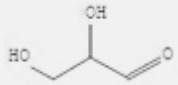
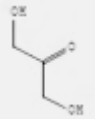
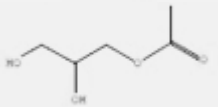
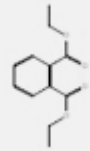
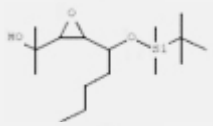
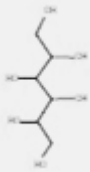
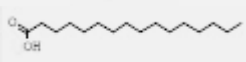
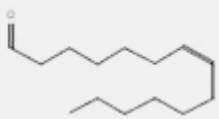
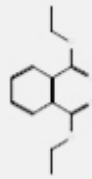
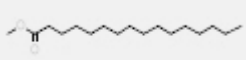
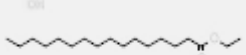
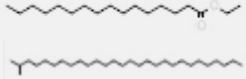
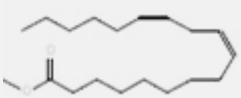
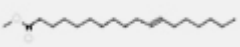
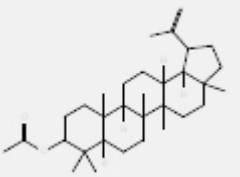


FIG. 5(C): GC-MS CHROMATOGRAM OF *F. HISPIDA* FRUIT

TABLE 5: PHYTOCHEMICAL PROFILING OF *F. HISPIDA* BARK, LEAVES, AND FRUITS *VIA* GC–MS

Sample name (FH)	Compound	Retention time	Molecular formula	MW g/mol	Area %	Structure
Bark	3,3-Diethoxy-1-propanol	13.950	$C_7H_{16}O_3$	148	0.526	

	Diethyl Phthalate	23.436	C12H14O4	222	98.892	
	Heneicosane	23.666	C21H44	296	0.165	
	Methyl isopropylidene-.beta.-d-arabinoside	23.786	C9H16O5	204	0.071	
	n-Hexadecanoic acid	31.236	C16H32O2	256	0.218	
Leaf	Glyceraldehyde	3.822	C6H8O2	112	2.760	
	Dihydroxyacetone	5.001	C3H6O3	90	2.065	
	1,2,3-Propanetriol, 1-acetate	14.345	C5H10O4	134	1.132	
	Diethyl Phthalate	23.323	C12H14O4	222	83.747	
	2-Oxiranemethanol, .alpha.,alpha.-dimethyl-3-[1-(t-butyldimethylsilyloxy)pentyl]-	23.783	C16H34O3Si	302	2.463	
	Sorbitol	24.713	C6H14O6	182	5.960	
	n-Hexadecanoic acid	31.232	C16H32O2	256	0.915	
	7-Tetradecenal, (Z)-	34.537	C14H26O	210	0.981	
Fruit	Diethyl Phthalate	13.954	C12H14O4	222	0.131	
	Pentadecane	18.767	C15H32	212	79.951	
	Heneicosane	23.394	C21H44	296	0.188	
	Hexadecanoic acid, methyl ester	23.664	C17H34O2	270	0.098	
	n-Hexadecanoic acid	28.074	C16H32O2	256	1.211	
	Hexadecanoic acid, ethyl ester	30.584	C18H36O2	286	0.341	
	Octacosane, 2-methyl-	31.244	C29H60	408	0.871	

9,12-Octadecadienoic acid (Z,Z)-, methyl ester	31.912	C19H34O2	294	0.055	
11-Octadecenoic acid, methyl ester	32.078	C19H36O2	296	0.381	
Methyl stearate	33.762	C19H38O2	298	4.464	
Oleic Acid	33.896	C18H34O2	282	0.860	
(E)-9-Octadecenoic acid ethyl ester	34.394	C20H38O2	310	0.729	
Octadecanoic acid, ethyl ester	34.558	C20H40O2	312	3.426	
Eicosanoic acid, ethyl ester	35.104	C22H44O2	340	0.778	
Lup-20(29)-en-3-ol, acetate, (3.beta.)-	35.595	C32H52O2	468	0.075	
Squalene	39.055	C30H50	410	5.590	

CONCLUSION: A detailed examination of the phytochemical, antioxidant, and GC–MS profiles of *Ficus hispida*, *Ficus semicordata*, and *Ficus racemosa* revealed that all three species are rich in different bioactive compounds with significant health benefits. Quantitative phytochemical analysis confirmed high levels of phenolics, flavonoids, tannins, and other secondary metabolites, all of which contribute to health-promoting effects. Antioxidant tests revealed strong free radical scavenging activity in all the species, which was closely related to their phenolic and flavonoid contents. These findings support their potential to help with conditions related to oxidative stress. GC–MS analysis also revealed a variety of compounds, such as fatty acids and their esters, long-chain hydrocarbons, terpenoids, glycosides, and phthalate derivatives. Many of these compounds have known antioxidant, antimicrobial, anti-inflammatory, lipid-lowering, and insect-repellent properties. While some compounds, such as n-hexadecanoic acid, oleic acid derivatives, and long-chain alkanes, were found in all the species, the unique compounds identified in each species may explain their different traditional medicinal uses. These findings support the traditional uses of *F. hispida*, *F. semicordata*, and *F. racemosa*, providing a scientific basis for their development into products for health and nutrition. Further studies, focusing on bioactivity and *in-vivo* tests, are needed to investigate and confirm the therapeutic benefits of the identified compounds.

ACKNOWLEDGEMENT: The authors gratefully acknowledge the Department of Biotechnology (DBT), Government of India, for their financial support under the BUILDER program (Reference No. BT/INF/22/SP45357/2022). We sincerely appreciate the assistance and resources provided, by Odisha State Higher Education Council, Govt. of Odisha sponsored RCOE-NPT which were crucial for the successful completion of this study.

CONFLICTS OF INTEREST: Nil

REFERENCES:

1. Clement WL: Evolution and classification of figs (Ficus, Moraceae) and their close relatives (Castilleae) united by involucral bracts. Botanical Journal of the Linnean Society 2020; 193(3): 316–339. https://doi.org/10.1093/botlinnean/boz079
2. Singh G: Indian Medicinal Plants: An Overview. Journal of Ethnopharmacology 2021; 267: 113464. https://doi.org/10.1016/j.jep.2020.113464a
3. Ali KWR: A study on the phytochemical and antioxidant properties of the aerial parts of *Ficus hispida* Linn. Research Journal of Pharmacognosy and Phytochemistry 2023; 15(3): 3.
4. Rao S and Ramakrishna A: Indian Medicinal Plants: Uses and Propagation Aspects. CRC Press 2020.

5. Sharma HL: "*Ficus racemosa* L: A review on its important medicinal uses, phytochemicals, and biological activities." J of Pharma and Therapeutic Sciences 2023; 14(1): 45-59.
6. Suil SJM: Untargeted NMR metabolomics analysis of *Ficus racemosa* fruit extracts. Phytochemistry 2025; 202: 113.
7. Gaur R, Chauhan A and Kanta C: A critical review of antioxidant potential and pharmacological applications of important Ficus species. Journal of Herbmed Pharmacology 2024; 13(4): 537–549.
8. Prasad KC, Ankanna S and Reddy TUK: Phytochemical screening and GC–MS analysis of methanolic extract of *Ficus racemosa*. Journal of Pharmacognosy & Phytochemistry 2024; 13(1): 77–109.
9. Yeniocak S, Karaduman-Yeşildal T and Arslan ME: Effect of *in-vitro* digestion on anticancer and antioxidant activity of phenolic extracts from latex of fig fruit (*Ficus carica* L.). Chemistry & Biodiversity 2025; 22(4): 202401624.
10. Kebal L: HPLC-DAD profile of phenolic compounds and *in-vitro* antioxidant activity of *Ficus carica* fruit extracts. Food Chemistry 2022; 367: 130703.
11. Knez M: Evaluation of Spectrophotometric Methods for Assessing Antioxidant Potential in Food. Appl Sci 2025; 15(11): 5925. doi:10.3390/app15115925.
12. Ilyasov IR, Beloborodov VL, Selivanova IA and Terekhov RP: ABTS/PP Decolorization Assay of Antioxidant Capacity Reaction Pathways. Int J Mol Sci 2020; 21(3): 1131. doi:10.3390/ijms21031131
13. Phytochemical Screening and Antimicrobial Activity Evaluation of Selected Traditionally Used Medicinal Plants. Pharmaceuticals 2023; 16(1): 1–12.
14. Lawag IL, Nolden ES, Schaper AA, Lim LY and Locher C: A modified Folin–Ciocalteu assay for the determination of total phenolics content in honey. Appl Sci 2023; 13(4): 2135. doi:10.3390/app13042135
15. Phytochemical and Biological Screening of *Tectona grandis* Leaves. International Journal of Pharmaceutical Sciences and Research 2023; 14(6): 240–245.
16. Glycerol-based extracts of *Clitoria ternatea* (Butterfly Pea Flower) and their hepatoprotective activity against acetaminophen-induced liver damage. Antioxidants 2024; 13(10): 1235.
17. Microencapsulation of Polyphenols and Their Application in Dairy Products. Foods 2024; 13(3): 660.
18. Abualzulof GWA, Scandar S and Varfaj I: The effect of maturity stage on polyphenolic composition, antioxidant and anti-tyrosinase activities of *Ficus rubiginosa* Desf. ex Vent. extracts. Antioxidants 2024; 13(9): 1129.
19. Burgaz O, Yıldırım İ and Baycan A: Extraction of phenolic compounds and antioxidant activity analysis of *Ficus carica* L. seed oil using supercritical fluid technology. IJPBP 2024; 4(2): 125–130.
20. Jahan T, Shahreen S, Banik J, Islam F, Mamun AA, Das R and Rahmatullah M: Antinociceptive activity studies with methanol extracts of *Ficus hispida* Lf leaves and fruits in Swiss albino mice. Advances in Natural and Applied Sciences 2011; 5(2): 131–135.
21. Chandrasekaran M, Kim KD and Chun SC: Antibacterial activity of chitosan nanoparticles: A review. Processes 2020; 8(9): 1173.
22. Pavani AN, Sheela D, Ramesh D and Goli DS: Toxicity studies and phytochemical screening of *Ficus racemosa* and *Kalanchoe pinnata*. International Journal of Life Science & Pharma Research 2023; 13(4): 52–60
23. Kyomuhimbo HD: Applications and immobilization strategies of the copper-containing laccase enzyme: A review. Microorganisms 2023; 11(3): 689. doi:10.3390/microorganisms11030689.
24. Rabizadeh F: Phytochemical Classification of Medicinal Plants Used in Traditional Medicine: An Overview. Pharmaceuticals 2022; 15(3): 305. doi:10.3390/ph15030305.
25. Le DD, Jang YS, Truong V, Yu S, Dinh T and Lee M: Bioactivities of quinic acids from *Vitex rotundifolia* obtained by supercritical fluid extraction. Antioxidants (Basel, Switzerland) 2024; 13(10): 1235.
26. El-Kased RF and El-Kersh DM: GC–MS profiling of naturally extracted essential oils: Antimicrobial and beverage preservative actions. Life 2022; 12(10): 1587.
27. Karakaya F, Şahin B, Bülbül AS, Ceylan Y, Kurt E and Tarakçı MF: Investigation of antimicrobial and antibiofilm effects of Ginkgo biloba L. Biyoloji Bilimleri Araştırma Dergisi 2020; 13(2): 28–36.
28. Al-Khayri JM: Essential oil from *Coriandrum sativum*: A review on its chemical composition and biological activities. Antioxidants 2023; 12(3): 741. doi:10.3390/antiox12030741.
29. Nouioura G: *Coriandrum sativum* L. essential oil as a promising source of bioactive compounds: Chemical composition and biological activities. Antioxidants 2024; 13(1): 1. doi:10.3390/antiox13010001.
30. Roy S and Rhim JW: Carboxymethyl cellulose-based antioxidant and antimicrobial active packaging film incorporated with curcumin and zinc oxide. International Journal of Biological Macromolecules 2020; 148: 666–676.
31. Edmond VD: Sugar alcohols in plants: implications for enhancing tree productivity and stress tolerance. Frontiers in Plant Science 2025; 14: 122. https://doi.org/10.3389/fpls.2025.12239448
32. Jesus M, Martins AP, Gallardo E and Silvestre S: Diosgenin: Recent highlights on pharmacology and analytical methodology. Journal of Analytical Methods in Chemistry 2016; 2016(1): 4156293.

How to cite this article:
Hota SS and Naik PK: Phytochemical profiling and antioxidant activity of fruit, leaf, and bark extracts from underutilized *Ficus species* (*viz. F. hispida, F. semicordata*, and *F. racemosa*). Int J Pharm Sci & Res 2026; 17(2): 668-87. doi: 10.13040/IJPSR.0975-8232.17(2).668-87.