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COMPARATIVE ANTIOXIDANT AND ANTIMICROBIAL ACTIVITIES OF PEEL AND PULP OF FRUITS OF *FICUS CARICA* L.

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ABSTRACT

The beneficial medicinal effects of naturally available products originally results from the combination of secondary metabolites present in the plant including parts such as leaves, root, tubers, peel, etc. The aim of the present study was to evaluate the antioxidant, antimicrobial and antiproliferative activities of peel and pulp of fruits of *Ficus carica* (Family: Moraceae). The IC_{50} of $DPPH^{\cdot}$ radical and $ABTS^{\bullet+}$ radical cation scavenging assays were 63.89 and 19.51µg/mL concentration respectively. Also, the RC_{50} of phosphomolybdenum reduction and ferric reducing power assay were 13.51 and 18.11µg/mL concentration respectively. Also, total phenolic and flavonoid content were determined, in which phenols were found to be predominantly higher. Peel extract of *Ficus carica* exhibited potent antioxidant activity when compared to pulp extract. The antibacterial activity was effective for peel extract by agar well diffusion method. The active compounds were identified by GC-MS analysis which revealed the presence of Thionodecalactone, Pentadecanoic acid, 4H-Pyran-4-one. The cytotoxic effect for the peel extract against colon cancer cells exhibited 79.96% at 100µg/mL concentration.

KEYWORDS: Free radicals, *Ficus carica* , Antioxidant, $DPPH^{\cdot}$ radical, $ABTS^{\bullet+}$ radical cation, RC_{50}, colon cancer.

INTRODUCTION

F. carica L. is an important member of the genus Ficus. It is ordinarily deciduous and commonly referred to as “fig”. The common fig is a tree native to southwest Asia and the

eastern Mediterranean, and it is one of the first plants that were cultivated by humans. The fig is an important harvest worldwide for its dry and fresh consumption. Its common edible part is the fruit which is fleshy, hollow and receptacle.[1,2]

The fresh and dried figs also contain high amounts of fiber and polyphenols. Its fruit, root, and leaves are used in traditional medicine to treat various ailments such as gastrointestinal (colic, indigestion, loss of appetite and diarrhea), respiratory (sorethroats, coughs and bronchial problems), and cardiovascular disorders and as anti-inflammatory and antispasmodic remedy.[2-3] *F. carica* L. belongs to the order of Urticales and family of Moraceae with over 1400 species classified into about 40 genera. A number of them are functionally female and produce only a seed-bearing fruit, whereas others are functionally male and produce only pollen and pollen-carrying wasp progeny.[4-7] The species of *F. carica* are shrubs or small trees and deciduous. Its roots are not adventitious, and the barks are grayish and slightly roughened. The leaves are stipulated and petiolated with obovate, nearly orbiculate or ovate leaf blade, palmately lobed, cordate base, undulate or irregularly dentate margin, acute to obtuse apex, and scabrous-pubescent surfaces.[8-11] Other pharmacological activities include antioxidant, anticancer, hepato-protective. antipyretic, hypoglycamic, etc.[12]

Figs have been traditionally used for its medicinal benefits as laxative, cardiovascular, respiratory, antispasmodic and anti-inflammatory remedies.[13-14] Its fruit is generally referred as figs which have been used as food and medicine for several centuries.[14-15] Its fruit, root and leaves are used in the native system of medicine in different disorders, such as colic, indigestion, diarrhea, sore throats, coughs, bronchial problems, inflammatory, cardiovascular disorders, ulcerative diseases, and cancers.[16-19]

Free radicals are considered to be involved in the multistage carcinogenic process. Antioxidant phytomolecules modulates the initiation of carcinogenesis process by protecting against DNA damage. Consumption of fruits, pulses and vegetables was shown to be inversely related to several types of cancers.[20-23] Polyphenols play an important role in anti-proliferative activity of phytochemicals. For instance, polyphenols ellagitannins and epicatechin gallate possess anti-carcinogenic properties. Significantly, antioxidant phytoconstituents may downregulate the expression of cancer-related genes to exert anticancer activity, such as cyanidin, keampferol and genistein.[24-26]

Taxonomic classification

Kingdom: Plantae

Subkingdom: Viridiplantae

Infrakingdom: Streptophyta

Superdivision: Embryophyta

Division: Tracheophyta

Subdivision: Spermatophytina

Class: Magnoliopsida

Superorder: Rosanae

Order: Rosales

Family: Moraceae

Genus: Ficus

Species: *Ficus carica*

Fig. 1: Fruits of *Ficus carica* .

MATERIALS AND METHODS

Collection of plant material and preparation of extracts

The fruits of *Ficus carica* were purchased from fruit market, Guindy. The collected fruits were carefully washed with tap water followed by rinsing in distilled water and air-dried at room temperature for few hours. The peel and the pulp part were separated and were subjected to extraction process for 72 hours using Methanol (high polar solvent) by direct method.[27]

Invitro Antioxidant activities of *Ficus carica*

(a) Free radical Scavenging Activity

The antioxidant activity was determined by DPPH scavenging assay in which various concentrations of peel and pulp extract was been pipetted out in clean test tubes.[28] Freshly prepared DPPH (1, 1-Diphenyl-2-picryl hydrazyl) solution (1mL) was added to each tube and the samples were incubated in dark at 37°C for 20 mins and read at 517 nm. The data were expressed as the percent decrease in the absorbance compared to the control. Ascorbic acid was used as reference compound. The percentage inhibition of radical scavenging activity was calculated.

% of Radical Scavenging Activity = [(Control OD-Sample OD)/Control OD] X100.

(b) Phosphomolybdenum reduction assay

Total antioxidant capacity can be calculated in which various concentrations of peel and pulp extracts from the prepared sample (1mg/mL) was been pipetted out and 1mL of the reagent solution was added, followed by incubation in boiling water bath at 95°C for 90mins.[29] After cooling the sample to room temperature, the absorbance of the solution was measured at 695 nm in UV spectrophotometer. A typical blank solution contained 1 mL of reagent solution and the appropriate volume of the same solvent used for the sample and it was incubated under same conditions. Ascorbic acid served as standard.

% of Phosphomolybdenum Reduction = [(Sample OD-Control OD)/Sample OD] X100.

(c) Ferric (Fe^{3+}) reducing power assay

The peel and pulp extracts was taken in various concentrations and was mixed with 1mL of phosphate buffer (0.2M, pH-6.6) and 1mL of potassium ferricyanide (1% w/v), and incubated in water bath at 50°C for 30 mins. Then, 0.5mL of trichloroacetic acid (10% w/v), 0.5mL $FeCl_3$ (0.01% w/v) was added to the mixture and then centrifuged at 3000 rpm for 10 mins and the absorbance was measured at 700 nm.[30-31] Ascorbic acid served as standard.

% of Ferric Reducing Potential= [(Sample OD-Control OD)/Sample OD] X100.

(d) $ABTS^{\bullet+}$ (2, 2-azinobis (3-ethylbenzo thiazoline-6-sulfonic acid) radical cation scavenging assay

The peel and pulp extracts from the stock solution was taken in various concentrations and this assay was performed according to the method of[32] The stock solutions included 7.4 mM ABTS solution and 2.6 mM potassium persulfate solution. The working solution was then

prepared by mixing the two stock solutions in equal quantities and allowing them to react for 12 hours at room temperature in the dark. Fresh ABTS solution was prepared for each assay. Plant extract of varying concentration were allowed to react with 500µL of the ABTS solution for 15 minutes in dark condition. Then the absorbance was taken at 734 nm using the spectrophotometer. The $ABTS^{\bullet+}$ radical cation scavenging activity was calculated as:

% of $ABTS^{\bullet+}$ radical cation inhibition = [(Control OD-Sample OD)/Control OD] X100.

Qualitative phytochemical analysis of *Ficus carica*

Screening of phytochemicals for *Ficus carica* (peel and pulp extract) was carried out comparatively using standardized methods.[27]

Quantitative estimations of total phenols and flavonoids

Determination of total Phenols

Folin-Ciocalteau reagent method was used to determine the total phenolic compounds with slight modifications.[33] One hundred µL of peel and pulp extract of *Ficus carica* (1mg/mL) was mixed with 900 µL of distilled water and 1 mL of Folin-Ciocalteau reagent (1:10 diluted with distilled water). After 5 mins, 1 mL of Na_2CO_3 (20% w/v) solution was added. The mixture was then allowed to stand for 30 mins incubation in dark at room temperature. The absorbance was measured by UV-vis spectrophotometer at 765 nm. The total phenolic content was expressed in terms of gallic acid equivalent (µg/mg of extract), which is a common reference compound.

Determination of total flavonoids

The total flavonoid content of peel and pulp extract of *Ficus carica* was determined using aluminium chloride reagent method with slight modification.[34] Five hundred µL of extract (1mg/mL) was mixed with 0.5 mL of methanol and 0.5 mL of (5% w/v) sodium nitrite solution. Then, 0.5 mL (10% w/v) aluminium chloride solution was added followed by 1 mL of 1M NaOH. The mixture was incubated for 30 minutes at room temperature and the absorbance was measured at 510 nm. The result was expressed as (µg/mg of extract) quercetin equivalent.

Thin layer chromatography analysis

Thin layer chromatography (TLC) analysis was carried out for peel and pulp extract of *Ficus carica* on silica gel aluminium sheet (Merck Silica gel 60 F254).[35] Each extract was spotted at 0.5 mm above from the bottom of the TLC plate. The spotted TLC plate was

placed in a 100mL beaker containing solvent mixture. The chromatogram was developed and the spots were visualized under UV light at 254 nm as well as in iodine vapour. The ratio in which distinct coloured bands appeared was optimized and R_f values were calculated.

$$R_f = \frac{\text{Distance travelled by the solute}}{\text{Distance travelled by the solvent}}$$

Screening of crude extract for antibacterial activity

Agar Well diffusion assay

Nutrient agar was prepared and poured in the sterile petri dishes and allowed to solidify. 24 hours grown bacterial pathogens were swabbed on nutrient agar plates. [36] Then, the stock crude of peel and pulp extract of *Ficus carica* individually (10mg/mL) was prepared in sterile test tubes. Varying concentration (250µg, 500µg, 750µg and 1000µg) of plant extracts was loaded in the wells made using cork borer. Tetracycline was used as standard. The plates were then incubated at 37ºC for 24hours. After incubation the inhibition diameter was measured using zone scale.

Identification of bioactive compounds by Gas chromatography-Mass spectrometry analysis

The presence of active compounds were been confirmed by thin layer chromatography and the compounds were identified using gas chromatography and mass spectrometry (GC-MS) method, (TSQ QUANTUM XLS). The name of the instrument is Gas Chromatography-Mass Spectrometry and the instrument made is of Thermo scientific. The software required for analytical studies is XCALIBUR (ver-2.2). The column size is of TG-5MS (30mX0.25mmX0.25um). The injector temperature and interface temperature (°C) was at 280°C.

Cytotoxic activity of selected extract on colon cancer (HT 29) cell lines

Cell culture

HT 29 cells obtained from NCCS (National Centre For Cell Science, Pune) were cultured in Rose well Park Memorial Institute medium (RPMI), supplemented with 10% fetal bovine serum, penicillin/streptomycin (250U/mL), gentamycin (100µg/mL) Andamphotericin B (1mg/mL) were obtained from Sigma Chemicals, MO, USA. All cell cultures were maintained at 37^0C in a humidified atmosphere of 5% CO_2. Cells were allowed to grow to confluence over 24 hours before use.

Cell growth inhibition studies by MTT assay

Cell viability was measured with the conventional MTT reduction assay, as described previously with slight modification. Briefly, HT 29 cells were seeded at a density of 5×10^3 cells/well in 96-well plates for 24 hours, in 200µL of RPMI with 10% FBS (v/v). Then culture supernatant was removed and RPMI containing various concentrations of plant extract was added and incubated for 48 hours. After treatment cells were incubated with MTT (10µL, 5mg/mL) at 37^0C for 4 hours and then with Dimethyl sulphoxide at room temperature for 1 hour. The plates were read at 595 nm on a scanning multi-well spectrophotometer.[37]

Cell cytotoxicity (%) = (100 – cell viability).

Statistical analysis

The experiments were conducted in duplicates and the data entered in tables were average of two replicates. The data mentioned were reported as the mean ± standard deviation of two replicates.

RESULTS AND DISCUSSION

Invitro Antioxidant activities of *Ficus carica*

The extraction process after 72 hours was subjected to filtration using clean filter paper. The filtrate of peel and pulp extract was subjected to condensation process separately in a rotary evaporator at 50°C, which yields gummy extract. The extracted residues were weighed and re-dissolved in respective solvent to yield 1mg/mL as final volume for further analysis.

(a) Free radical Scavenging Activity

The antioxidant activity was carried out by DPPH assay according to the method of (Khalaf, 2008). Antioxidant molecules can quench DPPH free radicals (i.e by providing hydrogen atoms or by electron donation, via a free radical attack on the DPPH molecule) and convert them to colorless. The percentage of DPPH scavenging activity was found to be higher as 72.84% at 120µg/mL for methanol peel extract when compared to methanol pulp extract as 38.51% (Table 1). The IC_{50} value was found to be 63.89µg/mL concentration for peel extract of *Ficus carica* (Figure 2) and was compared with standard (Ascorbic acid, IC_{50} value as 10.74µg/mL concentration).

Table 1: Radical scavenging activity by DPPH assay for peel and pulp extract of *Ficus carica* .

S.No	Concentration (µg/mL)	% of inhibition	
		Peel extract	Pulp extract
1	20	28.17±0.34	15.48±0.13
2	40	41.11±0.46	17.76±0.37
3	60	46.95±0.41	20.30±0.32
4	80	56.59±0.27	22.58±0.50
5	100	59.39±0.39	29.27±0.44
6	120	72.84±0.48	38.51±0.28

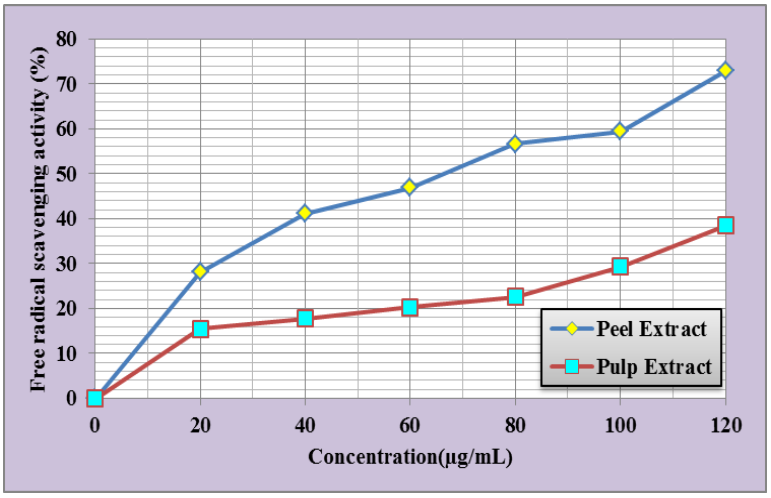


Fig. 2: Radical scavenging activity by DPPH assay for peel and pulp extract of *Ficus carica* .

(b) Phosphomolybdenum assay

The total antioxidant activity of peel and pulp extract of *Ficus carica* was measured spectrophotometrically by phosphomolybdenum reduction method which is based on the reduction of Mo (VI) to Mo (V) by the formation of green phosphate/Mo (V) complex at acidic pH, with a maximum absorption at 695 nm. The maximum reducing ability for peel extract of *Ficus carica* was 84.18% at 120µg/mL concentration and for pulp extract of *Ficus carica* was 83.22% at 120µg/mL concentration (Figure 3). The experiment demonstrated higher antioxidant activity the RC_{50} of 13.51µg/mL concentration for peel extract of *Ficus carica* (Table 2) and was compared with standard Ascorbic acid (IC_{50} value as 13.28µg/mL concentration).

Table 2: Phosphomolybdenum Reducing Potential of methanol extract of *Ficus carica* .

S.No	Concentration (µg/mL)	% of Phosphomolybdenum reduction	
		Peel extract	Pulp extract
1	20	73.97±0.31	74.47±0.32
2	40	75.82±0.45	77.45±0.37
3	60	78.23±0.46	77.93±0.40
4	80	79.17±0.49	78.80±0.44
5	100	81.43±0.33	81.96±0.38
6	120	84.18±0.28	83.22±0.14

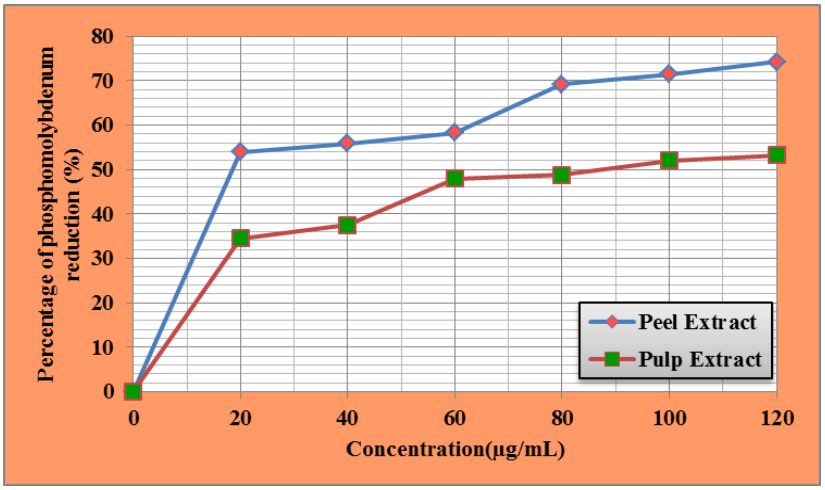


Fig. 3: Evaluation of Total antioxidant activity of methanol extract of *Ficus carica* .

(c)Ferric (Fe^{3+}) reducing power assay

The antioxidant activity of *Ficus carica* extract was calculated according to the Makari *et al*., 2008, Hennebelle *et al*., 2008. The inhibition in reducing power assay denotes the yellow color of the test solution changes to various shades of green and blue depends upon reducing power of each compound. The maximum reducing ability for methanol peel extract of *Ficus carica* was 86.13% at 120µg/mL concentration and for pulp extract of *Ficus carica* was 70.14% at 120µg/mL concentration (Figure 4). The RC_{50} value for methanol peel extract of *Ficus carica* was found to be 18.11µg/mL concentration (Table 3) and was compared with the standard (29.36µg/mL concentration) Ascorbic acid.

Table 3: Fe^{3+} Reducing Power (FRAP) of methanol extract of *Ficus carica* .

S.No	Concentration (µg/mL)	% of Fe^{3+} reduction	
		Peel extract	Pulp extract
1	20	55.21±0.43	42.06±0.36
2	40	56.93±0.50	50.17±0.11
3	60	68.60±0.45	55.48±0.46
4	80	78.46±0.27	61.17±0.25
5	100	85.60±0.38	67.55±0.30
6	120	86.13±0.19	70.14±0.41

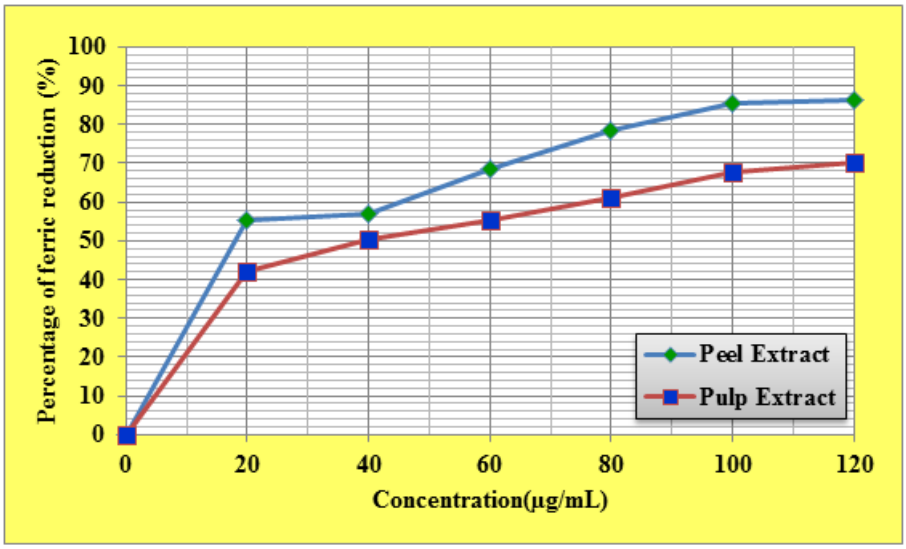


Fig. 4: Fe^{3+} Reducing Power (FRAP) of methanol extract of *Ficus carica* .

(d) $ABTS^{\bullet+}$ (2,2-azinobis (3-ethylbenzo thiazoline-6-sulfonic acid) assay

$ABTS^{\bullet+}$ (2,2 – azinobis (3-ethylbenzo thiazoline-6-sulfonic acid) assay measures the relative ability of antioxidant to scavenge the ABTS generated in aqueous phase (Table 4). ABTS is generated by reacting with a strong oxidizing agent (Potassium per sulfate) with ABTS salt. Reduction of blue green ABTS-radical coloured reaction by hydrogen-donating antioxidant is measured at 734 nm (Figure 5). The maximum $ABTS^{\bullet+}$ radical cation scavenging activity of methanol peel extract of *Ficus carica* was found to be 75.42% at 30µg/mL concentration and for pulp extract of *Ficus carica* was 53.31% at 30µg/mL concentration The IC_{50} value for methanol peel extract of *Ficus carica* was found to be 19.51µg/mL concentration and was compared with standard Ascorbic acid (IC_{50} value as 5.32µg/mL concentration).

Table 4: $ABTS^{\bullet+}$ assay of methanol extract of *Ficus carica* .

S.No	Concentration (µg/mL)	% of $ABTS^{\bullet+}$ radical cation scavenging activity	
		Peel extract	Pulp extract
1	5	17.38±0.21	19.26±0.48
2	10	25.56±0.39	23.17±0.41
3	15	33.98±0.26	29.22±0.46
4	20	51.24±0.40	40.35±0.37
5	25	68.03±0.33	48.64±0.19
6	30	75.42±0.29	53.31±0.23

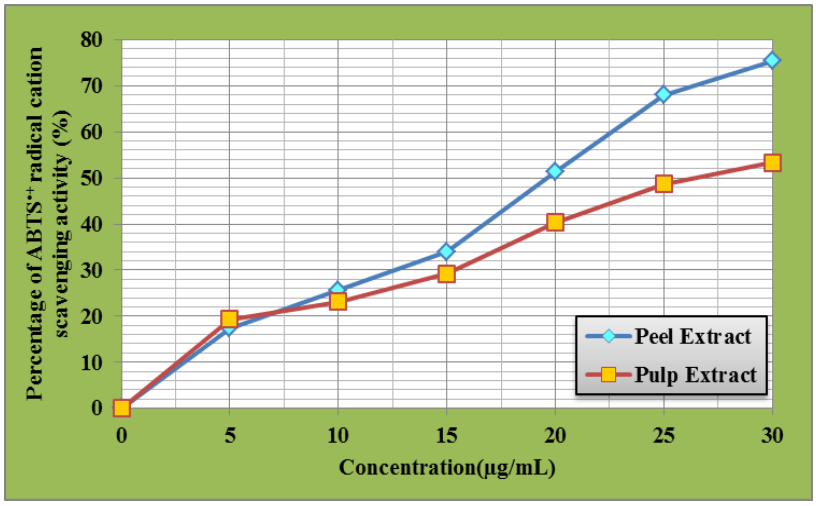


Fig. 5: ABTS$^{\bullet+}$ assay of methanol extract of *Ficus carica* .

The ABTS$^{\bullet+}$ radical is stable and solubility of ABTS$^{\bullet+}$ is with organic solvents and water, which determines the antioxidant capability of hydrophilic and lipophilic compounds.

Qualitative phytochemical analysis of *Ficus carica*

The results of phytochemical analysis for methanol extract of *Ficus carica* showed the presence of phenols, terpenoids, tannins, steroids and was quantified for pulp and peel extract comparitively.

Table 5: Qualitative analysis of methanol extract of *Ficus carica* .

S.No	Phytochemicals	Tests	Peel extract Results	Pulp extract Results
1	Alkaloids	Mayer's test	-	-
		(b) Hager's test	-	-
2	Phenols	Ferric chloride (5%) test	+	+
3	Tannins	Ferric chloride (0.1%) test	+	+
4	Flavonoids	Sodium hydroxide test	+	+
5	Glycosides	Legal's test	-	-
6	Steroids	Libermann-Burchard test	+	-
7	Terpenoids	Salkowski test	+	+
8	Saponins	Foam test	+	+

Quantitative estimations of total phenols and flavonoids

Total phenolic content was found to be 89.37±0.32 µg/mg of GAE for peel extract and 33.16±0.21 µg/mg for pulp extract comparatively. Total flavonoid content was 27.85±0.28 µg/mg for peel extract of QE and 19.02±0.40 µg/mg for pulp extract comparatively.

Table 6: Quantitative estimation of methanol extract of *Ficus carica* .

S.No	Phytochemical	Value (µg/mg)	
		Peel extract	Pulp extract
1	Phenols	89.37±0.32	33.16±0.21
2	Flavonoids	27.85±0.28	19.02±0.40

From the results, it is significant that due to presence of higher phenolic content and moderate flavonoid content, antioxidant and anti-proliferative activities were found to be higher for methanol peel extract of *Ficus carica* .

Thin Layer Chromatography analysis

Thin layer chromatography analysis was carried out in the solvent system of Methanol (0.8mL): Ethyl acetate (1mL): Distilled water (0.2mL). The separated active compounds were visualized in UV light and iodine balls. The R_f values of the separated compounds were measured and tabulated (Table 7).

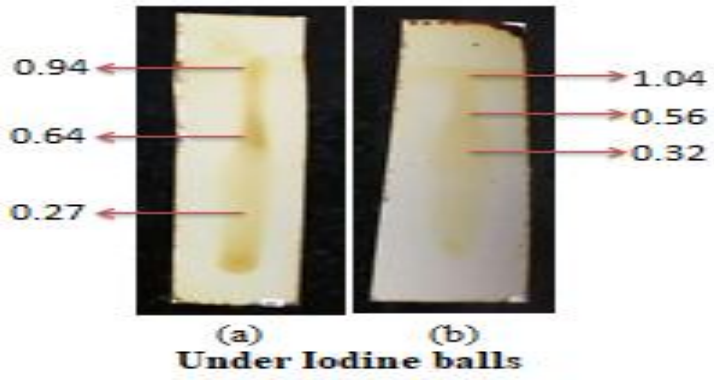


Fig. 6: Compounds separation separated by Thin Layer Chromatography (a) Peel extract of *Ficus carica* (b) Pulp extract of *Ficus carica* .

Table 7: R_f values of active compounds separated by Thin Layer Chromatography from peel and pulp extract of *Ficus carica* .

R_f values (Under Iodine balls)	
Peel extract	Pulp extract
0.94	1.04
0.64	0.56
0.27	0.32

Screening of crude extract for antibacterial activity

Agar Well diffusion assay

After incubation, the inhibition diameter was measured using zone scale. The maximum inhibition for methanol extract of *Ficus carica* was against *Micrococcus luteus* (21mm) for peel extract, (Table 8) when compared to pulp extract as 13mm inhibition, *Proteus vulgaris* (18mm) for peel extract and the antibacterial activity was not observed for pulp extract.

Table 8: Antibacterial activity of methanol extract of *Ficus carica* .

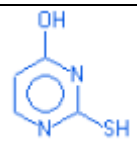
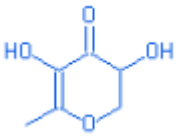
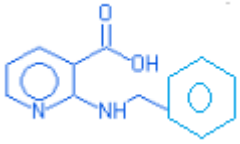
Test organisms	Zone of inhibition (mm)									
	Standard		250µg/mL		500µg/mL		750µg/mL		1000µg/mL	
	Peel	Pulp	Peel	Pulp	Peel	Pulp	Peel	Pulp	Peel	Pulp
S.aureus	32	28	12	12	15	12	16	13	17	16
M.luteus	19	13	12	10	14	11	17	12	21	13
B.subtilis	27	20	11	-	12	-	13	-	14	-
P.vulgaris	29	21	14	-	15	-	16	-	18	-
E.coli	10	28	11	10	12	11	12	12	14	13

Identification of bioactive compounds by Gas chromatography-Mass spectrometry analysis

The GCMS analysis for methanol peel extract of *Ficus carica* revealed the presence of phyto-active compounds (Table 9) such as 2-Heptene, 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, C-Thionodecalactone, Oleic acid exhibiting biological activities.

Table 9: GCMS analysis of peel extract of *Ficus carica* .

S.No	Compound name	RT	Compound Structure	Molecular Weight	Molecular Formula (g/mol)
1	Pentadecanoic acid,3-oxo-, methyl ester	17.05		270.40	$C_{16}H_{30}O_3$
2	1-Ethylcyclopropanol	3.27		86.13	$C_5H_{10}O$
3	2-Heptene	4.02		98.18	C_7H_{14}
4	Bicyclo[5.2.1]decan-10-one	5.07		152.23	$C_{10}H_{16}O$

5	Uracil,2-thio-	7.53		128.15	$C_4H_4N_2OS$
6	4H-Pyran-4-one,2,3-dihydro-3,5-dihydroxy-6-methyl	8.68		144.12	$C_6H_8O_4$
7	4-Mercaptophenol	10.45		126.17	C_6H_6OS
8	C-Thionodecalactone	14.17		186.31	$C_{10}H_{18}OS$
9	Nicotinic acid,2-(benzylamino)-	15.82		228.24	$C_{13}H_{12}N_2O_2$
10	n-Hexadecanoic acid	17.75		256.42	$C_{16}H_{32}O_2$
11	Hexadecenoic acid,Z-11-	18.85		254.40	$C_{16}H_{30}O_2$
12	Oleic acid	19.47		282.46	$C_{18}H_{34}O_2$

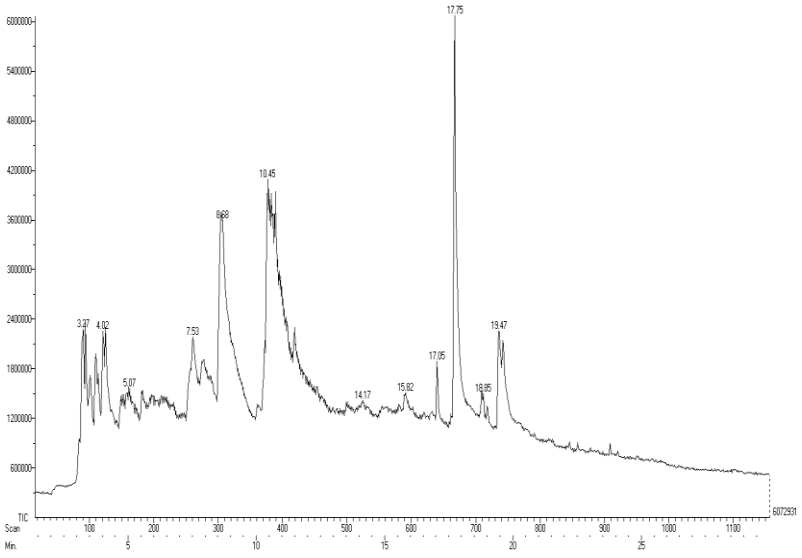


Fig. 7: GCMS Chromatogram of peel extract of *Ficus carica* .

Specifically, isolated fraction of 4H-pyranone, 2,3-dihydro-3,5-dihydroxy-6-methyl from methanolic leaf extract of *Dolichandrone atrovirens* possessed anti-inflammatory and antimicrobial activities.[38-39] From the present study, the peel extract revealed the presence of 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, possessing effective antibacterial activity against *Micrococcus luteus, Proteus vulgaris*.

Research study carried out according to[40] reported that hexadecanoic acid, methyl ester possessed hypocholesterolemic and anti-coronary activities. Similarly, the present findings revealed the presence of hexadecanoic acid, methyl ester, in higher amount for the peel extract of *Ficus carica* .

Cytotoxic activity of peel extract of *Ficus carica* on colon cancer (HT 29) cell lines

Globally cancer is a severe disease which affects the human population. New therapies have found to be proven in clinical trials and there is a constant demand for therapeutic uses to treat and prevent from several diseases.[41-43] Control survival and cancer cell death are important criteria in managing and treating cancer therapeutically.[44-45] Effective anticancer drugs should have the ability to kill the cancer cells with minimum side effects. In recent years, a number of natural products isolated from medicinal plants have been found to inhibit proliferation, induce apoptosis, suppress angiogenesis, inhibit invesiveness, retard metastasis and enhance chemotherapy.[46-48]

Table 10: Cytotoxic activity of peel extract of *Ficus carica* .

S.No	Concentration	Percentage of cytotoxicity (%)
1	Control	8.34±0.28
2	10ng	28.24±0.16
3	100ng	33.79±0.35
4	1µg	46.83±0.29
5	10µg	58.71±0.13
6	100µg	79.96±0.14

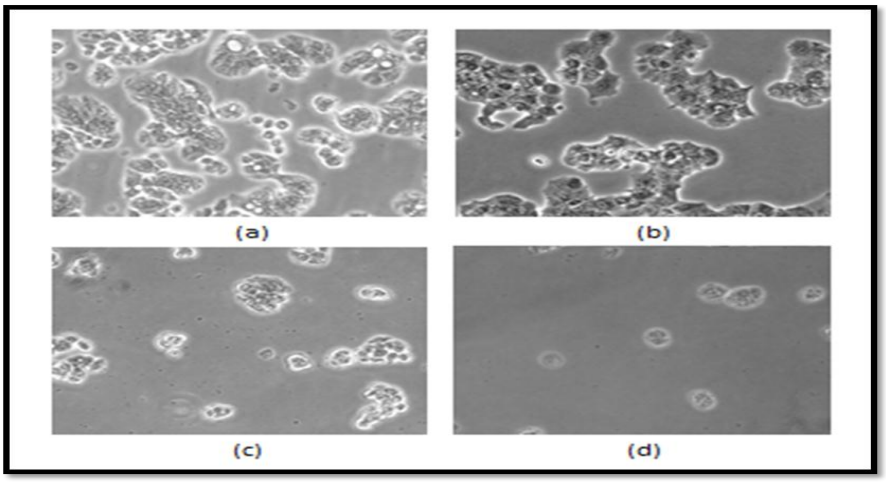


Fig. 8: Cytotoxic activity of peel extract of *Ficus carica* on HT 29 cells (colon cancer).

- Control – HT 29 cells only
- HT 29 cells treated with *Ficus carica* extract at 10ng concentration
- HT 29 cells treated with *Ficus carica* extract at 1µg concentration
- HT 29 cells treated with *Ficus carica* extract at 100µg concentration

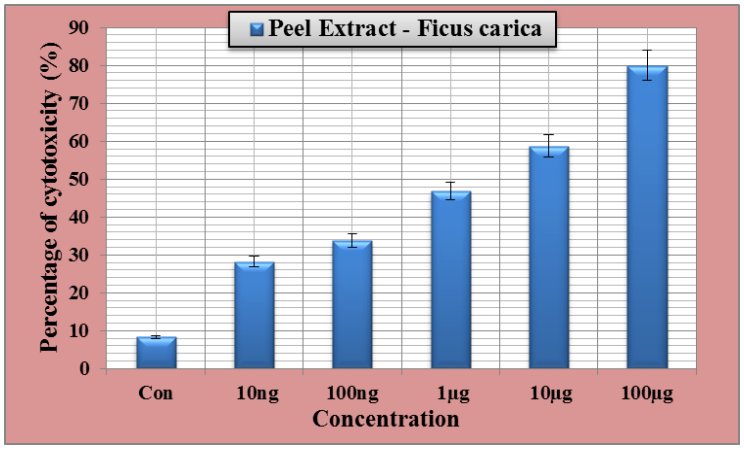


Fig. 9: Cytotoxic activity of peel extract of *Ficus carica* by MTT assay.

The ethanolic extract of *Ficus carica* showed strong anti-cancer activities against breast cancer cell lines (MCF-7). At a concentration of 1000µg/mL, 85.5% and 89% inhibition were recorded after 24 and 48 hours.[49] Similarly, the methanol peel extract of *Ficus carica* exhibited anti-proliferative activity (Table 10) against colon cancer cell lines (HT-29). The cytotoxic effect was recorded as 79.96% inhibition after 24 hours.

CONCLUSION

The present research investigation revealed that peel extract of *Ficus carica* composed of secondary metabolites along with therapeutic activity. Naturally available phytomolecules

have been widely used both invitro and invivo purpose. Usage of natural phytoconstituents for cancer therapy and treatment has been a promising and curable approach. In future, the pharmacokinetic and pharmacodynamic interactions, metabolic activity, toxicity response, clinical trials could be performed for the pure compound from fraction isolated from column chromatography with validated structure of the active drug.

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