

# PRELIMINARY PHYTOCHEMICAL ANALYSIS AND ANTIMICROBIAL PROPERTIES OF CARICA PAPAYA AND ZINGIBER OFFICINALE

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**ABSTRACT:-** The current work was undertaken in order to study the presence of bioactive compounds in two important medicinal plants, *Zingiber officinale* (Ginger) and *Carica papaya* (Papaya). Methanol and chloroform was used as organic solvents. Qualitative and quantitative analysis by FTIR and GC-MS revealed the presence of phytoconstituents like alkaloids, phenols, tannins and terpenoids. Well diffusion method was used to analyse the antimicrobial activity against bacteria, *E. coli* and *Staphylococcus aureus*, fungi species; *Aspergillus niger* and *Aspergillus flavus*. Papaya methanolic extract showed greater antimicrobial activity against all the test organism. Methanolic extracts of both ginger and papaya showed highest percentage of DPPH scavenging activity in the range of 45 to 50% for 1ml of sample.

## INTRODUCTION

In today's world the foundation or base to modern medicines could be termed as the phytoconstituents from plant sources which exhibit high potential nature to be utilized as drugs to cure diseases. Even though we have learned a lot about medicinal plants it demands at most care and management. It changes with different medicinal species as they need different growth conditions and habitats. The *Zingiber officinale* (ginger) is a perennial flowering plant and also herbivorous mostly used for medicinal purposes and also as a good spice in food items. In Chinese and Indian medicines raw ginger as well as fresh ginger eliminates stomach upsets vomiting and intake of fresh ginger increases our immune system. Rather than this ginger also provide good memory digestion and liver health. The *Carica papaya* formed in the tropics of America. Papaya fit to the family *caricaceae*. The papaya skin parts, leaves and seed constitutes carotenoids and polyphenols. The papaya leaves are used for curing malaria and young leaves and ripen papaya is used for many culinary matters like salad preparations. Rather than this the papaya leaves show antibacterial natures by blocking the growth of disease causing or pathogenic bacteria which are hazardous to humans.

## MATERIALS AND METHODS

Source of plant material: the plant sample of ginger and papaya was collected from Calicut, Kerala and authenticated by BSI, Coimbatore.

Sample preparation: the collected sample was extracted using methanol and chloroform as solvent by rotary shaker method.

Preliminary screening: the primary screening for phytochemical was carried out and further advanced level of qualitative characterization was conducted by FTIR and GC-MS.

Antimicrobial activity: For the antibacterial activity nutrient agar (28gm in 1000ml of distilled water, Himedia, Mumbai, India) was prepared and sterilized by standard procedure in autoclave and swabbed the culture of *E. coli* and *S. aureus*, 60µl each in separate plate with cotton swab. After swabbing well were made with sterile cork borer and the sample was added, positive control (Antibiotic disc, Erythromycin- E15) was also placed and the plate was incubated at 37°C for 24hrs. zone of inhibition was noted after the incubation. For the antifungal activity PDA (39gm in 1000ml of distilled water, Himedia, Mumbai, India) plate was prepared by sterilization and swabbed 60 µl *A. niger* and *A. flavus*, followed by well were made and added the sample, the plate was incubated at 30°C for 3-5days and the zone if inhibition was noted in mm. (Kabesh et al., 2015).

Antioxidant Activity: Free radical scavenging activity was determined in the different concentration of the sample. 2, 2-diphenyl-1-picrylhydrazyl was dissolved in methanol in the concentration of 0.1M and mixed with 0.25ml, 0.5ml and 1ml of the sample solution. After adding sample was incubated for 2 minutes and added 50mM tris HCl and incubated in dark room temperature for 30minutes. The OD was measured under spectrophotometer in the nm of 517nm. (Monisha et al., 2018).

**RESULTS**

1. Phytochemical screening of Carica papaya and Zingiber officinale in methanol and chloroform extracts

The results of phytochemical screening of both papaya and ginger showed the presence of many phytochemicals like alkaloids, terpanoids, phenols, tannins etc.

Table: 1.0 Observation of Phytochemical Screening

	Ginger Methanol	Ginger Chloroform	Papaya Methanol	Papaya Chloroform
Alkaloids	+	+	-	+
Terpanoids	-	-	-	-
Phenols&Tannins	-	+	+	+
Reducing sugars	-	+	-	+
Saponins	-	+	-	-
Flavinoids	-	+	+	+
Quinines	-	+	-	+
Protein	+	+	-	+
Steroids	+	+	-	+

+ represents presence , - represents absence

Fig: 1.1 Phytochemical analysis of Ginger methanol



Fig: 1.2 Phytochemical analysis of Ginger in chloroform



Fig: 1.3 Phytochemical analysis of Papaya in Methanol

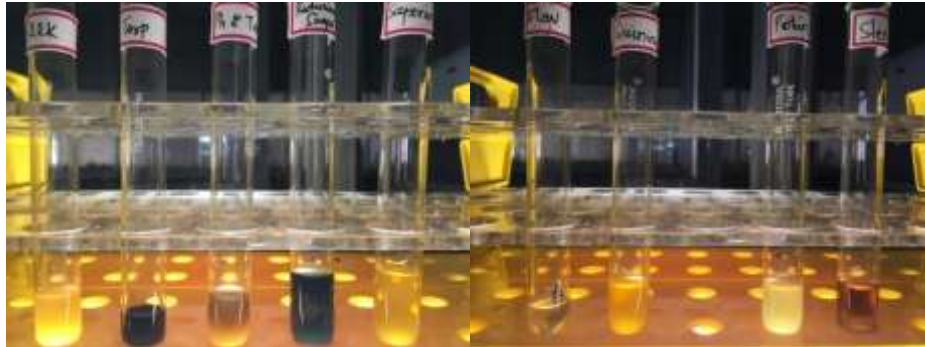
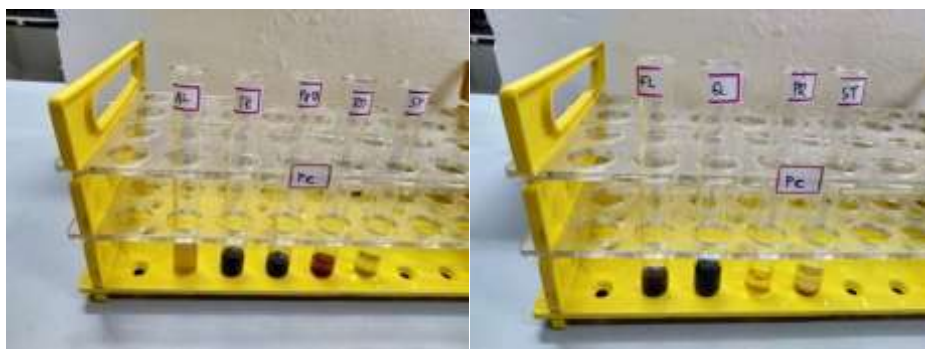


Fig: 1.4 Phytochemical analysis of Papaya in Chloroform



## 2. Fourier Transforms Infrared (FTIR) Spectroscopy

The powdered form of each plant samples were loaded in FTIR Spectroscope (Shimzadzu, IR Affinity 1, Japan) and the peak values are as tabulated below

Table: 2.0 Characteristic FTIR Absorptions- Ginger Methanol

Frequency $\text{cm}^{-1}$	Bond	Functional group
3360	N-H stretch	1 <sup>o</sup> 2 <sup>o</sup> amines, amides
2945.30	C=O stretch	unsaturated aldehydes, ketones
1703.14	C=O stretch	unsaturated aldehydes, ketones
1479.40	C-C stretch	C-C stretch (in-ring) aromatics
1244.09	C-N stretch	aliphatic amines
800.46	C-Cl stretch	alkyl halides
673.16	C-Br stretch	alkyl halides
532.35	C-Br stretch	alkyl halides

Table 2.1 Characteristic FTIR Absorptions- Ginger Chloroform

Frequency $\text{cm}^{-1}$	Bond	Functional group
3196.05	C-H: C-H stretch	alkynes (terminal)
3012.81	=C-H stretch	alkenes
2806.43	H-C=O: C-H stretch	aldehydes
1724.36	C=O stretch	aldehydes, saturated aliphatic
1155.36	C-H wag (-CH <sub>2</sub> X)	alkyl halides

Table 2.3 Characteristic FTIR Absorptions- Papaya Methanol

Frequency cm <sup>-1</sup>	Bond	Functional group
3085.07	=C-H stretch	alkenes
2943.37	C-H stretch	alkanes
2328.08	C=N	nitriles
1701.22	C=O stretch	Unsaturated aldehydes, ketones
1251.80	C-H wag (-CH <sub>2</sub> X)	alkyl halides
1047.35	C-N stretch	aliphatic amines
790.81	C-Cl stretch	alkyl halides
690.52	-C≡ C-H: C-H bend	alkynes

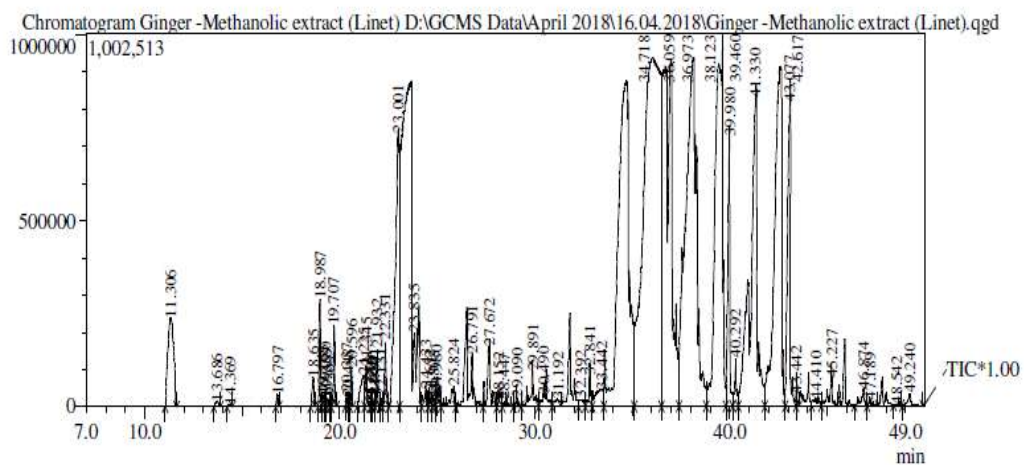
Table 2.4 Characteristic FTIR Absorptions- Papaya Chloroform

Frequency cm <sup>-1</sup>	Bond	Functional group
2949.16	C-H stretch	alkanes
1708.93	C=O stretch	-unsaturated aldehydes, ketones
1251.80	C-H wag (-CH <sub>2</sub> X)	alkyl halides
1049.28	C-N stretch	aliphatic amines
746.45	C-Cl stretch	alkyl halides

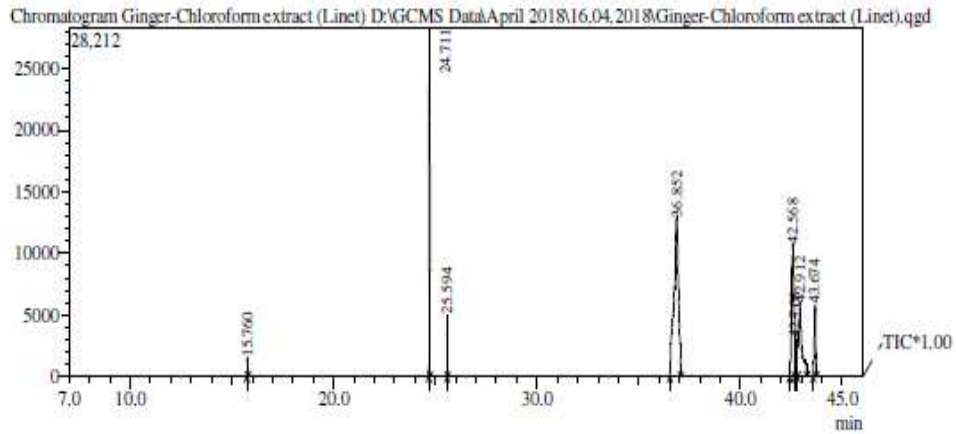
### 3. Gas Chromatography And Mass Spectroscopy Analysis Of Methanol And Chloroform Extract Of Zingiber officinale And Carica papaya

The methanol and chloroform extract plant sample was dissolved completely and analyzed by Gas Chromatography and Mass Spectroscopy in Shimadzu GC-MS-QP2010S, Column of Rxi-5Sil MS with 30 meter length, 0.25 mm ID and 0.25 μm thickness and the peaks are recorded by the software GC MS Solutions and compound identification was done by comparing with standard peaks of NIST 11 and WILEY 8 libraries. (Thakuria et al., 2017).

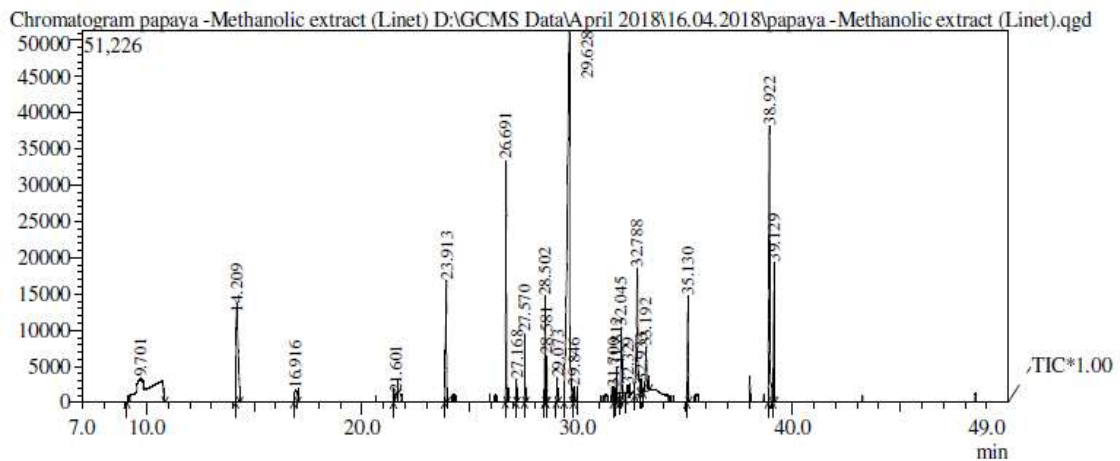
Graph: 3.0 GC-MS-Chromatogram Ginger Methanol



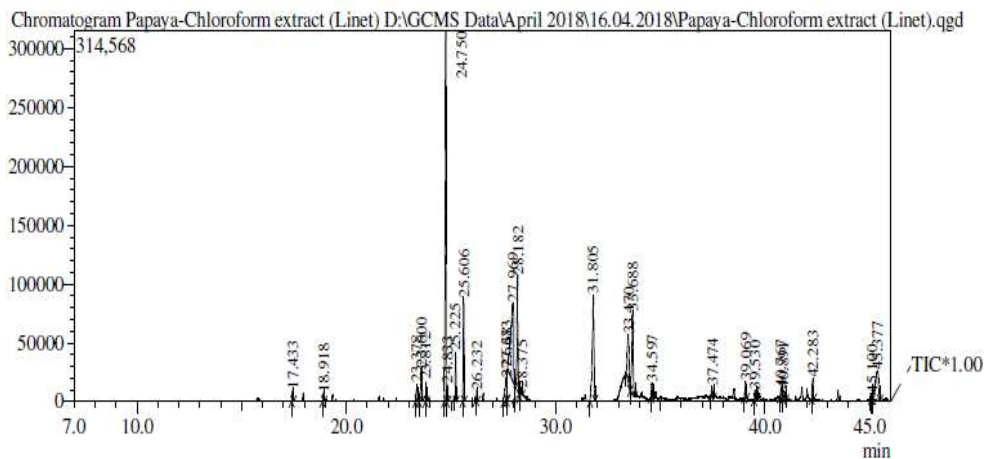
Graph: 3.1 GC-MS-Chromatogram Ginger Chloroform



Graph: 3.3 GC-MS-Chromatogram Papaya Methanol



Graph: 3.4 GC-MS-Chromatogram Papaya Chloroform





4. Antimicrobial Activity Using Well Diffusion Method

Table: 4.0 Zone of Inhibition against different microorganisms

Microorganisms used	Zone of inhibition in mm				
	GM	GC	PM	PC	Antibiotic
E.coli	2	3	7	3	4
S.aureus	3	1	8	Nil	5
A.niger	4	2	9	Nil	Nil
A.flavus	3	3	8	Nil	Nil

Fig: 4.1 Antimicrobial Plates With Microorganisms



a) Escherichia coli

b) Aspergillus flavus



c) Aspergillus niger



d) Staphylococcus aureus

### 5. Antioxidant Analysis

Graph: 5.1 DPPH-Antioxidant activity of Ginger and Papaya extracts

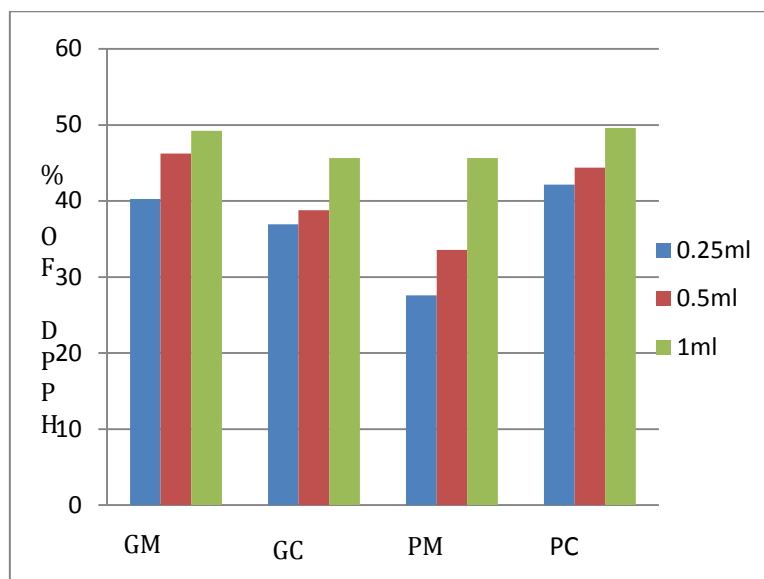


Table: 5.2. Percentage of DPPH Antioxidant Activity

Name of the sample	Ginger Methanol	Ginger Chloroform	Papaya Methanol	Papaya Chloroform
Concentration	Percentage DPPH activity (%)			
0.25 ml	40.25	36.94	27.61	42.16
0.5 ml	46.26	38.8	33.58	44.40
1.0 ml	49.25	45.65	47.76	49.62

### DISCUSSION

Phytochemical screening of the papaya and ginger in methanol and chloroform extract exhibited the presence of around eight phytoconstituents such as alkaloids, tannins, phenols, sterol, flavonoid, steroid and carbohydrates. Methanol and also chloroform organic solvents were taken because many previous studies reported better extraction of bioactive compounds using methanol and chloroform solvents. Otunola et al., (2010).The IR peaks of both papaya and ginger extract the test samples identified similar bands corresponding to the functional groups such as aliphatic amines, aromatics, nitro compound, aldehydes, alkanes and alcohol or phenol. It is assumed that the presence of these bioactive compounds enable them to be a active source of reducing or capping agent. (Zhou et al., 2011).The GC-MS analysis showed the presences of various bioactive compound with beneficial biological and pharmaceutical importance. The antimicrobial tests proved that Papaya methanolic extract showed greater antimicrobial activity by exhibiting larger zone of inhibition against all the test organism. Methanolic extracts of both ginger and papaya showed highest percentage of DPPH scavenging activity in the range of 45 to 50% for 1ml of sample compared to chloroform extracts.

### CONCLUSION

According to the findings of standardized graphs and charts of FTIR and GC-MS, the microbial and antioxidant characters of both Carica papaya and Zingiber officinale plant extracts were determined. Presence of many bioactive compounds in these plant extracts which results in the demonstration of therapeutic behaviours to these plant extracts.

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