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Phytochemical and antibacterial studies on the leaf extracts of female Carica papaya.linn

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Abstract: Leaves of *Female Carica papaya.L* were Shaded, powdered and were extracted using different solvents Ethanol, Methanol, Acetone, Chloroform, Petroleum ether, Hexane and Ethyl acetate. Preliminary phytochemical screening of the extracts revealed that the presence of simple phenols, proteins, amino acids, carbohydrates, glycosides, flavonoids, saponins, alkaloids, phytosterol and terpenoids. The presence of these bioactive constituents is associated with the antibacterial activity of the plant. The leaf extracts of *Female Carica papaya* solvented by ethanol, showed the spectrum of inhibition of *Klebsiella pneumonia*. Most of the bacterial pathogens like *Klebiella pneumonia, Salmollea paratyphi, Vibrio cholera, Streptococcus mutans* and *E.coli* were found to be susceptible in leaf extracts of the *Female carica papaya*. Ethanol leaf extracts of Female carica papaya showed good activity against *Klebsiella pneumonia.*
Key words: *Female Carica papaya*, phytochemical, antibacterial activity.

Introduction

The medicinal plants have been used for centuries for substances have recently become of great interest owing to their versatile applications. It has been estimated that 14-28% of higher plant species are used medicinally and that 74% of pharmacologically active plant derived components were discovered after following up on ethno medicinal use of the plants[1]. The earliest known write medical prescription is about four thousand years, where Sumerian clay tablets showed remedies for various illnesses[2]. Sumerian prescribed mandrake plant for pain relief, turmeric for blood clotting, endive plant roots for treatment of gall bladder disorders, and raw garlic for circulatory disorders. Despite the advent of modern medicine, the popularity of plant/natural products as treatment modalities for various ailments has increased worldwide due to their nontoxic or less toxic nature and the lesser known side effects than the modern generic drugs[3,4]. *Carica papaya(Caricaceae)* is believed to probably originate from Southern Mexico and Costa Rica and then plantation crop was started in almost in all regions of tropical and subtropical[5]. *Carica papaya* is widely grown now and used in different parts of the world not only for food but also for ornamental purpose[6]. It has also been utilized in traditional medicine for providing relief in various ailments[7]. The burden infectious diseases is a big challenge and nuisance to human health and responsible for almost 50,000 deaths on daily basis[8,9]. Plants have now scientifically proven as effective, cheaper alternative sources and have very least side effects than commercially available synthetic drugs[10,11]. Its fruits, leaves and flowers are edible. Its roots can be shed as medicine for renal urinary bladder problem, and its seeds have anhelmintic acticity[12]. Papaya leaf extracts have phenolic compounds, such as protocatechui acid, p-coumaric aned and caffeic acid[13].this research was done to observe the antibacterial activity of *Carica papaya* leaf extracts against pathogenic bacteria.

Experimental

Material and methods:

Female Carica papaya. L leaves were collected from village in the month of November. The plant material was identified and authenticated by The Rapinat Herbarium and Center for molecular systematics in St. Joseph College (Autonomous), Tiruchirapalli, Tamil Nadu, India. The plant leaves were shaded dried at ambient temperature 31^0C and the dried materials were crushed into fine powder using an electric blender. The powdered leaf stored in polythene bags before use.

Extraction of plant material:

Dried and powdered *carica* leaves were extracted with Ethanol, Methanol, Benzene, Hexane, Acetone, Petroleum ether, Dichloromethane, Chloroform, Ethyl acetate for about 48 hours at 31^0C until complete exhaustion of the material. At the end of 48 hrs, the extracts were distilled. The crude plant extract was extracted by Soxhlet apparatus and was concentrated to dryness in vacuum evaporator below 40^0C and stored until needed for the bioassays at -4^0C. The compound in the leaf extracts were separated using TLC technique[14]. Then the compounds were identified using UV spectroscopy.

Preliminary phytochemical investigations

The major secondary metabolites like alkaloids, flavonoids, saponins, phenols, terpenoids, anthraquinones, proteins and aminoacids, carbohydrates and glycosides were assesses according to the standard procedure described by Harborne[15].

Antibacterial screening test

Disc diffusion method

The plant extract were tested for anti-bacterial activity in the disc-diffusion method by using standard procedure[16]. Its essential feature is the placing of filter paper discs with the antibiotics on the surfaces of agar immediately after inoculation with the organism tested. Undiluted over night broth cultures should never be used as an inoculam. Routine direct application of discs to plates seeded with clinical material is not recommended because of problems with inoculam control and mixed cultures.

Results and Discussion

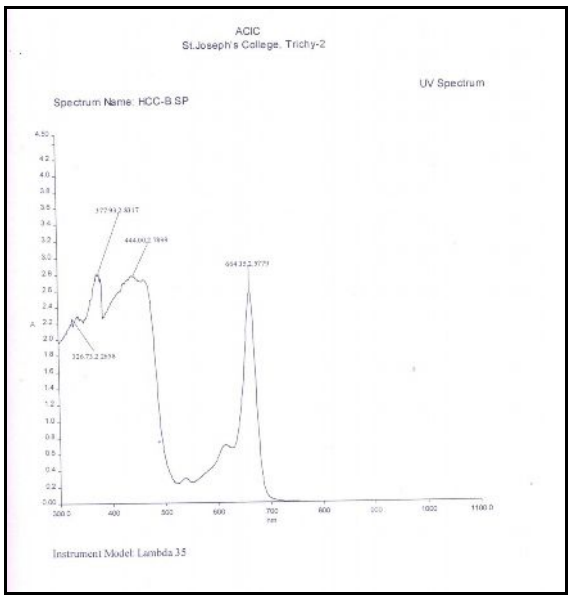
Preliminary phytochemical screening

The phytochemical screening of *Female Carica papaya.L* leaf extracts was done with, Ethanol, Methanol, Benzene, Hexane, Acetone, Ethyl acetate, Chloroform, Dichloromethane and Petroleum ether. The components present in all the extracts were found to be alkaloids, terpenoids, saponins, glycosides, proteins and amino acids, phytosterol, flavonoids, carbohydrates, phenols and tannins is also given in table-1. The phytochemical compounds were also identified by UV and IR analysis given in table-2.

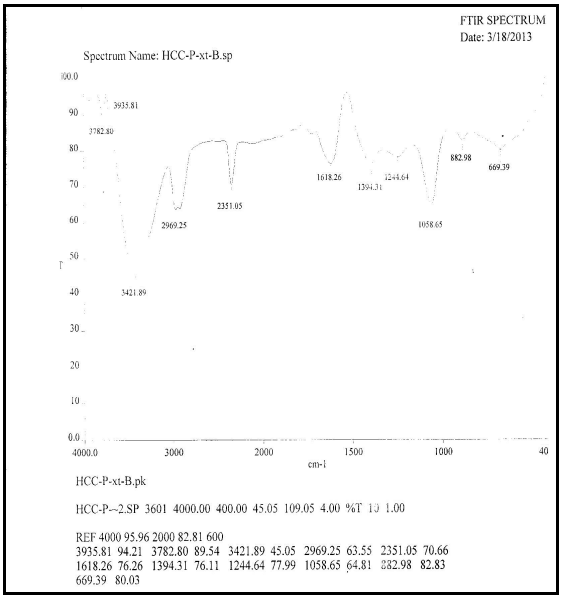
Table 1: Preliminary phytochemical screenin

Chemical compounds	Ethanol extract	Methanol extract	Acetone extract	Chloroform extract	Petroleum ether extract	Hexane extract	Ethyl acetate extract
Alkaloids	+	-	+	+	+	+	+
Carbohydrates	+	-	-	+	+	-	+
Saponins	+	+	+	-	-	-	+
Glycosides	+	+	+	-	+	-	+
Proteins& amino acids	+	+	+	-	-	-	+
Phytosterol	+	+	+	+	+	+	+
Phenolic compounds	-	-	+	+	+	-	+
Flavonoids	+	+	+	-	-		+
Terpenoids	+	+	+	-	+		+
Tannins	-	-	-	+	+	+	

(+) Presence (-) Absence



Phytochemical compounds identified by UV spectroscopy:



Phytochemical compounds identified by IR spectroscopy

Table 2: Identified phytochemical compounds by UV-IR spectroscopy

Sample	UV spectroscopy		IR spectroscopy	
	UV range (nm)	**Compound present**	**IR range(cm^{-1})**	**Functional group present**
Carica papaya. L leaf ethanol extract	377.93	Anthroquinone	3500-3950	Hydroxyl compound
	444.00	Chlorophylls	3409-3870	Hydroxyl compound
	664.35	Flavonoids	3400-3500 3409-3870	Carboxylic acid, Hydroxyl compounds
	326.73	Carotenoids	2398.27-3420.29 2400-3600	Sulphinic acid, Alcohols and Phenols
			2250-2700	Primary Amine salt
			1560-1640	Primary Amines
			1378-1418.39 1300-1430	Aromatic, Carboxylates
			1220-1260 1200-1300	Ethers, conjugated c=c
			1000-1100 1000-1600 1030-1200	Fluoro alkanes, Nitro compounds, Polysaccharides
			860-900 800-1300 780-975	Meta disubstituted benzene, Alkane group, Aldehyde group
			473-374 597-671 600-670	Sulphur, Amides, Nitrite

Antibacterial activity

By disc diffusion method, the analysis of antibacterial activity, *Klebsiella pneumonia(K.p)* expres a very clear indication of inhibitory activity and they show wide Spectrum of inhibition in the ethanol solvent. *Vibro chloreae(V.c)*, *Enterobacter aerogenes(E.a)*, *Staphylococcus aureus(S.a)* showed a moderate inhibitory activity and *E.Coli*, *Salmonella paratyphi(S.p)*, had significant inhibitory activity and *Streptococcus faecalis(S.f)* showed very poor susceptibility even at the higher concentration to ethanol extracts shown in table -3.

Disc diffusion method

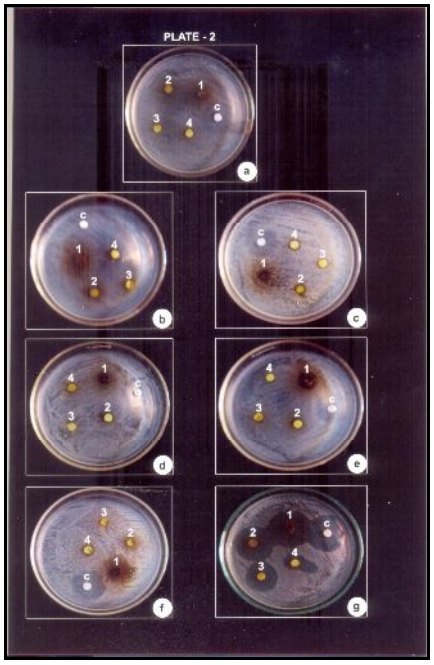


Table:3

Name of the extract	Concentration of extract	Diameter of zone of inhibition (mm)						
		Gram negative bacteria					Gram positive bacteria	
		E.a	E.Coli	K.p	S.p	V.c	S.a	S.f
Ethanol	1000 µg	8.4	9.2	13	8.6	9.4	8.0	7.3
	500 µg	7.8	8.8	11	7.6	9.0	6.8	6.4
	250 µg	7.0	7.3	7	6.3	7.5	6.0	5.5
	125 µg	-	-	5	-	-	-	-

Each value represents the mean of triplicate analysis. Standard deviation was 0.05 to 0.10 for the values.

Conclusion

It is very necessary to introduce new and biologically safe and active drugs eco-friendly in nature and effective as antibacterial agents. Usually medicinal plants contain several phytochemical compounds, which are very much necessary to control the growth of the microorganisms. Thus this study on the leaf extracts of *Female Carica papaya* reveals that many phytochemical compounds have been identified and the compounds present in it have a high antibacterial activity. So the leaf extracts can be used as a drug in the Indian system of medicine.

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