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Pharmacological studies of *Carica papaya* leaves extract

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Abstract

The present study was undertaken to explore the phytochemical screening, antioxidant and anti-bacterial activities of the hydro-methanolic leaves extract of *Carica papaya* using standard screening methods such as disc diffusion, DPPH methods. In phytochemical screening, *Carica papaya* leaf extract showed presence of secondary metabolites such as Carbohydrate, phenols, saponins, and tanins. It also showed dose dependent antibacterial and antioxidant activities.

Keywords: Antibacterial; Phytochemical; Antioxidant; *Carica papaya*

1. Introduction

Carica papaya is a vegetable fruit widely distributed throughout the world, mostly grow in tropics. The tree is one of the most distributive plants on the earth. In some developing countries, the traditional use of papaya is being investigated as an alternative to standard treatments for a range of ailments. A synergistic effect of *Carica papaya* latex sap and fluconazole on *Candida albicans* growth, was reported [1-2]. Antimalarial and antihelminthic activity of *Carica papaya* latex was also reported [3-8]. The seed of papaya has antimicrobial activity against *Trichomonas vaginalis* trophozoites. The report suggests the use of papaya seed in urogenital disorder like trichomoniasis with care to avoid toxicity. The seed and pulp of papaya was shown to be bacteriostatic against several enteropathogens [9 -11] The antifertility effects of *Carica papaya* were reported by feeding adult and pregnant rats with different components of the fruit. The results indicated that the unripe fruit interrupted the estrus cycle and induced abortion [12-15]. Nephro-protective effect of aqueous extract of the unripe seeds of *Carica papaya* in CCl₄ induced renal injury in Wistar rats was reported in a dose-related manner [16]. Recent studies showed that unripe papaya fruit extract has anti- sickling property in a dose-dependent manner [17]. Aqueous extract of *Carica papaya* leaf had the anti-tumor effect on the proliferative responses of solid and haematopoietic tumor cell lines such as cervical carcinoma, breast adenocarcinoma, hepatocellular carcinoma, lung adenocarcinoma, pancreatic epithelioid carcinoma and mesothelium in a dose dependent manner [18]. It is therefore planned to study the antibacterial and antioxidant properties of *Carica papaya* leaves extract *In vitro* models.

2. Material and methods

The *Carica papaya* leaves were obtained from the local garden of Satna, cleaned and dried for few days in shade then powder was made with the help of grinder. 50 gms of leaves powder was taken in a separating funnel and added 50% methanol, then mixed it gently. After every 24 hours extract was collected in a beaker till the solvent appeared colorless. The final extract was pooled together and dried in to powder at 60° C using water bath. The total weight of dried powder

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was weighed. On the day of experimentation, the desired amount of powder was suspended in double distilled water for the final administration. Phytochemical screening was done as per method reported by Agrawal, RC, 2021 [19].

2.1. Antibacterial Activity

The test organisms *Escheria Coli.* and *Bacillus* were obtained from the Department of Research, PBCRI Satna(M.P.). Antibacterial screening was done to find out the antibacterial properties of different concentration of 50% methanolic extract of *Carica papaya* leaves under study Kirby-Bauer Method (Disc diffusion method) was followed to test the antibacterial activity of different concentration of leaves extract. Nutrient agar broth media were used for the antibacterial activities. Nutrient Agar media prepared and poured in Petri- plates after solidifying swab of the bacterial cultures on the plates and allowed for incubation at 37°C for 24 hrs. Measurement of Zone of Inhibition (In mm). Sterile nutrient agar plates were inoculated with the test culture by surface spreading using sterile wire loops and each bacterium evenly spread on the entire surface of the plate to obtain uniformity of the inoculums. 4 different concentrations of crude extract were prepared (100%, 75 % 50%, 25%,) and were used for antibacterial analysis using agar disk diffusion methods. Paper disks were made in each of the plate with a sterile 2.0 mm diameter. Each of the four disk was soaked in a given concentration of the extract mixed with plane sterile agar. The plates were then incubated at 37°C for 24 hours. The diameters of zones of inhibition were measured using a meter rule and the mean value for each organism was recorded.

2.2. DPPH radical scavenging assay

The radical scavenging activity of *Carica papaya* leaves extracts against the DPPH radical was determined by the standard method.. Determination procedures were as follow: 1 mL of 6×10^{-5} M DPPH radical solution (prepared daily) was mixed with 33.33 μ L of methanolic solutions of *Carica papaya* leaves extracts (maximum dissolved concentration). After 30 min incubation for at 37 °C, absorbance decrease of the mixture was monitored at 515 nm. During reduction by the antioxidant, the solution colour changed from violet to yellow pale. DPPH radicals have an absorption maximum at 515 nm. Blank samples with 33.33 μ L of methanol in the above DPPH radical solution were prepared and measured daily at same wavelength (*Ab*). The experiment was carried out in triplicate. Radical scavenging activity was calculated using the following formula.

$$\text{Inhibition rate [\%]} = \frac{A_b - A_s}{A_b} \times 100$$

The 50% inhibitory concentration (IC50) was expressed as the quantity of the extracts to react with a half of DPPH radicals.

3. Results

3.1. Phytochemical screening

Table 1 Phytochemical present in the hydromethanolic extract of *Carica papaya* leaves extract

Sr. No.	Phytochemical Test	Hydromethanolic Extract
I.	Test for Carbohydrates and reducing sugars	
A	Fehling's Test	+
II	Test for Phenolic compound's	
A	Ferric Chloride test	+
III	Test for Tannins	
A	Lead Acetatetest	+
IV	Test for Phytosterols	
A	Salkowski Test	-
V	Test for Proteins	
A	Biuret Test	-
VI	Test for Saponins	

A	Foam Test	+
VII	Test for Flavonoid	
A	Lead Acetate Test	-

+ indicate Present, - indicate Absent

3.2. Antibacterial Activity

50% methanolic extract of leaves of *Carica papaya* at the different concentration i.e.25%, 50%, 75%, 100% exhibited antibacterial against *Bacillus subtilis* (8-10 mm), and *Escheria . coli* (10 mm)

Table 2 Antibacterial activity of *Carica papaya* against bacterial strains

Name of microorganisms	% Concentration of Extract [zone of inhibition(mm)]			
	25	50	75	100
B. subtilis	8	9	8	10.3
E.Coli	10.1	10.1	10	10.3

3.3. Antioxidant Activity

The *In vitro* antioxidant activity of *Carrica papaya* extract was tested in various concentrations against Ascorbic acid as standard. Percentage of TBARS was calculated for both Ascorbic acid and *Carrica papaya* extract, with the help of formula, for a comparative study. The percentage of TBARS was plotted in the graph in different concentration.

$$\frac{\text{Absorbance of Control} - \text{Absorbance of Test}}{\text{Absorbance of control}} \times 100$$

Table 3 *In vitro* antioxidant activity of 50% methanolic *Carrica papaya* extracts Vs Ascorbic acid (standard)

Sr. No.	Concentration of ascorbic acid (µg)	% TBARS inhibition ± SEM	Concentration of <i>Carrica papaya</i> (µg)	% TBARS inhibition ± SEM
1	50	25	200	3.77
2	100	73	400	5.79
3	150	65	600	34.09
4	200	96	800	32.88
5	250	55	1000	27.72
6	300	144	1200	31.50
7	350	145	1400	38.84
8	400	171	1600	38.84
9	450	209	1800	57.74
10	500	270	2000	60.40

IC₅₀ = Concentration at which % inhibition of TBARS is 50%.

4. Discussion

Since ancient times, plants have been widely used as treatment against variety of ailments. Concentrated flowers or leaves extract can be found in various herbal preparations that are in market today. Recent scientific research has established the presence of many active compounds in this plant that are known to possess specific pharmacological properties. Indian plant possesses many therapeutic properties. Present study showed that hydromethanolic extract of *Carica papaya* leaves caused antimicrobial activity against gram positive and gram negative bacteria. The seed of papaya

has been reported antimicrobial activity against trichomonas vaginalis trophozoites.. The seed and pulp of papaya was shown to be bacteriostatic against several entero pathogens (9 -11).Phenols, saponins, Tannins and Alkaloids were present in the 50% methanolic extract of *Carica papaya* extract. Phenolic compounds which naturally present in *Carica papaya* plant can reduce the risk of many diseases and its effects which correlated with the antioxidant compounds.

5. Conclusion

Carica papaya leaf extract showed presence of secondary metabolites such as Carbohydrate, phenols, saponins, and tanins. It also showed dose dependent antibacterial and antioxidant activities. *The study is important because the carica papaya is used as a fruit in Indian diet and also used as a medicine in traditional medicine* Therefore *Carica papaya* may be used for development of modern drugs for various ailments

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest between the authors.

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