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In-vitro assessment of anti-bacterial, anti-fungal and anti-oxidant potential of *Ficus carica* stems bark

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Abstract

Medicinal plants have been using for treatment of different diseases since ages. *Ficus carica* is a plant which is abundantly present and easily available in Pakistan. In this study methanolic extracts of *Ficus carica* stem bark was examined for anti-bacterial, anti-fungal and anti-oxidant potential. Anti-bacterial and anti-fungal potential was examined following disc diffusion method whereas anti-oxidant activity was determined using DPPH scavenging method. The maximum antibacterial activity was recorded 19 mm against *Klebsiella pneumonae* and *Escherichia coli*, and the highest anti-fungal potential was also recorded 19 mm against *Fusarium oxysporum* and *Mucor racemosus* each. The mean anti-oxidant activity was also recorded 63.45% in comparison to DPPH. The plant extracts was exhibited appropriate anti-oxidant potential and antimicrobial activity against various human pathogenic bacterial and fungal strains.

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Introduction

Even though a large number of anti-biotics have been produced synthetically in last few decades, but resistance to synthetic anti-microbial agents has also been increased (Aref *et al.*, 2010; Nascimento, Locatelli, Freitas, & Silva, 2000). Anti-bacterial resistance has become a global concern; it has been increasing incidence of multiple resistance in human pathogenic microorganisms in recent years. Deaths have been reported worldwide, due to indiscriminate use of commercial antimicrobial drugs commonly employed in the treatment of infectious diseases (Parekh & Chanda, 2007). Commercially synthetic antibiotics development is highly expensive as compared to herbal medicines. The development of such drugs are declining as United States Food and Drug Administration (FDA) approval of new anti-bacterial agents have decreased by 56% over the past 20 years (Spellberg, Powers, Brass, Miller, & Edwards Jr, 2004). On the other hand the human as well as animals are using 250,000 to 500,000 plant species in daily life to resolve different microbial infections (Borris, 1996; Cowan, 1999). In this study *Ficus carica* is selected as one of medicinal plants, widely distributed from South Asia to Eastern Mediterranean and easily available in different areas of Pakistan. Traditionally it is used for healing various diseases. (Ahad *et al.*, 2010; Dueñas, Pérez-Alonso, Santos-Buelga, & Escribano-Bailón, 2008). The stem bark of *Ficus carica* is beneficial as anti-oxidant, anti-fungal, anti-bacterial and anti-diabetic (Mopuri, Ganjayi, Meriga, Koorbanally, & Islam, 2017), anti-inflammatory (Ramazani, Zakeri, Sardari, Khodakarim, & Djadidt, 2010) and anti-depressant (Badgujar, Patel, Bandivdekar, & Mahajan, 2014), anti-viral and anti-fungal effects (Lee & Cha, 2010). The objective of this study was to determine the of *F. carica* stem bark methanolic extracts and evaluate the anti-oxidant, anti-bacterial and anti-fungal potential.

Material and methods

Collection of plant materials

Ficus carica stem bark was collected from Canal rest house chichawatni district Sahiwal (Punjab). The plant was identified by Dr. Mansoor Hameed Associate prof. (Botanist). Shade dried plant materials were ground to fine powder and stored in air tight jar for further use.

Extraction of plant materials

400gm of sample was macerated in methanol for 7 days, filtered through whatman no.1 filter paper, the filtrates were then concentrated under reduced pressure using rotary evaporator at 45°C (Nebedum, Udeafor, & Okeke, 2010).

Anti-fungal activity

Sabouraud dextrose agar was sterilized in a flask and distributed into inoculated petri plates. Each fungal strain was inoculated in sabouraud dextrose plates. Sterile filter paper discs loaded with plant extracts and standard drug (clotrimazole) were placed on the top of sabouraud dextrose plates. The treated plates were kept at 4°C for 1-2 hour and then incubated for 24 hours at 28°C. Zone of inhibition was measured using vernier caliper in mm. Antifungal potential was founded as the mean diameter of zone of inhibition (mm) of plant extracts (Chaturvedi *et al.*, 2010; Shi *et al.*, 1996).

Anti-bacterial activity

Nutrient agar was sterilized in flask and distributed into petri plates. Each bacterial strain was inoculated in nutrient agar broth plates. Sterile filter paper discs loaded with methanolic extracts of fig stem bark and standard drug (gentamycin) were placed on the top of nutrient agar plates. The treated plates were kept at 4°C for 1-2 hour and then incubate for 24 hours at 37°C. Zone of inhibition were measured using vernier caliper in mm. Anti-bacterial potential was founded as the mean diameter of zone of inhibition (mm) of plant extracts (Shi *et al.*, 1996).

DPPH scavenging assay

The antioxidant activity of *Ficus carica* stem bark extracts was assessed by measuring their scavenging ability to 1, 1-diphenyl-2-picrylhydrazyl stable radicals (DPPH). The assay was performed as described by (Neves, Matos, Moutinho, Queiroz, & Gomes, 2009) with slight modifications. Methanolic extracts (10,20 and 30µl were added an equal volume in ethanolic solution of DPPH (0.1mM). After 30 minutes it was incubated at room temperature.

Absorbance was recorded at 517nm. The experiment was repeated thrice. Butylated Hydroxytoluene (BHT) was used as standard control. Inhibition of free radical by DPPH was calculated using following way:

$I(\%) = 100 \times (A_{blank} - A_{sample} / A_{blank})$

A_{blank} is the absorbance of the control reaction mixture excluding the test compounds, and A_{sample} is the absorbance of the test compounds.

Results

Anti-fungal

Results obtained, shows *Ficus carica* stem bark methanolic extracts have the maximum zone of inhibition (ZOI) against *Fusarium oxysporum, Mucor racemosus* 19 mm each, 18mm against *Mucor mucedo,* 17 mm against *Aspergillus flavus* and 16 mm against *Candida albicans* as indicated in Table 1. The lowest zone of inhibition was 14 mm recorded each against *Rhizopus stolonifer* and *Aspergillus nigar*.

Table 1. Anti-bacterial potential of methanolic extracts of *Ficus carica* stem bark.

Bacteria strain	Zone of Inhibition (mm)	
	Sample	Standard
Staphylococcus aureus	16	25
Klebsiella pneumonae	19	23
Pseudomonas aeruginosa	14	20
Salmonella typhi	18	25
Escherichia coli	19	22
Bacillus subtilis	17	25
Pseudomonas fluorescens	14	25
Staphylococcus epidermidis	16	24
Staph. Haemolyticus	13	20
MRSA	15	22

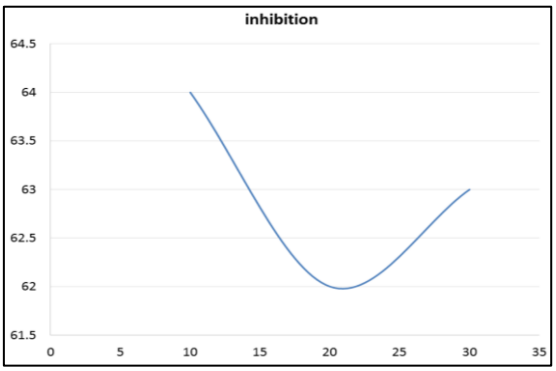

Fig. 1. Anti-Oxidant potential of methanolic extracts of *Ficus carica* stem bark.

Anti-bacterial

Ficus carica stem bark methanolic extracts exhibit maximum ZOI against *Klebsiella pneumonae* and *Escherichia coli* i.e. 19mm each respectiveIy whereas 18mm was recorded against *Staphylococcus typhi,* 17mm against *Bacillus subtilis,* 16mm against *Staphylococcus aureus,* shown in Table 2. The lowest zone of inhibition was recorded 13mm against *Staph. haemolyticus*.

Table 2. Anti-fungal potential of methanolic extracts of *Ficus carica* stem bark.

Fungi strain	Zone of Inhibition (mm)	
	Sample	Standard
Candida albicans	16	21
Fusarium oxysporum	19	22
Aspergillus nigar	14	20
Mucor mucedo	18	22
Mucor racemosus	19	22
Aspergillus flavus	17	21
Rhizopus stolonifer	14	20

Anti-oxidant activity

Ficus carica stem bark methanolic extracts were exhibited 63.45% anti-oxidant potential using DPPH scavenging assay method.

Discussion

Anti-fungal Activity

F. carica stem bark was used in traditional medicine for management of different fungal infections (Debib, Tir-Touil, Mothana, Meddah & Sonnet, 2014). *Candida albicans, Fusarium oxysporum, Aspergillus nigar, Mucor mucedo, Mucor racemosus, Aspergillus flavus* and *Rhizopus stolonifer* were used in my study. *Ficus carica* stem bark has an effective potential against.

These strains as compared to previous research work because it has no activity previously while in my study it has significant results. Anti-fungal potential of this species was also justified by the research work of (Oyelana *et al.*, 2011). A specie of same genus, *Ficus bubu* methanolic extracts of stem bark and leaves extracts were examined for anti-microbial and antifungal activity (Oyelana *et al.*, 2011).

Anti-bacterial activity

Plants having anti-bacterial activity are used against management of different disorders because of the

presence of active phytochemicals (Joshi & Boyd, 2009). According to this study, *F. carica* stem bark has an effective potential against bacterial strains (*Staphylococcus aureus, Klebsiella pneumonae, Pseudomonas aeruginosa, Salmonella typhi, Escherichia coli, Bacillus subtilis, Pseudomonas fluorescens, Staphylococcus epidermidis* and *Staph. haemolyticus*). Previously by the research work of (Jeong, Kim & Cha, 2009), anti-bacterial activity of fig leaves methanolic extracts were evaluated with significant results using MIC assay (broth dilution method).

Anti-oxidant activity

Previous research work on *Ficus carica* stem bark was exhibited less anti-oxidant potential as compared to this analysis (Ao, Li, Elzaawely, Xuan & Tawata, 2008). Results were also justified by comparison of other species of same genus i.e. *Ficus racemosa* stem bark aqueous extracts being evaluated for anti-oxidant activity (Ahmed, Siddesha, Urooj & Vishwanath, 2010).

Conclusion:

Ficus carica is one of the oldest and nutritious known medicinal plant species in the world. Its history goes back to ancient times and people from different fields of life have been using its (leaves, fruits and bark) for both nutritious and medicinal purposes. Keeping in view the current review, fig bark can be useful in management of various disorders but recent scientific approaches are required for bio-assay guided isolation of different phytochemicals present in bark.

Conflict of Interest:

The authors has declared that there is no conflict of interest

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