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RESEARCH ARTICLE

IMPACT OF MEDICINAL PLANT EXTRACTS AGAINST FUNGAL STRAIN IN THANJAVUR AREA, TAMIL NADU, INDIA

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ABSTRACT

The present investigation was aimed to evaluate the growth inhibitory effect of *Hibiscus rosasinensis, Azadirachta indica, Ficus religiosa and Ocimum sanctum* leaves extracts on *Aspergillus niger*, *Candida albican*s, *Cunninghamella bertholatiae* and *Penicillium notatum*. Aquous plant extracts were tested against 4 fungi. Gel diffusion method, were used in this investigation. The *Azadirachta indica* medicinal plant extract 11 mm (Mean value in Dia.) were showed enormous antimicrobial activity against *Aspergillus niger, Candida albicans* and *Cunnighamella bertholatiae. Ocimum sanctum* medicinal plant extract showed the maximum zone of inhibition 11 mm (Mean value in Dia.) against *Penicillium notatum.* Moderate amount of antifungal activity was observed on *Hibiscus rosasinensis* medicinal plant extract, the maximum zone of inhibition 7 mm (Mean value in Dia.) against *Aspergillus niger*. At the same time *Hibiscus rosasinensis* plant extract was highly sensitive 11 mm (Mean value in Dia.) against *Candida albicans*. All the *pathogenic fungi* were more resistance to *Ficus religiosa* medicinal plant extract. The present observation, the *Azadirachta indica* and *Ocimum sanctum* medicinal plants extracts were showed very promising antifungal activity.

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INTRODUCTION

The development of freshwater aquaculture in the country only finally became established following the establishment of the Pond Culture Division at Cuttack in 1949 under the name of the Center of Central Inland Fisheries Research Institute (CIFRI), West Bengal. Significant developments took place thereafter with the standardization of induced breeding techniques and the development of hatchery systems and composite carp culture with the three Indian major carps and three exotic carps, including silver and grass carp, forming the basis for carp polyculture systems. The Food and Agricultural Organization of the United Nations (FAO, 2009), state that illness due to contaminated food is perhaps the most widespread health problem in the contemporary world and an important cause of reduced economic productivity (Edema *et al*., 2005). Fungi are known to attack fish eggs, fry, fingerlings and adult fish. Water molds infections cause losses of freshwater fishes and their eggs in both natural and commercial fish farms (Bangyeekhun and Sylvie, 2001).

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The fungal diseases occur in brood stock and all life stages of fish and eggs. Fungal infection cause low productivity of fry and low production in fish culture (Kwanprasert *et al*., 2007). The mortality rate due to fungal infection may reach some time up to 80-100% in incubated eggs. According to post-harvest handling of fishes may also result in infection with microorganisms such as bacteria and fungi (Akande and Tobor, 1992).

Drug resistance is a serious global problem, and spread of resistance poses additional challenges for clinicians and the pharmaceutical industry. Use of herbal medicines in the developed world continue to rise because they are rich source of novel drugs and their bioactive principles form the basis in medicine, nutraceuticals, pharmaceutical intermediates and lead compounds in synthetic drugs (De and Ifeoma, 2002 and Ncube *et al.,* 2008). Screening medicinal plants for biologically active compounds offers clues to develop newer antimicrobial agents. These compounds after possible chemical manipulation provide new and improved drugs to treat the infectious diseases (Natarajan *et al.,* 2003 and Shah *et al.,* 2006). Plant based products extracts are cheaper alternatives to the development of synthetic drugs.

The plant-derived medicines are based upon the premise that they contain natural substances that can promote health and alleviate illness. So returns to natural substances are an absolute need of our time (Kumar *et al.*, 2007). In the last few years a number of studies have been conducted to verify the effectiveness of plant extracts against bacterial infections (Prashanth *et al.,* 2006; Ung *et al.*, 2010). *Azadirachta Indica* belongs to the family Meliaceae, commonly known as neem. It is used in traditional medicine as a source of many therapeutic agents. *A. indica* (leaf, bark and seed) are known to contain antibacterial, antifungal activities against different pathogenic microorganisms and antiviral activity against vaccinia, chikungunya, measles and coxsackie B viruses (Biswas *et al.,* 2002). Different parts of neem (leaf, bark and seed oil) have been shown to exhibit wide pharmacological activities including; antioxidant, antimalarial, antimutagenic, anticarcinogenic, antiinflammatory, antihyperglycaemic, antiulcer and antidiabetic properties (Talwar *et al*., 1997). The biological activities are attributed to the presence of many bioactive compounds in different parts. The present study evaluated the individual and in combination growth inhibitory effect of 4 medicinal plant extracts against 4 fungi.

MATERIALS AND METHODS

Plants were collected between the month of June and July 2016 in the Thanjavur area Tamil Nadu, India. Plant leaves were initially dried in an air-conditioned, dehumidified room, then further dried in an oven at ca. 40^{o}C for a total of seven days, and then finally ground to a fine powder. Antimicrobial activity test was determined by the Kirby-Bauer disc diffusion method (Bauer *et al.*, 1966).

The Antimicrobial activity was tested against isolated 4 fungal strains. The medicinal plants of *Hibiscus rosasinensis, Azadirachta indica, Ficus religiosa and Ocimum sanctum* leaves extract were tested by the disc diffusion method. The extracts were prepared by reconstituting with aquous. The test microorganisms were seeded into respective Potato dextrose agar medium by spread plate method 10 µl (10 cells/ml) with the 72h cultures of fungal growth in Potato dextrose agar broth. After solidification the filter paper discs (5 mm in diameter) impregnated with the extracts were placed on test organism-seeded plates*., Esherichia coli, Salmonella typhii, Staphylococcus aureus* and *Enterobacter aerogen* were used for antibacterial test. Erythromycin (10 µg mlG1) used as positive control. The antibacterial assay plates were incubated at 37°C for 72h. After incubation, the results were observed and measured the diameter of inhibition zone (mm) around the each well.

RESULTS AND DISCUSSION

Antifungal activity of medicinal plant extracts such as *Hibiscus rosasinensis, Azadirachta indica, Ficus religiosa and Ocimum sanctum* (Leaves) were tested against some pathogenic fungi such as *Aspergillus niger*, *Candida albican*s, *Cunninghamella bertholatiae* and *Penicillium notatum*. The different pathogenic fungi were quantitatively assessed for zone of inhibition. The resulted were presented (Table 1, Fig. 1 and Plate 1).

The antimicrobial acitivity test with medicinal plant extracts such as *Hibiscus rosasinensis, Azadirachta indica, Ficus religiosa and Ocimum sanctum* (Leaves) were studied against selected fungal pathogens. The selected fungal strains such as *Aspergillus niger*, *Cunninghamella bertholatiae, Candida albicans* and *Pencillium notatum.* The *Azadirachta indica* medicinal plant extract 11 mm (Mean value in Dia.) were showed enormous antimicrobial activity against *Aspergillus niger, Candida albicans* and *Cunnighamella bertholatiae. Ocimum sanctum* medicinal plant extract showed the maximum zone of inhibition 11 mm (Mean value in Dia.) against *Penicillium notatum.* Moderate amount of antifungal activity was observed on *Hibiscus rosasinensis* medicinal plant extract*,* the maximum zone of inhibition 7 mm (Mean value in Dia.) against *Aspergillus niger*. At the same time *Hibiscus rosasinensis* plant extract was highly sensitive 11 mm (Mean value in Dia.) against *Candida albicans*. All the *pathogenic fungi* were more resistance to *Ficus religiosa* medicinal plant extract. The *Azadirachta indica* and *Ocimum sanctum* medicinal plants extracts were showed very promising antifungal activity. The *Azadirachta indica* medicinal plant extract were showed enormous antimicrobial activity against *Aspergillus niger, Candida albicans* and *Cunnighamella bertholatiae,* when compared with other medicinal plant extracts. According to Winee Surabhi Lall *et al*., (2013) were studied the methanolic and acetonic extracts of the three medicinal plants posseses antifungal activity against *A. niger* and *A. fumigatus* with the maximum zone of inhibition against *A. niger* 22 mm for methanolic extract of *Curcuma longa* and the minimum inhibition was shown by acetonic extract of *Azadirachta indica* against *A niger* 8 mm. According to Nishant Rai *et al*. (2011) were studied the petroleum ether and methanolic extracts of *Azadirachta indica* exhibited high activity against *Candida albicans* (15-18mm).

Lalit Mohan *et al*., (2011) were reported that the *Ocimum sanctum* also possesses antifungal activity against *Asperigillus niger* and aqueous extract of it was found to be effective in patients suffering from viral encephalitis.6 In the treatment of ring worm infections, Tulsi leaves paste is indeed found to be very effective. Tulsi has significant natural antibacterial, antiviral and antifungal activities and is helpful in treating many serious systemic diseases, as well as localized infections. Many similar studies reported differences in antibacterial and antifungal activity of different medicinal plant extracts and the differences were rationalized as due to differend in morphological structure of the cell membranes (Mazutti *et al*., 2008 and Rang *et al*., 2001). Different plant extracts have been reported for their antifungal properties (Al-Fatimi *et al*., 2007; Afolayan *et al*., 2002), which supports our present findings.
There is very little information available on the activity of medicinal plants aromatic and medicinal plants are known to produce certain bioactive molecules which react with other organisms in the environment, inhibiting bacterial or fungal growth (antimicrobial activity).

The substances that can inhibit pathogens and have little toxicity to host cells are considered candidates for developing new antimicrobial drugs. The present study similar workers reported (Chopra *et al*., 1992; Bruneton, 1995).

Table 1. Statistical analysis of Antimicrobial activity test in medicinal plants extract against fungus (± S.D. of Mean)

Name of the Species	Zone of inhibition (dia in mm)			
	S1. *Hibiscus rosasinensis*	**S2. *Azadirachta indica***	**S3. *Ficus religiosa***	**S4. *Ocimum sanctum***
Aspergillus niger	7.67 ± 1.53	11.67 ± 0.58	9.00 ± 3.60	8.67 ± 2.52
Candida albicans	11.00 ± 2.00	11.33 ± 0.58	8.67 ± 3.51	10.33 ± 4.04
Cunnighamella bertholatiae	10.67 ± 1.52	11.67 ± 0.58	9.67 ± 4.51	8.33 ± 3.05
Penicillium notatum	9.67 ± 0.58	10.33 ± 2.08	10.67 ± 2.52	11.00 ± 3.60

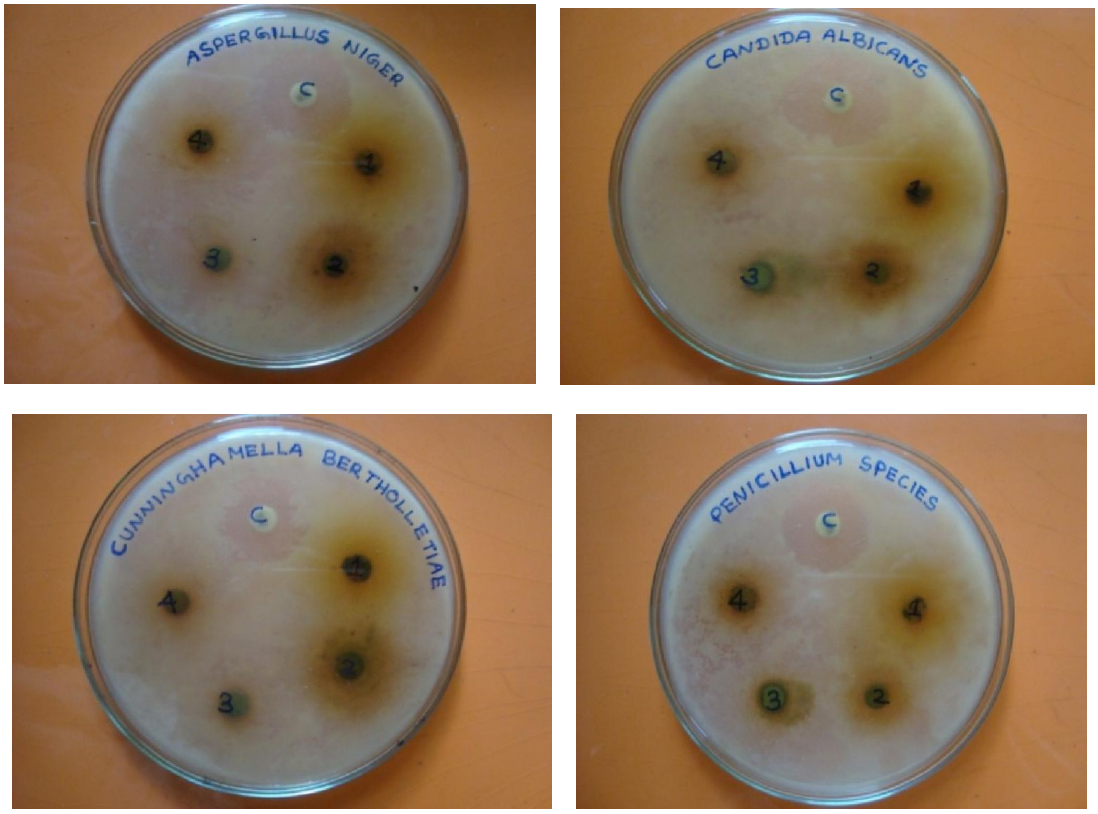

Plate 1. Antimicrobial activity test against isolated fungi from infected fresh water carp *Labeo rohita*

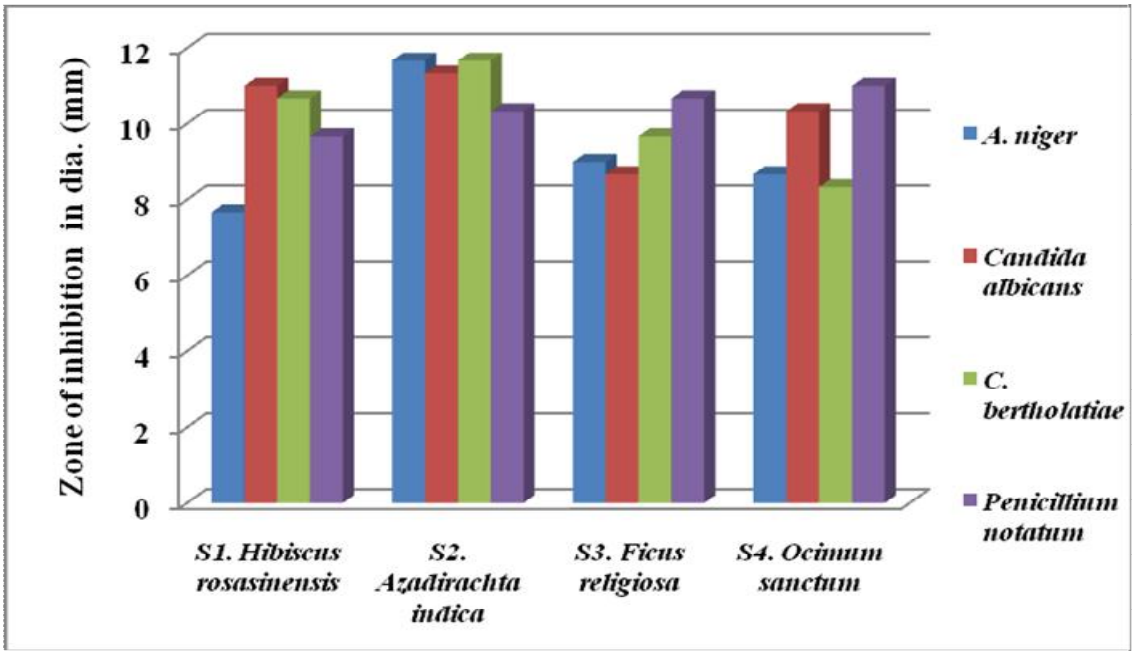

Fig. 1. Antimicrobial acitivity test against isolated fungi from infected carp *Labeo rohita*

Conclusion

In the present observation, the antifungal activity of *Azadirachta indica* plant extract was exhibited maximum zone of inhibition against *Aspergillus niger, Candida albicans* and *Cunnighamella bertholatiae* 15 mm (Mean value in Dia.). *Ocimum sanctum* medicinal plant extract showed the maximum zone of inhibition 11 mm (Mean value in Dia.) against *Penicillium notatum.* All the *pathogenic fungi* were more resistance to *Ficus religiosa* medicinal plant extract. The *Azadirachta indica* and *Ocimum sanctum* medicinal plants extracts were showed very promising antifungal activity.

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