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Antifungal Properties of Extracts of *Ipomoea carnea* Jacq. Subsp. *fistulosa* Against some Vegetable Pathogenic Fungi

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Abstract

Ipomoea carnea Jacq. subsp. *fistulosa* (Mart. ex Choisy) extracts were tested using the well in agar method against *Fusarium oxysporum* and *Rhizopus stolonifer* to find out their antifungal activity. Chloroform, ethanol, and aqueous extracts of leaf, stem, and root bark were used in the *in vitro* studies. All organs of selected plant with different extracts showed variable antifungal activity. Maximum activity was seen with the Leaves alcoholic extract, however minimal activity was found in the root extract (aqueous) with the test fungus. All test organisms showed radial growth inhibition in response to the extracts being added to the culture medium. The test organisms responded differently to the various extracts, but in overall, growth inhibition shows stronger with each extract's concentration. In plant and organisms, the antifungal activity was discovered to be in ascending from root bark then stem bark and highest in leaves.

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Introduction

The plant *Ipomoea carnea* Jacq. subsp. *fistulosa* has been found widely distributed as an living fence or hedge plant. It is escaped cultivation and established itself as a weed in cultivated fields, such as rice plantations. It is invasive and naturalised primarily in disturbed sites, riparian areas and wetlands. It has the potential to outcompete native plants because it is a fierce competitor for resources (such nutrients and water). The species has a noxious weed category.[1] Many of tropical medicinal and aromatic plants have been shows to have notable antifungal and antibacterial activity and because they are natural origin, almost all of which are used by humans, there is nothing much side effects or toxicity even at extremely high level application.[2] A very well-known examples are Neem (*Azadirachta indica*)[3] and Lemon Grass (*Cymbopogon citratus*).[4]

The harmful effect of synthetic chemicals can only be solved through an uninterrupted search for new and safer pesticides, combined with widespread usage of eco-friendly and effective pest control methods.[5] Plants serve as a reservoir for potent chemotherapeutants and can be valuable sources of natural insecticides.[6,7] Different plant parts like

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stem and stem bark are known to have potential antibacterial activities. The antifungal properties of the stem and its bark extracts have been seen by several researchers.[8-11]

In comparison to synthetic pesticides, plant metabolites and plant-based insecticides are known to have less of an adverse effect on the environment and shows minimum risks to consumers.[12] Numerous higher plant extracts have been found to have antifungal effects in laboratory tests.[13-15] It seems promising to use plant metabolites to safeguard crops and stop biodeterioration brought on by fungi. In consideration of these, the author tested a few extracts for their ability to inhibit pathogenic fungi that affect vegetables, and the results are described in this work.

Materials and Methods

Isolation of Pathogenic Fungus

Pathogenic fungus were isolated from infected plant host and grown on potato dextrose agar (PDA) medium. Pure cultures of each fungus have been grown independently on PDA slants from identified pathogenic fungus cultures. Further research was conducted using these pure cultures.

Fig. 1: Habitat of *I. carnea* subsp. *fistulosa*

Preparation of Powder

Samples of I. *carnea* subsp. *fistulosa* were collected from the Gondur Dam, Near Dhule city (MS), India. It was confirmed by comprising with an authentic specimen in laboratory. A voucher specimen of the plant was deposited in the Departmental herbarium for future reference. The collected plant material cleansed with tap water in-depth before being rinsed with sterile distilled water. With the help of sharp knife, the bark from stem and root was collected; the collected material were put to shade-dried and grounded in an electric mixer to make fine powder. Air tight polythene bags were used to store the fine powder of various parts. Further extraction was performed using this stock powder.

Preparation of Various Extracts

Different solvent systems, such as distilled water, alcohol and chloroform, were used to prepare the extracts. 100 ml of the abovementioned solvent was used to dissolve 100 g of each type of powder. The three-layered filter paper was used to filter it. From this stock, various concentration levels (100%, 75%, 50% and 25%) were produced. This was saved as a stock solution. The solvent system in use served as the control. These different concentrations were used to biocide the pathogen that causes fungus. The extract's bio-efficacy was evaluated *in vitro* using the well-in-agar diffusion method.[16]

Well-in-agar Method

For even dispersion of the spores, a loopful of the test organism from the inoculums suspension was spread evenly on the solidified sterile culture media in the petridishes. A 0.5 cm well was formed in the media using a sterile cork borer, and known amounts of plant extract were placed inside each well to allow for diffusion of the extract into the media. The petridishes were incubated for 24 hours at a temperature of 30±2°C and the measurements of the inhibitory zone's diameter in millimeters were taken. In all of the studies, a well in an agar plate was filled with sterile distilled water and solvent as a control. Each experiment was performed in triplicate, and the mean was taken into account in the observation table.

Results and Discussions

Results of I. *carnea* subsp. *fistulosa* extracts against vegetable pathogenic *F. oxysporum* and *R. stolonifer* (Table 1)

In 100% concertation of leaf extract in alcohol showed maximum inhibition values of 21.23 mm

and 20.9 mm for *F. oxysporum* and *R. stolonifer* compared to 19.2 mm and 18.25 mm for chloroform extract and 19.90 mm and 14.3 mm for aqueous extract. At concentration of 25% aqueous extract, the minimal inhibition by leaf extract was 5.1 mm for *F. oxysporum* while 6.5 mm is for *R. stolonifer*.

The highest 20.6 mm and 20.1 mm inhibition for *R. stolonifer* and *F. oxysporum* were obtained by the stem bark alcoholic extract at a concentration of 100%, but the findings for the chloroform and aqueous extracts were in decreasing order. At a concentration of 25% aqueous extract, the minimum inhibitory effect of stem bark extract was measured to be 6.1 mm for *F. oxysporum* and 7.2 mm for *R. stolonifer*.

The highest 13.5 mm and 12.3 mm inhibition for *R. stolonifer* and *F. oxysporum* were shown by the alcoholic root bark extract at a concentration of 100%, but the findings for the chloroform and aqueous extracts were in decreasing order. At a concentration of 25% aqueous extract, the minimum inhibitory effect of root bark extract was measured to be 4.6 mm for *F. oxysporum* and 4.2 mm for *R. stolonifer*.

The leaves alcoholic extract exhibited the greatest activity against the test fungus, but the root aqueous extract showed the least activity. All of the test organisms' radial growth was found to be inhibited by the extracts when added to the culture medium. Although the test organisms responded differently to each extract, overall growth inhibition became more pronounced as extract concentration increased. The antifungal activity was shown to be in ascending sequence, i.e., root, stem bark and leaves.

Table 1: Effect of *I. carnea* subsp. *fistulosa* extract on vegetable pathogenic fungi

Vol. no.	Plant part	Solvent	*Fusarium oxysporum*				*Rhizopus stolonifer*			
			Inhibition* (mm)				Inhibition* (mm)			
			25%	50%	75%	100%	25%	50%	75%	100%
1	Leaf	Alcohol	10.7	17.6	18.1	20.9	14.5	15.3	18.9	21.3
		Chlorf.	8.8	11.2	13.7	18.5	11.2	12.9	15.8	19.2
		D.W.	5.1	11.0	12.7	14.3	6.5	7.6	8.5	10.5
2	Stem bark	Alcohol	11.5	14.7	19.6	20.1	17.5	18.1	18.8	20.6
		Chlorf.	9.3	12.6	15.3	19.4	14.9	17.4	17.6	18.2
		D.W.	6.1	11.3	12.5	13.1	7.2	9.6	10.4	11.3
3	Root bark	Alcohol	8.0	8.2	9.7	13.5	6.2	9.7	10.5	12.3
		Chlorf.	6.2	8.4	10.3	10.6	6.3	7.5	9.1	10.2
		D.W.	4.6	5.7	6.7	7.4	4.2	4.9	5.2	6.6

* - Values are averages over three replicates; Chlorf= Chloroform; D.W. = Distilled water

According to numerous research, plant metabolites and plant-based pesticides are among the best alternatives because they are recognized to have less of an adverse effect on the environment and pose fewer risks to consumers than synthetic pesticides.[12,17-18] Upadhyay *et al.*, (2010) investigated the antifungal activity and preliminary phytochemical analyses of *Juglans regia* Linn. stem bark extracts.[10] Shilpakala *et al.* (2009) conducted research on the antifungal activity of several *Cassia fistula* extracts as well as bioactivity-guided isolation and identification of antifungal agent[19] Igbinosa *et al.* (2009) investigated *Jatropha curcas* stem bark extracts antibacterial efficacy and phytochemical screening.[20] Cucumber (*Cucumis sativus* L.) stems were used to make sphignolipids, which Tang *et al.* (2010) discovered and found to have antibacterial activity.[21] Priya *et al.* (2010) investigated the antifungal properties of various *Cassia fistula* extracts and bioactivity assisted in the isolation and

identification of an antifungal agent.[22] *Achyranthes aspera* could have antibacterial and antifungal properties, according to Londonkar *et al.*, 2011.[23] The antifungal properties and phytochemical analysis of Ocimum gratissimum L. extracts.[24] Recently, Mayuri *et al.* (2015) have demonstrated the antifungal activity of several medical plant material extract against the fungus *Aspergillus niger,* the antifungal activity of two medicinal plants against the fungus *Candida albicans*, and the antimicrobial activity of the leaves of *Aegle marmelos.*[25-28] Therefore, as a first step in the order to explore the relationship, it is necessary to look for alternative techniques to taking things into consideration.

Conclusion

A study was conducted to assess the antifungal effects of *Ipomoea carnea* extracts on vegetable pathogenic *F. oxysporum* and *R. stolonifer*a using the well in agar technique. Chloroform, ethanol, and aqueous extracts of leaf, stem, and root bark were used in the *in vitro* investigations. The alcoholic leaf extract displayed the highest level of activity against the test fungus, whereas the aqueous root extract displayed the lowest level of activity. All of the test organisms' radial growth was found to be inhibited by the extracts when added to the culture medium. Although the test organisms reacted differently to each extract, overall growth inhibition became more pronounced as extract concentration increased.

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Conflict of Interest

The authors do not have any conflict of interest.

References

1. Sandoval J. and K.H. Shaltout, "*Ipomoea carnea* subsp. *fistulosa* (bush morning glory). Invasive Species Compendium" Wallingford, UK: CABI. 2018.
2. Adegoke G.O., R. Gbadamosi, F. Evwoer-hurhima, P. Uzo-Peters, K. Falade, O. Itiola, O. Moody, B. Skura, "Protection of maize (*Zea mays*) and Soybean (*Glycine max*) using *Aframomum danielli*", European Food Research and Technology, 2002; 214: 408-411.
3. Bankole S.A., Adebanjo A. "Inhibition and growth of some plant pathogenic fungi using extracts from some Nigerian plants", *International Journal of Tropical Plant Diseases,* 1995; 13: 91-95.
4. Bankole S.A., Joda A.O., Ashidi J.S. "The use of powder and essential oil of *Cymbopogon citratus* against mould deterioration and aflatoxin contamination of 'egusi' melon seeds", *Journal of Basic Microbiology,* 2005; 45: 20-30.
5. Mohana, Devihalli Chikkaiah, Pravin Prasad, Veena Vijaykumar and Anandrao Raveesha Koteshwara, "Plant extract effect on Seed-borne pathogenic fungi from seeds of paddy grown in southern India", *Journal of plant Protection Research,* 2011; 51(2): 101-106.
6. Balandrin M.F., Klocke J. A., E.S. Wurtele, Bollinger W.H., "Natural plant chemicals: Sources of Industrial and Medicinal materials", Science, 1985; 228: 1154-1160.
7. Hostettmann K., Wolfender J. "The search for Biological active secondary metabolites", Pesticides Science, 1997; vol. 51: 471-482.
8. Boughalleb, Naima, Nouri Débbabi, Hichem Ben Jannet, Zine Mighri and Mohamed El Mahjoub, "Antifungal activity of volatile components extracted from leaves, stems and flowers of four plants growing in Tunisia", Phytopathol. Mediterr, 2005; 44: 307–312
9. Vats, Manisha, Neha Sharma and Satish Sardana, "Antimicrobial Activity of Stem Bark Extracts of *Nyctanthes arbortristis* Linn. (Oleaceae)", *International Journal of Pharmacognosy and Phytochemical Research*, 2009; 1 (1): 12-14
10. Upadhyay V., Kambhoja S., and K. Harshaleena, "Antifungal activity and preliminary phytochemical analysis of

stem bark extracts of *Juglans regia* Linn.", *International Journal of Pharmaceutical & Biological Archives,* 2010; 1 (5) : 442-447.

11. Sule W.F., I.O. Okonko, S. Omo-Ogun, J.C. Nwanze, M.O. Ojezele, O.J. Ojezele, J.A. Alli, E.T. Soyemi and T.O. Olaonipekun, "Phytochemical properties and *in-vitro* antifungal activity of *Senna alata* Linn.", Crude stem bark extract. Journal of Medicinal Plants Research, 2011; vol. 5 (2):176-183.
12. Varma J. and N, K. Dubey, "Prospectives of botanical and microbial products as pesticides of tomorrow". *Curr. Sci.* 1999; 76 (2): 172–179.
13. Parekh J., N. Karathia and S. Chanda, "Evaluation of antibacterial activity and phytochemical analysis of *Bauhinia variegate* L. bark", Afr. J. Biomed. Res., 2006; 9 : 53–56.
14. Buwa L.V. and J.V. Staden, "Antibacterial and antifungal activity of traditional medicinal plants used against venereal dis¬eases in South Africa", *J. Ethnopharmacol.* 2006; 103 (1): 139–142.
15. Mohana D.C., K.A. Raveesha and R. Lokanath, "Herbal reme¬dies for the management of seed-borne fungal pathogens by an edible plant *Decalepis hamiltonii* (Wight & Arn). Arch.", Phytopathol. Plant Protect. 2008; 41(1): 38–49.
16. Onkar D., Dhingra and B. James, "Basic plant pathology method", Boca Raton, Fla.: CRC Press, 1995; pp 287-305.
17. Harborne J. B., "Phytochemical methods: A guide to modern techniques of plant analysis. 3rd ed", Chapman & Hall Pub., London, UK. 1998; pp.7–8.
18. Gottlieb O. R., M. R. Borin and N. R. Brito, "Integration of ethnobotany and Phyto-chemistry: dream or reality", Phytochemistry, 2002; 60 (2): 145–152.
19. Shilpakala, Sainath R., J. Prathiba and R. Malathi "Antimicrobial properties of the stem bark of *Saraca indica* (Caesalpiniaceae)", European Review for Medical and Pharma-cological Sciences, 2009; 13: 371-374.
20. Igbinosa O. O., E.O. Igbinosa and O.A. Aiyegoro, "Antimicrobial activity and phytochemical screening of stem bark extracts from *Jatropha curcas* (Linn.)", *African Journal of Pharmacy and Pharmacology,* 2009; 3(2): 058-062.
21. Tang, Jing, Xiangjie Meng, Hao Liu, Jianglin Zhao, Ligang Zhou, Minghua Qiu, Xianming Zhang , Zhu Yu and Fuyu Yang, "Antimicrobial activity of sphingolipids isolated from the stems of cucumber (*Cucumis sativus* L.)" Molecules, 2010; 15: 9288-9297.
22. Priya S., Zeeshan Afsar, Salma Khanam and Bhuvaneshwari, "Studies on antifungal activity of different extracts of *Cassia fistula* and bioactivity guided isolation and identification of antifungal agent", *International Journal of Pharma World Research,* 2010; 1(2): 1-19.
23. Londonkar R., V. Chinnappa Reddy and K. Abhay Kumar "Potential antibacterial and antifungal activity of *Achyranthes aspera*", Recent Research in Science and Technology, 2011; 3(4): 53-57.
24. Amadi J.E., Salami S.O. and C. S. Eze, "Antifungal properties and phytochemical screening of extracts of African Basil (*Ocimum gratissimum* L.) Agric. Biol. J. N. Am., 2010; 1 (2): 163-166.
25. Mayuri C. Rathod, Namrata Das and D. A. Dhale, "Antifungal Activity of Two Medicinal Plants against Fungus *Candida albicans*" *International Journal of Pharma and Bio Sciences.* 2015; 6 (4): 701-706.
26. Mayuri C. Rathod, Rinkal Lakhani and D. A. Dhale, "Antimicrobial Activity of Methanol Solvent Extracts of *Cassia fistula*", World Journal of Pharmaceutical Research, 2015; 4 (11): 1140-1147.
27. Mayuri C. Rathod, Vaishali G. Godhani and D. A. Dhale, "Antifungal Activity of Some Medicinal Plant Material Extract Against Fungus *Aspergillus niger*", World Journal of Pharmacy and Pharmaceutical Sciences, 2015; 4 (10): 1323-1332.
28. Mayuri C. Rathod, Dashrath D. Ghori and D. A. Dhale, "Antimicrobial Activity of *Aegle marmelos* leaves Extracts in Different Solvents", *International Journal of Botany Studies,* 2021; 6(04): 228-230.