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Evaluation of *In vitro* Antifungal Activity of Some Plant Extractives

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Abstract

Thirty-two extractives of seven plants obtained using hexane, ethyl acetate and methanol were tested for their *in vitro* antifungal activity against the mycelial growth of *Colletotrichum gloeosporioides*. Among these extractives, ethyl acetate extractives of onion seeds, chilli seeds and chilli pericarps and methanol extractives of chilli seeds and chilli pericarps exhibited more than 20% mycelial growth inhibition at a concentration of 0.5% level. Methanol extractives of *Solanum viarum* berries and ethyl acetate extractive of soybean leaves exhibited more than 20% mycelial growth inhibition at a concentration of 1.0% level. Thin layer chromatographic bioautography showed that hexane and ethyl acetate extractives of onion seeds, chilli seeds and chilli pericarps exhibited spore germination inhibition of *Cladosporium cucumerinum* at a dose of 1.0 mg.

Keywords: Antifungal activity • Plant extractives • *Colletotrichum gloeosporioides* • *Cladosporium cucumerinum*

Introduction

Investigations regarding the antifungal activity of plant extractives are important because they give insight into the defence mechanism evolved by plants against the attack of fungal pathogens. Such plant extractives and compounds with antifungal activity can be used against human, animal and plant pathogens and for post-harvest preservation, provided they possess suitable properties and sufficient amounts can be extracted from natural sources. Alternatively, structure elucidation of natural antifungal compounds helps in the synthesis of the compounds per se or analogues with improved physical and biological properties. Quantitative evaluation of such compounds in crop plants can facilitate the screening of plants for the development of resistant varieties [1-3].

Case Study

In this paper the evaluation of thirty-two extractives of plant materials namely onion seeds, onion leaves, *Gloriosa superba* seeds, *Bougainvillea spectabilis* (green leaves, white bracts and pink bracts), chilli seeds, chilli pericarps, *Solanum viarum* berries *Albizia amara* leaves and soybean leaves obtained using hexane, ethyl acetate and methanol for their antifungal activity against the mycelial growth of *Colletotrichum gloeosporioides* is being discussed. Evaluation of the extractives of onion seeds, chilli seeds and chilli pericarps against the spore germination of *Cladosporium cucumerinum* by TLC bioautography is also being discussed (Table 1) [4,5].

Table 1. Plant materials extraction based on therapeutic activity.

Plant materials extraction	Solvent used for extraction	Therapeutic activity
Onion seeds	Hexane	Anti-fungal activity
Onion leaves		
Gloriosa superba seeds		
Chilli seeds	Ethyl acetate	
Chilli pericarps		
Solanum viarum berries	Methanol	
Soybean leaves		

The plant materials except soybean leaves were collected from the farms of ICAR-Indian Institute of Horticultural Research (IIHR), Hessaraghatta, Bangalore, India or purchased from the local market. Soybean leaves were obtained from ICAR-Indian Institute of Soybean Research, Indore, Madhya Pradesh, India. The plant materials were dried at 60 °C and subsequently powdered. The powdered plant materials were extracted in a Soxhlet apparatus first with hexane, then with ethyl acetate, and finally with methanol. In the case of *G. superba*, methanol extraction was done immediately after hexane extraction. The respective extractives were obtained by completely distilling out the solvents on a water bath and were tested for antifungal activity [6].

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Discussion

Colletotrichum gloeosporioides ITCC 4573 was used for the poisoned food technique and *Cladosporium cucumerinum* IMI 249540 was used for TLC bioautography. Antifungal activity of hexane, ethyl acetate, and methanol extractives was studied by observing the mycelial growth inhibition of *C. gloeosporioides* by poisoned-food technique by procedure earlier reported from this institute. Percent mycelial growth inhibition was calculated using the formula P=(C-T/C) × 100, where C is the mycelial diameter of the control and T that of treated ones, after giving due adjustment of the mycelial diameter of the inoculum. For TLC bioautography, conidial suspension of *C. cucumerinum* in the nutrient solution [7,8].

The results of *in vitro* antifungal activity of thiry-two extractives of seven plants against the mycelial growth of *C. gloeosporioides*. Among these extractives, ethyl acetate extractives of onion seeds, chilli seeds and chilli pericarps and methanol extractives of chilli seeds and chilli pericarps exhibited more than 20% mycelial growth inhibition at a concentration of 0.5% level. Methanol extractives of *Solanum viarum* berries and ethyl acetate extractive of soybean leaves exhibited more than 20% mycelial growth inhibition at a concentration of 1.0% level. Hexane extractives of onion seeds, chilli seeds and chilli pericarps did not show activity against the mycelial growth of *C. gloeosporioides*. The extractives of onion leaves, *Albizia amara* leaves, *Bougainvillea spctabilis* (green leaves, white bracts and pink bracts) and seeds of *Gloriosa superba* also did not show any significant activity [9,10].

Chemical nature of some antifungal compounds present in the presently investigated plants has been reported by earlier workers. An antimicrobial protein has already been isolated from onion seeds. But it is doubtful whether the antifungal activity of ethyl acetate extractive presently reported is due to this protein since ethyl acetate extractive has only moderate polarity. In an earlier communication from this institute, nematicidal activity of methanol extractive obtained by hot percolation of defatted seeds was also reported. Antifungal activity of capsaicin present in chilli has been established. Antifungal activity of isoflavones in soybean leaves and glyceollins in infected soybean leaves also has been reported. Antifungal activity of glycoalkaloids of *Solanum viarum* has been proved [11,12].

Conclusion

The results shows that the hexane extractives of onion seeds, chilli seeds and chilli pericarps do not show activity against the mycelial growth of *C. gloeosporioides* even at a high concentration of 1% level. These extractives show activity against the spore germination of *C. Cucumerinum* on TLC plate. A similar trend was observed in the earlier studies reported from this institute in the cases of watermelon seeds and tomato seeds. Most probably the fatty acid esters present in the hexane extractives of these vegetable seeds (watermelon, tomato, onion and chilli) have an antagonistic effect on the antifungal compounds as far as mycelial growth inhibition of *C. gloeosporioides* is concerned. But this antagonistic effect of fatty acid esters is not effective in case of activity against the spore germination of *C. cucumerinum*. It is noteworthy that the ethyl acetate extractives of onion seeds, chilli seeds and chilli pericarps exhibit activity against the mycelial growth of *C. gloeosporioides* and spore germination of *C. cucumerinum* on TLC plate. Direct bioautography of the methanol extractives of onion seeds, chilli seeds and chilli pericarps on TLC plate without prior elution with ethyl acetate did not exhibit any inhibition. This is most probably due to the presence of some carbohydrates or peptides present in the methanol extractives which promote the growth of *C. cucumerinum*. For the TLC plates spotted with methanol extractives are previously eluted with ethyl acetate and then sprayed with the inoculum, inhibition zones are seen upon incubation.

References

1. Nene, YL, Thapliyal PN. "Fungicides in Plant Disease Control Oxford and IBH Publ." (1993): 507.
2. Nidiry, Eugene Sebastian J, Ganeshan G, and Lokesha AN. "Antifungal Activity Of Mucuna Pruriens Seed Extractives And L-Dopa." *J Herbs Spices Med Plants* 17 (2011): 139-143.
3. Homans, AL, and Fuchs A. "Direct Bioautography on Thin-Layer Chromatograms as a Method for Detecting Fungitoxic Substances." *J Chromatogra* 51 (1970): 327-329.
4. Nidiry, ESJ. "Antifungal Activity of Watermelon Seed Extracts." *Fitoterapia* 69 (1998): 466-468.
5. Cammue, Bruno Philippe Angelo, Thevissen K, and Hendriks M, et al. "A Potent Antimicrobial Protein from Onion Seeds Showing Sequence Homology to Plant Lipid Transfer Proteins." *Plant Physiol* 109 (1995): 445-455.
6. Nidiry, ESJ, Chandravadana MV, Khan RM, and Rao MS. "*In vitro* Nematicidal Activity of Extracts of Bulbs and Seeds of Onion against Root-Knot Nematode Meloidogyne incognita." *Nematologia Mediterranea* (1994): 37-40.
7. Fieira, Claudia, Oliveira F, Calegari RP, and Machado A, et al. "*In vitro* And *In vivo* Antifungal Activity of Natural Inhibitors against Penicillium expansum." *Food Sci Technol* 33 (2013): 40-46.
8. Cipollini, Martin L, and Levey DJ. "Antifungal Activity of Solanum Fruit Glycoalkaloids: Implications for Frugivory and Seed Dispersal." *Ecol* 78 (1997): 799-809.
9. Kim, Hyo Jung, Suh HJ, Lee CH, and Kim JH, et al. "Antifungal Activity of Glyceollins Isolated from Soybean Elicited with Aspergillus sojae." *J Agri Food Chem* 58 (2010): 9483-9487.
10. Naim, Michael, Gestetner B, Zilkah S, and Birk Y, et al. "Soybean isoflavones Characterization, Determination, and Antifungal Activity." *J Agri Food Chem* 22 (1974): 806-810.
11. Nidiry, ES J. "Antifungal Activity of Watermelon Seed Extracts." *Fitoterapia* 69 (1998): 466-468.
12. Nidiry, ES J. "Antifungal Activity of Tomato Seed Extracts." *Fitoterapia* 70 (1999): 181-183.

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