

## Antifungal activity of the ethyl acetate extract of *Cyperus rotundus* rhizome against certain fungi responsible for food spoilage and plant diseases

Meera Pal<sup>1</sup>, JS Srivastava<sup>2</sup>

<sup>1</sup> Research Scholar, Department of Home Science, Mahila Mahavidyalaya, Banaras Hindu University, Varanasi, Uttar Pradesh, India

<sup>2</sup> Department of Mycology and Plant Pathology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

### Abstract

Antifungal activity of the ethyl acetate EXTRACT of *Cyperus rotundus* rhizome was tested against certain saprophytic fungi viz. *Alternaria spp.*, *Curvularia spp.*, *Colletotrichum sp.*, *Erysiphe cichoracearum*, *Fusarium sp.* and *Helminthosporium sp.* The inhibition of the spore germination of the fungi was recorded against all tested fungi at concentration of 750 ppm.

**Keywords:** Antifungal activity, *Cyperus rotundus*, ethyl acetate extract

### Introduction

Synthetic fungicides being used continuously for the control of the plant diseases have caused serious threat to the environment as well as human health. Recent awareness of the hazardous effects of these chemicals has resulted in use of eco- friendly approaches for plant disease control by using plant products and biocontrol agents. Various active principles isolated from plant sources have proven their efficiency in suppressing diseases *in vitro* (Asthana *et al.*, 1982, Singh *et al.*, 1996, Prithiviraj *et al.*, 1997) [1, 8, 5] and in the field conditions (Prithiviraj *et al.*, 1996, 1998, Sharma *et al.*, 1999) [7].

*Cyperus rotundus* (Family: Cyperaceae), a common weed of the tropical area propagates through its rhizomes. Crude aqueous extract from rhizome and rhizome meal has shown prominent inhibitory activity against several fungi and induced basidial stage in *Citrantia limitata* (Singh *et al.*, 1996, Maurya *et al.*, 2002) [8, 3]. Looking at the varied activities of *C. rotundus*, the present investigation was carried out to assess the effect of the acetate fraction of the *C. rotundus* rhizome on various phytopathogenic and saprophytic fungi.

### Material and methods

All the fungi were isolated from their natural habitat for respective hosts collected from agricultural research farm, Banaras Hindu University, Varanasi, India and cultured on PDA (peeled potato 250 g, dextrose 20 g, agar-agar powder 15 g and distilled water 1 l.). Fresh rhizomes of *C. rotundus* collected from the field are washed to remove soil particles and dried at room temperature. Rhizomes were ground in an electric grinder and the powder (1 kg) was extracted in Soxhlet extractor using ethyl acetate for 12 h. the solvent was distilled to yield crude extract (34 g) and subjected to clean-up on silica-gel column packed with sigel (120 mesh size), The column was first eluted with petroleum ether (250 ml) and then washed with ethyl acetate (250 ml) to obtain purified extract (16.9 g). Various concentrations (750, 1000, and 1500 ppm) of this purified extract was prepared to

assess the spore germination inhibition activity as per the standard method against different fungi (Maurya *et al.*, 2001) [3].

### Results and discussion

Ethyl acetate extract of *C. rotundus* rhizome showed prominent antifungal activity in terms of the inhibition of the spores of various phytopathogenic fungi (Table 1). The results indicated that spores of *Curvularia penniseti* and *Colletotrichum gloeosporioides* failed to germinate even at lowest concentration (750 ml) tested while certain other fungi i.e. *Branchysporium sp.*, and *Alternaria tenuissima*, *A. solani*, *Erysiphe cichoracearum* and *Curvularia sp.* inhibited completely at 1500 ml. Even at 750 and 1000 ml, the spore germination of the fungi was quite less as compare to control, indicating that inhibition of spores was found at all concentrations tested.

**Table 1:** Effect of ethyl acetate extract of *C. rotundus* rhizome on spore germination of some fungi.

Fungus	Spore germination (%) Concentration ( $\mu\text{g/ml}$ )			
	0	750	1000	1500
<i>Alternaria sp.</i>	86	42	22	18
<i>Alternaria solani</i>	75	5	0	0
<i>Alternaria tenuissima</i>	31	26	19	0
<i>Branchysporium sp.</i>	71	18	4	0
<i>Curvularia sp.</i>	26	9	3	0
<i>Curvularia penniseti</i>	71	0	0	0
<i>Colletotrichum sp.</i>	50	0	0	0
<i>Fusarium sp.</i>	53	14	-	2
<i>Helminthosporium</i>	78	32	20	10
<i>Erysiphe cichoracearum</i>	25	12	3	0

From the results, it is evident that the ethyl acetate fraction of rhizome of *C. rotundus* contain potent active constituents responsible for the antifungal activity. Singh *et al.* (1996) [8] observed that the ethyl acetate fraction of rhizome showed antifungal activity and inhibited spore germination and

development of *Fusarium udum*, a fungal pathogen responsible for wilt of pigeon pea. On the other hand, methanolic extract of rhizome induced basidial stage in several fungi (Singh *et al.*, 1996)<sup>[8]</sup>. Mayura *et al.*, (2002)<sup>[2]</sup> observed enhancement in the sporulation of some fungi at low concentrations of rhizome meal amended medium but there was decrease in sporulation with the increase in the concentration of rhizome meal.

From the present studies, it is evident the rhizome of *C. rotundus* consists of variable chemical compounds, inhibitory at higher concentration and induction of sexual stage as well as enhancement of sporulation at low concentration.

## References

1. Asthana A, Chandra H, Dixit A, Dixit SN. Volatile fungi toxicants from leaves of some higher plants against *Helminthosporium oryzae*. Z. Pflanzenkr. 1982; 89:475-479.
2. Mayura S, Srivastava JS, Jha RN, Pandey VB, Singh UP. Effect of tetrahydropalmatine, an alkaloid on spore germination of some fungi. Mycobiol. 2001; 29:142-145.
3. Maurya S, Srivastava JS, Singh UP. Effect of *Cyperus rotundus* rhizome on mycelial growth and sporulation of some fungi. bioved. 2002; 13:1-6.
4. Prithivira JB, Singh UP, Khiste S, Ram D. Effect of methanol extract of *Aegle marmelos* leaves on *Sclerotium rolfsii*. Int. J. Pharmacol. 1996; 34:148-150.
5. Prithiviraj B, Manicham M, Singh UP, Ray AB. Antifungal activity of anacardic acid, a naturally occurring derivative of salicylic acid. Can. j Bot. 1997; 74:207-211.
6. Prithiviraj B, Singh UP, Singh SK, Schumacher KP. Field evaluation of ajoene, a constituents of garlic (*Allium sativum*) an product of neem and neemazal, a product of neem (*Azadirachta indica*) against powdery mildew (*Erysiphe pisi*) of pea (*Pisum sativum*) z. pflanzen car pflanzensch. 1998; 105:274-278.
7. Sarma SK, Pandey VB, Mishra GD, Singh UP. Antifungal activity of berberine iodide, a constituents of *Fumaria indica*. Folia Microbiol. 1999; 44:164-166.
8. Singh UP, Prithivira JB, Khiste S, Dalai S, Singh A. Induction of sexual reproduction in *Sclerotium rolfsii*, *Ustilago cynodontis* and *Citrancia limitata* by *Cyperus rotundus*. Can. j. Botany. 1996; 74:803-806.
9. Singh UP, Prithiviraj B, Khiste S, Kumar V, Srivastava JS, Manichum M, Singh A. Effect of *Cyperus rotundus* rhizome extract on *Fusarium udum*. Indian Phytopath. 1999; 52:18-23.