International Journal of Applied Research 2016; 2(1): 450-451

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2016; 2(1): 450-451
www.allresearchjournal.com
Received: 26-11-2015
Accepted: 29-12-2015

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

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Abstract
Antifungal activity of the ethyl acetate Extract of *Cyperus rotundus* rhizome was tested against certain saprophytic fungi *viz. Alternaria spp., Curvularia spp., Colletrotrichum 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 effacts of these chemicals has resulted in use of eco- friendly approches for plant disease control by using plant products and biocontrol agents. Various active prnciples 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) [4, 7].
Cyperus rotundus (Family: Cyperaceae), a common weed of the tropical area spropagates 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 from respectives hosts collected from agricultural research farm, Banaras Hindu University, Varanasi, India and cultured on PDA (peeled Patoto 250 g, dextrose 20g, agar-agar powder 15 g and distilled water 1 l.). Fresh rhizomes of *C. rotundus* collected from the field were washed to remove soil particles and dried at room temprature. 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) [2].

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 pennisetti* 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 and 1000 ml, the spore germinition of the fungi was quite less as compare to control, indicating that indicating that inhibition of spores was found at all concentrations tested.

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

Fungus	Spore germination (%) Concentration ($\mu g/ml$)			
	0	**750**	**1000**	**1500**
Alernaria sp.	86	42	22	18
Alternaria saloni	75	5	0	0
Alternaria tenuissima	31	26	19	0
Brachysporium sp.	71	18	4	0
Curvularia sp.	26	9	3	0
Curvularia pennisetti	71	0	0	0
Colletotrichum sp.	50	0	0	0
Fusarium sp.	53	14	-	2
Helminthosporium	78	32	20	10
Erysiphe chicoracearum	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*. (1999) [9] 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) [8]. Mayura *et al.,* (2002) 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 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.

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