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Biological Control of *Cyperus rotundus* L. by *Fusarium oxysporum*

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Cyperus rotundus L. is one of the most pernicious perennial weeds. It reproduces by seeds and also from chain of tubers underground connected by rhizomes. It affects almost all the crops from temperate to tropical region and difficult to control. There has been a number of attempts for development of bioherbicides that leaves minimum residue to the environment and are less toxic to non-target elements. In our present investigation, the diseased *C. rotundus* plants were collected for isolation and identification of the pathogen with a view to control this weed biologically using this bioagent.

Few infected, *C. rotundus* plants were collected from farmers' field at Kairapur, District 24 Parganas (N) and also from CRIJAF main farm, during January 2004. The symptoms of the disease were death of central leaf whorl followed by wilting of the whole plant. The outer leaf whorl remained alive for some days. The apical meristem of the tubers, where from the pseudostem and the active leaves originate, were rotten which was confirmed from the longitudinal section through the infected nuts. The pathogen was isolated and purified by repeated hyphal tip techniques. The purified pathogen was grown on PDA (containing extract of 200 g peeled potato, dextrose 20 g and agar-agar 20 g dissolved in 1000 ml distilled water, sterilized at 1.1 kg cm^{-2} for 20 min) at 25±1°C for 10 days in a BOD incubator. The micro conidia, macro conidia and chlamydospore of the pathogen were produced abundantly in PDA. The aqueous suspension of the spores was prepared. The concentration of spores in the suspension was 4.10×10^6 ml^{-1}.

A pot culture experiment was arranged in the laboratory in sunny and airy situation to test its pathogenecity on *C. rotundus*. This spore suspension was used for inoculation by soil drenching at three different concentrations, namely, original concentration (C), half (C/2) and quarter (C/4) of original concentration i. e. 4.10×10^6 spores per ml. Control or checks without pathogen were also maintained. The pots were kept moist by artificial watering. The room temperature ranged from 25 to 32° C. The inoculated plants were closely monitored. The death percentage and regeneration ability of *C. rotundus* were observed over control. The fate of the nuts after the death of plants through infection was also recorded.

The pathogen was identified as *Fusarium oxysporum* (Schlect) Snyder & Hansen. About two weeks after application, the infection started. Initially the central leaf whorl of the sedges started yellowing followed by wilting and they finally died. The mature and (6 to 8 inches height with 4 to 8 leaves) young both the types of plants were infected. The pathogen was found to be more virulent on young seedlings emerging from tubers compared to older ones. Almost entire population died within 40 days of inoculation. And hence a sort of seedling blight was also noticed. Ninety-eight per cent weeds died at 40 days after spray at full concentration 'C'. At half and quarter doses also the pathogen was found to control 90% of the total weeds inoculated initially. A linear relationship between the per cent death of *C. rotundus* and concentration of inoculum (spore of *Fusarium oxysporum*) was recorded.

$$Y = 86.5 + 2.72 \times 10^{-6} X, r = 0.976$$

Where, Y is the per cent death of sedge weed and X is the concentration of inoculums and $C = 4.10 \times 10^6$ spore ml^{-1} Till sixty days after death of *C. rotundus* plants, the regeneration from tubers was almost negligible. On the other hand, all the plants in control pots were active and healthy. The pots were maintained in the laboratory for further study. At 100 days after inoculation it was observed that under these three concentrations of inoculation, the percentage of rotten nuts was 88, 84 and 83,

respectively. The abortive nuts (the new sprouts grew upto few mm and then died due to infection within soil) at the said concentrations were 12, 16 and 17%, respectively (Table 1). Thus, *F. oxysporum* can kill *C. rotundus* terminating its regeneration capacity by destroying its nuts. However, the *F. oxysporum* being a notorious pathogen throughout the world, caution must be taken before its use. The toxic metabolites of this fungus can be extracted and its scope as herbicide can be confirmed through further experimentations.

Table 1. Cidal effect of *Fusarium oxysporum* on *Cyperus rotundus* at 40 days after inoculation

Inoculum concentration	Initial count of weeds	At 40 days after inoculation			At 60 days after inoculation	At 100 days after inoculation	
		No.of living weeds	No.of dead weeds	Mean death (%)	No. of regenerated plants	Rotten nuts (%)	Aborted nuts (%)
C	121	2	119	98	1	88	12
C/2	105	9	96	91	1	84	16
C/4	141	14	127	90	5	83	17
Control	70	95	0	0	0	0	0

C=4.10 x 10^6 spore ml^{-1}.

REFERENCE

Snyder, W. C. and H. N. Hansen, 1940. The species concept in *Fusarium*. *Amer. J. Bot.* **27** : 64-67.