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EFFECT OF PRAWN EXOSKELETON SUPPLEMENTED SMAY ON CULTURAL CHARACTERISTICS OF ENTOMOPATHOGENIC FUNGI (*ZOOPHTHORA RADICANS*)

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Abstract

Different concentrations of prawn exoskeleton were added along with standard medium sabouraud maltose agar yeast extract to check the effect of prawn exoskeleton on the growth and infectivity of *Zoophthora radicans*. Among different treatments, highest biomass, radial growth, spore germination and infectivity were recorded with SMAY+60% prawn exoskeleton treatment and lowest biomass, spore germination and infectivity were recorded in SMAY alone. There was significant difference between control and best treatment.

Key words: Growth, infectivity, prawn exoskeleton, *Zoophthora radicans*

Introduction

Entomopathogenic fungi as biological control agents show promise in reducing insect pest populations and damage in different agro-ecosystems (Inglis *et al.,* 2010). *Zoophthora radicans* has shown broad spectrum pathogenicity with varying degree of virulence and host specifity. Several methods and techniques are available for mass production but mostly designed to yield infective conidia. Present studies were undertaken to know the effect of prawn exoskeleton supplemented SMAY medium on the growth of entomopathogenic fungi, *Zoophthora radicans*

Materials and Methods

Fungus and insect culture

The fungus, *Z. radicans* was isolated from cadavers of rice leaf folder collected from field and cultured on SMA plates and maintained at 27°C. Healthy rice leaf folder larvae were collected from rice fields and reared on potted IR 50 rice plants following the standard method developed at International Rice Research Institute, Manila. Philipines (Heinrichs *et al.,* 1994).

Preparation of prawn exoskeleton powder

The prawn waste collected from shrimp farm and market was cleaned and washed thoroughly to remove the adhering tissues. Later it was thoroughly sundried and powdered finely. To get a uniform mixture with the synthetic medium, the ground powder was passed through sieve and fine powder of particle size, 37µ was obtained.

Five dosages *viz.* 2, 4, 6, 8, 10 gram per 100 ml amounting to 20, 40, 60, 80, 100 per cent of powder was added to Sabouraud maltose agar yeast extract medium (SMAY) separately and mixed thoroughly. The medium was autoclaved at 1.15kg/cm^2 for 15 min. and plated. Four replications were maintained in each dose besides control with the standard medium without prawn powder. Cultural features of the fungus namely *viz.,* biomass, radial growth, spore germination; infectivity of fungus against the rice leaf folder larvae in all the treatments were characterized (Basu and Banik, 2005).

Biomass

Fungal culture of 10 mm discs of the *Z. radicans* grown in SMA medium were taken from petri plate and inoculated in the SMAY medium containing 20, 40, 60, 80 and 100 per cent prawn waste powder separately and incubated for 10 days at 27°C. Mycelia mats were collected separately by suction filtering on pre-weighed filter paper (Whatman No.1), dried in hot air oven at 105°C for 24 h and weighed again. The difference in the weight denoted the biomass produced.

Radial Growth

Mycelia discs of ten mm were collected from actively grown *Z. radicans* culture. The colonies were seeded at the middle of agar medium containing 20, 40, 60, 80, 100 per cent prawn waste powder separately in petri plate. The dishes were incubated at 27°C. The diameter of growth circle of the fungal colony in each treatment was measured in mm.

Spore Germination

A drop of spore suspension of a concentration of 10^7spores per ml of *Z. radicans* prepared from the

respective treatment culture was placed on two mm agar discs seeded on cavity glass slide. The slides were incubated at 27°C in moist chambers having 100 per cent humidity and per cent germination was determined after 24 h. The criterion of spore germination was development of germ tube equal to diameter of spore.

Infectivity

The spore suspension of *Z. radicans* culture plate with a spore load of 10^7 spores per ml prepared from the respective treatment culture was given as fine mist spray on the leaf folder larvae confined in the mylar film cages. Third instar larvae numbering twenty were tested in each replication and mortality due to mycosis was recorded after four days of treatment. All the treatments were replicated four times.

Results and Discussion

Results of role of prawn exoskeleton supplemented SMAY medium on the biomass, radial growth, spore germination and infectivity of the fungus are illustrated.

Prawn waste showed varying response on biomass production by *Z. radicans*. Among the different concentrations of the prawn waste tested in the standard media, 60%, 80% and 100% doses were found to be better (722.49 mg, 710.67 mg and 698.31 mg) in brought out the biomass production which was significantly higher than that produced from 20% (611.50 mg), 40% (644.17 mg), whereas the control (SMAY) recorded biomass of 597.63 mg and it was less than that of 20 and 40 percent dosages in the standard medium.

Among the various concentrations of prawn waste tested in the synthetic media, 60 per cent prawn waste has influenced the highest radial growth (84.88 mm) of the fungus followed by 80 per cent prawn waste (78.22 mm) and 100 per cent (76.65 mm). The control with synthetic media without prawn waste recorded (74.25 mm) radial growth and it was on par with the synthetic medium with 20 and 40 per cent (74.34 mm and 74.19 mm) respectively

Synthetic medium containing 60 per cent prawn waste resulted in the maximum spore germination (91.64%) followed by 80 and 100 per cent prawn waste (91.15 and 90.50%). The synthetic medium with 20 per cent prawn waste had lowest germination (81.06%) and on par with the control.

Highest per cent mortality (74.70%) of the leaf folder larvae was obtained with synthetic medium having 60 per cent fish scale waste followed by 80 and 100 per cent fish scale waste with 70.90 and 69.74% mortality. However the doses of prawn waste in the synthetic medium excelled the control medium (Synthetic media alone) in respect of infectivity of the fungus.

The results obtained showed that 60% prawn waste in the synthetic medium SMAY was rated as the superior in enhancing the growth parameters and infectivity of the fungus *Z. radicans* when compared to the control (Synthetic medium SMAY alone). Similarly Narayanasamy and Udhaya prabhakar (1996) found that growth characteristics and infectivity of the fungus *Z. radicans* increased significantly when cultured on SMA + 50 per cent prawn exoskeleton. Findings obtained in the present study also confirmed with the observations of Parthasarathy (1998). Fish scale waste was also tested for biometric characteristics and 100% fish scale waste was rated as superior in enhancing the growth parameters and infectivity of the fungus *Z. radicans.*

Magalhaes *et al.* (1991) stated that various nitrogen and carbon sources influenced the conidium germination and fungal morphology. From the above findings, it can be inferred that chitin, a rich source of carbon and nitrogen can be utilized effectively by *Z. radicans* to put forth more growth and infectivity. But when synthetic chitin alone was used, it remained under utilized.

Coudron *et al.* (1984) examined the production of chitinase and exochtinase activity in the germinating conidia of fungi like *Beauveria bassiana, Metarhizium anisopliae* and *Nomuraea rileyi.* Similarly to quicken the process of infection*, Z. radicans* might utilize the chitin by producing chitinase enzyme. Therefore, it is concluded that the Prawn waste can be a good supplement in promoting the growth of entomopathogens like *Z. radicans.* Based on this, it is suggested that prawn waste which get accumulated in the prawn market can be used as an ingredient in synthetic medium in the production of pathogenic culture.

Table 1: Effect of prawn exoskeleton supplemented SMAY on cultural characteristics of *Z. radicans*

S. No.	Treatments	Biomass (mg)*	Radial Growth (mm)*	Spore Germination (%)**	Infectivity (%)**
1.	SMAY+20% PE	611.50 (24.70)^{c}	74.34 (8.60)^{be}	81.06 (64.20)^{ef}	66.57 (55.10)^{de}
2	SMAY+40% PE	644.17 (25.40)^{b}	74.19 (8.60)^{bf}	86.23 (68.40)^{d}	67.26 (55.10)^{d}
3.	SMAY+60% PE	722.49 (26.90)^{a}	84.88 (9.20)^{a}	91.64 (73.70)^{a}	74.70 (59.30)^{a}
4	SMAY+80% PE	710.67 (26.70)^{ab}	78.22 (8.80)^{b}	91.15 (71.80)^{b}	70.91 (57.10)^{b}
5	SMAY+100% PE	698.31 (26.40)^{ac}	76.65 (8.80)^{bc}	90.50 (71.80)^{bc}	69.74 (57.10)^{bc}
6	SMAY (Control)	597.63 (24.40)^{cd}	74.24 (8.60)^{bd}	80.52 (64.20)^{e}	60.98 (51.30)^{f}
	CD($p_{=0.05}$)	0.006	0.0047	0.2193	0.4184
	SE	0.0021	0.0016	0.0762	0.1423

Each value is mean of four replications
Figures in parenthesis are square root* /arc sin** transformed values
In a column means followed by common letter are not significantly different

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