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Original Research Article

Bioassay of Fungicides against *Aspergillus niger*, an Incident of Collar Rot Disease of Groundnut

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Keywords

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A B S T R A C T

Groundnut is a very important crop of developing countries. *Aspergillus niger* commonly results in seedling blight, but also may affect older plants from mid to late season. *A. niger* is present in most peanut soils and is a common contaminant of peanut seed. The efficacy of ten different chemicals was tested on PDA medium against *A. niger* by inhibition zone technique for analyzing the efficiency of chemicals in managing the disease. Against *Aspergillus niger* maximum antifungal activity was shown by thiophanate methyl at 0.15% (100%) followed by tebuconazole (60.60%), difenconazole (50.8%), azoxystrobin (49.69%). Thiophanate methyl at 0.15% was the most effective fungicide and chlorothalonil was the least effective fungicide against *Aspergillus niger.*

Introduction

Groundnut is very important crop of developing countries which contributes around 95% of world production (Nautiyal, 2002). In India it is considered to be major oilseed crop. Major groundnut growing states in India are Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Rajasthan and Maharashtra. The rest of the area are mainly scattered in the states of Odisha, Punjab, Uttar Pradesh and Madhya Pradesh. Diseases caused by soil borne pathogens especially pose a threat to groundnut production. Collar rot of groundnut caused by *Aspergillus niger van Tieghem* is a very common and destructive seed and soil borne disease in India causing seedling losses up to 50 per cent, largely account for the pre and post-emergence death of the seed and seedlings(Rajasekharam and Reddy, 2013).

Aspergillus crown rot commonly results in seedling blight, but also may affect older plants from mid to late season. The fungus that causes crown rot, *Aspergillus niger*, is different from the species that causes aflatoxin contamination of harvested kernels. *A. niger* is present in most peanut soils and is a common contaminant of peanut seed. However, outbreaks of the disease are sporadic and appear to be related to the prior occurrence of one or more stresses. Extreme heat or fluctuations in soil

moisture during the seedling stage, poor seed quality, seedling damage from pesticides or cultivation, and feeding by root and stem boring insects are stresses thought to aggravate the disease. Therefore, the present study mainly focuses on analyzing the efficiency of chemicals in managing the disease.

Materials and Methods

The efficacy of ten different chemicals was tested on PDA medium against *A. niger* by inhibition zone technique. PDA was prepared, sterilized and poured in sterile petriplates @10ml/petriplate from an actively growing and sporulating pure culture of fungus, spores are harvested by pouring sterile distilled water and gently scraping the culture with the help of flame sterilized and cooled inoculation loop. Harvested spores are collected in a spore suspension. Spore suspension was mixed with sterile luke warm and molten PDA to prepare seeded agar. Swrilling was done to distribute spores uniformly in the PDA. Seeded agar was poured on the top of the agar in agar plates @5ml/PDA plate. Fungicide solutions of required concentrations are prepared. Sterilized filter paper discs were immersed in fungicide solution for 10-20 min. Filter paper discs impregnated with fungicide were transferred on to the center of seeded agar plate. Plates were incubated @27±1ºC in BOD chamber. Per cent inhibition in the growth of the organism in different chemical treatments over the control was calculated.

Percentage of inhibition I =C-T/C × 100

I - % inhibition.
C - Area of growth in control plate
T - Area of growth in treatment plate.

Where,

T = total area of plate – area of zone of inhibition.

Further, angular transformation values for the data were taken and analysed statistically.

Results and Discussion

Antifungal activity of various chemicals was assayed *in-vitro* by inhibition zone technique for *Aspergillus niger*. Results revealed that all the systemic fungicides were capable of inhibiting growth of test fungus at recommended dosage as compared to check.

Against *Aspergillus niger* maximum antifungal activity was shown by thiophanate methyl at 0.15% (100%) followed by tebuconazole 60.60%, difenconazole 50.8%, azoxystrobin 49.69%. Mixed fungicide carbendazim + mancozeb, carboxin + thiram showed 26.90% or 21.90% inhibition which was at par with each other and least inhibition of growth was shown by chlorothalonil (6.75%).

Thiophanate methyl at 0.15% was the most effective fungicide and chlorothalonil was the least effective fungicide against *Aspergillus niger*.

Similar results were obtained by Nathawat, (2014) who reported that the cent per cent growth inhibition was recorded in tebuconazole and propiconazole at 100 to 1000 ppm (Table 1).

The next effective fungicides were carbendazim (500, 750 and 1000 ppm), difenoconazole (750 and 1000 ppm), combination product of carbendazim + mancozeb and captan (1500, 2000 & 2500 ppm) which were also caused cent per cent growth inhibition of collar rot fungus.

Table.1 Evaluation of fungicides against *Aspergillus niger in vitro*

Sl. No	Treatment	Dosage	*Aspergillus niger*	
			Radial growth(cm)	% inhibition
T1	Carbendazim 12%WP+Mancozeb63%WP	0.2%	2.33	26.96 (31.21)*
T2	Chlorothalonil 75%WP	0.2%	1.16	6.75 (14.97)
T3	Thiophanate methyl 50%WP	0.15%	0.00	100.00 (90.00)
T4	Tebuconazole 25.9%EL	0.1%	3.50	60.60 (51.14)
T5	Hexaconazole 5%SC	0.1%	3.06	46.70 (43.07)
T6	Difenconazole 10% WP	0.1%	3.36	57.83 (49.59)
T7	Azoxystrobin 25%EC	0.1%	3.16	49.69 (44.80)
T8	Propiconazole 25%EC	0.1%	1.46	10.63 (18.96)
T9	Carboxin 37.5%+Thiram 37.5%	0.2%	2.10	21.90 (27.83)
T10	Control		8.83	0.00 (0.00)
	CD 5%		0.365	5.481
	SE(m)±		0.123	1.845
	CV%		7.342	8.601

* Figures in the parenthesis are arc sin transformed value

Sharma *et al.,* (2012) observed that maximum inhibition of mycelial growth of *A. niger* with bifenthrin whereas, carbendazim and mancozeb completely inhibited the growth of *A. niger* at 500 and 1000 ppm and partially inhibited the growth at 100 and 250 ppm *in-vitro*, respectively.

Results of present study revealed that Thiophanate methyl at 0.15% inhibited *Aspergillus niger* growth by 100% followed by triazole group of fungicides and carbendazim + mancozeb.

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