

Original Research Article

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Evaluation of Fungicides and Botanicals against Major Seed-Borne Pathogen of Chickpea Seed Isolated from Tikamgarh District of Madhya Pradesh, India

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ABSTRACT

Keywords

Fungicides, Botanicals, Seed borne pathogens, Chickpea and poisoned food technique

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The present study revealed that the growth of *R. bataticola* was effectively inhibited (100%) by all the fungicides viz., Carbendazim (0.2%), Carboxin (0.2%), Mancozeb (0.2%), Carbendazim (0.1%) + Carboxin (0.1%) except inhibition (23.28%) by Neem extract 5%. Similar trend was observed in pathogens viz., *F. oxysporum* f. sp. *ciceri*, *Penicillium* spp. and *A. niger*. The completely growth (100%) was inhibited by fungicides Carbendazim (0.2%), Carboxin (0.2%), Carbendazim (0.1%) + Carboxin (0.1%) followed by Mancozeb (77.49, 75.60 and 74.52 %). Whereas Neem extract was resulted in poor inhibition of the pathogens (74.56, 48.41 and 43.97%). The seed-borne pathogens *Rhizopus* spp. was effectively completely (100%) inhibited by the Carbendazim (0.1%)+Carboxin (0.1%) followed by Carboxin (42.34%), Mancozeb (30.98%), Carbendazim (23.49%) and the lowest inhibition of the pathogens radial growth was showed by the Neem extract (23.43%).

Introduction

Chickpea (*Cicer arietinum*) is one of the most important pulse crops district Tikamgarh of Madhya Pradesh. In Madhya Pradesh, the chickpea production was 22.97 lac tonnes from an area of 26.21 lac ha with an average productivity of 877 kg ha⁻¹ during 2015-16¹. In Tikamgarh district, the annual production

was 240.26 tonnes from 20.26 ha with an average productivity 1200 kg/ha^{2&3}.

Chickpea cultivation is often subjected to significant yield losses due to insects and diseases ranging from 5-10% in temperate and 50-100% in tropical regions⁴.

Currently chickpea is affected by 172 pathogens of which 67 fungi, 3 bacteria, 22

viruses and mycoplasma, and 80 nematodes reported from 55 countries. Maximum number of pathogens infecting chickpea (89) had been reported from India while in other countries, it varied from 1 to 40⁵. Important fungal diseases of chickpea and their causal organisms are Dry root rot (*Rhizoctonia bataticola*), Fusarium wilt (*Fusarium oxysporum f. sp. ciceri*), Seedling/ seed rot (*Aspergillus niger*), Ear rot of maize (*Penicillium sp.*), soft rot of vegetables (*Rhizopus sp.*)

Despite of different diseases, Fusarium wilt is most important disease of chickpea causes severe damage. Although the disease is wide spread in the chickpea growing areas of the world and most prevalent in the Mediterranean Basin and the Indian subcontinent⁶. The dry root rot (*R. bataticola*) is an important plant pathogen with worldwide distribution and wide host range and with variable characteristics. The species *R. bataticola* is a pathogen of over 290 plant species⁷. In view of its importance and significance of seed-borne diseases of chickpea, evaluation of fungicides and bio-pesticides against major seed-borne pathogens of chickpea seed *in-vitro* was carried out.

Materials and Methods

Evaluation of seed dressing fungicides

This study was carried out to know the efficacy of different seed dressing fungicides in eliminating the seed-borne fungal infections in the infected seed sample. The fungicides were tested initially under *in vitro* condition by using poison food technique⁸.

The trade name, common name and chemical names of fungicides used in the experiment are given below (Table 1).

All the fungicides were tested at recommended by adopting poisoned food

technique. The test pathogen was grown on PDA medium in Petri plates for seven days prior to setting up of experiment.

The required fungicidal suspension was added to the melted PDA medium to obtain the desired concentration on the basis of active ingredients present in the chemical. 20 ml of poisoned medium was poured in each Petri plate. Suitable checks were maintained without addition of fungicides.

A mycelial disc of five mm diameter was taken from the periphery of 7 days old colony and placed in the centre and incubated at $28 \pm 2^\circ\text{C}$ for full growth of the fungus. Three replications were maintained for each treatment. The radial growth of the colony was measured in two directions and average was recorded. Per cent inhibition was recorded by using the formula as under⁹:

$$PI = [(C-T)/C] \times 100$$

Where, PI = Per cent inhibition, C = Growth in control, T = Growth in treatment

Evaluation of plant extract

These plant extracts were tested initially under *in-vitro* condition by using poison food technique. The fresh leaves were grounded in a blender with distilled water.

The extract was filtered through double layered muslin cloth. The extracts were tried at concentration of 5 per cent for seed treatment, prepared by diluting the extract in distilled water.

Preparation of cold aqueous extract

Fresh plant material were collected and washed first in tap water and then in distilled water. 100 grams of fresh sample was chopped and then crushed in a surface sterilized pestle

and mortar by adding 100 ml sterile water (1:1 w/v). The extract was filtered through two layers of muslin cloth and the filtered was used as stock solution.

To study the antifungal mechanism of plant extract, the poisoned food technique⁸. 5 and 10 ml of stock solution was mixed with 95 ml and 90 ml of sterilized molten PDA media respectively so as to get 5 and 10 per cent concentration.

The medium was thoroughly shaken for uniform mixing of extract. 20 ml of medium was poured into sterile Petri dishes. Day Mycelium of 5 mm size disc taken from periphery of 7 day old culture were cut out by sterile cork borer and one such disc was placed on the centre of each agar plate. Control was also maintained by growing the pathogen on PDA plates.

Each treatment was replicated thrice and plates were incubated at $20 \pm 2^{\circ}\text{C}$ till control

plates reached the radial growth of 90 mm. The per cent inhibition over control was calculated by the formula given below⁹.

Results and Discussion

Among the different fungicides and bio-pesticide Table 1-3, figure 1 and chart-1, the growth of *R. bataticola* was effectively inhibited (100%) by all the fungicides viz., Carbendazim (0.2%), Carboxin (0.2%), Mancozeb (0.2%), Carbendazim (0.1%) + Carboxin (0.1%) except inhibition (23.28%) by Neem extract 5%. Similar trend was observed in pathogens viz., *F. oxysporum* f. sp. *ciceri*, *Penicillium* spp. and *A. niger*.

The completely growth (100%) was inhibited by fungicides Carbendazim (0.2%), Carboxin (0.2%), Carbendazim (0.1%) + Carboxin (0.1%) followed by Mancozeb (77.49, 75.60 and 74.52 %). Whereas Neem extract was resulted in poor inhibition of the pathogens (74.56, 48.41 and 43.97%).

Table.1 List of fungicides used in the experiment

S. N.	Common Name	Trade name	Chemical name
1.	Carbendazim (0.2%)	Bavistin 50% WP	2-(methoxy carbonyl)-benzimidazol
2.	Carboxin (0.2%)	Vitavax powder 75% WP	5,6-dihydro-2-methyl-1,4-oxathiin-3-carboxamide
3.	Mancozeb (0.2%)	Maneb 75% WP	Ethylene-bisdithiocarbamates
4.	Carbandazim (0.1%) + Carboxin (0.1%)	Bavistin + vitavax powder	2-(methoxy carbonyl)-benzimidazol + 5,6-dihydro-2-methyl-1,4-oxathiin-3-carboxamide

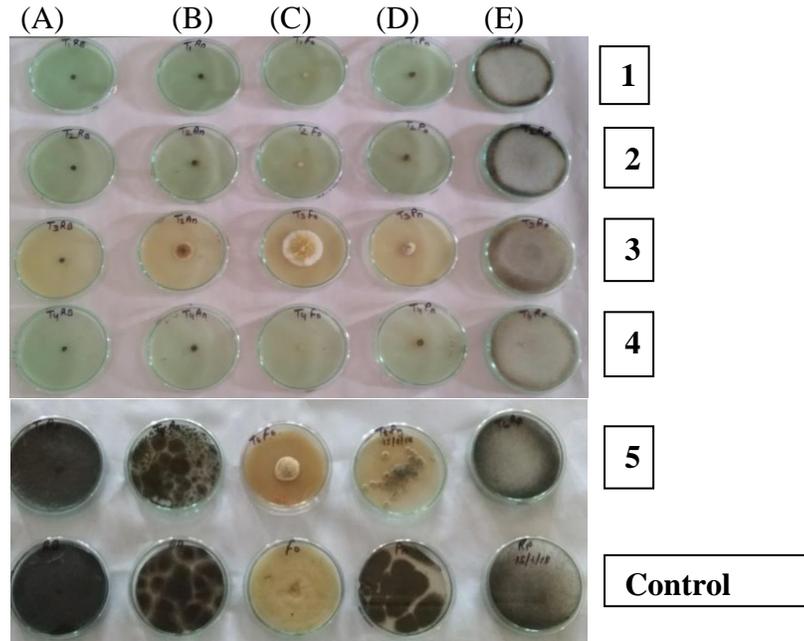
Table.2 Name of the bio-pesticide used in experiment

S.N.	Botanical name	Common name	Family	Used plant part
1.	<i>A. indica</i>	Neem	Meliaceae	Leaf

Table.3 Percent inhibition of radial growth of seed-borne pathogens of chickpea in *in-vitro*

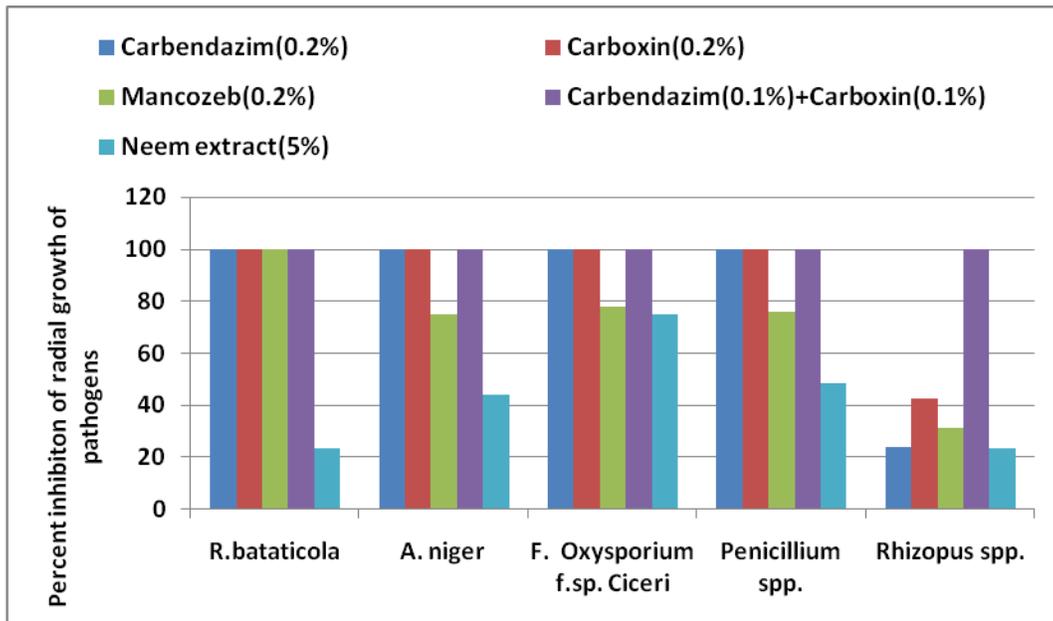
Fungicides and Bio-pesticide	Mean growth (mm) of seed-borne pathogens and inhibition over control (%)									
	<i>R. bataticola</i>		<i>A. niger</i>		<i>F. oxysporum</i> f. sp. <i>ciceri</i>		<i>Penicillium</i> spp.		<i>Rhizopus</i> spp.	
	Growth (mm)	Inhibition (%)	Growth (mm)	Inhibition (%)	Growth (mm)	Inhibition (%)	Growth (mm)	Inhibition (%)	Growth (mm)	Inhibition (%)
Carbendazim (0.2%)	00.00	100	00.00	100	00.00	100	00.00	100	33.00	23.43
Carboxin (0.2%)	00.00	100	00.00	100	00.00	100	00.00	100	24.86	42.34
Mancozeb (0.2%)	00.00	100	09.86	74.52	08.73	77.49	09.60	75.60	29.76	30.98
Carbendazim(0.1%) +Carboxin (0.1%)	00.00	100	00.00	100	00.00	100	00.00	100	00.00	100
Neem extracts (5%)	33.16	23.28	21.96	43.97	9.86	74.56	19.17	48.41	33.06	23.33
Control	43.23	-	39.20	-	38.80	-	37.16	-	43.13	-
C.D at 5 %	0.46		0.72		0.55		0.86		0.92	
S.E.(m)±	0.14		0.23		0.17		0.27		0.29	

Fig.1 Evaluation of fungicide and bio-pesticide against major seed-borne pathogens



(A) *R. bataticola*, (B) *A. niger*, (C) *F. oxysporium*, (D) *Penicillium* spp. and (E) *Rhizopus* spp and 1. Carbendazim (0.2%), 2. Carboxin (0.2%), 3. Mancozeb (0.2%), 4. Carbendazim (0.1%)+ (B) Carboxin (0.1%) and 5. Neem extract (5%)

Chart.1 Percent inhibition of seed-borne pathogens of chickpea over control by Poisoned Food technique



The seed-borne pathogens *Rhizopus* spp. was effectively completely (100%) inhibited by the Carbendazim (0.1%) + Carboxin (0.1%) followed by Carboxin (42.34%), Mancozeb (30.98%), Carbendazim (23.49%) and the lowest inhibition of the pathogens radial growth was showed by the Neem extract (23.43%). These results are also reported by the previous workers.^{10, 11 & 12}

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