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Integrated disease management of anthracnose of greengram

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Abstract

The field trial were conducted during *kharif* at Agricultural Research Station, Bidar on the management of anthracnose of greengram. The experiments were laid out in Randomized Block Design with two replication, botanicals and untreated control. Out of 17 treatments foliar spray of Propiconazole was found to be effective in control of the disease and increased the grain and stalk yields but foliar spray of Hexaconazole showed maximum BCR followed by Carbendazim seed treatment foliar spray of Carbendazim than Propiconazole and was also found to be effective in managing anthracnose of greengram and increased the grain and stalk yields.

Keywords: Management, anthracnose, greengram, field evaluation

Introduction

Greengram (*Vigna radiata* L.) is one of the important pulse crops of India. It is quite versatile crop grown for seeds, greengram manure and forage and it is also considered as “Golden Bean”. Presently in India greengram is cultivated over an area of 32.99 lakh hectare with a production of 13.74 lakh tones (Rajendra Prasad, 2006). The Hyderabad Karnataka area particularly Bidar and Gulbarga districts has an extensive cultivated area of greengram, pigeonpea and chickpea hence this region are called as “Pulse Bowl” of Karnataka. In Karnataka anthracnose caused by *Colletotrichum truncatum* (schw.). Andrus and More is one of the major diseases of greengram. In Northern Karnataka Anthracnose severity in the range of 18.2 to 86.5 % percent (Laxman, 2006) [5]. As there are no resistant variety available against this disease, it has become inevitable to go for effective management strategy using plant extracts, bioagents, Indigenous Technology Knowledge (ITK's) and fungicides. In the present study, the fungicides and biorationals which were found effective in laboratory condition were evaluated under field conditions.

Materials and Methods

The field trials were conducted during *kharif* at Agricultural Research Station, Bidar. The experiments were laid out in Randomized Block Design with two replications and seventeen treatments including chemicals, bioagent, botanicals and untreated control. The details of treatment combinations are given hereunder.

Experimental details

Variety: Chinamung; **Plot size :** 3.0 × 5.0 m

T ₁	: <i>Trichoderma harzianum</i> at 4 g/kg of seed (SD)
T ₂	: Carbendazium 50 WP at 2 g/kg of seed (SD)
T ₃	: Benomyl 50 WP at 2 g/kg of seed (SD)
T ₄	: Thiophanate methyl 70 WP at 2 g/kg of seed (SD)
T ₅	: Carbendazim 12% + mancozeb 63% at 2 g/kg of seed (SD)
T ₆	: Tricyclozole 75 WP at 2 g/kg of seed (SD)
T ₇	: T ₁ + One spray of Eucalyptus oil at 10%
T ₈	: T ₁ + One spray of cow urine at 10 %
T ₉	: T ₁ + One spray of Azadirachtin (1500 ppm) at 0.2%
T ₁₀	: T ₂ + One spray of carbendazim 50 WP at 0.1%
T ₁₁	: T ₃ + One spray of Benomyl 50 WP at 0.1%
T ₁₂	: T ₄ + One spray of Thiophanate methyl 70 WP at 0.1%
T ₁₃	: T ₅ + One spray of carbendazim 12% + Mancozeb 63% at 0.2%
T ₁₄	: T ₆ + One spray of Tricyclozole 75 WP at 0.1%
T ₁₅	: One spray of Hexaconazole 5% EC at 0.1%
T ₁₆	: One spray of Propiconazole 25% EC at 0.1%
T ₁₇	: Control

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The spraying of fungicides was undertaken immediately after the appearance of the disease. Ten plants in each plot were scored for disease severity and data were converted into per cent disease index (PDI) as explained earlier.

Results and Discussion

The experiment on integrated disease management of anthracnose of greengram using fungicides, herbal products (eucalyptus oil and azadirachtin), ITKs (cow urine) and bioagent formulations (*Trichoderma harzianum*) was conducted during *kharif*. The results are presented in Table 1 and Plate 1

Table 1: Integrated disease management of anthracnose of greengram during Kharif

Sl. No.	Treatment	Per cent disease index	Per cent reduction in disease over control	Grain yield (q/ha)	Per cent grain yield increase over control	Stalk yield (q/ha)	B:C ratio
1	<i>Trichoderma harzianum</i> at 4 g/kg of seed (SD)	51.05(45.58)*	6.01	7.94	0.63	7.98	4.88
2.	Carbendazium at 2 g/kg of seed (SD)	47.10 (43.34)	13.23	7.99	1.27	8.43	9.77
3.	Benomyl at 2 g/kg of seed (SD)	46.92 (43.23)	13.56	8.02	1.65	8.55	7.95
4.	Thiophanate methyl at 2 g/kg of seed (SD)	47.30 (43.45)	12.86	7.98	1.14	8.35	4.15
5.	Carbendazim + mancozeb at 2 g/kg of seed (SD)	48.75 (44.28)	10.19	7.97	1.01	8.17	7.29
6.	Tricyclazole at 2 g/kg of seed (SD)	49.26 (44.57)	9.25	7.96	0.89	8.08	2.44
7.	T ₁ + One spray of Eucalyptus oil at 10%	41.67 (40.20)	23.23	8.23	4.31	11.10	0.03
8.	T ₁ + One spray of cow urine at 10 %	43.85 (41.47)	19.22	8.19	3.80	10.96	0.60
9.	T ₁ + One spray of Azadirachtin (1500 ppm) at 0.2%	39.28 (38.81)	27.63	9.03	14.45	11.89	5.84
10.	T ₂ + One spray of carbendazim at 0.1%	23.50 (28.99)	56.71	11.23	42.08	14.09	22.35
11.	T ₃ + One spray of Benomyl at 0.1%	20.10 (26.64)	62.97	11.43	44.87	14.28	12.47
12.	T ₄ + One spray of Thiophanate methyl at 0.1%	25.18 (30.11)	53.61	10.98	39.16	13.83	7.52
13.	T ₅ + One spray of carbendazim + Mancozeb at 0.2%	28.08 (31.99)	48.27	10.12	28.26	12.97	8.95
14.	T ₆ + One spray of Tricyclazole at 0.1%	29.05 (32.61)	46.48	9.89	25.35	12.74	3.69
15.	One spray of Hexaconazole at 0.1%	19.85 (26.46)	63.43	11.82	49.81	14.52	23.04
16.	One spray of Propiconazole at 0.1%	18.88 (25.75)	65.22	12.16	53.99	14.82	14.10
17.	Control	54.28 (47.45)	-	7.89	-	7.75	-
	S.E m ±	0.54		0.17		0.11	
	C.D at 5%	1.63		0.51		0.30	

* Values in parenthesis are arcsine transformed values.

Cost of the grain at Rs. 2200/qt and stalk at Rs. 50/qt. Labour charges for spray =Rs. 250/-.

Quantity of spray solution used per hectare: 500lit. Cost of fungicides / biorational in Rs/kg or liter *Trichoderma harzianum* (200), Carbendazim (450), Benomyl (1040), Thiophanate methyl (1600), Carbendazim + Mancozeb (460), Tricyclazole (2200), Eucalyptus oil (625), Azadirachtin (350), Hexaconazole (600), Propiconazole (1200) and cow urine (25).





Plate 1: Effect of different treatments on severity of anthracnose of greengram for effective management

Per cent disease index (PDI): The results obtained *kharif* revealed that, all the treatments were significantly superior over untreated control (Table 1). From the data, it is clear that the least per cent disease index was found in the treatments *viz.*, T₁₆ (foliar spray of propiconazole) and T₁₅ (foliar spray of hexaconazole) and they were found on par with each other with PDI of 18.88 and 19.85 per cent, respectively and they were significantly superior over other treatments. This was followed by T₁₁ (benomyl seed treatment + foliar spray of benomyl), T₁₀ (carbendazim seed treatment + foliar spray of carbendazim) and T₁₂ (thiophanate methyl seed treatment + foliar spray of thiophanate methyl) which recorded 20.10, 23.50 and 25.18 PDI, respectively. Whereas, the other treatments like T₁₃ (carbendazim + mancozeb seed treatment + foliar spray of carbendazim + mancozeb) and T₁₄ (tricyclazole + foliar spray of tricyclazole) were statistically on par with each other with PDI of 28.08 and 29.05 per cent, respectively and they were significantly superior over untreated control. Among the biorationals used, the least incidence of anthracnose was noticed in T₉ (*Trichoderma harzianum* seed treatment + foliar spray of azadirachtin) followed by T₇ (*T. harzianum* seed treatment + foliar spray of eucalyptus oil) and T₈ (*T. harzianum* seed treatment + foliar spray of cow urine) with PDI of 39.28, 41.67 and 43.85 per cent, respectively and they were significantly superior over untreated control.

The highest per cent disease reduction of 65.22 was recorded in propiconazole followed by hexaconazole (63.43%) and benomyl seed treatment + foliar spray of benomyl (62.97%). Treatments like carbendazim seed treatment + foliar spray of carbendazim, thiophanate methyl seed treatment + foliar spray of thiophanate methyl and (carbendazim + mancozeb) seed treatment + foliar spray of (carbendazim + mancozeb) recorded considerably more per cent disease reduction 56.71, 53.61 and 48.27 per cent, respectively. The least per cent reduction of 6.01, 9.25 and 10.19 was recorded in *T. harzianum* seed treatment, tricyclazole seed treatment and carbendazim + mancozeb seed treatment, respectively.

The fungicides and biorationals which were found effective in the laboratory condition were evaluated under field conditions. In the present investigation, it is evident that, foliar spray of propiconazole and foliar spray of hexaconazole followed by benomyl seed treatment + foliar spray of benomyl and carbendazim seed treatment + foliar spray of carbendazim were effective in minimizing the per cent disease index and getting higher grain and stalk yields. Deeksha and Tripathi (2002) [4] and Laxman (2006) [5] reported propiconazole, hexaconazole and carbendazim were effective

fungicides against anthracnose of blackgram and greengram, respectively. Madhusudhan (2002) [6] observed that either benomyl or carbendazim seed treatment along with two foliar applications was found effective in controlling the soybean anthracnose. There were similar reports regarding effectiveness of benomyl and carbendazim in controlling *Colletotrichum* sp. (Bharadwaj and Thakur, 1991; Shirshikar, 1995; Singh *et al.*, 1999 and Varaprasad, 2000) [2, 7, 8, 9].

The biorationals were found less effective in controlling the disease as compared to chemical and did not enhance the yield. Among the biorational, the least incidence of anthracnose was noticed in *T. harzianum* seed treatment + foliar spray of azadirachtine. The present findings are in accordance with Chandrasekaran *et al.* (2000), Varaprasad (2000) [9] and Laxman (2006) [5], who reported the ineffectiveness of plant products and bioagents over the fungicides in controlling anthracnose of soybean, chickpea and greengram, respectively. The low effectiveness of the bioagents might be attributed to the low level of relative humidity prevailing in the field (Belanger *et al.*, 1994) [1].

In the present investigation, as far as disease control and yields are considered, triazoles *viz.*, propiconazole and hexaconazole performed better as compared to conventional fungicides. These findings are in conformity with those of Deeksha and Tripathi (2002) [4], Madhusudhan (2002) [6] and Laxman (2006) [5] in case of anthracnose of blackgram, soybean and greengram, respectively. From the practical point of view, the chemical, which gives the maximum returns is more important rather than the control of the disease. So calculation of benefit:cost ratio gives an information on whether the technology could be adopted in the farmers fields or not. Hence, benefit: cost ratio is an important parameter for recommendation of any treatment for successful control of plant disease. In the present study, though the treatment containing foliar spray of propiconazole gave significant control of anthracnose, maximum cost:benefit ratio of 23.10 was realized in treatment containing foliar spray of hexaconazole followed by carbendazim seed treatment + foliar spray of carbendazim (22.62), foliar spray of propiconazole (14.16) and benomyl seed treatment + foliar spray of benomyl (12.73). This clearly indicated that one foliar spray hexaconazole (0.1%) was more useful not only in reducing the cost of protection but also gave higher benefits as compared to other treatments and can be recommended for the management of greengram anthracnose. This is followed by carbendazim seed treatment + foliar spray of carbendazim, foliar spray of propiconazole and benomyl seed treatment + foliar spray of benomyl treatments. Similar types of findings

were observed by many workers (Bharadwaj and Thakur, 1991; Shirshikar, 1995; Madhusudhan, 2002^[6,7] and Laxman, 2006)^[2, 5, 7]. Hence, spraying of hexaconazole (0.1%) could be considered as an effective management practice to manage anthracnose of greengram. Integration of moderately resistant genotypes (BGS-9, TM-98-50 and TM-97-55) coupled with hexaconazole spray will be effective in reducing the disease pressure and enhancing the yields of greengram.

Conclusions

Studies on integrated approach for the management of greengram anthracnose disease under field conditions revealed that out of 17 treatments, foliar spray of propiconazole was found to be effective in control of the disease and increased the grains and stalk yields but foliar spray of hexaconazole showed maximum BCR followed by carbendazim seed treatment + foliar spray of carbendazim than propiconazole and was also found to be effective in managing anthracnose of greengram and increased the grain and stalk yields.

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