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Efficacy of fungicides on dry root rot of chickpea under field condition

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Abstract
An experiment was conducted on efficacy of fungicides of chickpea dry root rot incited by *Rhizoctonia bataticola* (Taub.) Butler has been emerging as a potential threat in last decades for successful and profitable chickpea cultivation because the pathogen is soil borne nature. The present investigation conducted at chickpea dry root rot hot spot area under natural conditioning Harda district of Madhya Pradesh during rabi 2017-18. The data evident that the spraying of Trifloxystrobin 25% + Tebuconazole 50% @ 500g ha^{-1} proven most effective for reducing dry root rot incidence in chickpea followed by Propiconozole 25 EC@ 500g ha^{-1}, Tebuconazole 250 EC (25.9% W/W) @625 ml ha^{-1}, Metalaxyl 4%+ Mancozeb 64% @ 1000g ha^{-1}, and Pyraclostrobin 20 WG @500g ha^{-1} compare to control, while, the incidence of dry root rot noticed minimum 1.50, 2.25, 3.75, 9.50 and 11.50 per cent respectively, although, the incidence 60.75 per cent chickpea dry root rot was noticed in control in respect to management of the diseases, while, Pyraclostrobin 20 WG was found least effective in minimizing the disease incidence. The grain yield maximum 23.25 q ha^{-1}, while, least grain yield 8.75 q ha^{-1} was harvested in control. Apart from this, the Benefit Cost Ratio 1:2.76 and 1:1.18 was noticed in Trifloxystrobin 25% + Tebuconazole 50% and control treatment, respectively.

Keywords: Chickpea, management, fungicides *Rhizoctonia bataticola*, dry root rot

Introduction
Chickpea, *Cicer arietinum* L. is one of the most important pulse crop of India. It occupies very important position in semi-arid farming system both for human nutrition and restoring the soil fertility, Singh and Sirohi (2003) [3]. In Harda, a district of Madhya Pradesh, India, the crop occupied an area of 0.025 lakh ha with a production of 0.62775 mt and productivity of 2511 kg / ha (Anon, 2019-20) [1]. The average production of chickpea is 25.50 quintal per hectare in district Harda, Madhya Pradesh with good new agronomic practices. The main reason of low yield of this crop is the incidence of dry root rot disease. India is the world leader in chickpea production. The chickpea crop is attacked by 172 pathogens (67 fungi, 22 viruses, 3 bacteria, 80 nematodes and mycoplasma) from all over the world, Nene et al. (1996). Among all, only a few of them have the potential to devastate the crops. Some of the serious disease in order of their importance are wilt *Fusarium oxysborum* f. sp. ciceri) wet root rot (*Rhizoctonia solani*), dry root rot (*Rhizoctonia, bataticola*), Ascochyta blight (*Ascocthya rabiei*) and Coller rot (*Sclerotium rolfsie*). The grain losses due to chickpea wilt and root rot has been estimated around 5-7 per cent in the district. The present investigation was undertaken for management of disease through various systemic and non-systemic fungicides under field condition.

Materials and Methods
The present experiment was conducted at Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur under Krishi Vigyan Kendra, Harda (Madhya Pradesh), India during rabi season 2017-18. The experiment was laid out in randomized block design with replicated four times during Rabi season 2017-18 and application of fungicides before appearance of symptoms. The observations noticed as Plant Height (CM), Branches plant^{-1}, Pods plant^{-1}, and yield q^{-1} ha apart this, the experiment economics assessed.

The field experiment on dry root rot prone field for chickpea and variety JG-14 were taken in six treatment with five fungicides including Metalaxyl 4%+ Mancozeb 64% @ 1000g ha^{-1}, Tebuconazole 250 EC (25.9% W/W) @625 ml ha^{-1}, Propiconozole 25 EC@ 500g ha^{-1}, Pyroclostrobin 20 WG @500g ha^{-1}, Trifloxystrobin 25% + Tebuconazole 50% @ 500g ha^{-1} and a control which was not treated with any chemical.

In treatment each plot ten plants were tagged. The standard agronomical practices followed during the experiment and observation of disease incidence was commenced at pre-harvesting stage of crop as well as grain yield per plot was recorded. Insecticidal measures were also taken out as and when required. The observations on dry root rot incidence statistically investigated. Root rot incidence DI % (Disease Incidence Percent, Bharti et al., 2016) [5] in each treatment was calculated using following formula.

$$DI\% = \frac{\text{Number of diseased plant}}{\text{Total number of plants observed}} \times 100$$

Results and Discussion

The data evident that all the treatments inhibited dry root incidence over untreated control during rabi season 2017-18 (Table 1 and 2). In the present experiment, Trifloxystrobin + Tebuconazole proven most effective for reducing dry root rot incidence in chickpea followed by Propiconozole, Tebuconazole, Metalaxyl+ mancozeb and Pyroclostrobin compare to control, while, the incidence of dry root rot noticed minimum 1.50, 2.25, 3.75, 9.50 and 11.50 per cent respectively, although, in control 60.75 per cent noticed for the management of Chickpea, while, Pyroclostrobin was found least effective in minimizing the disease incidence. Trifloxystrobin 25% + Tebuconazole 50% @ 500g ha^{-1} was noticed statistically significant superior with other treatments, while, Tebuconazole 250 EC (25.9% W/W) @625 ml ha^{-1} and Propiconozole 25 EC@ 500g ha^{-1} at par with each other over control. The highest yield (23.25 q ha^{-1}) harvested in the Trifloxystrobin 25% + Tebuconazole 50% @ 500g ha^{-1}, while, minimum yield (18.75 q ha^{-1}) harvested in Pyroclostrobin treatment, However, lowest grain yield (8.75 q ha^{-1}) harvested in control. The Benefit cost ration 1:2.76 and 1:1.18 were noticed in Trifloxystrobin 25% + Tebuconazole 50% @ 500g ha^{-1} and control treatment, respectively. Earlier worker, Taya et al. (1990) [4] reported that the Carboxin, Phenylpyrrole and Chlorothalonil were comparatively less effective in reducing the disease incidence but significantly superior over check in their study reported that field experiment the chemical treatments checked dry root incidence incidence over untreated control during both the years 2014-15 and 2015-16. As seed Carbendezim @ 1 g/kg seed provided minimum incidence, highest grain yield of 20.7 and 17.3 per cent in 2014-15 and 2015-16, respectively. The treatments *viz.*, Carboxin, Phenylpyrrole and Chlorothalonil were proved poore for increasing the grain yield, the results similarly was found by Sigh and Sindhn (1998).

Table 1: Screening of different fungicides against dry root rot of chickpea under In-*vivo* in Harda (Madhya Pradesh)

S. No	Treatment	Plant Height	Branches per plant	Pods per plant	D I%	Yield (q/ha)
1	Tebuconazole 250EC	40.25	6.5	85.5	8.75	20.25
2	Propiconozole 25 EC	42.5	7.5	87.0	7.25	20.75
3	Metalaxyl 4% + Mancozeb 64%	40.5	6.5	81.75	15.50	20.75
4	Trifloxystrobin 25% + Tebuconazole50%	43.25	8.25	87.0	5.5	23.25
5	Pyroclostrobin 20WG	39.75	6.75	76.0	17.5	18.75
6	Control	39.25	6.25	72.25	60.75	8.75
Se(M)		0.475	0.369	1.848	1.42	0.903
CD (0.5%)		1.433	1.112	5.57	4.282	2.721

Table 2: Economics of applied different fungicides for management of dry root rot of chickpea under In-*vivo* in Harda (Madhya Pradesh)

S. No	Treatment	Yield (q/ha)	Cost of Cultivation	Gross Returns	Net Return	B:C Ratio
1	Tebuconazole 250EC	20.25	26370	69000	42630	2.62
2	Propiconozole 25 EC	20.75	26430	71588	45158	2.71
3	Metalaxyl 4% + Mancozeb 64%	20.75	26920	69000	42080	2.56
4	Trifloxystrobin25% + Tebuconazole50%	23.25	29070	80213	51143	2.76
5	Pyroclostrobin 20WG	18.75	27920	64688	36768	2.32
6	Control	8.75	25670	30188	4515	1.18
Se(M)		0.903	-	-		-
CD (0.5%)		2.721	-	-		-

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