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Studies on Role of Bio Control Agents and Fungicide against Soil Borne Dry Rot/Wilt Complex in Chickpea

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A B S T R A C T

Chickpea is a major pulse crop being grown for rich source of protein and form an important part of vegetarian diet and the crop being affected by various diseases; the wilt caused by *Fusarium oxysporum f. sp. ciceri* is a important disease occurs in many parts of the country and the pathogen in association with other soil-borne pathogens like root rots and stem rot also causes extensive damage to chickpea crop. Wilt/dry root rot pathogen affects in all growth stages results in yield losses in terms of both quality and quantity parameters of grain and this reinforces the need to exploit several management strategies including biological and chemical control. Therefore, an investigation was laid out to test the bio efficacy of various biological agents and fungicides chemicals used alone and/or in combination against wilt disease of chickpea at Markumbi during rabi 2018. The *in vivo* studies consisting of three replication and twelve treatments revealed that the seed treatment by combination of seed treatment Thiophonate methyl 45% +Pyraclostrobin 50% FS @ 4 ml/kg + chickpea special magic spray has reduced the wilt incidence by 7.77 PDI with maximum yield of 13.11qtl/ha followed by followed by Seed treatment by Tebuconazole @ 1 g/kg + chickpea special magic spray recorded with 9.0 PDI and 12.45qtl/ha yield. Similarly, among bioagents combination of seed treatment by *Trichoderma harzianum*@ 10g/kg + chickpea special magic spray has recorded minimum incidence of 12.26 PDI and higher yield 11.26qtl/ha followed by seed treatment with *T. harzianum* @ 4g/kg + chickpea special magic spray had 13.60 PDI and yield 11.01 qtl/ha when compared to control plot recorded highest mean 27.61 PDI and lowest yield of 6.52 qtl/ha.

Introduction

India is the major chickpea producing country, contributing for over 75% of total production in the world. Chickpea is a key pulse crop being grown in 8.75 million ha with an annual production of 8.25 million tons and national productivity is 925 kg/ha. While chick pea is the topper among pulses occupying 39% of pulse area, pigeon pea follows with 21% area share. Although India accounts for 90% of world production of chickpea (*Cicer arietinum* L.), there is mismatch between the demand and supply because of its consumption as

protein rich staple food. It has resulted in imports of 3-4 lakh tonnes at the approximate cost of Rs 3000-5000 Crores annually. No doubt the production shortage are due to technological fatigues, the crop is highly sensitive to attack by a wide range of pests (plant diseases, insects and weeds) both in the fields (at various stages of crop growth) as well as storage conditions (Nene Y L *et al* 2012) Chickpea is cultivated for its seeds and it has rich source of protein and form an important part of vegetarian diet as chickpea seeds contain about 17-20% of protein (Singh, 2011). Chickpea is best suited to areas having low to moderate rainfall and a mid cold weather and excessive rains soon after sowing or at flowering stage are harmful for the crop.
Chickpea being grown mainly as rabi crop sown in September-November and harvested in February. Diseases are the most serious constraints to chickpea productivity causing up to 100% losses. Environmental factors and intensity of abiotic stresses are known to compound the occurrence and severity of the diseases. Though many diseases are reported, only a few such as Wilt (*Fusarium oxysporum* f.sp.*ciceri),* Dry root rot *(Rhizoctonia bataticola),* Rust (*Uromyces ciceris-arietini*), Collar rot (*Sclerotium rolfsii),* Wet root rot *(Rhizoctonia solani),* Ascochyta blight (*Ascochyta rabiae),* Botrytis grey mould *(Botrytis cinerea)* and Chichpea stunt may cause major losses and prevent farmers from realizing the potential yield of chickpea. (Nene Y L *et al* 2012).

The crop suffers from serious diseases that affect it in all growth stages and pathogens that affect chickpea include fungi, bacteria, viruses, nematodes and mycoplasma, which results in severe economic losses globally. Among these, fungi are the largest and perhaps most important group affecting roots, stem, leave, flowers and pods of chickpea. Wilt and root rot diseases of chickpea caused by *Fusarium oxysporum f. sp. ciceri* and *Macrophomina phaseolina* are serious biotic constraints for chickpea production. These are most important and widespread soil- and seed-borne diseases of chickpea grown where the climate is relatively dry and warm.

Wilt caused by *Fusarium oxysporum f. sp. ciceris* (Padwick) synd. and Hans.produces microconidia, macroconidia and chlamydospores. The wilt symptoms characterized by drooping of petioles, rachis and leaflets. The lower leaves are chlorotic, gradually turn yellow and then light brown or straw-coloured, and finally dry up. Discoloration of xylem vessels extends towards stem and branches and can be seen when split open vertically. Sometimes only a few branches are affected, resulting in partial wilt. Affected plants do not show external root discoloration (Singh, *et al* 1989). The pathogen is both soil- and seed-borne, and its infection is systemic. It can be isolated from the aerial plant parts, including seeds. The pathogen can survive on infected crop residues, roots and stem buried in the soil for up to 6 years. The infected seeds play an important role in spread of the disease to uninfected areas. Other leguminous host plants such as lentil, pea, pigeon pea, bean and faba bean have been identified as symptomless carriers.

Materials and Methods

To study the *invivo* efficacy of different bio-control agents and various combination of fungicides, an field experiment was conducted at Markumbi during rabi 2018. The experiment was designed as Randomize Block Design (RBD) with three replications and twelve treatments with genotype A-1 was used during the study. In order to test the effects of bio-control agents and fungicides alone or in combination by seed treatment for the management of wilt complex at different concentration. The seeds were treated before

sowing with the selected fungicides as well as bioagents and the chickpea magic special was applied at 8.0gm/kg to selected treatments. While untreated plot served as control treatment. Chickpea magic spray is liquid formulation common for all the treatments at 1ml/lit twice at 50 percent flowering except control. The agronomic practice was carried out as per the recommendations. The observation on percent wilt disease incidence and yield data were recorded and statistically analyzed and the following formula was used for calculation of incidence of wilt disease.

$$\text{Percent disease incidence} = \frac{\text{No. of plant infected}}{\text{Total no. of plants observed}} \times 100$$

The treatment details are as follows

T_1: Seed treatment with Thiram 37.5% + Carboxin 37.5% @ 2 g/kg + chickpea special magic spray, T_2: Seed treatment with Carbendazim 25% + Mancozeb50% @ 3.5 g/kg + chickpea special magic spray, T_3: Seed treatment Thiophonate methyl 45% +Pyraclostrobin 50% FS @ 4 ml/kg + chickpea special magic spray, T_4: Seed treatment with Tebuconazole @ 1 g/kg + chickpea special magic spray ,T_5: Seed treatment with *Trichoderma harzianum*@ 10g/kg + chickpea special magic spray, T_6: Seed treatment with *T. harzianum* @ 4g/kg + chickpea special magic spray, T_7: ST with *P. fluorescens* @10 g/kg + chickpea special magic spray, T_8 : Seed treatment with *P. fluorescens* @ 4/kg + chickpea special magic spray, T9: Seed treatment Thiophonate methyl 45% +Pyraclostrobin 50 % FS @ 4 ml/kg + without chickpea special magic spray, T10: Seed treatment with Tebuconazole @ 1 g/kg + without chickpea special magic spray, T_{11}: Spray of Chickpea special magic alone and T12: untreated plot served as control.

Results and Discussion

An experiment study was conducted at farmers field in Markumbi during *rabi* 2018 to know the efficacy of different bioagents and test fungicide chemicals alone or in combination through seed treatments at different concentrations. Application of chickpea magic special as seed treatment and spray formulation against root rot-wilt incidence and yield was assessed. The *invivo* efficacy of different fungicides against the *Fusarium* wilt-root rots disease complex in chickpea and comparative efficacy of different bioagents on wilt incidence and crop yield were presented (table-1) along with mean PDI on wilt-root rot complex and yield observations (Qtl/ha) was presented.

Management of chickpea rot/wilt complex revealed that seed treatment by combination of seed treatment Thiophonate methyl 45% +Pyraclostrobin 50% FS @ 4 ml/kg + chickpea special magic spray has reduced the wilt incidence by 7.77 PDI with maximum yield of 13.11qtl/ha was observed when compared to control recorded highest 27.61 PDI and lowest yield 6.52 qtl/ha during field study conducted at markumbi for rabi 2018.

Among all the seed treatment, minimum wilt incidence and higher yield was observed from the combination of Thiophonate methyl 45% +Pyraclostrobin 50% FS @ 4 ml/kg + chickpea special magic spray found to record minimum 7.77 PDI with maximum yield of 13.11qtl/ha followed by Seed treatment by Tebuconazole @ 1 g/kg + chickpea special magic spray recorded with 9.0 PDI and 12.45qtl/ha yield. Similarly, Seed treatment with Thiram 37.5% + Carboxin 37.5% @ 2 g/kg + chickpea special magic spray had shown to record 10.53PDI with yield 11.60 qtl/ha and Seed treatment by Carbendazim 25% + Mancozeb50% @ 3.5 g/kg + chickpea special magic spray recorded 11.20PDI and

yield of 11.43 qtl/ha are on par with each other.

However, treatment by combination or alone by Seed treatment with *Trichoderma harzianum*@ 10g/kg + chickpea special magic spray has recorded minimum incidence of 12.26 PDI and higher yield 11.26qtl/ha followed by T_6: Seed treatment with *T. harzianum* @ 4g/kg + chickpea special magic spray had 13.60PDI and yield 11.01 qtl/ha when compared to control plot recorded highest mean 27.61 PDI and lowest yield of 6.52 qtl/ha (Table-1). Similarly, Seed Treatment with *P. fluorescens* @10 g/kg + chickpea special magic spray had moderate incidence of 16.67 with yield of 10.44qtl/ha while, T_8: Seed treatment with *P. fluorescens* @ 4/kg + chickpea special magic spray showed high incidence of 23.85 PDI with 8.74 qtl/h ayield.

The seed treatment receiving combination of Thiophonate methyl 45% +Pyraclostrobin 50 % FS @ 4 ml/kg + without chickpea special magic spray recorded mean PDI of 18.35 with yield of 10.01qtl/ha followed by Seed treatment with Tebuconazole @ 1 g/kg + without chickpea special magic spray had 20.13 PDI and 9.81qtl/ha of yield, while, treatment receiving only of Chickpea special magic alone recorded higher wilt incidence of 20.39 PDI and lower yield of 9.96 qtl/ha compared to control recorded highest mean 27.61 PDI and lowest yield of 6.52 qtl/ha.

However, among all the fungicides, the seed treatment by combination of seed treatment Thiophonate methyl 45% +Pyraclostrobin 50% FS @ 4 ml/kg + chickpea special magic spray has reduced the wilt incidence by 7.77 PDI with maximum yield of 13.11qtl/ha followed by followed by Seed treatment by Tebuconazole @ 1 g/kg + chickpea special magic spray recorded with 9.0 PDI and 12.45qtl/ha yield (Table-1). Similarly, among bioagents combination of seed treatment by *Trichoderma harzianum*@ 10g/kg + chickpea special magic spray has recorded minimum incidence of 12.26 PDI and higher yield 11.26qtl/ha followed by seed treatment with *T. harzianum* @ 4g/kg + chickpea special magic spray had 13.60 PDI and yield 11.01 qtl/ha when compared to control plot recorded highest mean 27.61 PDI and lowest yield of 6.52 qtl/ha. The studies were in accordance with Suman Patra and Mohan Kumar Biswas (2016), who reported chickpea seeds treated with fungicides gave 9.66 to 15.18 % incidence of *Fusarium* wilt as compared to untreated plants, which have 21.76 % incidence and combination fungicides (Tebuconazole + Trifloxystrobin) @ 2000 ppm with yield 1671.50 kg/ha and yield increased 17.38 % over control. The lowest yield found in Chlorothalonil treated plot with 1627.50 kg/ha and increased 14.29 % yield over control and similar result were stated by Pandey, R.N *et al* (2017), who stated lowest incidence of wilt and root rot (8.59%) and grain yield (1535 kg/ha) observed by seed biopriming for 10 hrs with suspension of talc based formulation of *T. viride* @ 50 g in 250 ml of water/ kg of seed + soil application of *T. viride* enriched FYM.

The results from the present studies concluded that, seed treatment by combination or alone with bio control agents or fungicides chemical along with chickpea magic special showed significant reduction in the wilt incidence of 77.77 percent with higher yield attributes by 101.07 percent increased compared to treatment receiving without chickpea magic special spray and control treatment which exhibited highest percent wilt disease and lower yield record. However, all the treatments are significantly differed from the control plot**.**

Table.1 Management of chickpea wilt /root rot complex soil borne disease during rabi 2018-19 Conjugate

Treatment	Treatment details	Markumbi			
		Dosage (gm or ml/kg)	Mean PDI	Mean yield (Qtl/ha)	Yield % Increase
T_1	Seed treatment with Thiram 37.5% + Carboxin 37.5% @ 2 g/kg + chickpea special magic spray.	2.0	10.15 (18.6)	11.60	77.90
T_2	ST with Carbendazim 25% + Mancozeb50% @ 3.5 g/kg	3.5	11.20 (19.6)	11.43	75.30
T_3	ST Thiophonate methyl 45% +Pyraclostrobin 50% FS @ 4 ml/kg + chickpea special magic spray	4.0	7.77 (16.2)	13.11	101.07
T_4	ST with Tebuconazole @ 1 g/kg + chickpea special magic spray	1.0	9.00 (17.5)	12.45	90.95
T_5	ST with *Trichoderma harzianum*@ 10g/kg + chickpea special magic spray	10	12.26 (20.5)	11.26	72.69
T_6	ST with *T. harzianum* @ 4g/kg + chickpea special magic spray	4.0	13.60 (21.6)	11.01	68.86
T_7	ST with *P. fluorescens* @10 g/kg + chickpea special magic spray	10	16.67 (24.1)	10.44	60.12
T_8	ST with *P. fluorescens* @ 4/kg + chickpea special magic spray	4.0	23.85 (29.2)	8.74	34.04
T9	ST Thiophonate methyl 45% +Pyraclostrobin 50 % FS @ 4 ml/kg + without chickpea special magic spray.	4.0	18.35 (25.4)	10.01	53.52
T10	ST with Tebuconazole @ 1 g/kg + without chickpea special magic spray.	1.0	20.13 (26.7)	9.81	50.46
T_{11}	Spray of Chickpea special magic alone	4.0	20.39 (26.9)	9.96	52.76
T12	Control	-	27.61 (31.7)	6.52	-
	Sem±	-	0.38	0.25	-
	CD (5%)	-	1.11	0.72	-
	CV	-	2.86	4.12	-

Chickpea magic is common for all the treatments from T1-T8

*Figures in parenthesis are arc sign angular transformed values

References

1. Nene YL, Reddy MV, Haware MP, Ghanekar AM, Amin KS, Pande S and Sharma M. 2012. Field Diagnosis of Chickpea Diseases and their Control**.** Information Bulletin No. 28 revised).Patancheru, A.P. 502 324, India: International Crops Research, Institute for the Semi-Arid Tropics. 60 pp.

2. Pandey, R.N., N.M. Gohel and Pratik Jaisani, 2017, Management of Wilt and Root Rot of Chickpea caused by *Fusarium xysporum* f. sp. *ciceri* and *Macrophomina phaseolina* through Seed Biopriming and Soil Application of Bio-Agents International Journal of Current Microbiology and Applied Sciences Volume 6 Number 5, pp. 2516-2522
3. Singh, N. P., 2011, Project Co-coordinator Report, 2010-11. All India Coordinated Research Project, Kanpur-208024.
4. Singh, G., Gill, A.S., Verma, M.M. and Kaur, L. 1989, High susceptibility of chickpea to stem rot in Punjab, India. International Chickpea Newsletter 20(16)
5. Suman Patra and Mohan Kumar Biswas, 2016, Efficacy of fungicides for the management of chickpea wilt disease caused by *Fusarium oxysporum f.sp. ciceri*., International Journal of Advanced Research.,4 (10),1457 1460, Department of Plant Protection, Palli-Siksha Bhavana,Vivsa-Bharati, Sriniketan, West Bengal, India-731236.

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