Original Research Paper

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Managing wilt/root rot using different seed dresser

AGRICULTURE

KEYWORDS: Chickpea (*Cicer arietinum L.*), RBD, *Mancozeb, Carbendazim, Carboxin ,Thiram, Trichoderma.*

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ABSTRACT

Chickpea (*Cicer arietinum* L.) is an important food legume crop. In Maharashtra it ranks 2nd in area, 3rd in production. 10.51 lakh hector area is under the cheakpea crop. Production of cheakpea is 8.15 lakh tones and 775 kg/hector. This crop is cultivated on large scale in Maharashtra. Due to cultivation of chickpea in large areas it is attacked by several pathogens. Soil borne pathogens like *Fusarium, Sclreotium* and *Rhizoctonia* is major constraint to chickpea production in Vidarbha region of Maharashtra. Yield reductions results from post emergence death of seedling and weakening, wilt, root rot as well as premature death of infected plants. This is controlled by using different seed dressers having combinations of different chemicals such as *Mancozeb ,Carbendazim,Carboxin,Thiram,* and biological agents ie. *Trichoderma.* This paper contains analysis of variance between treatment effects of different seed dressers on seed of Chickpea to get most effective combination of seed dressers. Due to wilt or root rot seed get damaged, hence to control wilt and root rot seed dressers are used.

1 INTRODUCTION

Chickpea is most important food legume. There is a greater loss in production of chickpea due to wilt or root rot. We can control this by different methods i.e. using fertilizers, seed dresser. But we prefer method of seed dresser. Because the fungus is soil borne and can survive in the soil for long period, it is not possible to control the disease through normal crop rotations. Control of the disease is more efficient when integrated measures are adopted involving, treatment of seeds with bio-agent and chemicals. Under such circumstances seed dressing with beneficial microbes and certain chemicals helps to manage harmful myco-flora of soil.

Root rot occurs during period of seedling to flowering and pod development. Wilt occurs during period of Seedling to flowering. Yield reduction results from post emergence death of seedling and weakening wilt, root rot, as well as premature death of infected plants. Hence, present investigation undertaken to management of wilt/root rot of chickpea with fungicides, and biological control agents.

This study was undertaken in Regional Research Center, Amravati of Dr. Panjabrao Deshmukh Krushi Vidyapith, Akola, Maharashtra, India.

Figure 1: Experimental Field

2 MATERIAL AND METHODS

The design used for the experiment is Randomized Block Design. In this design all three principles of design of experiments randomization, replication, and local control given by Prof. R.A.Fisher are used. If the treatments are applied at random to relatively homogeneous units within each strata or block and replicated over all the blocks then the design is called as Randomized Block Design (R. B. D.).RBD with eight treatments and three replications is shown in the figure1, in which each plot is of size 3.6m X 4m. The spacing between the Blocks and plots is of 30cm X 10cm.Variety used for the experiment is Chaffa. Seeds were sown by the method of Dibbling on 24 November 2014.

For testing efficiency of test treatment we compare it with control or standard treatment. Here one control and 7 test treatments were taken. Different treatments with their combinations are given below.

T_1: Untreated Control
T_2: Seed treatment with *Thiram* 3g/kg plus *Trichoderma* 4g/kg of seed.
T_3: Seed treatment with *Thiram* 2g/kg plus *Carbendazim* 1g/kg of seed.
T_4: Seed treatment with *Carboxin* plus *Thiram* 3g/kg of seed. (Combination product)
T_5: Seed treatment with *Carbendazim* plus *Mancozeb* 3g/kg of seed. (Combination product)
T_6: Seed treatment with *Carboxin* plus *Thiram* 3g/kg of seed plus *Trichochoderma* 4g/kg of seed.
T_7: Seed treatment with *Carbendazim* plus *Mancozeb* 3g/kg of seed plus *Trichoderma* 4g/kg of seed.
T_8: Seed treatment with *Trichoderma* 4g/kg of seed.

3 DATA COLLECTED

Data is most important factor in Statistics. In our experiment we collected the data of following different types on the dates given in Table1.

Table1. Data collection

Sr. No.	Date	Collected Data
1.	03/12/2014	Count the number of seeds germinated
2.	21/12/2014	Wilt/Root rot and recorded at 30 days after sowing
3.	20/01/2015	Wilt/Root rot and recorded at 60 days after sowing
4.	26/03/2015	Measure 100 seed weight (in mg)
5.	26/03/2015	Measure total seed weight (in kg)

4 ANALYSIS

To analyze the data, the software 'MS-EXCEL' is used. Data entry, tabulation and all other operations performed on the data are done in it. Collected data is written in tabular form having 5 columns for 5 sample units selected from each plot for each treatment. In this way for each replication there is a separate table and hence separate ANOVA.

Table 2. ANOVA for germination

S.V.	D.F	S.S.	M.S.S.	F (Cal)	F (Tab)	S/NS
Replication	2	127.69	63.85	2.0269	3.74	NS
Treatment	7	782.00	111.71	3.5466	2.77	S

Error	14	440.99	31.50			
Total	23	1350.69				

Table 3. ANOVA for wilt after 30 days of sowing.

S.V.	D.F	S.S.	M.S.S.	F (Cal)	F (Tab)	S/NS
Replication	2	0.06	0.03	0.3744	3.74	NS
Treatment	7	2.32	0.33	3.8884	2.77	S
Error	14	1.19	0.09			
Total	23	3.58				

Table 4. ANOVA for wilt after 60 days of sowing.

S.V.	D.F	S.S.	M.S.S.	F (Cal)	F (Tab)	S/NS
Replication	2	0.25	0.13	0.9197	3.74	NS
Treatment	7	6.34	0.91	6.6337	2.77	S
Error	14	1.91	0.14			
Total	23	8.50				

Table 5. ANOVA for 100 seed weight

S.V.	D.F	S.S.	M.S.S.	F (Cal)	F (Tab)	S/NS
Replication	2	0.03	0.01	0.05	3.74	NS
Treatment	7	5.24	0.75	2.77	2.76	S
Error	14	3.78	0.27			
Total	23	9.04				

Table 6. ANOVA for Yield per plot

S.V.	D.F	S.S.	M.S.S.	F (Cal)	F (Tab)	S/NS
Replication	2	0.20	0.10	2.89	19.42	NS
Treatment	7	5.46	0.78	2.89	2.76	S
Error	14	3.78	0.27			
Total	23	9.44				

From all the above ANOVA tables, since FCal < FTab , at 5 % Level of Significance, for (2, 14) Replication degrees of freedom, the null hypothesis HB0 is accepted. Therefore we can conclude that all the blocks are Homogeneous. Also since FCal > FTab , at 5 % Level of Significance, for (7, 14) Treatment degrees of freedom, the null hypothesis HT0 is rejected. Therefore we can conclude that there is significant difference between the treatment effects on different characteristic.

5 CONCLUSIONS

Whenever we want to compare the variability in the averages or which are measured in different units we do not merely calculate the measures of dispersion. But we calculate the coefficient of dispersion (CD) which is pure numbers independent of the units of measurement. Hundred times the CD based upon the standard deviation is called as coefficient of variation (CV),

$$CV = \frac{\sigma}{\bar{X}} X\ 100$$

According to Professor Karl Pearson who suggested this measure *CV is the percentage variation in the mean, Standard deviation being considered as the total variation in the mean.*

Coefficient of variation is calculated to know that whether our sample drawn is correct or not. Sample drawn gives efficient results having the CV in the range four to nineteen. Since there is significant difference between the treatment effects, Critical difference is calculated from ANOVA Table to find the optional treatments for the most effective treatment. CD gives the critical difference up to which we can extend the range of disease.

Following are the formulae used to calculate CD and CV;

- $Standard\ Error = SE = \frac{\sqrt{M.S.S.E}}{No.of\ Replications}$
- $Standard\ Deviation = SD = M.S.S.E.* \sqrt{2}$
- $Critical\ Difference = CD = SE * t_{(0.05,14)}$
- $Coefficient\ of\ Variation = CV = \frac{\sqrt{M.S.S.E}}{Mean\ of\ all\ observations} * 100$

Table 7. Effect of different treatments on seed of chickpea.

Sr. No.	Treatments	Germination %	% Mortality		% disease control (at 60 DAS)	Yield (Kg/ha)
			30DAS	60 DAS		
T1	Untreated control	60.74 (51.26)*	4.26 (2.06)**	8.53 (2.90)**		2023.135
T2	ST with Thiram (3.0 g/kg seed) + Trichoderma 4g/kg seed	73.15 (59.10)	2.04 (1.40)	2.80 (1.66)	67.19	2423.596
T3	ST with Thiram (2.0 g/kg seed) + Carbendazim 1g/kg of seed	66.74 (54.84)	2.22 (1.46)	3.93 (1.93)	53.91	2331.004
T4	ST with Carboxin + Thiram @ 3 g/kg seed (combined product)	78.70 (62.92)	1.48 (1.21)	1.80 (1.32)	78.91	2923.592
T5	ST with Carbendazim + Mancozeb @ 3 g/kg seed (combined product)	52.41 (46.39)	3.70 (1.91)	2.07 (1.40)	75.78	2722.205
T6	ST with Carboxin + Thiram @ 3 g/kg seed + Trichoderma 4g/kg seed	58.52 (49.91)	3.52 (1.85)	4.07 (1.99)	52.34	2296.282
T7	ST with Carbendazim + Mancozeb @ 3 g/kg seed + Trichoderma 4g/kg seed	49.81 (44.92)	1.48 (1.21)	3.87 (1.96)	54.69	2060.172
T8	ST with Trichoderma 4g/kg seed	63.96 (53.38)	2.04 (1.40)	6.87 (2.60)	19.53	1888.877
	Test	Sig.	Sig.	Sig.		
	SE ±	3.24	0.17	0.21		
	CD (P=0.05)	9.83	0.51	0.65		

*Figures in parenthesis are arcsine transformed values. **Figures in parenthesis are square root transformed values. DAS- Days after sowing.

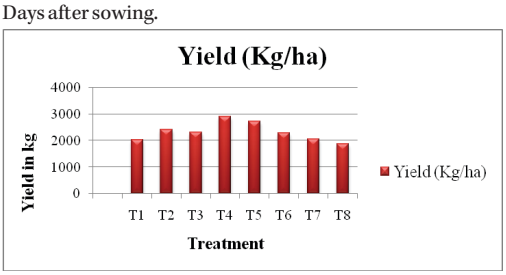

Figure 2 : Estimated production (in kg/ha).

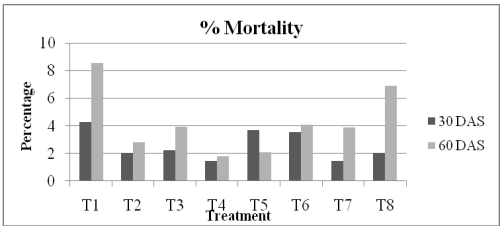

Figure 3 : Percent Mortality after 30 and 60 days of sowing.

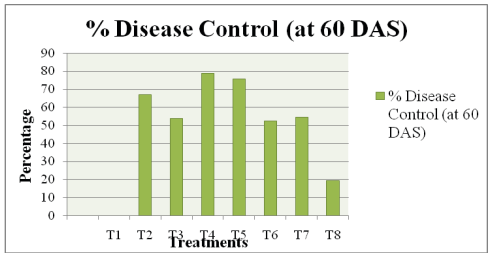

Figure 4 : Disease control due to effect of treatments on seed of chickpea.

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6 INTERPRETATION

Figure 1 and table 7 shows under field evaluation, maximum seed germination, minimum percent mortality, maximum percent disease control and maximum yield were observed in treatment T4- ST with Carboxin + Thiram (3.0 g/kg seed). In case of unavailability of this seed dresser due to some reason, with the help of CD the next effective treatments can be obtained as follows.

In table 7, CD calculated for germination percentage is 9.83. Now subtract this CD from maximum percentage of germination to get range which gives minimum tolerance limit for the germination percentage.

Range = 78.70 - 9.83 =68.87

Therefore 68.87 is the minimum tolerance limit. Hence, the treatment combinations having germination percentage in the range 78.70 to 68.87 can be used as they are the next effective treatments among all.Therefore we can conclude that the next effective treatment with maximum seed germination is observed in treatment T2- ST with Thiram (3.0 g/kg seed) + Trichoderma 4g/kg seed followed by treatment T3- ST with Thiram (2.0 g/kg seed) + Carbendazim 1g/kg of seed.

In case of mortality CD is added to the minimum percent mortality. So Range for 30 DAS and 60 DAS mortality is given by,

Maximum tolerance limit 30 DAS = 1.48 + 0.51 = 1.99 ...(1)

Maximum tolerance limit 60 DAS = 1.80+0.65 = 2.45 ...(2)

Therefore it is seen that percent mortality for 30das and 60 das has lowest mortality percentage due to treatment T4 - ST with Carboxin + Thiram @ 3 g/kg seed (combined product) with 78.91 % diseases can be control. From equation (1) and (2) , the next effective treatment giving minimum mortality is treatment T5 - ST with Carbendazim + Mancozeb @ 3 g/kg seed (combined product) followed by T2- ST with Thiram (3.0 g/kg seed) + Trichoderma 4g/kg seed.

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