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Integrated Wilt Disease Management in Chickpea

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ABSTRACT

Chickpea, Cicer aritinum L. is the world third most important pulse crop. The average yield losses of chickpea vary between 10% and 100% depending on the agro climatic conditions due to incidence of wilt disease. Experiment was conducted in 2010-11 & 2011-12 to evaluation Integrated Disease Management module (Summer Deep Ploughing + Resistant Variety + Seed treatment by Trichoderma viridae @ 4 gm along with carboxin @ 1 gm/ Kg Seed). Chickpea wilt resistant variety JG-130 was used during the experiments with a seed rate of 75 kg/ha. The IDM module were reduce the wilt disease incidence which is ranges from 62.75 % to 71.92 % in 2010-11 & 2011-12, respectively over farmers practice resulted enhance the average productivity 16.50 % over farmers practice. The benefit: cost ratio was also enhance under technology, it was ranged from 1:1.50 to 1:2.60 in demonstration & 1:1.30 to 1:2.40 in farmers practice, respectively in 2010-11 & 2011-12.

Key words: *Resistant variety; Wilt incidence; IPM; INM; BCR;*

INTRODUCTION

Chickpea, *Cicer aritinum* L. is the world third most important pulse crop. India rank first in terms of chickpea production and consumption in the world. Chickpea (*Cicer arietinum* L.) is the premier pulse crop of India, grown all over the country mainly Madhya Pradesh, Rajasthan, Uttar Pradesh, Maharashtra, Karnataka and Haryana states in Rabi season. It is a good source of essential amino acids such as tryptophan, methionine, cystiene and is the primary source of high quality protein for the largely vegetarian population of India and for those who live under the poverty line. Chickpea is predominantly consumed as a pulse, dry chickpea is also used in preparing a variety of snack foods, sweets and condiments and green fresh chickpeas are commonly consumed as a vegetable. Low yield of chickpea is attributed to its susceptibility to several fungal, bacterial and viral diseases. Chickpea wilt incited by *Fusarium oxysporum f. sp. ciceris* is one of the serious diseases causes annual loss at 10 per cent in yield. Nema and Khare[5] observed damage to be upto 61% at seedling stage and 43% at flowering stage. The seeds harvested from wilted plants are lighter, wrinkled and duller than those from healthy plants. The yield losses vary between 10% and 100% depending on the agroclimatic conditions[2].

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At national level the yield losses encountered due to wilt may vary between five to ten per cent. The pathogen is both seed and soil borne facultative saprophyte and can survive in soil up to six years in the absence of susceptible host[3,4]. The chief symptoms of the disease are: yellowing and drying of leaves from base upward, drooping of petioles and rachis, improper branching, withering of plants, browning of vascular bundles and finally wilting of plants[6].

Considering the nature of damage and survival ability of the fungus, use of resistant varieties is the only economical and practical solution. Most of the resistant varieties have been found to be susceptible after some years because of breakdown in their resistance and evolution of variability in the pathogen. There appears to be no apparent reason as to why these already tested wilt resistant materials showed such a variable wilt reaction and which creates a doubt about the possibility of existence of physiologic forms of the pathogen. The pathogen with high saprophytic ability can survive in soil for a pretty long period during which it may have to go through different environmental stresses and biological competition which may lead to the existence of physiologic races. Therefore, integrated management strategies are the only solution to maintain plant health. These strategies should includes minimum use of chemicals for checking the pathogen population, encouragement of beneficial biological agents to reduce pathogen inoculum, modification of cultural practices and use of resistant varieties[1].

MATERIALS AND METHODS

The demonstration was carried out on farmer's field in adopted Village of Krishi Vigyan Kendra, District– Sehore (M.P.) during Rabi season, 2010 -11 & 2011-12. The farming situations under demonstration are semi irrigated. Improved variety of Chickpea (JG-130) was sown in second to third week of October at selected six farmer's field in 2010-11 & five farmers in the year 2011-12. For the evaluation Integrated Disease Management module (Summer Deep Ploughing + Resistant Variety + Seed treatment by *Trichoderma viridae* @ 4 gm along with carboxin @ 1 gm/ Kg Seed). Chickpea wilt resistant variety JG-130 was used during the experiments with a seed rate of 75 kg/ha. The crop was sown during the II fortnight of October at a spacing of 30x10 cm. Fertilizer NPK @ 20, 60,& 20 kg/ha in the form of DAP and Muriate of potash were applied as basal dose.

Treatment I: Farmers practice

- High seed rate (40 Kg/ha)
- Use of local/ old variety – Katila chana
- Seed treatment are not in practice
- Imbalance use of plant nutrient (9:23:0 Kg N,P & K/ Ha)

Treatment II: IPM Module

- Summer Deep Ploughing
- Optimum seed rate (75 Kg/ Ha)
- Resistant Variety
- Seed treatment by *Trichoderma viridae* @ 4 gm along with carboxin @ 1 gm/ Kg Seed

The wilt incidence was recorded at 30 days intervals till harvest. In each plot, three rows, each 10 m long, were chosen arbitrarily. Plants in each row were examined and the number of plants showing symptoms of yellowing or wilting vascular noted. Disease incidence is expressed as the percentage of affected plants, counted in three rows by the total number of plants. Per cent disease incidence in each treatment was calculated using the following formula.

$$\text{Per cent wilt incidence} = \frac{\text{Number of plants wilted X 100}}{\text{Total number of plants examined}}$$

The yield data were collected from both the demonstration and farmer's practice and workout to calculate the technology gap; extension gap and the technology index as given below[7].

Technology gap = Potential yield-demonstration yield

Extension gap = Demonstration yield -farmer's yield

$$\text{Technology index} = \frac{\text{(potential yield-demonstration yield) X 100}}{\text{Potential yield}}$$

RESULTS AND DISCUSSION

Total 11 no of experiments were conducted at farmer's field in their farming situation. Table

1 revealed that the reduction of wilt disease ranges from 62.75 % to 71.92 % in 2010-11 & 2011-12, respectively over farmers practice resulted enhance the average productivity 16.50 % over farmers practice. The average yield under demonstration fluctuated and ranged from 11.2 q ha^{-1} & 17.1 q ha^{-1} during the 2010-11 & 2011-12, respectively (Table-2). The results clearly indicated that the yield of Chickpea could be increased by 16.33 % to 16.67 % over the yield obtained under farmer's practices of chickpea cultivation due to adoption of IDM module for the management of yellow mosaic disease. Dixit and Singh & Patil *et al.* were also found the similar type of findings.

The extension gap which ranged from 1.6 q ha^{-1} to 2.4 q ha^{-1}, respectively in 2011-12 & 2010-11 during the period of study emphasized the need to educate the farmers through various means for adoption of Integrated Disease Management module for the management of wilt disease in chickpea.

The technology gaps were ranged from 0.9 qha^{-1} to 6.8 q ha^{-1}, respectively in 2011-12 & 2010-11. The technology gap observed may be attributed to the dissimilarity in the trends adopted by farmers, day by day enhancing disease incidence as well as changing weather condition. Hence timely application of IDM technology for manage wilt disease incidence in chickpea resulted minimize the technology gap for yield level of different situations.

Table 3 showed that the cost of production under experiment was Rs. 17400 to Rs. 18500 per hectare in 2010-11 & 2011-12, respectively while the cost of farmer practice (FP) Rs.16250 to 17300 ha^{-1} in 2010-11 & 2011-12, respectively. The table 3 also revealed that the average net return from technology Rs 18810 ha^{-1}, while average net return from farmers practice was Rs. 14730 ha^{-1}. It means the net return from assessed technology was higher than farmer's practices. Similar finding are found by Kumar & Kumar, 2012. The additional cost Rs.1150 to Rs.1200 gave additional net return, it was ranged Rs. 2640 to Rs. 5520 per hectare in 2010-11 & 2011-12, respectively. The increased benefit: cost ratio was also calculated, it was ranged from 1:1.50 to 1:2.60 in demonstration & 1:1.30 to 1:2.40 in farmers practice, respectively in 2010-11 & 2011-12.

Thus, it was clearly showed that the IDM modules for the management of wilt disease in chickpea are more effective technology over farmers practice. In this technology eco- friendly & timely manage the wilt disease chickpea resulted enhance the net profit. The results indicated that the assessed technology has given a good impact among the farming community of Sehore district resulted farming community were motivated for future adoption of the technology.

Table 1: Wilt Disease Incidence in chick pea field (Pooled data of 2010-11 and 2011-12)

Treatment	Wilt Incidence (%)								Average Wilt incidence (%)		% reduction in disease	
	After 30 Days of sowing		After 60 Days of sowing		After 90 Days of sowing		Harvesting time					
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
T1	0.72	0.48	11.54	4.12	14.62	5.28	13.8	5.35	10.2	3.8	-	62.75
T2	3.2	0.64	18.46	4.2	20.92	6.46	15.8	5.2	14.6	4.1	-	71.92

Table2: Disease incidence, Productivity, extension gap, technology gap and technology index of Green gram

Year	No. of Demo	Disease incidence (%)			Yield q/ha			Extension gap q/ha	Technology gap q/ha	Technology index%
		T1	T2	% reduction	T1	T2	% enhancement			
2010-11	6	10.2	3.8	-62.75	9.6	11.2	16.67	1.6	6.8	37.8
2011-12	5	14.6	4.1	-71.92	14.7	17.1	16.33	2.4	0.9	5
Average		**12.4**	**3.95**	**-67.33**	**12.15**	**14.15**	**16.50**	**2**	**3.85**	**21.4**

Table 3: Economics analysis

Year	Demonstration			Farmer practices			Additional cost of cultivation Rs ha^{-1}	Additional net return Rs ha^{-1}	Incremental benefit cost ratio	
	Cost of cultivation Rs ha^{-1}	Gross returns Rs ha^{-1}	Net return Rs ha^{-1}	Cost of cultivation Rs ha^{-1}	Gross returns Rs ha^{-1}	Net return Rs ha^{-1}			T1	T2
2010-11	17400	25640	8240	16250	21850	5600	1150	2640	1.3	1.5
2011-12	18500	47880	29380	17300	41160	23860	1200	5520	2.4	2.6
Average	17950	36760	18810	16775	31505	14730	1175	4080	1.85	2.05

T1-Farmers practice T2 – Recommended practice

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