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Efficacy of certain modern insecticides and fertilizer against the pest in eastern UP

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Abstract
Chickpea is well known legume crop in the dry lands and has high demand due to its high protein content. But the current yield and its attributes declines due to various infection from the insects and pest throughout its life stages. Thus, the application of insecticides and pesticides at proper stage is important practices to optimize the reduced yields. An experiment was conducted to study efficacy of certain modern insecticides and fertilizer against the pest at KVK, Sonbhadra, A. Narendra Dev University of Agriculture and Technology, Kumarganj in Rabi Season**.** It was arranged with 4 treatments and 4 replications. Yield attributes for all treatments are significant except neck thickness and neck diameter. The results invokes that Third treated plot (plethora) shows maximum yield return with 18.11 q ha^{-1} as compared to others 13.5 q ha^{-1}, 15.6 q ha^{-1} and 16.85 q ha^{-1}. The increase in the yield is due to more incidences of insecticides over the pods which cause less infection. However, the highest gross return (Rs. 67550/ha) as well as net monitory return (Rs. 105038/ha) was found from the second treatment i.e., sentry application as compared to other treatments, which was mainly due to higher yield under this treatment. Hence, the highest Benefit: Cost ratio (B:C) derived from this treated plot is 1:2.82. Therefore, economic wise sentry while performance wise plethora gives the best results.

Keywords: Certain modern, life stages, eastern UP

Introduction
Chickpea (*Cicer arietinum* L.) is one of the earliest cultivated legumes: 7500-year-old remains have been found in the Middle East (Bell 2014) [3], a legume crop belongs to Fabaceae is locally known as gram or Bengal gram, garbanzo, or garbanzo bean, Egyptian pea or chana. It characterizes of Desi and Kabuli in India. Nutritionally, it contains 24% protein, 59.6% carbohydrates, and 3.2% minerals (Bakr *et al.* 2004) [2]. It fixes atmospheric nitrogen and tolerates high temperature (Cumming and Jenkins 2011) [4]. Globally, chickpea is grown in 13.54 million hectares with a production of 13.10 million tons and productivity of 968 kg ha^{-1} with major producing countries as India (67.41%), Australia (6.21%), Pakistan (5.73%), Turkey (3.86%), and Myanmar (3.74%) (FAOSTAT 2015) [5]. Eleven different insect-pests have been reported as the main damaging pests of the chickpea crop (Rahman *et al*. 1982) [8]. Among these, the pod fly *Melanagromyza Obtusa*, is considered to be the most serious insect-pest in the dryland (Anwar and Shafique 1993) [1], causing on average 30-40 % damage to pods (Luckmann and Metcalf 1975; Saleem and Younis 1982; Rahman 1990; Hashmi 1994) [7, 11, 9, 6], and increases 80–90% in conducive environments (Sehgal and Ujagir 1990; Sachan and Katti 1994) [12, 10]. Keeping the view of infestation and consideration of the yield potential of chickpea the study was conducted on the farmer's farms to judge the efficacy of three insecticides.

Material and methods
A field experiment was experimented for the efficacy of insecticides in the local variety in a randomized block design with four treatments and four replications during the Kharif season, 2019-20 at three villages under the jurisdiction of Krishi Vigyan Kendra, Sonbhadra. Before sowing the seeds were treated with thiram @ 2g kg^{-1} seed and total require seed for all replication was *12Kg* ha^{-1}.
Three insecticides *viz.*, Farmer's practice (Chlorpyriphos), Abhimanu right gold, Plethora, Sentry super were used in this experiment and had been examined for various infectious parameters such as incidence of the pest on randomly selected plant before and after the spraying. The total coverage area under this experiment 1 ha with plot size was 1 x 5 m^2 and the spacing between row to row and plant to plant was 60 cm × 20 cm. Recommended dose of NPK fertilizers @ 115, 72 and 75 kg per hectare were applied to all treatments using Urea,

DAP and MOP as a major source of nitrogen, phosphorous and potassium. Inspite of recommended dose of fertilizers, the well rotten cow dung @ 15 tons per hectare were also applied so as to maintain the physical condition of the soil. Proper care had been taken for irrigation, weeding and plant protection measure if found necessary. The affected pod due to concern pest as *M.obtusa* was recorded at fortnightly interval from 10 plants selected per treatment per replication at random in recommended area. Population of affected pod due to pest counts was made on whole plant basis. In all, several observation were made at 15 days interval upto maturity of the crop from beginning of infestation due to pest.

Results and discussion

Incidence of infection of the pods: The mean data (Table 1) clearly revealed that the per cent of infected seeds due to larval population of fly (Melanagromyza Obtusa) was significantly decreased in two the insecticidal treatments (plethora and sentry) as compared to others during first spraying might be due to the fact that the insectides are sprayed at the time of flowering which was supposed to be converted into pod hence, increases number of pod. However, there was competent decreament in the number of infected pods with the increase in the spraying order.Among these plethora caused maximum reduction in the larval population of test insect. It caused 4.12, 3.14 and 2.59 per cent reduction from total incidence of infection after first, second, third and fourth spray, respectively and was closely followed by the application of sentry which caused 4.04, 3.81 and 2.89 per cent reduction from total incidence of infection after each spray, respectively. The detail overview of the treatments is shown from table – 2 to 5.

Yield and economics of the treatments: The yield of each treatments is well tabulated in the table - 1. Third treated plot (plethora) shows maximum yield return with 18.11 q ha^{-1} as compared to others 13.5 q ha^{-1}, 15.6 q ha^{-1} and 16.85 q ha^{-1}. The increase in the yield is due to more incidences of insecticides over the pods which cause less infection. The economics of the treated plot is well tabulated in table – 1. The net fixed cost of treated plot (farmers' practice) was Rs. 33951 however, maximum cost of cultivation was noted from the treatment receiving sentry insecticide. The fluctuation of cost among the treatments was mainly because of insecticidal differences.

The highest gross return (Rs. 67550/ha) as well as net monitory return (Rs. 105038/ha) was found from the second treatment i.e., sentry application as compared to other treatments, which was mainly due to higher yield under this treatment. Hence, the highest Benefit: Cost ratio (B:C) derived from this treated plot is 1:2.82.

Acknowledgment

The replication under this experiment is at different farmers land hence, there might be certain controversy when the same replication would be conducted on the same land of surface. There is no conflict of interest among the authors.

Tables and Figures

Table 1: Yield and the economics of the treatments

Farmers	**Treatment**			
Replication	T_1	T_2	T_3	T_4
R_1	13.20	14.30	18.69	16.88
R_2	12.19	15.94	19.57	15.54
R_3	15.27	16.11	16.84	17.46
R_4	13.33	15.95	17.34	17.51
Total Yield	53.99	62.30	72.44	67.39
Mean Yield	13.497=13.5	15.575=15.6	18.11	16.847=16.85
Cost of Cultivation	33951	35866	37488	36591
Total income	78300	90480	1,05,038	97730
Net income	44349	54614	67,550	61139
% increase	-	15.6	34.15	24.82
B:C ratio	1:2.35	1:2.46	1:2.82	1:2.62

Table 2: Description of the first replication

S.No.	**Treatment**	**Incidence of the pest on randomly selected plant before and after the spraying**								
		No of Spraying								
		Before Dated 25.01.20 Ist spraying	**After Dated 09.02.20 Ist spraying**	**Before Dated 10.02.20 IInd spraying**	**After Dated 25.02.20 IInd spraying**	**Before Dated 26.02.20 IIIrd spraying**	**After Dated 12.03.20 IIIrd spraying**	**Before Dated 13.03.20 IVth spraying**	**After Dated 29.03.20 IVth spraying**	**Total % Incidence Treatment base**
1.	Farmer's Practice	121/1480	166/1480	171/1480	159/1480	140/1480	132/1480	131/1480	108/1480	9.53
2.	Abhimanu right gold	133/1469	141/1469	136/1469	114/1469	102/1469	88/1469	78/1469	34/1469	7.02
3.	Plethora	144/1511	79/1511	66/1511	53/1511	50/1511	44/1511	44/1511	18/1511	4.12
4.	Sentry	107/1610	97/1610	81/1610	60/1610	53/1610	51/1610	50/1610	22/1610	4.04
	Av. Affected pod	505/6070	483/6070	454/6070	386/6070	345/6070	315/6070	303/6070	182/6070	24.71/4
	Percent incidence	8.32	7.96	7.48	6.36	5.68	5.19	4.99	2.99	=6.18%

Table 3: Description of the Second replication

S.No.	**Treatment**	**Incidence of the pest on randomly selected plant before and after the spraying**								
		No of Spraying								
		Before Dated 25.01.20 Ist spraying	**After Dated 09.02.20 Ist spraying**	**Before Dated 10.02.20 IInd spraying**	**After Dated 25.02.20 IInd spraying**	**Before Dated 26.02.20 IIIrd spraying**	**After Dated 12.03.20 IIIrd spraying**	**Before Dated 13.03.20 IVth spraying**	**After Dated 29.03.20 IVth spraying**	**Total % Incidence Treatment base**
1.	Farmer's Practice	135/1611	155/1611	176/1611	167/1611	167/1611	140/1611	119/1611	100/1611	8.99
2.	Abhimanu right gold	143/1404	135/1404	127/1404	99/1404	89/1404	60/1404	57/1404	14/1404	6.44
3.	Plethora	136/1699	88/1699	88/1699	40/1699	31/1699	21/1699	20/1699	3/1699	3.14
4.	Sentry	119/1479	84/1479	83/1479	55/1479	34/1479	32/1479	31/1479	13/1479	3.81
	Av. Affected pod	533/6193	462/6193	474/6193	361/6193	321/6193	253/6193	227/6193	130/6193	22.38/4
	Percent incidence	8.60	7.46	7.65	5.83	5.18	4.08	3.66	2.09	=5.59%

Table 4: Description of the Third replication

S.No.	Treatment	Incidence of the pest on randomly selected plant before and after the spraying								
		No of Spraying								
		Before Dated 25.01.20 Ist spraying	After Dated 09.02.20 Ist spraying	Before Dated 10.02.20 IInd spraying	After Dated 25.02.20 IInd spraying	Before Dated 26.02.20 IIIrd spraying	After Dated 12.03.20 IIIrd spraying	Before Dated 13.03.20 IVth spraying	After Dated 29.03.20 IVth spraying	Total % Incidence Treatment base
1.	Farmer's Practice	87/1400	78/1400	78/1400	83/1400	83/1400	91/1400	92/1400	80/1400	6.00
2.	Abhimanu right gold	72/1761	65/1761	65/1761	69/1761	69/1761	77/1761	77/1761	54/1761	3.89
3.	Plethora	49/1569	31/1569	31/1569	17/1569	17/1569	6/1569	6/1569	2/1569	1.27
4.	Sentry	90/1203	54/1203	50/1203	30/1203	30/1203	21/1203	20/1203	11/1203	3.18
	Av. Affected pod	298/5933	228/5933	224/5933	199/5933	199/5933	195/1203	195/5933	147/5933	14.34/4
	Percent incidence	***5.02***	***3.84***	***3.77***	***3.35***	***3.35***	***3.29***	***3.29***	***2.48***	***=3.58***

Table 5: Description of the Fourth replication

S.No.	Treatment	Incidence of the pest on randomly selected plant before and after the spraying								
		No of Spraying								
		Before Dated 25.01.20 Ist spraying	After Dated 09.02.20 Ist spraying	Before Dated 10.02.20 IInd spraying	After Dated 25.02.20 IInd spraying	Before Dated 26.02.20 IIIrd spraying	After Dated 12.03.20 IIIrd spraying	Before Dated 13.03.20 IVth spraying	After Dated 29.03.20 IVth spraying	Total % Incidence Treatment base
1.	Farmer's Practice	75/1111	70/1111	71/1111	84/1111	84/1111	90/1111	90/1111	83/1111	7.28
2.	Abhimanu right gold	60/1469	71/1469	71/1469	64/1469	70/1469	89/1469	89/1469	66/1469	4.94
3.	Plethora	98/1348	60/1348	60/1348	24/1348	27/1348	5/1348	6/1348	0/1348	2.59
4.	Sentry	101/1092	45/1092	53/1092	14/1092	20/1092	9/1092	10/1092	1/1092	2.89
	Av. Affected pod	334/5020	246/5020	255/5020	186/5020	201/5020	193/5020	195/5020	150/5020	17.7/4
	Percent incidence	6.65	4.90	5.08	3.70	4.00	3.84	3.88	2.98	=4.42%

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