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TO STUDIES ON INTEGRATED PEST MANAGEMENT AGAINST GRAM POD BORER (*HELICOVERPA ARMIGERA* HUB.) ON CHICKPEA (*CICER ARIETINUM* L.)

Ramnivas[*1], S.K. Singh[*2], Satish Napit[*3], Dilip Meena[*4], Ravi Giri[*5]

[*1,3,4,5]PG Student, Department Of Ag. Entomology, Raja Balwant Singh College, Bichpuri, Agra 283105 (U.P) India.

[*2]Assistant Professor, Department Of Ag. Entomology, Raja Balwant Singh College, Bichpuri, Agra 283105 (U.P) India.

ABSTRACT

A field experiment was conducted at Agriculture Research Farm of Raja Balwant Singh College, Bichpuri, Agra (U.P) during Rabi season of 2020-2021. The experiment was consisted of one variety of chickpea " Desi Chana (40J14)". Research was conducted to studies on integrated pest management against Gram pod borer (*Helicoverpa armigera*) on chickpea. Total two sprays were taken. The evaluation of different modules used for control of pod borer (*H.armigera*) best among all modules and found minimum larval population at one day before last spray , 3 , 7 and 12 days after last spray recorded with 5.04, 3.42 and 2.7 larvae per 10 plants , respectively . The lowest effective module was botanical intensive (Neemastra 3 E.C. @ 15ml/l. > Neem oil 0.15 E.C. @ 10ml/l. > Neem oil 0.15 E.C. @ 10ml/l.+ Neemastra 3 E.C. @ 15ml/l) with 4.80 , 4.56 and 4.32 larvae / 10 plants at one day before last spray , 3 , 7 , and 12 days after last spray , respectively and though it was found statistically superior to the untreated control.The results recorded on per cent pod damage revealed that all the modules were found significantly superior over control to reduce the per cent pod damage. The minimum pod damage of 5.68, 5.46 per cent pod damage per 10 plants was recorded in botanical Intensive module (Neem Oil 0.15 E.C. @ 10ml/l and Neemastra 3 E.C. @ 15ml/l) . The lowest pod damage of 4.67 per cent pod damage per 10 plants was recorded in Botanical module (Neem Oil 0.15 E.C. @ 10ml/l + Neemastra 3 E.C. @ 15ml/l) and though it was statistically superior to the untreated control (7.45 per cent pod damage per 10 plants).The highest chickpea grain yield (1449.27 kg/ha.) was recorded in treatment V_1P_1 (Neem Oil 0.15% E.C.+ Neemastra 3%), the minimum chickpea grain yield (966.18 kg/ha. , 908.21kg/ha.) was recorded in treatment V_1P_3 (Neem Oil 0.15%) and V_1P_2 (Neemastra 3%) and the lowest chickpea grain yield (444.44 kg/ha.) was recorded in Uncontrol plot V_1P_4 (Untreated plot).

Keywords: Botanical intensive, Chickpea, Pod Borer, Pod Damage. Yield,

I. INTRODUCTION

Chickpea (*Cicer arietimum* Lin*, Leguminasae)* is the most important " Rabi pulse crop ". It is growing the semi - arid tropics area in india it is known gram or Bengal gram as "Chana" in hindi garbanzo bean, cecibean, Sanogalu hummus etc.

The cultivated 9.44 million hectare with the annual production of 10.13 million tones with the productivity of 1073 kg/hac (Ag statistics at a glance 2019),10.56 million hectare with an annual production of 11.23 million tones with productivity of 1063 kg/ha (Ag statistics at a glance 2018) ,9.63 million hac. with annual Production of 9.38 million tonnes with productivity of 974 kg/ ha (Ag. statistics at a glance 2017) india particularly yielding about 80% Of the world (sithantham ,1987). Chickpea growing states in india are Madhya Pradesh,Uttar Pradesh , Rajsthan, Maharastra, Gujrat, Haryana & other state. When, *H. armigera* larvae were reared on leaves, flower and pod of gram in laboratory at 30 ±1^{0}C, the pupal period was observed to be 9.4, 9.3, 9.5 days, respectively (Goyal and Rathore, 1988). On gram pod at 26±1^{o}C, this period was 14.59 days (Bilapate, 1988). The integrated pest management (IPM) is a concept which aims to integrate many Methods of pest control to manipulate the agro ecosystem in such a way that The pest are maintained at sub economic population level with minimum environmental disturbance. The integrated Pest management tactics include culture manipulation of crop and environment interculture operation Sowing date inter cropping , plant density Varieties use of microbial agents, Plant Products and lastly the chemical.

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The integration of various IPM components was found to be the best in reducing the pod damage (10.4 per cent) with highest grain yield (1264.4 kg/ ha) with 58.5 percent increase in yield over control (797.9 kg/ ha). Among various IPM components , Neem and HaNPV were as effective as Endosulfan in reducing the larval population and pod damage. The highest cost–benefit ratio (1:3.01) was obtained in plots treated with IPM. (Visalakshmi et al., 2005).

Keeping in mind the importance of *Helicoverpa armigera* and the need to develop effective IPM Module for management of This dreaded pest alterpts were made in the present investigation to obtain information on these aspects with the following objective.

1. Management of *Helicoverpa armigera* (Hub.) through some cultural practices.
2. Influence of intercropping on the incidence of *Helicoverpa armigera (Hub.)* and its natural enemies.
3. Efficacy of bio-pesticides in management of *Helicoverpa armigera (Hub).*

II. MATERIAL AND METHODS

The experiment was conducted at Raja Balwant Singh College , Agriculture Research Farm, Bichpuri, Agra (U.P) with the objectives to study on integrated pest management against gram pod borer (*H.armigera*) in chickpea at R.B.S College Bichpuri Agra during Rabi season 2020-2021.

Geographically, Bichpuri is located 11 km. from Agra on Agra- Bharatpur Road , 27^{o} north and longitude of 77.9^{o} ans is about 169.4 m. above sea level.

One experiment was layout in the field. The details of each experiment are as follows.

Design of experiment -RBD
No. of replication - 4
No. of treatment - 3
No. of plot - 12
Gross Plot size - 5× 12 M
Net Plot Size -4.5×11.5
Distance between replication - 0.5 M
Fertilizer and Manuars - 20-50-50 kg NPK/ha.
Seed treatment -Thiram @ 2gm/kg seed
Soil treatment - Carbandazim @ 50gm/252 metre sqeuare
Preparation of land Date -03-12-2020
Sowing Date - 04-12-2020
Variety - Desi chana(40J14)

Treatment details-

A. V1P1
B. V1P2
C. V1P3
D. V1P4

Protection treatment-

V_1P_1- Neem oil + Neemastra

V_1P_2- Neemastra (Neem leafs+onion+ garlic+ caster leafs+ ginger+ green chilli+oak leafs+cow urine+Curd straw) all paste mixture

V_1P_3 - Neem Oil - 0.15EC

V_1P_4 - Uncontrol plot

Table – 1 Detail of IPM methods used:

S. No.		Formulation	Concentration (%)
V1P1	Neem oil+ Neemastra	Liquid	0.15 EC+ 3%
V1P2	Neemastra	Liquid	3%

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V1P3	Neem oil	Liquid	0.15EC
V1P4	Control (Water spray)	_	_

III. RESULT AND DISCUSSION

The data presented in table 4.4 showed that the effect of IPM components on overall mean larval population after 1st and 2nd spraying in chickpea. The significantly mean lowest larval population (3.21/10plants) was recorded in V_1P_1 than all other treatments. Treatment V_1P_1, V_1P_3 and were at per with each V_1P_1 . treatment V_1P_4 has highest larval population (4.77/10 plants) and not differ significantly with V_1P_4 because one the untreated plots.

The control schedules showed significant difference in the larval population being lowest and highest (4.77/10 plants) in untreated control.

The botanical insecticide Neem Oil treated plots were also differed significantly from Neemastra and untreated plot. The botanical insecticide alone as well as Neemastra significantly had lesser *H. armigera* larvae as compared to untreated control.

Table -2 Seasonal Mean larval population of *Helicoverpa armigera* in different treatment.

Treatment No.	No. of larval Population/10 Plants							Total	Overall Mean
	First Spray				Second Spray				
	Treatment	**3 Days**	**7 Days**	**12 Days**	**3 Days**	**7 Days**	**12 Days**		
V1P1	**Neem Oil 0.15% EC+ Neemastra 3%EC**	5.04 (1.68)	4.50 (1.12)	4.14 (1.03)	3.60 (1.20)	1.44 (0.36)	0.54 (0.13)	19.26	3.21 (0.80)
V1P2	**Neemastra 3%EC**	4.68 (1.56)	4.32 (1.08)	3.96 (0.99)	3.96 (1.32)	2.16 (0.54)	1.08 (0.27)	20.16	3.36 (0.84)
V1P3	**Neem Oil 0.15%EC**	5.40 (1.80)	4.68 (1.17)	4.32 (1.08)	2.88 (0.96)	2.70 (0.67)	1.98 (0.49)	21.98	3.66 (0.91)
V1P4	**Control (Water spray)**	6.30 (2.10)	5.76 (1.44)	5.40 (1.80)	5.04 (1.68)	3.42 (0.85)	2.70 (0.67)	28.62	4.77 (1.19)
	Grant Total	21.42 (5.35)	19.26 (4.81)	17.82 (4.45)	15.48 (3.87)	9.72 (2.42)	6.30 (1.57)	90.02	
	SEM ±	0.6144							
	C.D 5%	1.181							

Figures in parentheses are transformed value $\sqrt{X + 0.5}$

Effect of IPM components on pod damage by *Helicoverpa armigera* in chickpea.

The data presented in table 4.4 showed that the effect of IPM component (Neem Oil, Neemasta and Neem Oil+ Neemastra spraying) on pod damage by *H. armigera* in chickpea. The parual of data reveals that the control schedules have significantly effects in chickpea. Pod damage by caused by *H. armigera*.

Pod damage in control schedule ranged from 18.70 to 29.31 percent in Neem Oil + Neemastra (V_1P_1) treated plot and untreated control plot (V_1P_4). The Neem Oil (V_1P_3) and Neemastra (V_1P_2) as well as Neem Oil + Neemastra (V_1P_1) had significantly lesser pod damage than uncontrol plot (V_1P_4).

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Table -3 Percent of pod damage of H. armigera/10 plants.

Treatment No.	Treatment	Mean
V1P1	**Neem Oil 0.15 % EC+ Neemastra 3 % EC**	18.70
V1P2	**Neematra 3 % EC**	22.73
V1P3	**Neem Oil 0.15 % EC**	21.85
V1P4	**Untreated plot**	29.81
SEM±	0.9313	
C.D	1.6695	

Effect Of IPM component on chickpea yield.

The data presented in table 4.5 showed that effect of IPM schedules *H. armigera* on yield of chickpea. The highest chickpea grain yield (1449.27 kg/ha.) was recorded in treatment V_1P_1 (Neem Oil 0.15% EC + Neemastra 3%), the minimum chickpea grain yield (966.18 kg/ha. , 908.21kg/ha.) was recorded in treatment V_1P_3 (Neem Oil 0.15%) and V_1P_2 (Neemastra 3%) and the lowest chickpea grain yield (444.44 kg/ha.) was recorded in Uncontrol plot V_1P_4 (untreated plot).

Table- 4 Yield of Chickpea (kg/ha.) under different IPM modules.

Treatment	Yield(Kg/ha.)
V1P1 (Neem Oil+ Neemastra)	**1449.27**
V1P2 (Neemastra)	**908.21**
V1P3 (Neem Oil)	**966.18**
V1P4 (Uncontrol)	**444.44**

Effect of different modules on pod damage by *H. armigera*

The minimum pod damage was recorded with botanical Intensive module (Neem Oil 0.15 EC @ 10ml/l + Neemastra 3 EC @ 15ml/l > Neem Oil 0.15 EC @ 8ml/l > Neemastra 3 EC @ 15ml/l) with 4.67 per cent per 10 plants followed by Recommended module (Neem Oil 0.15 EC @ 8ml/l > Neemastra 3 EC 15ml/l > Uncontrol plot) 5.46, 5.68 and 7.45 per cent pod damage per 10 plants , respectively . The present findings are supported by Choudhary et al. , (2008) who evaluated the efficacy of 7 insecticides 7 insecticides (Indoxacarb 0.5ml / liter , Quinalphos 2.0ml/ liter , Cypermethrin 0.5ml/ liter , Chloropyriphos 2.0ml / liter , Endosulfan 2.0 ml/ liter , Cartap hydrochloride 1.5 g / liter , Acephate 0.7gm/litre .The findings of Nayak and Gupta (2012) also supported the present finding that evaluated IPM modules against the incidence of pod borer in chickpea and reported chemical The module superior in comparison to the other organic module and organo-chemical module in controlling of pod damage. by the adoptive module involved the use of Profenophos (1.0 kg a . i . / ha), Endosulfan (0.5 kg a.i./ ha), HaNPV (250 LE / ha) and two applications of NSKE at 5.0 per cent. They also recorded the bio - intensive module better than the untreated control .

Grain yield

The maximum grain yield of 14.27 q/ha was recorded in botanical Intensive module (Neem Oil 0.15 EC @ 10ml/l + Neemastra 3 EC @15ml/l > Neem Oil 0.15 EC @ 8 ml/l > Neemastra 3 EC @ 15 ml/l) and followed Recommended module (Neem Oil 0.15 EC @ 8ml/l > Neemastra 3 EC @ 15ml/l > Uncontrol plot) with 9.66 and 9.21 q / ha and 4.44 q/ha. , respectively . The present experimental findings are supported by Singh and Devi (2004) reported that the chemical module (M3) with highest grain yield (12.9 q / ha) followed by the adoptive module (M2).

IV. CONCLUSION

The botanical insecticide Neem Oil treated plots were also differed significantly from Neemastra and untreated plot. The botanical insecticide alone as well as Neemastra significantly had lesser *H. armigera* larvae as compared to untreated control. Pod damage in control schedule ranged from 18.70 to 29.31 percent in Neem Oil + Neemastra (V_1P_1) treated plot and untreated control plot (V_1P_4). The Neem Oil (V_1P_3) and Neemastra

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(V_1P_2) as well as Neem Oil + Neemastra (V_1P_1) had significantly lesser pod damage than uncontrol plot (V_1P_4). The module superior in comparison to the other organic module and organo-chemical module in controlling of pod damage. by the adoptive module involved the use of Profenophos (1.0 kg a . i . / ha), Endosulfan (0.5 kg a.i./ ha), HaNPV (250 LE / ha) and two applications of NSKE at 5.0 per cent. They also recorded the bio - intensive module better than the untreated control.

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