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BIOEFFICACY OF NEWER INSECTICIDES AGAINST GRAM POD BORER, *HELICOVERPA ARMIGERA*

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SUMMARY

Bio efficacy of newer insecticides was studied against *Helicoverpa armigera* in chickpea. Novaluron 10 EC was found as superior against *H. armigera wrt* minimum number of larvae. However, flubendiamide proved significantly superior in terms of minimum pod damage (21.71%), maximum reduction over control (41.18%) and highest yield (3409.26 kg/ha). Next best chemicals with reduction over control were emamectin benzoate 5SG (9.77%), chlorantraniliprole 18.5SC (39.55%), flubendiamide 8.33 + deltamethrin 5.56SC (36.95%), novaluron 10EC (36.33%), novaluron 5.25+ indoxacarb 4.50SC (34.11%), quinalphos 25EC (32.48%) and lambda-cyhalothrin 5EC (22.08%).

Key words: *Helicoverpa armigera*, pod damage, bioefficacy and newer insecticides

Cicer arietinum L. commonly known as chickpea is one of the most important *rabi* pulse crop due to its high nutritional value (protein : 21.5%, carbohydrates : 64.5%, fat : 4.5%, vitamin B, potassium and phosphorus etc.). In India, chickpea is grown over an area of 10.47 m ha with production and productivity of 12.27 mt and 1172 kg/ha, respectively as compared to 29.00 thousand ha, 26.00 thousand tonnes and 911 kg/ ha, in Haryana (Anonymous 2024). Worldwide India is the largest producer of chickpea, but the productivity is less as compared to other countries due to biotic stress (insect-pests) and about 60 insect species found feeding on it (Reed *et al*., 1987). Among insect-pests, gram pod borer, *H. armigera* (Order : Lepidoptera, Family : Noctuidae) is the most important pest causing yield losses from 70 to 95 per cent (Prakash *et al*., 2007). An estimated loss of US$325 million in chickpea and over US$5 billion on different crops worldwide, despite application of insecticides costing over US$2 billion annually due to *Helicoverpa* spp. has been reported (Sharma, 2005). *H. armigera* is the most damaging pest of chickpea crop causing damage from seedling to crop maturity stage with significant reduction in crop yield. Under favourable condition pod damage of about 90 to 95 per cent has been reported due to *H. armigera* (Sehgal and Ujagir, 1990; Sachan and Katti, 1994). Management strategies *viz.* use of resistant/tolerant varieties (ICCL 86111), biocontrol agents, cultural practices, spray of botanicals, biopesticides and insecticides (spinosad 45 SC @100 g a. i/ ha, indoxacarb 15.8 EC @ 75 g a.i./ ha: Mishra *et al*., 2014) etc. are effective against *H. armigera*. But indiscriminate use of pesticides leads to adverse effects like environmental pollution, resurgence of pests, insect resistance to insecticides, health hazards etc. Various workers studied the efficacy of newer insecticides against *H.* armigera which are effective at lower dosage and cause high mortality, longer protection (Saini *et al*., 2013) among insect-pests and safe to environment. Newer insecticides *viz.* spinosad (Sreekanth and Seshamahalakshmi, 2012, Nitharwal *et al*., 2017), indoxacarb (Kulhari *et al*., 2009, Gudipati et al. 2020), lambda cyhalothrin (Yadav, 2009, Hossain *et al*., 2010), emamectin benzoate (Yadav and Verma, 2007, Chauhan *et al*., 2016), flubendiamide (Basavanneppa and Balikai 2016), chlorantraniliprole 20SC (Sreekanth *et al*., 2014), novaluron (Saini *et al*., 2013) proved highly effective aginst *H. armigera* over conventional insecticides. Keeping in view the more effectiveness of newer insecticides over conventional pesticides and long term protection against *H. armigera* the present studies was undertaken to study the bio efficacy of newer insecticides against *H. armigera* in chickpea crop.

MATERIAL AND METHODS

Chickpea crop (variety HC 1) was grown in RBD (Randomized Block Design) with three replication, during the *Rabi* season of year 2021-22, at the Pulses Research Farm, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar. Plot size of each treatment was maintained as 10 rows of 4 metre each with row to row and plant to plant spacing of 30cm and 10 cm, respectively. Bioefficacy of eight insecticides *viz*. Chlorantraniliprole 18.5SC (125 ml/ha), Emamectin benzoate 5SG (220 g/ha), Flubendiamide 20 WG (250 g/ha), Flubendiamide 8.33 + deltamethrin 5.56SC (250 ml/ha), Lambda-cyhalothrin 5EC (500 ml/ha), Novaluron 10EC (750 ml/ha), Novaluron 5.25+ indoxacarb 4.50SC (825-875 ml/ha), Quinalphos 25EC (1000 ml/ha) was assessed against *H. armigera* and compared with control (No spray). Larval population of *H. armigera* was recorded before spray (BS) and then at 1, 3, 7, 10 and 14 days after first (DAFS) and second spray (DASS) from 3 locations (3 mrl) in each treatment and each replication. Pod damage (%) was recorded from 10 randomly selected plants and each treatment in each replication. Yield per plot was also recorded at the time of threshing and converted into kg per ha.

RESULTS AND DISCUSSION

Larval population of *H. armigera* showed non-significant differences before spray of insecticides (First spray), whereas significant differences were observed after 1, 3, 7, 10 and 14 days after first and second spray (Table 1). Maximum population of *H. armigera* was recorded in control after first and second spray of insecticides at 1, 3, 7, 10 and 14 DAS (days after spray). Larval population of *H. armigera* showed decline pattern in all the treatment at 1, 3 and 7 days after first spray (DAFS) except untreated control. Plot sprayed with emamectin benzoate 5SG showed minimum population (6.78 and 5.00 larvae/mrl) and it was at par with all other treatments except Control at 1 and 3 DAFS, respectively. At 7 DAFS, Novalron 5.25 + Indoxacarb 4.50SC was found more effective w.r.t. to minimum population of *H. armigera* (2.44 larvae/mrl) and it was at par with all other treatments except Flubendiamide 20WG and control). Increasing trend in population of *H. armigera* was found in all the treatments at 10 and 14 DAFS with minimum number in Chlorantraniliprole 18.5SC (4.22 larvae/mrl) and novaluron 10EC (4.67 larvae/mrl) sprayed plots at 10 and 14 DAFS, respectively. Overall mean of first spray indicated that emamectin benzoate was superior over other treatment (4.93 larvae/mrl) and was at par with all other treatments except control (T_9). Second spray resulted in decline in *H. armigera* number upto 7 DASS. At 1 DASS, all treatments showed decline in larval population of *H. armigera* except novaluron 5.25+indoxacarb 4.50SC, with minimum number in novaluron 10EC (4.00 larvae/ mrl). At 3, 7 and 10 DASS, plot sprayed with flubendiamide showed minimum population (3.11, 2.67 and 3.33 larvae/mrl, respectively) and it was found at par with all other treatments except control. However, at 14 DASS, novaluron sprayed plot showed minimum number of *H. armigera* (3.44 larvae/mrl). Overall mean of second spray indicated that novaluron was superior over all treatments, while all other treatments were superior over control. The present findings are more or less in confirmation with Kumar and Sarada (2015) who reported minimum number of *H. armigera* larvae in chlorantraniliprole 20SC (0.50 larvae/10 plants), spinosad 45 SC (0.67 larvae/10 plants) and flubendiamide 20WG (0.84 larvae/10 plants) sprayed plots as against untreated plot (8.17 larvae/10 plants), respectively.

Pooled mean of first and second spray indicated that all the treatments showed significant impact on larval population of *H. armigera* over untreated control (Table 2). Novaluron sprayed plot recorded minimum larvae of *H. armigera* (4.46 larvae/ mrl) and it was at par with all other treatments except untreated control (12.24 larvae/mrl). On the basis of pod damage (%), flubendiamide was found significantly superior with minimum pod damage (21.71%) and was at par with all other treatment except control (36.91%). The present studies are in confirmation with those of Deshmukh *et al.* (2010) and Basavanneppa and Balikai (2016) who reported flubendiamide and emamectin benzoate as most effective against *H. armigera*. Maximum reduction over control (41.18%) was also recorded in flubendiamide 20 WG sprayed plot followed by emamectin benzoate 5SG (39.77%), chlorantraniliprole 18.5SC (39.55%), flubendiamide 8.33 + deltamethrin 5.56SC (36.95%), novaluron 10EC (36.33%), novaluron 5.25+ indoxacarb 4.50SC (34.11%), quinalphos 25EC (32.48%). The present studies are more or less in accordance with those of Chavan and Patil (2014) who reported maximum cost benefit ratio in flubendiamide 48SC (1:19.22) followed by rynaxypyr 20 SC (1:11.1), profenophos 50 EC

TABLE 1

Efficacy of different insecticides against gram pod borer, *Helicoverpa armigera*

Treatments	Larval population of *H. armigera*/mrl										
	First Spray						Second spray				
	BS	1 DAS	3 DAS	7 DAS	10 DAS	14 DAS	1 DAS	3 DAS	7 DAS	10 DAS	14 DAS
Chlorantraniliprole 18.5SC	9.78 (3.27)	7.67 (2.92)	5.67 (2.56)	2.56 (1.88)	4.22 (2.28)	5.78 (2.60)	4.67 (2.38)	4.00 (2.14)	3.33 (2.02)	4.67 (2.37)	5.67 (2.58)
Emamectin benzoate 5SG	9.33 (3.21)	6.78 (2.77)	5.00 (2.44)	2.56 (1.88)	4.44 (2.33)	5.89 (2.62)	4.78 (2.39)	4.56 (2.33)	4.00 (2.21)	5.00 (2.43)	5.67 (2.57)
Flubendiamide 20 WG	11.11 (3.47)	8.56 (3.08)	6.44 (2.71)	3.67 (2.13)	4.78 (2.40)	5.89 (2.61)	4.67 (2.36)	3.11 (2.01)	2.67 (1.91)	3.33 (2.06)	5.22 (2.48)
Flubendiamide 8.33 + deltamethrin 5. 56SC	11.89 (3.59)	9.00 (3.16)	6.56 (2.74)	2.67 (1.91)	5.33 (2.50)	5.56 (2.55)	5.00 (2.43)	3.56 (2.10)	3.00 (1.99)	3.67 (2.16)	4.78 (2.40)
Lambda-cyhalothrin 5EC	9.44 (3.23)	7.11 (2.84)	5.56 (2.56)	2.89 (1.96)	5.56 (2.54)	6.67 (2.77)	5.44 (2.51)	3.56 (2.10)	2.67 (1.91)	4.00 (2.19)	4.11 (2.24)
Novaluron 10EC	11.00 (3.46)	7.78 (2.96)	6.00 (2.64)	3.00 (1.99)	5.33 (2.51)	4.67 (2.34)	4.00 (2.21)	3.67 (2.15)	3.00 (2.00)	3.67 (2.15)	3.44 (2.06)
Novaluron 5.25 + indoxacarb 4.50SC	10.56 (3.40)	8.11 (3.02)	5.33 (2.52)	2.44 (1.85)	4.67 (2.36)	5.56 (2.56)	5.56 (2.53)	4.44 (2.32)	3.67 (2.15)	4.33 (2.31)	4.78 (2.39)
Quinalphos 25EC	9.67 (3.26)	7.44 (2.89)	5.44 (2.52)	2.78 (1.93)	5.00 (2.44)	6.11 (2.67)	4.78 (2.39)	4.33 (2.29)	3.67 (2.15)	4.33 (2.30)	5.89 (2.62)
Control (No spray)	10.33 (3.36)	11.78 (3.57)	13.67 (3.83)	14.22 (3.90)	14.22 (3.90)	12.33 (3.64)	11.78 (3.57)	11.44 (3.51)	10.00 (3.31)	11.00 (3.46)	12.00 (3.60)
C.D. at 5%	(N.S.)	(0.31)	(0.34)	(0.27)	(0.33)	(0.49)	(0.64)	(0.75)	(0.51)	(0.52)	(0.48)
S.E. m (+)	(0.10)	(0.10)	(0.11)	(0.09)	(0.11)	(0.16)	(0.21)	(0.25)	(0.17)	(0.17)	(0.16)

Values in parenthesis are sq. root transformation values, * Angular transformed values.

TABLE 2

Pod damage (%), larval population of *H. armigera* in different insecticidal treatments

Treatments	Larval population of *H. armigera*			Pod damage (%)*	Reduction over control (%)	Yield (kg/ha)
	Mean (1st Spray)	Mean (2nd Spray)	Pooled mean			
Chlorantraniliprole 18.5SC	5.18 (2.48)	4.47 (2.32)	4.82 (2.40)	22.31 (28.17)	39.55	3140.74
Emamectin benzoate 5SG	4.93 (2.43)	4.80 (2.40)	4.87 (2.42)	22.23 (28.10)	39.77	3305.92
Flubendiamide 20 WG	5.87 (2.60)	3.80 (2.19)	4.83 (2.41)	21.71 (27.49)	41.18	3409.26
Flubendiamide 8.33 + deltamethrin 5. 56SC	5.82 (2.61)	4.00 (2.23)	4.91 (2.43)	23.27 (28.60)	36.95	3295.56
Lambda-cyhalothrin 5EC	5.56 (2.55)	3.96 (2.20)	4.76 (2.39)	28.76 (32.37)	22.08	2440.74
Novaluron 10EC	5.36 (2.52)	3.56 (2.13)	4.46 (2.33)	23.50 (28.98)	36.33	3074.07
Novaluron 5.25+ indoxacarb 4.50SC	5.22 (2.49)	4.56 (2.35)	4.89 (2.43)	24.32 (29.38)	34.11	2688.89
Quinalphos 25EC	5.36 (2.51)	4.60 (2.36)	4.98 (2.44)	24.92 (29.72)	32.48	2633.33
No Treatment	13.24 (3.77)	11.24 (3.49)	12.24 (3.64)	36.91 (37.29)	-	2081.48
C.D. at 5%	(0.21)	(0.40)	(0.24)	(5.15)		631.51
S.E. m(+)	(0.07)	(0.13)	(0.08)	(1.70)		208.84

*Values in parenthesis are angular transformed values.
Values in parenthesis are square root transformation values.

(1:7.8), emamectin benzoate 5 SG (1:4.2) and lufenuron 5.4 EC (1:3.5). Similarly maximum yield was recorded in flubendiamide sprayed plots (3409.26 kg/ha) and was at par with chlorantraniliprole 18.5SC (3140.74 kg/ha), emamectin benzoate 5SG (3305.92 kg/ha), flubendiamide 8.33 + deltamethrin 5.56SC (3295.56 kg/ha) and novaluron 10EC (3074.07 kg/ha). Untreated control recorded minimum yield (2081.48 kg/ha) and it was at par with lambda-cyhalothrin 5EC (2440.74 kg/ha), novaluron 5.25+ indoxacarb 4.50SC (2688.89 kg/ha) and quinalphos 25EC (2633.33 kg/ha). The present findings are more or less in accordance with those of Patel and Chaudhari (2016) who reported higher yield in chlorantraniliprole @ 0.006% (2511 kg/ha) followed by emamectin benzoate (2427 kg/ha) and flubendiamide (2425 kg/ha).

REFERENCES

Anonymous. 2024 : Project Coordinator's Report (2023 24), ICAR-All India Coordinated Research Project on Rabi Pulses, ICAR-IIPR, Kanpur.

Basavanneppa, B. B. and R. A. Balikai, 2016 : Bio-efficacy of newer insecticide molecules against pod borer, *Helicoverpa armigera* (Hübner) in chickpea. *International Journal of Agricultural Statistical Sci*ences, 12(1): 147-152.

Chauhan, Pooja, N. S. Bhadauria, Bondre and M. Chetan, 2016 : Bio-efficacy of newer insecticides against gram pod borer, *Helicoverpa armigera* (Hübner). *Advancements in Life Sci*ences, 5(1): 280-282.

Deshmukh, S. G., B. V. Sureja, D. M. Jethva and V. P. Chatar, 2010 : Field efficacy of different insecticides against *Helicoverpa armigera* (Hübner) infesting chickpea. *Legume Research*, 33: 269-273.

Gudipati, Naveen and G. S. Mondal, 2020 : Efficacy of some insecticides against gram pod borer, *Helicoverpa armigera* on chickpea. *Indian Journal of Entomolgy*, 82(3): 515-518.

Hossain, M. S., M. S. Islam, M. A. Salam, M. A. Hossain and M. U. Salma, 2010 : Management of chickpea pod borer, *Helicoverpa armigera* (Hübner) using neem seed extract and lambda-cyhalothrin in high barind tract. *Journal of Bio-Science*, 18: 44-48.

Kulhari G.L., V. Singh and H.L. Deshwal, 2009 : Efficacy of insecticides and biopesticides against *Helicoverpa armigera* (Hübner) in chickpea. *Indian Journal of Applied Entomology*, 23:53-56.

Kumar, G. S., and O. Sarada, 2015 : Field efficacy and economics of some new insecticide molecules against lepidopteran caterpillars in chickpea. *Current Biotica*, **9**(2): 153-158.

Mishra, K., N. N. Singh, S. K. Singh and R. Kumari, 2014 : Efficacy of insecticides against *Helicoverpa armigera* on chickpea. *Annuals of Plant Protection Science*, 22(2): 422-460.

Nitharwal, R. N., A. Kumar, S. L. Jat and M. P. Chula, 2017 : Efficacy of newer molecules against gram pod borer, *Helicoverpa armigera* (Hübner) on chickpea (*Cicer arietinum* L.). *Journal of Pharmacognosy and Phytochemistry*, 6(4): 1224-1227.

Patel, S. D. and R. L. Chaudhari, 2016 : Bio-efficacy study of different insecticides against *Helicoverpa armigera* (Hübner) infesting chickpea. *Advancements in Life Sci*ences, 5(1) :126-132.

Prakash, M. R., U. Ram and A. Tariq, 2007 : Evaluation of chickpea (*Cicer arietinum* L.) germplasm for the resistance to gram pod borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae). *Journal of Entomology Research*, **31**: 215-218.

Reed, W., C. Cardona, S. Sithanantham and S. S. Lateef, 1987 : The Chickpea insect pests and their control. In: Saxena, M. C. and Singh, K. B. (eds) The Chickpea. CAB Internationals, Wallingford, UK, pp. 283-318.

Sachan, J. N. and G. Katti, 1994 : Integrated pest management. Proceeding of international symposium on pulses research, April 2-6, IARI, New Delhi, India. pp. 23-30.

Saini, R. K., Roshan Lal Yadav, J. L., Yadav, S. P. and Sushil. 2013 : Bio-efficacy of novaluron against *Helicoverpa armigera* (Hübner) on chickpea. *Journal of Insect Science*, **26**: 148-154.

Sehgal, V. K. and R. Ujagir, 1990 : Effect of synthetic pyrethroids, neem extracts and other insecticides for the control of pod damage by *Helicoverpa armigera* (Hübner) on chickpea and pod damage-yield relationship at Pantnagar in northern India. *Crop Protection*, **9**(1): 29-32.

Sharma, H. C., 2005 : *Heliothis*/*Helicoverpa* Management: *Emerging Trends and Strategies for Future Research*. p. 469. Oxford and IBH Publishing, New Delhi, India.

Sreekanth, M. and M. Seshamahalakshmi, 2012: Studies on relative toxicity of biopesticides to *Helicoverpa armigera* (Hübner) and *Maruca vitrata* (Geyer) on pigeonpea (*Cajanus cajan* L.). *Journal of Biopesticides*,**5**: 191-195.

Sreekanth, M., M. S. M. Lakshmi and Y. K. Rao, 2014: Bio-efficacy and economics of certain new insecticides against gram pod borer, *Helicoverpa armigera* (Hubner) infesting pigeonpea (*Cajanus cajan* L.). *International Journal of Plant, Animal and Environmental Sciences*, **4**(1): 11-15.

Yadav, D. K., 2009 : Assessment of Pesticides against *Helicoverpa armigera*. *Annals of Plant Protection Science*. 17 (1): 56-58.

Yadav, J. B., and R. A. Verma, 2007 : Efficacy of certain synthetic insecticides and biopesticides used as foliar application against the gram pod borer, *Helicoverpa armigera* (Hübner). *Journal of Entomological Research*, **31**(4): 327-329.