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SHORT COMMUNICATION

COMPARATIVE EFFICACY AND ECONOMICS OF SELECTED CHEMICALS AND BOTANICALS AGAINST GRAM POD BORER [*HELICOVERPA ARMIGERA* (HUBNER)] ON COWPEA [*VIGNA UNGUICULATA* (L.) WALP.]

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Abstract: During the Kharif season of 2022, the experiment titled "Comparative efficacy and economics of selected chemicals and Botanicals against gram pod borer [*Helicoverpa armigera* (Hubner)] on cowpea [Vigna unguiculata (L.) Walp.]" was carried out at the central research farm field was laid out in randomised block design (RBD) with seven treatments and an untreated control plot. The larvae population per plant was counted before spraying, and 3, 7, and 14 days later, all of the treatments tested significantly reduced pest infestation compared to the untreated control.The efficacy findings showed that treatment Chlorantraniliprole 18.5% SC (1.38) had the lowest larval population. The next most effective treatments were Spinosad 45% SC (1.58), 1/2 dose chlorantraniliprole 18.5% SC + Niscosixerplus 2ml/l(1.82),1/2dose Chlorantraniliprole18.5% SC+ Neem oil 5% (2.05), Niscosixerplus 2ml/l (2.17), Neem oil 5% (2.44), and Tobacco leaf Extract 10% (2.65). which was found to be least effective among all treatments, these treatments were found superior over untreated control recording highest larval population (3.87).The best and most cost-effective treatment was Chlorantraniliprole 18.5% SC (1:2.34) and then next effective treatments were Spinosad 45% SC (1:2.03), ½dose Chlorantraniliprole 18.5% SC + Niscosixerplus 2ml/l (1:1.80), ½ dose Chlorantraniliprole 18.5% SC + Neemoil5% (1:1.59), Niscosixerplus 2ml/l (1:1.49), Neemoil 5% (1:1.34), and Tobacco leaf Extract 10% (1:1.13), and the least C: B ratio was recorded in untreated control(1:1.04).

Keywords: Cost Benefit ratio, Cowpea, *Helicoverpa armigera*, Neem oil

INTRODUCTION

Cowpea [*Vigna unguiculata* (L.) Walp.] is a tropical, annual herbaceous legume in the Fabaceae family (Stoilova *et al*., 2013). The genus Vigna contains approximately 100 species with a wide range of physical and ecological variety (Oyewale *et al*., 2014). It is also known as black-eyed pea or southern pea and has a variety of purposes including food, feed, forage, fodder, green manuring, and vegetable. Cowpea is also used as a cover crop and helps to improve soil fertility through nitrogen fixation (Asiwe et al., 2009).Cowpea seeds are high in protein and calories, as well as minerals and vitamins (Oyewale *et al*., 2014) found that the grain includes 26.61% protein, 3.99% fat, 56.24% carbs, 8.60% moisture, 3.84% ash, 1.38% crude fibre, 1.51% gross energy, and 54.85% nitrogen free extract. Cowpea production employs the majority of people in poor countries. Africa, Nigeria, Brazil, Haiti, India, Myanmar, Sri Lanka, Australia, and the United States are among the top cowpea producing countries. Cowpeas are planted all over the world, with an estimated yearly cultivation area of 12 to 14 million hectares and a global production of around 4.5 million metric tonnes (Singh *et al*., 2006). India is one of the biggest contributors to global cowpea production. India ranks top and contributes over 25% of the world's total pulse basket (Choudhary, 2009). Cowpeas are grown on approximately 3.9 million hectares, with a productivity of 567 kg per ha. In India, cowpea is planted on around 0.5 million hectares, with an average production of 600 to 750 kg grains/ha.

MATERIALS AND METHODS

During the Kharif season of 2022, the experiment was conducted at the Department of Entomology, Central Research Farm (CRF), Sam Higginbottom University of Agriculture Technology And Sciences, in a Randomised Block Design (RBD) with seven treatments and an untreated control were replicated three times using variety Kashi kanchan seeds in a plot size of 2m x1m at a spacing of 30cm x15cm with a recommended package of practices excluding

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plant protection. The soil at the experimental site was well drained and medium high. The research field was located at $25^0$27" North latitude $80^0$05" East longitudes and at an altitude of 98 metre above sea level. The highest temperature in July reached 47^0C and dropped to 20^0C in winter. The pest population was estimated by inspecting five plants randomly selected from each treatment for the presence of egg masses and larvae one day before insecticide application and 3 7 and 14 days afterwards. The larval population over control against pod borer (*H. armigera*) was calculated by using the mean of three observations made three days after the first and second spraying. The healthy marketable yield obtained from various treatments was collected and weighed separately. During the Kharif season, the price of the insecticides employed in this experiment was recorded. The cost of the botanicals was acquired at a neighbouring market. The cost of treatments, sprayer rental fees, and personnel costs for the spraying made up the overall cost of plant protection. During the research period, there are two sprays, and the overall cost of plant protection was determined. The total yield per hectare was multiplied by the going market rate to get at total income, and the entire cost of plant protection was deducted to arrive at net benefit. The benefit relative to the control for each sprayed treatment was derived by deducting the income of the control treatment from that of each sprayed treatment.

The C:B ratio was calculated by formula:

Gross return = Marketable yield × Market price

$$\text{Cost: Benefit Ratio} = \frac{\text{Gross return}}{\text{Total cost of cultivation}}$$

RESULTS AND DISCUSSION

The results of the field trail using insecticides and botanicals showed that among the insecticides treated against gram pod borer after first spray at 14 DASChlorantraniprole 18.5% SC (1.73)was found significantly superior in reducing the larval population which was followed by Spinosad 45% SC with (2.00), ½ dose Chlorantraniliprole 18.5% SC + Nisco sixer plus 2ml/l (2.20), ½ dose Chlorantraniliprole 18.5% SC + Neemoil5%(2.40), Nisco sixer plus 2ml/l (2.53) Neemoil 5% (2.80) and Tobacco leaf Extract 10% (3.00) as compared to untreated control (3.00). After second spray at 14 DAS all the insecticides were found to be more effective than untreated control Chlorantraniprole 18.5% SC (0.93) was found significantly more effective in reducing the larval population which was followed by Spinosad 45% SC with (1.06), ½ dose Chlorantraniliprole 18.5% SC + Nisco sixer plus 2 ml/l (1.33), ½ dose Chlorantraniliprole 18.5% SC + Neemoil 5% (1.66), Nisco sixerplus2ml/l (1.73) Neemoil 5%(2.00)andTobacco leaf Extract 10% (2.20)ascompared to untreated control (4.40) The treatments were found to be statistically at par with each other. The gram pod borer larval population was observed to be decreased by chlorantraniliprole to a level of 1.38. Chlorantraniliprole greatly increased cowpea production (22.20 q/ha), and the C:B ratio was 1:2.34 (Table 1). The current result is consistent with observations made when Chlorantraniliprole 18.5% SC 0.5 ml/l was applied in the field to combat cowpea pod borer, which resulted in the lowest larvae population in cowpea. (Patil *et al.*, 2018, Santhosh and Kumar, 2022). Chlorantraniliprole 18.5% SC, Spinosad 45% SC, ½ dose Chlorantraniliprole 18.5% SC + Niscosixerplus 2ml/lit, ½ dose Chlorantraniliprole 18.5% SC + Neemoil5%,Niscosixerplus 2ml/lit, Neem oil 5%, Tobacco leaf Extract 10% was found effective in reducing larval population (Pant *et al.*, (2021)' Santhosh and Kumar (2022), Jayanth and Kumar (2022), Barwa and Kumar (2022), Tejeswari andKumar (2021), Konda and Kumar (2022). The current study is consistent with Konda and Kumar's findings from 2022, which claimed that the botanical compound (2.334) was the most successful in reducing the larvae population by the maximum percentage and that the yield and quality parameters measured were higher in treated plots than in control plots.

The yields from the treatments were substantial.. The highestyield was recordedin T_2- Chlorantraniliprole 18.5% SC (22.20 q/ha) followed by Next effective treatment was T_1-Spinosad 45% SC with (19.40 q/ha), T_5 - ½ dose Chlorantraniliprole 18.5% SC+ Nisco sixerplus2ml/l (17.10 q/ha), T_7-½ dose Chlorantraniliprole 18.5% SC + Neemoil 5% (14.30q/ha),T_3 – Neemoil 5% (12.60q/ha) and T_6 - Tobacco leaf Extract 10% (10.80q/ha) as compared to control (9.10q/ha). When cost benefit ratio was worked out, interesting result was achieved. Among the treatment best and economical treatment was in T_2 Chlorantraniliprole 18.5% SC (1:2.34) followed by Next effective treatment was T_1- Spinosad 45SC with (1:2.03), T_5- ½ dose Chlorantraniliprole 18.5% SC+ Niscosixerplus 2ml/lit (1:1:80),T_7-½ dose Chlorantraniliprole 18.5% SC + Neemoil 5% (1:1:59), Niscosixerplus 2ml/lit (1:1:49),T_3-Neemoil 5% (1:1.34), and T_6- Tobacco leaf Extract 10% (1:1:13) as compared to control (1:1.04).

Table 1. Efficacy of certain in secticides against larval population of gram pod borer on cowpea (overall mean)

S. N.	Treatments	Larval Populationof *H. armigera*/fiveplants							Overall mean	Yield (q/ha)	C:B ratio
		First spray				Second spray					
		1DBS	3DAS	7DAS	14DAS	3DAS	7DAS	14DAS			
T_1	Spinosad 45% SC	2.66	2.20	1.80	2.00	1.53	0.93	1.06	1.58	19.40	**1:2.03**
T_2	Chlorantraniprole 18.5%SC	2.80	1.93	1.53	1.73	1.40	0.80	0.93	1.38	22.20	**1:2.34**

T_3	Neemoil5%	2.93	2.93	2.60	2.80	2.53	1.80	2.00	2.44	12.60	**1:1.34**
T_4	Nisco sixer plus 2ml/l	3.00	2.80	2.40	2.53	2.26	1.33	1.73	2.17	13.75	**1:1.49**
T_5	½dose Chlorantraniliprole18.5SC+ Nisco sixer plus 2ml/l	2.93	2.40	2.00	2.20	1.80	1.20	1.33	1.82	17.10	**1:1.80**
T_6	Tobacco leaf Extract 10%	3.00	3.00	2.80	3.00	2.80	2.13	2.20	2.65	10.80	**1:1.13**
T_7	½ dose Chlorantraniliprole18.5SC +Neemoil5%	2.86	2.86	2.20	2.40	2.06	1.40	1.66	2.05	15.30	**1:1.59**
T_8	Control	3.53	3.53	3.73	3.00	3.86	4.00	4.40	3.87	9.10	**1:1.04**
	F-test	**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	_	_
	CV	_	2.997	2.243	4.803	9.863	12.076	10.81	12.904	_	_
	C.D. (P = 0.5)	_	0.140	0.094	0.215	0.394	0.360	0.363	0.685	_	_

DAS -Day after spray, DBS - Day before spray

CONCLUSION

The treatment shown to be the most efficient and cost-effective overall was chlorantraniliprole 18.5% SC. In controlling *helicoverpaarmigera* reduction, similar treatments include Spinosad 45% SC, 1/2 dose Chlorantraniliprole 18.5% SC+ Niscosixerplus 2ml/lit, 1/2 dosage Chlorantraniliprole 18.5% SC + Neem oil 5%, Niscosixerplus 2ml/lit, Neem oil 5%, and Tobacco leaf Extract 10%. Developing a proper integrated pest control plan against the cowpea pod borer requires the use of recommended chemical doses and chemical combinations with botanicals.

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