Plant Archives Vol. 25, Supplement 2, 2025 pp. 704-708 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-2.089

EFFICACY OF INSECTICIDES AND BIO-PESTICIDES AGAINST LEAF HOPPER/JASSID (*EMPOASCA KERRI*) AND SPOTTED POD BORER (*MARUCA VITRATA*) INFESTING COWPEA

Aditya Kumar Sharma*, Amarendra Pratap Singh, Sushil Kumar, Ankit Kumar and Rahul Raj
Department of Entomology, Baba Raghav Das Post Graduate College, Deoria - 274 001, Uttar Pradesh, India
*Corresponding author E-mail: adisharmajmd098@gmail.com
(Date of Receiving : 08-05-2025; Date of Acceptance : 16-05-2025)

ABSTRACT

A field experiment was conducted to evaluate the efficacy of insecticides and bio-pesticides against Leaf hopper/Jassid (*Empoasca kerri*) and spotted pod borer (*Maruca vitrata*) infesting cowpea crop at Agricultural Research farm of B.R.D. PG College Deoria during *kharif* season 2022. The result revealed that Imidacloprid 17.8 SL @ 1ml/l was found to be most effective treatment against Leaf hopper/Jassid (*Empoasca kerri*) caused high mortality rate (1.34 Jassid/3leaves) over the control. It was followed by Thiamethoxam 25WG @ 0.5g/l and Emamectin benzoate 5%SG @ 1ml/l caused mortality 3.47/3leaves and 2.29/3leaves, respectively. The lowest pod damage caused by spotted pod borer (11.93%) and high pod yield (29.83 q/ha) also recorded in the plot treated with Lambda-cyhalothrin 5% EC @ 1ml/l was found to be most effective against spotted pod borer. Thus Imdacloprid 17.8SL @ 1ml/l and Lambda-cyhalothrin 5% EC being most effective treatments could be viable option to manage Leaf hopper/Jassid and Spotted pod borer in cowpea production.

Keywords: Bio-pesticides, *Empoasca kerri*, Lambda-cyhalothrin 5% EC and *Maruca vitrata*.

Introduction

Cowpea (*Vigna unguiculata* L.) is traditional crop with high nutrition value that's grown in the semi arid and sub humid tropics of India. In India it is predominantly cultivated in state such as Uttar Pradesh, Punjab, Haryana, Tamil Nadu, West Bengal and Andhra Pradesh. It is referred to as black eyes bean or southern pea in English, while chola/choli/ chavli/ lobia in various informal languages in India. Cowpea is an annual herbaceous plant recognized for its drought resistant characteristics and extensive tap root system, often referred to as "vegetable meat" due to its high protein content in the grain, desiccated seeds have abundant in protein 22%-24% (Chauhan and Mehera, 2023). Average 4.8 lakh tons are produced in India an area of 58000 ha. In Uttar Pradesh 16900 ha area with a production of cowpea around 113200 tons and the productivity of 6.70 t/ha (Chauhan and Mehera, 2023). Among the major insect-pest of cowpea the Leaf hopper/Jassid (*Empoasca kerri*) and larval stage of spotted pod borer (*Maruca vitrata*) is the major responsible for low Production/yield of cowpea. *Empoasca kerri* have been reported as one of the major sucking insect-pest infesting cowpea crop, The destructive stage of this insect is Nymph and Adult. Both have a Piercing and Sucking type mouth part which suck the cell sap (especially phloem part of the vascular system) from the leaves. About 40% Yield reduction by this insect has been reported by Singh and Van Emden (1975). Another *Maruca vitrata* is the most damaging pest in cowpea grown areas and reduce the yield losses up to 46 to 80% were noted in cowpea. It has been observed that the spotted pod borer is more destructive to the cowpea crop in term of incidence and damage. The major constraint in the cultivation of cowpea is insect pest attack which has been observed to have caused 72% grain yield loss; out of this about 18.34% pod damage was estimated due to spotted pod borer. These losses together cause greater damage to the overall pulses production of the country (Patel et al, 2023). The nature of damage of larvae is webbing the leaves, inflorescence, flower, flower buds, pods and

feeds inside. The preferred stage of egg lying is the flower bud stage. The peak incidence of larvae was recorded at flowering and pod development stage of cowpea crop. The pod borer larvae attack on flower buds, flowers, green pods and seeds of cowpea and damage them reducing overall production (Mahalakshmi *et al*., 2016). Grain yield loss of legumes is estimated to be 22 to 65% in India due to *Maruca vitrata* Fabricious (Singh & Allen, 1980). To decrease the crop yield, farmers are practicing indiscriminate use of chemical pesticides especially those pesticides with long waiting/residual period leading contaminate the food materials. So, the ecologically conscious and imperishable management of cowpea jassid and spotted pod borer is essential. This research aimed to evaluate the efficacy and yield assessment of some insecticides and bio-pesticides against jassid and spotted pod borer.

Materials and Methods

The present investigation was conducted at Agriculture Research farm of Entomology Department, B.R.D. P.G. College Deoria (U.P) during *kharif* season of 2022. The experiment was laid out in RBD (Randomized Block Design) with three replication and eight treatments. The cowpea crop local variety that is Kashi Kanchan was grown in 2×2 square meter plot with distance 30×15 Cm. The treatment is: Imidacloprid 17.8SL @ 1ml/l, Thiamethoxam 25WG @ 0.5g/l, Spinetoram 11.7SC @ 0.25ml/l, Lambda-cyhalothrin 5%EC @ 1ml/l, Emamectin benzoate 5%SG @ 1ml/l, Dr. Neem @ 2ml/l, Neem oil 5% @ 5ml/l and Untreated (Control). Population of jassid (Nymph and Adult) were counted on three leaves (Each from top, middle and bottom of the plant) from five randomly selected plants in each plot. The population recorded at one day before and 3, 5, 7, and 10 days after application of treatments during morning hours. Another the population of spotted pod borer were recorded at the time of each harvest. Pods from tagged 15th plants of each plot were collected separately. Total number of pods and damage pods were counted to calculate the percent pod damage of each plot. At the end of crop, pods of each harvest were pooled for each treatments/ insecticides and calculated overall pod damage % by using formula:

$$\text{Pod damage}\% = \frac{\text{Total number of infested pod}}{\text{Total number of pod}} \times 100$$

Result and Discussion

Efficacy of Insecticides and Bio pesticides against Leaf hopper/Jassid; *Empoasca kerri*

It is evident from the data in (table-1; figure-1) that pre-treatment population of leaf hopper/jassid was homogenously distributed throughout the experimental field as, non-significant difference. It varied from 7.98 to 9.87 jassid/3leaves during the investigation. However, significant reduction in population of the pest was recorded after application of insecticides. All the insecticidal treatments were significantly superior over control plot. At 3 days after spray the significantly minimum population of jassid (1.47/3leaves) was recorded in Imidacloprid 17.8SL @ 1ml/l treated plot. It was followed by Thiamethoxam 25WG @ 0.5g/l (2.37/3leaves), Emamectin benzoate 5%SG @ 1ml/l (3.50jassid/3leaves), Lambda-cyhalothrin 5%EC @ 1ml/l (4.77 jassid/3leaves) and Spinetoram 11.7%SC @ 0.25ml (6.27/3leaves) were considered moderately effective. Among the botanicals Dr.Neem @ 2ml/l (7.20/3leaves) and Neem oil 5% @ 5ml/l (8.33/3 leaves) remained at par to each other. The significantly maximum population of leafhopper (11.33/3leaves) was observed in control. Observation recorded on 5th day after spray significantly minimum population of jassid (0.97/3leaves) was recorded in Imidacloprid 17.8SL @ 1ml/l treated plot. It was followed by Thiamethoxam 25WG @ 0.5g/l (2.07/3leaves) and Emamectin benzoate 5% SG @ 1ml/l (3.30/3leaves). The next effective treatment Lambda-cyhalothrin 5% EC @ 1ml/l and Spinetoram 11.7%SC @ 0.25ml/l in which leafhopper population was recorded, respectively 4.57 and 6.00/3leaves were moderately effective. Among the botanicals Dr.Neem @ 2ml/l (7.60 jassid/3leaves) and Neem oil 5% @ 5ml/l (9.40/3leaves) were least effective. The significantly maximum population of jassid (11.67/3leaves) was recorded in control. Observation recorded on 7th day after spray significantly minimum population of jassid (1.47/3leaves) was recorded in Imidacloprid 17.8SL @ 1ml/l treated plot. It was followed by Thiamethoxam 25WG @ 0.5g/l (2.30/3leaves) and Emamectin benzoate 5% SG @ 1ml/l (3.33/3leaves). The next effective treatment viz., Lambda-cyhalothrin 5% EC @ 1ml/l and Spinetoram 11.7%SC @ 0.25ml/l in which population of jassid was recorded, respectively 4.60 and 6.00 per three leaves were moderately effective. Dr.Neem @ 2ml/l and Neem oil 5% @ 5ml/l the population of jassid was recorded, 7.60 and 9.47/3 leaves were least effective treatment. Significantly maximum population of jassid (12.53/3leaves) was observed in control plot. Observation recorded on 10th day after spray significantly minimum population of jassid (1.50/3leaves) was recorded in Imidacloprid 17.8 SL @ 1ml/l treated plot. It was followed by Thiamethoxam 25 WG @ 0.5g/l (2.43/3leaves). The population of jassid in plot treated with Emamectin benzoate 5%SG @ 1ml/l (3.73/3leaves) and Lambda-cyhalothrin 5% EC @ 1ml/l (4.07/3leaves) remained at

par to each other. The next effective treatment viz., Spinetoram 11.7%SC @ 0.25ml/l, Dr.Neem @ 2ml/l and Neem oil 5% @ 5ml/l in which population of jassid recorded, respectively 5.27, 6.90 and 8.90 per three leaves were show least effective treatments. Significantly maximum population of jassid (13.78/3 leaves) was recorded in control. Poolod performance of treatments show the minimum population of jassid (1.34/3leaves) was recorded in Imidacloprid 17.8 SL @ 1ml/l treated plot and its considerd most promising treatment against jassid. It was followed by Thiamethoxam 25WG @ 0.5g/l (2.29/3leaves), Emamectin benzoate 5%SG @ 1ml/l (3.47/3leaves) and Lambda-cyhalothrin 5% EC @ 1ml/l (4.50/3 leaves). The next effective treatment Spinetoram 11.7% SC @ 0.25ml/l, Dr.Neem @ 2ml/l and Neem oil 5% @ 5ml/l in which jassid population was recorded, respectively as 5.88, 7.33 and 9.03 per three leaves were considered least effective. Significantly maximum population of leafhopper (12.33/3leaves) was recorded in control. The high efficacy of Imidacloprid against the leafhopper population as revealed in present studies were in line with the findings Gocher *et al*., (2019) result revealed that the population of jassid in successive sprays the treatment of Imidacloprid 17.8SL (84.31%) was found most effective, followed by thiamethoxam 25WG (81.66%) and acetamiprid20SP (80%) and were also statistically at par with each otherin their efficacy. Our results are in close conformity with that of Chaudhary *et al*., (2018) found that imidacloprid 17.8SL @ 0.005% as the most effective followed by acetamiprid 20SP @ 0.004%and dimethoate 30EC @0.03%.

Efficacy of Insecticides and Bio pesticides against spotted pod borer; *Maruca vitrata*

The efficacy of different insecticidal applications on spotted pod borer infesting cowpea is presented in table-1; figure-2. Pod infestation under various treatments varied between 11.93% to 23.79%. The data revealed that pod damage was significantly suppressed in all the insecticidal treatments in comparison to Control. The plot treated by Lambda-cyhalothrin 5%EC @ 1ml/l found most effective as significantly lowest pod infestation (11.93%). It was followed by Dr.Neem @ 2ml/l (12.62%) and Emamectin benzoate 5%SG @ 1ml/l (13.53%) showed non-significant variation in their efficacy. A moderate reduction in pod infestation was noticed in plot treated with Neem oil 5%, Spinetoram 11.7SC, Thiamethoxam 25WG and Imidacloprid 17.8SL recorded 16.25, 17.63, 20.76 and 23.28 per cent pod infestation, respectively. These treatments exhibited non-significant variation in their efficacy. Significantly highest pod infestation was observed in control plot (23.79%). The descending order of efficacy of insecticides against spotted pod borers (Number basis) was Lambda-cyhalothrin 5% EC @ 1ml/l, Dr.Neem @ 2ml/l, Emamectin benzoate 5%SG @ 1ml/l, Neem oil 5% @ 5ml/l, Spinetoram 11.7SC @ 0.25ml/l, Thiamethoxam 25WG @ 0.25g/l and Imidacloprid 17.8SL @ 1ml/l. The above findings are in accordance with the results of Kaushik *et al*. (2016) who revealed that the Lambda-cyhalothrin was most effective treatments caused highest mortality (63 to 70%) of pod borers over control. Reddy and Paul (2020) recorded lowest pod damage in lambda cyhalothrin4.6% + chlorantraniliprole 9.3% ZC @ 30 g a.i ha^{-1} (15.82%) and it was on par with hand mixed product of chlorantraniliprole 18.5% SC + thiamethoxam 25% WG @(1:1) (27.60), beta cyfluthrin 8.49% + imidacloprid 19.81%SC @ 15.75+ 36.7 g a.i ha^{-1} (28.18%), chlorantraniliprole18.5% SC @ 30 g a.i ha^{-1} (28.61%) after fifteen days of spraying. The treatments chlorantraniliprole 8.8% + thiamethoxam 17.5% SC @ 150 g a.i ha^{-1} and thiamethoxam12.6% + lambda cyhalothrin 9.5% ZC @ 27.5 g a.i ha^{-1} recorded 29.92, 36.67 per cent respectively and have non significant difference.

Data recorded on cowpea pod yield (q/ha) is presented in the Table-1; figure-2 revealed that all the insecticides were significantly superior in increasing yield over control except neem oil 5% @ 5ml/l. The pod weight (q/ha) was recorded maximum in Lambda-cyhalothrin 5%EC @ 1ml/l treated plot (29.83q/ha), followed by Dr.Neem @ 2ml/l (29.17q/ha), Emamectin benzoate 5%SG @ 1ml/l (28.50q/ha), Thiamethoxam 25WG (24.92q/ha) and Spinetoram 11.7SC @ 0.25ml/l (24.92q/ha). These treatments were significantly comparable to each other as well as best in enhancing the yield of cowpea. Neem oil 5% @ 5ml/l (22.00 q/ha), Imidacloprid 17.8SL @ 1ml/l (19.83q/ha) treated plot recorded pod yield lower than control (23.92q/ha) were considered uneconomical treatments. Based on the above results these findings are in close conformity with the findings of Kumar and Kumar(2022) who recorded maximum yield Lambda cyhalothrin (20.50 q/ha) Similar findings were made by Hossain *et al*. (2010) who recorded Lambda-cyhalothrin treated plot produce maximum yield of cowpea.

Table 1 : Efficacy of insecticides and Bio-pesticides against leaf hopper and spotted borer infesting cowpea crop.

Treatments	Dose (ml/l)	Jassid or Leaf hopper /3leaves						% Infestation of pod borer and Yield of Cowpea	
		DBS	3 DAS	5 DAS	7 DAS	10 DAS	Avg.	Pod infestation (%)	Pod Yield (q/ha)
Imidacloprid 17.8 SL	1 ml/l	8.67 (2.94)	1.47 (1.21)	0.97 (0.96)	1.43 (1.19)	1.50 (1.20)	1.34 (1.15)	23.28 (28.82)	19.83 (26.38)
Thiamethoxam 25 WG	0.5 ml/l	7.98 (2.79)	2.37 (1.54)	2.07 (1.43)	2.30 (1.50)	2.43 (1.56)	2.29 (1.51)	20.76 (27.01)	24.92 (29.92)
Spinetoram 11.7 SC	0.25 ml/l	8.92 (2.98)	6.27 (2.50)	6.00 (1.45)	6.00 (2.44)	5.27 (2.29)	5.88 (2.43)	17.63 (24.78)	24.92 (29.87)
Lambda-cyhalothrin 5% EC	1 ml/l	8.62 (2.93)	4.77 (2.18)	4.57 (2.14)	4.60 (2.14)	4.07 (2.01)	4.50 (2.12)	11.93 (20.07)	29.83 (33.09)
Emamectin benzoate 5% SG	1 ml/l	8.12 (2.84)	3.50 (1.87)	3.30 (1.82)	3.33 (1.82)	3.73 (1.93)	3.47 (1.86)	13.53 (21.39)	28.50 (32.25)
Dr. Neem	2 ml/l	8.93 (2.98)	7.20 (2.68)	7.60 (2.76)	7.60 (2.76)	6.90 (2.63)	7.33 (2.71)	12.62 (20.73)	29.17 (32.44)
Neem oil 5%	5 ml/l	8.73 (2.95)	8.33 (2.89)	9.40 (3.07)	9.47 (3.08)	8.90 (2.98)	9.03 (3.00)	16.25 (23.77)	22.00 (27.92)
Control		9.87 (3.14)	11.33 (3.36)	11.67 (3.11)	12.53 (3.54)	13.78 (3.71)	12.33 (3.51)	23.79 (29.19)	23.92 (29.18)
SEM		-	0.09	0.09	0.10	0.11	0.06	1.55	2.00
CD		NS	0.26	0.28	0.29	0.34	0.18	4.70	6.06

DBS: Day before spray
DAS: Day after spray
* Value in the parenthesis is square root transformation

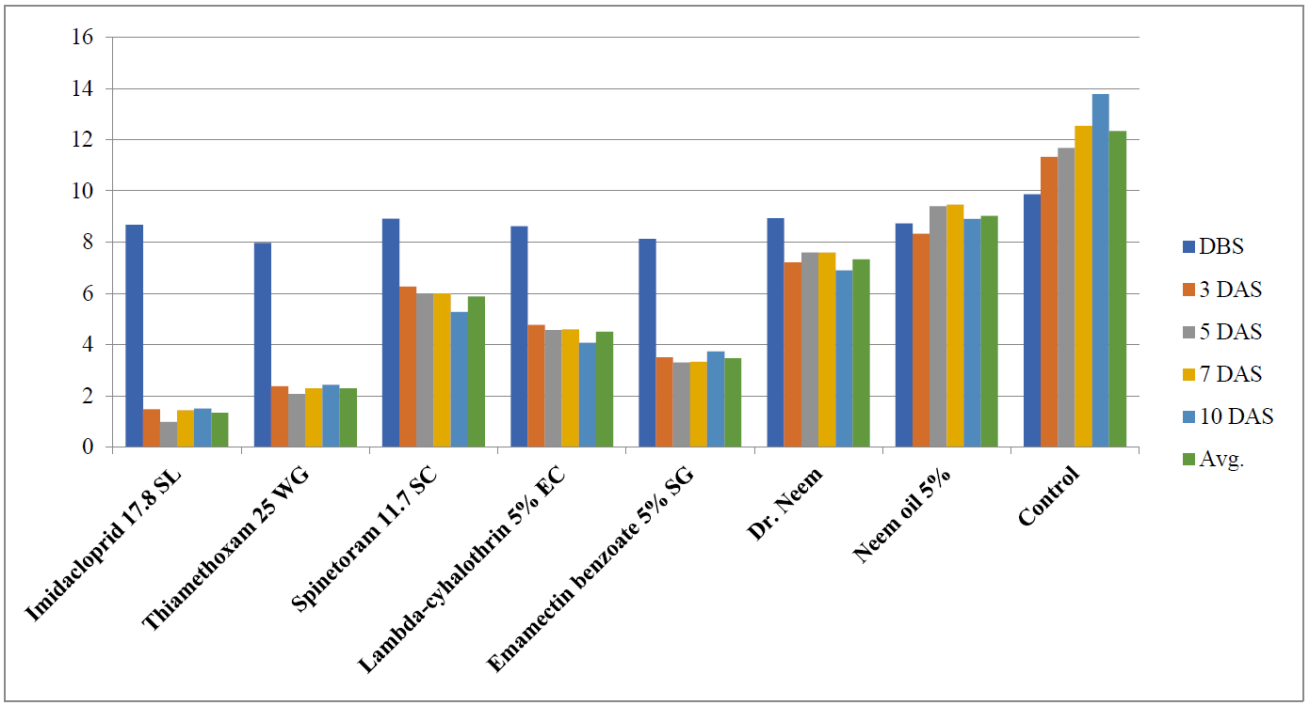

Fig. 1 : Efficacy of insecticides and Bio-pesticides against leaf hopper.

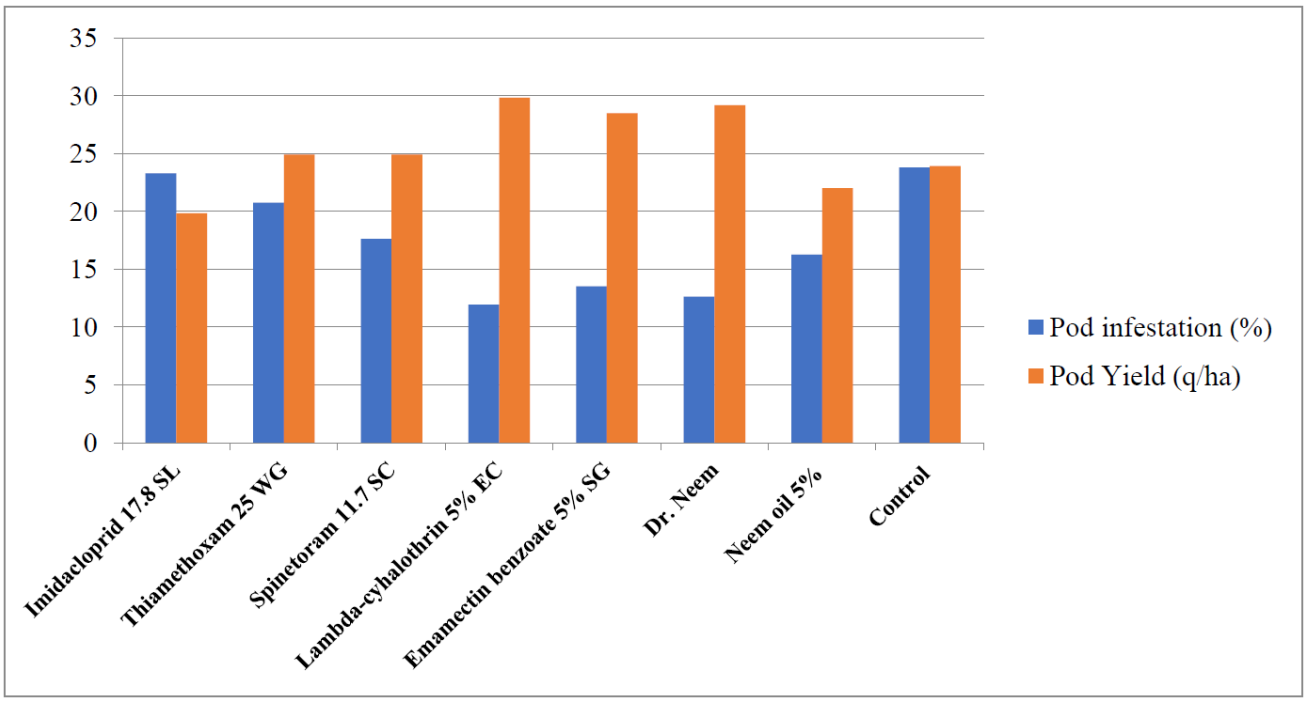

Fig. 2 : Efficacy of insecticides and Bio-pesticides against spotted pod borer.

Acknowledgement

I would like to express our sincere gratitude to Prof. Rajnish Kumar, Department of Entomology (Professor and Head) at B.R.D. PG. College Deoria, for their crucial support and guidance throughout this research.

References

Chauhan, A. and Mehera, B. (2023). Effect of zinc levels on growth and yield of cowpea (*Vigna unguiculata* L.) varieties. *Int. J. Pl. Soil Sci.* **35(8),** 181-187.

Patel, R.M., Patel, H.C. and Mohapatra, R.A. (2023). Evaluation of different insecticides against spotted pod borer, *Maruca vitrata* infesting vegetable cowpea. *Environ. Ecol*. **41 (4A**), 2516-2525.

Mahalakshmi, M.S., Sreekanth, M., Adinarayana, M., Reni, Y. P., Rao, Y., and Narayana, E. (2016). Incidence, bionomics and management of spotted pod borer in major pulse crops in India-A review. *In Agricultural Reviews*, **37 (1),** 19-26.

Singh, S.R., and Allen, D.J. (1980). Pests, diseases, resistance, and protection in cowpeas. In: Summerfield RJ, Bunting AH (eds) *Adv. Legume Sci* . HMSO, London, pp 419–443.

Singh, S.R. and Van Emden, H.F. (1979). Insect pests of grain legumes, *Annu. Rev. Entomol*; **24**, 255-278.

Gocher, S., Ahmad, K. and Nayak, K.R. (2019). Comparative bio-efficacy of newer insecticides and bio-pesticides against leafhopper, *Empoasca kerri* Pruthi of groundnut in semi-arid region of India. *Entomol. Zool. Stud* , **7**(5), 112-115.

Chaudhary, D.M., Chaudhary, M.M. and Chaudhary, F.K. (2018). Evaluation of Newer Insecticidal Formulation against Sucking Pests and Effect on Yield of Soybean (*Glycine max* L.) *IJCMAS* **7**(8), 3834-3840.

Kaushik, A.K., Yadav, S.K. and Srivastava, P. (2016). Field efficacy of insecticides and mixture against spotted pod borer, *Maruca vitrata* Fabricius on Cowpea. *Ann. Plant Sci*, **24**(1), 89-92.

Reddy, B.K.K. and Paul, A. (2020). Dissipation and risk assessment of lambda cyhalothrin 4.6%+ chlorantraniliprole 9.3% zc residues in vegetable cowpea. *Indian J. Entomol* **82**(4), 720-724.

Kumar, S.T. and Kumar, A. (2022). Field efficacy of insecticides with neem products against chickpea pod borer [*Helicoverpa armigera* (Hubner)]. *The Pharm Innov J*, **11**(6), 1238-41.

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