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Effect of Pre-Harvest Spray of Insecticides on Pulse Beetle (*Callosobruchus chinensis* L.) Emergence in Green Gram (*Vigna radiata* (L.) Wilczek)

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Abstract **– Field and laboratory experiments were conducted to study the effect of pre-harvest insecticidal sprayings on pulse beetle in storage at Agriculture Research Farm and in storage laboratory of Banaras Hindu University, Varanasi. The emergence of pulse beetle, (*Callosobruchus chinensis* L.) observed after 4 weeks during both years i.e. 2010-11 and 2011-12. During year 2010-11 the lowest grain damage due to pulse beetle in storage after 4 weeks was found in spinosad treated plot followed by indoxacarb which were at par. The grain damage per cent in azadirachtin and endosulfan were at par. The *Bt* and profenphos treated plots wear at par. The lowest grain damage per cent after 5 weeks was in spinosad followed by indoxacarb. During year 2011-12 after 4 weeks in storage, the lowest grain damage per cent was in spinosad followed by indoxacarb and lamda cyhalothrin. The grain damage was highest in control plot 57.3 per cent.**

Keywords **– Grain, Greengram, Insecticide, Pulse Beetle, Storage.**

I. Introduction

Greengram, Vigna radiata (L.) Wilczek is an important pulse crop and also known as mung bean in India. It is originated from India and Central Asia. It is a great source of protein (22-24 per cent). In India the average productivity of green gram crop has rather remained static due to several reasons viz., lack of suitable seed production techniques, cultural practices, inefficient harvest and post-harvest operations, improper storage management practices, etc. Green gram seed is bound to show rapid and greater losses both quantitatively and qualitatively due to attack of several insect pests at both pre-harvest and post-harvest stages. As many as 65 different insect species attack green gram crop at different stages of pre-harvest and post-harvest (Lal, 1985). Among these insect pests, pulse beetle, *Callosobruchus chinensis* is the most destructive and major pest as it causes 50 to 60 per cent damages in green gram seeds (Ramzan *et al.*, 1990). According to Casewell (1961) and German *et al.* (1987), pulse bruchid (*Callosobruchus chinensis*) is a minor pest in the field wherein, it lays eggs on seeds before harvest and subsequently becomes a serious pest in storage by causing quantitative and qualitative damages to seeds. Attempts are made by several workers in different field crops to maintain viability, vigour and quality of seeds in storage for longer period by controlling insect pests at both pre- and post-harvest periods (Merwade, 2000 and Singh *et al*., 2003).

The field as well as storage pests can be controlled effectively by prophylactic applications of chemical pesticides at different growth stages. Although, several insecticides are very effective in field but their indiscriminate uses are imparting more residual toxicity affecting the non-targeted animals including human beings besides affecting quality of seeds, due to their non-degradability and buildup of resistance by targeted pests which need integrated protection approaches for their effective control at both field and storage levels (Di-

-ngra, 2001).

II. Materials and Methods

The field and laboratory experiments were conducted to study the effect of pre-harvest insecticidal sprayings on pulse beetle in storage. The field experiments were conducted during *Kharif* 2010 and 2011 at Agricultural Research Farm, Banaras Hindu University, Varanasi. Storage experiments were carried out for 6 months from October, 2010 to May, 2011 and October, 2011 to May, 2012 at Department of Entomology and Agricultural Zoology, Institute of Agricultural Sciences, BHU, Varanasi. The field experiment was laid out in Randomized Block Design consisted of 10 treatments with three replications. Gross plot size adopted was 3.0 m in length and 3.0 m in width. The insecticides chosen for experimental investigation were sprayed as per treatment detail. The exact dosages of insecticides were prepared in adequate quantity and were sprayed at 25 and 10 days before harvest (DBH) by using knapsack sprayer until all plants were fully drenched with spray solution control of pod borers and other sucking pests attacking the crop. The crop was harvested on first fortnight of October, 2010 and 2011, when plants started showing the symptoms of drying, shredding of pale colored leaflets and pods turning to dark black colour well matured and dried pods were picked up manually from plants of each plot kept separately in labeled polythene bags. After picking, pods were dried in sun for 2 days and seeds were separated manually by gentle beating the pods with wooden stick, cleaned by winnowing and dried under well, aerated shade for 3-4 days to around 10 per cent moisture content. Seeds obtained from net plot area of each treatment replication wise were dried and cleaned properly. The 100 gm seeds were taken from yield of each treatment by counting manually. By using 10x magnifying lens external damages were checked on seeds due to field insect pest. The seeds having eggs on their surface, single or multiple holes were counted as infested seeds and their average was expressed as percentage of infested seeds per plot. Thereafter these 100 gm seeds were put into small cloth bags and stored under laboratory conditions separately for 5 weeks to allow pulse beetle developing within seeds to emergence. Percent grain damage was computed by using the formula (Mohan and Sundaar babu, 1999).

$$\text{Percent grain damage} = \frac{\text{No. of damaged grains}}{\text{Total No. of grain in sample}} \times 100$$

Statistical Analysis

The experimental data collected for various grain yield and quality parameters were analyzed statistically by adopting appropriate statistical design as described by Sundaraj *et al.* (1972) and Panse and Sukhatme (1978). The critical difference (CD) values were calculated at five per cent probability level wherever 'F' test was found significant. The data in percentage were transformed into arc sin root transformation and same was used for statistical analysis.

III. Results and Discussion

It is evident from the table 1 that emergence of pulse beetle observed after 4 week during both years. The grain damage due to pulse beetle ranging from 6.3-54 per cent after 4 weeks and 14.3 to 68.7 per cent after 5 weeks during 2011 while 8.3-52.3 per cent after 4 weeks and 15.7-62.3 per cent after 5 weeks during 2012 in storage. During 2011, the lowest grain damage due to pulse beetle in storage after 4 weeks was found in spinosad treated plot (6.3 per cent) followed by indoxacarb (7.7 per cent) which were at par. The grain damage in lamda (λ) cyhalothrin treated plot was 11.0 per cent and in acetamiprid 31.3 per cent. The grain damage per cent in azadirachtin and endosulfan were at par. The Bt and profenphos treated plots wear at par. After 5 weeks the grain damage percent were increased in all the treated plots. The lowest grain damage per cent after 5 weeks was in spinosad (14.3 per cent) followed by indoxacarb (17.0 per cent) On the basis of mean the lowest grain damage per cent (10.3 per cent) was found in spinosad treated plot and highest (61.3 per cent) was in control plot during 2010-11. During 2011-12 after 4 weeks in storage, the lowest grain damage percent (8.3 per cent) was in spinosad followed by indoxacarb (9.0 per cent) and lamda (λ) cyhalothrin (16.0 per cent). The grain damage highest in control plot (57.3 per cent). On the basis of mean the lowest grain damage due to pulse beetle was in spinosad (12.0 per cent) followed by indoxacarb (14.7 per cent). The present findings are agreement with the report of Sanon *et al*., 2010, Duraimurugan *et al*., 2014, Balasubramanian and Vindhini, 2018, Hosamani *et al*., 2018, Dhobi and Barad, 2019, Malarkodi and Srimathi, 2007, Padmasri *et al*., 2020, Patolia *et al*., 2020 and Raghu *et al*., 2016; who reported application of pre- harvest spray of insecticides helped in reduction in grain damage by pulse beetle in storage.

Table 1. Percentage of grain damage by pulse beetle after 4 and 5 weeks storage period from greengram.

S. No	Treatment details	Dosage	Grain damage per cent					
			2010-11			2011-12		
			After 4 Weeks	After 5 Weeks	Mean	After 4 Weeks	After 5 Weeks	Mean
1	Azadirachtin 10000ppm	2ml/lit	27.3	40.0	33.7	25.3	38.0	31.7
2	*B. thuringiensis (Bt)*	2gm/lit	21.0	28.3	24.7	21.7	29.0	25.3
3	Endosulfan 35 EC	0.07%	26.7	38.3	32.5	31.3	35.7	33.5
4	Thiodicarb 75 WP	0.04%	38.0	46.0	42.0	37.3	43.0	40.2
5	Spinosad 45 SC	0.2ml/lit	6.3	14.3	10.3	8.3	15.7	12.0
6	λ Cyhalothrin 5 EC	0.004%	11.0	23.0	17.0	16.0	25.3	20.7
7	Indoxacarb 14.5 SC	50g.a.i./ha	7.7	17.3	12.5	9.0	20.3	14.7
8	Profenophos 50EC	1lit/ha	20.0	31.3	25.7	23.7	32.7	28.2
9	Acetamiprid 20 SP	0.004%	31.3	41.7	36.5	28.7	39.7	34.2
10	Control	-	54.0	68.7	61.3	52.3	62.3	57.3
CD@5%			3.02	3.84	3.43	3.79	3.11	3.45

IV. Conclusion

The pre-harvest sprayings of Spinosad 45 SC and Indoxacarb 14.5 SC at maturity stage reduced the pulse beetle, *Callosobruhus chinensis* infestation at field level as well in storage conditions in greengram and also recorded lowest pulse beetle emergence and seed damage.

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