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Bioefficacy of Pesticides Against Pod Borer *Lampides boeticus* L. (Lycaenidae: Lepidoptera) in Summer Mung Bean

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Abstract: Two concentrations each of endosulfan 35EC, monocrotophos 36SC and carbaryl 50WP were evaluated against pod borer *Lampides boeticus* in the summer crop of mung bean cv. Pusa Baisakhi. The insecticides were applied 20 days after sowing @ 500 L ha^{-1}. Monocrotophos 0.04% spray afforded the best protection up to 25 days after spray, with only 4.7 to 8.7% pods damaged by the pod borer. It was followed by monocrotophos 0.02%, endosulfan 0.07% and carbaryl 0.2%, which were statistically at par. The bioefficacy of insecticides, in decreasing order, was inferred as monocrotophos 0.04%>monocrotophos 0.02% = endosulfan 0.07%>carbaryl 0.2%>endosulfan 0.035%>carbaryl 0.1%.

Key words: *Lampides, boeticus*, mung bean, bioefficacy of insecticides.

Mung bean and dew gram are the most important pulse crops in Rajasthan and the former is the dominant crop on account of higher productivity, demand and returns. The pest complex of mung bean in India has been studied and reviewed by Verma and Saxena (1987). Among the severe pests causing substantial losses in yield, pod borers are the most important, being direct depredators of grain yield. Pod borers, reported to damage mung bean crop, include the lycaenids [Long tailed blue *Lampides boeticus* (Linn.) and gram blue *Euchrysops cnejus* (Fabricius)], the noctuid *Heliothis armigera* L., the pyraustid *Maruca testulalis* (Geyer), and the tortricids *Leguminivora* (=*Cydia*) *ptychora* (Meyrick) and *Cydia critica* (Meyrick). The lycaenid pod borer, *Lampides boeticus* (Linn.) is the most common and important of all these borers. The damage caused by the pest is particularly severe in the summer crop when very few other hosts are available. Therefore, studies were made to find out most effective of the commonly used insecticides such as monocrotophos (systemic organophosphate compound), endosulfan (cyclodiene compound) and carbaryl (carbamate compound) against *L. boeticus*.

Material and Methods

Summer crop of mung bean cv. Pusa Baisakhi was sown on April 20, 1985 at the College of Agriculture, Udaipur, in 3 x 3 m plots, at 30 cm row spacing, with usual cultural practices (basal fertilizer application of 18 kg N and 46 kg P_2O_5 as DAP, irrigation at 15 to 20 day interval and manual hoeing and weeding 15 days after sowing). At flowering, 40 days after sowing (DAS), one high volume spray (500 L ha^{-1}) was applied using foot-sprayer, of two concentrations each of endosulfan 35EC (0.035 and 0.07%), monocrotophos 40SC (0.02 and 0.04%) and carbaryl 50 WP (0.1 and 0.2%) was given. In the control plots, only water was sprayed. Each treatment

was replicated thrice and 21 plots were laid out in a randomized block design. To judge the bioefficacy of the treatments, 50 pods were picked at random from each plot (5 pods plant^{-1}) and examined in the laboratory for the pod borer infestation. Percentage of pods damaged by the pod borer was worked out and data transformed into angular values for the analysis of variance.

Results and Discussion

The mean per cent pods damaged by *Lampides boeticus* at 15, 20 and 25 days after the insecticide spray are depicted in Table 1. Up to 15 days after spray no pod borer damage was observed in (1988) regarded less than 10% damaged pods as the criterion for judging a variety to be better against the pod borer damage and damage above this level as substantially high. Insecticide efficacy should also, therefore, be judged by the same criterion. At the very onset of the perceptible damage, carbaryl 0.1% and endosulfan 0.035% were quite inferior to the rest of the treatments, and statistically no better than control. Monocrotophos (0.02 and 0.04%), endosulfan (0.07%) and carbaryl (0.2%) were statistically at par in controlling the pest.

There was a slight increase in the borer infestation after 20 days of spray in all

Table 1. Mean per cent pods damaged by Lampides boeticus Linn. in summer crop of mung bean cv. Pusa Baisakhi, following insecticide spray given 40 days after sowing (figures in parentheses are angular means, those followed by the same alphabets in a column are statistically at part)

Treatment		Per cent pods damaged (days after spray)			
Insecticide	Conc. (%)	15 days	20 days	25 days	Mean
Carbaryl	0.2	9.33 (17.77)^{a}	14.00 (22.50)^{ab}	14.66 (22.47)^{bcd}	12.66
Carbaryl	0.1	17.33 (24.59)^{b}	20.00 (26.50)^{c}	19.33 (26.05)d	18.89
Endosulfan	0.07	4.66 (13.30)^{a}	14.66 (22.47)^{b}	11.33 (19.61)ab	10.22
Endosulfan	0.035	14.66 (22.37)^{b}	18.66 (25.55)^{c}	16.66 (24.08)cd	16.66
Monocrotophos	0.04	4.66 (12.42)^{a}	6.66 (14.93)	8.66 (17.10)a	6.66
Monocrotophos	0.02	7.33 (15.60)^{a}	10.66(19.05)^{a}	12.66 (20.76)^{abc}	10.22
Control	-	18.66 (25.30)^{b}	28.66 (32.68)	29.22 (32.66)	25.55
	CD (P=0.05)	5.20	3.94	4.83	
	SEm±	1.689	1.279	1.567	

insecticide treated plots. It indicated that all the treatments satisfactorily protected the crop against pod borer damage for that period. However, the infestation appears to have set in any time after 10 days of the spray for damage to become perceptible at 15 days after spray. Verma and Henry

the plots. Monocrotophos 0.04% proved to be distinctly superior to all other treatments, monocrotophos 0.02% was superior to endosulfan 0.07% and carbaryl 0.2%; the latter two were statistically at par. Endosulfan 0.035% and carbaryl 0.1% were also at par, but superior to the control,

which had a very high (28.7%) borer incidence by this time. The percentage of pods damaged by the borer increased, in general, at 25 days after spray. Notwithstanding this change, all the treatments were still superior to control.

A perusal of the overall mean incidence of *L. boeticus* in different treatments gives the order of efficacy of insecticides as monocrotophos 0.04%>monocrotophos 0.02%> endosulfan 0.07%>carbaryl 0.2% endosulfan 0.035%>carbaryl 0.1%. Results establish monocrotophos 0.04% as an effective insecticide of choice for the management of *L. boeticus* in mung bean. However, if the pods are to be utilized for vegetable purposes, carbaryl 0.2% or endosulfan 0.07% should be preferred to monocrotophos or other persistent insecticides as these pesticides have no residue hazard considerations (Verma and Saxena, 1988).

Increased yield consequent to pesticide application was considered to work out the economics of spray application on per hectare basis (Table 2). Highest benefit:cost ratio of 23.5 was achieved with the application of monocrotophos 0.04% spray, followed by its lower concentration of 0.02% (19.7). A slightly higher ratio (16.9) from the lower concentration of endosulfan over its higher concentration spray (14.8) despite higher returns from latter indicated fragility of the benefits from this insecticide in comparison to monocrotophos. Comparable net returns from the two concentrations of endosulfan also reflect poor efficacy of carbaryl, besides a low benefit: cost ratio at its higher concentration.

Mung bean cv. Pusa Baisakhi is an early maturing variety, but it is highly susceptible to YMV disease, which did appear in the crop. Effect of insecticide application in terms of yield increase cannot be ascribed solely due to reduction in pod borer damage, but also due to concurrent effects in containing the whitefly and other pests. Moreover, insecticides do have certain beneficial effects on crop growth as well. Verma and Saxena (1988 a, b) also indicated the beneficial effects of the insecticides such as monocrotophos and carbaryl on the growth of the crop plants. Increased yield or the consequent returns do not only imply reduced losses caused by pod borers but also indicate the overall advantages reflecting several aspects of crop production.

Table 2. Economics of pesticides used (ha^{-1}) to manage L. boeticus in summer mung bean cv. Pusa Baisakhi

Treatment			Cost of spray (Rs.)	Increase in yield	Returns (Rs.)		B:C ratio
Insecticide	Conc. (%)	Qty.			Gross	Net	
Carbaryl	0.1	1.0 kg	830.00	288.90	5778	4948	5.96
Carbaryl	0.2	2.0 kg	1230.00	330.50	6610	5380	4.37
Endosulfan	0.035	0.5 L	350.00	313.80	6276	5926	16.93
Endosulfan	0.07	1.0 L	470.00	372.40	7448	6978	14.85
Monocrotophos	0.02	0.25 L	303.00	314.00	6280	5977	19.73
Monocrotophos	0.04	0.5 L	375.00	460.00	9200	8825	23.53

[1]Basis: Cost of pesticide {Endosulfan 35EC Rs. 240 L^{-1}, Monocrotophos 36SC Rs. 290 L^{-1}, Carbaryl 50WP Rs. 500 kg^{-1})}+ cost of labor (2 persons to cover spraying in one ha in 12 h = 3 man days

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