

EFFECT OF BOTANICAL AND SYNTHETIC PESTICIDES IN CONTROLLING EPILACHNA BEETLE AND THE YIELD OF BITTER GOURD

M. A. RAHAMAN¹, M.D.H. PRODHAN² AND A. K. M. MONJURE MAULA³

¹Technical Officer (Agriculture), Partnership in Agricultural Research and Extension (PARE) Program, Mennonite Central Committee (MCC), Bangladesh, Thonthonia, Bogra, ²Scientific Officer, Entomology Division, BARI, Joydebpur, Gazipur-1701, ³Agricultural Extension Officer, Department of Agriculture Extension (DAE), Paba, Rajshahi, Bangladesh

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ABSTRACT

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The study was conducted at the farmers of Mennonite Central Committee (MCC) partner organization namely CVDP (Community Village Development Programme), Sirajgonj during the year 2005-2006 to find out the possibility of the management of epilachna beetle using botanical and synthetic pesticides. A total of three approaches viz., Tephrosia leaf extract (20g fresh leaves/100ml water), Diazinon 60 EC @ 2 ml/L of water and an untreated control were evaluated. The Tephrosia leaf extract performed well for effective control of epilachna beetle with its different stages and also performed highest yield followed by a synthetic pesticide (Diazinon 60 EC). On the other hand the highest plant infestation was observed in untreated control and also performed lowest yield. The Tephrosia leaf extract is inhibiting or killing the beetle and treated as a environment friendly pest control method.

Keywords: Bitter gourd, epilachna beetle, botanical and synthetic pesticides, yield

INTRODUCTION

Bangladesh is a vegetable deficit country. The vegetables are not produced evenly throughout the year in this country. Less than one-fourth of the vegetables are produced during the kharif season and more than three-fourth are produced in the rabi season (Anonymous, 1993a). Thus, smaller quantities of vegetables are grown in the kharif (Summer & rainy months) season. The major vegetables grown in the summer are the cucurbits. Bitter gourd is a plant of cucurbitaceous family. It has a medicinal value for the human being. On the other hand it contains a high amount of vitamins and minerals. In the summer season, it grows well and its market value is high. Its cultivation procedure is easy and farmer choice it to make a good profit. It grows wide extensively in Bangladesh. It has some special growing area in Bangladesh like Jessore, comilla, Bogra, Narsingdi etc. But it is seriously affected by two major pest, epilachna beetle and cucurbit fruit fly. By affecting these pest production hampered seriously. If pest attack at its early stage, the whole plot may go under damage.

In Europe, the epilachna beetle is known as the Maxican beetle, which is a mandibulated insect; it doesn't swallow solid food material. Both larva and adult chew of leaf, masticate it and suck the plant juice (Robert, 1978). In some areas of the world it is regarded as being a troublesome insect to control. This beetle may also be controlled through foliar applications of some synthetic pesticides like malathion, parathion, methoxychlor and rotenone (Robert, 1978). Sometimes people use the home made botanical pesticides such as extracts of Neem, Bishkatali, and Nishinda leaves, all of which are reported to have pest control properties. One year ago a trial was conducted with Neem leaf extract, Neem oil, and Bishkatali leaf extract, showed no effect on final yield or insect population (Nadene, 2004).

To get rid of this problem most of the farmers are using insecticide indiscriminately. But indiscriminate use of insecticide has not only complicated the management but has also created several adverse effects such as pest resistance, outbreak of secondary pests (Hagen and Franz, 1973), health hazards (Bhaduri *et al.*, 1989) and environmental pollution (Kavadia *et al.*, 1984; Desmarchelier, 1985; Devi *et al.*, 1986; Fishwick, 1988). But we are always searching to get environment friendly and easily applicable method. From where we are thinking about the use of tephrosia leaf extracts which act as a repellent, feeding inhibitor and some time killing agent. The leaves of this plant contain chemicals called rotenoids that are toxic to insects. It's also a nitrogen fixing legume, also reported to effective as a green manure plant. It has been mentioned to control termites, ants, beetles, aphids, cut worms, flies and other insects. In view of this requirement this experiment was conducted to compare the effect of tephrosia leaf extract with a chemical pesticide for the control of epilachna beetle and on the yield of bitter gourd.

MATERIALS AND METHODS

The experiment was conducted at the MCC selected area, Jamuna char, Sirajganj. The trial was set in the mid October, 2005 and laid out in Randomized Complete Block design. The farmer was the beneficiaries of MCC partner organization namely CVDP.

The three treatments were as follows-

1. Tephrosia leaf extract (20 g fresh leaf/100ml);
2. Diazinon 60 EC @ 2 ml/L of water (sprayed at 14 days interval)
3. Control

Each treatment had five replications. The main plot size was 200.06 m² (14.29 m X 14 m) and it was divided into 15 sub-plots to replicate the treatments. The sub-plot size was 4 m X 2.26 m = 9.04m². 50 cm gap was maintained between two sub-plots and 50 cm drainage canal was maintained around the field. The land was prepared with four ploughing. During final land preparation compost: 80kg/decimal and chemical fertilizer like Urea: 460 g, TSP: 460 g and MP: 230 g per decimal were used. In case of urea 1/3 dose was used during final land preparation. Rest of urea was used into two splits at vegetative and flowering stage.

Seedlings were grown in a well prepared seed bed to raise seedling at a fallow land. The seedlings were transferred into the main field when they were 4-5 leaves stage. In the field, 150 cm distance for plant to plant and 150 cm distance for row to row was maintained. Different intercultural operations like weeding, irrigation, drainage etc were maintained. There were only two hand weeding which was at 15 days after transplanting (DAT) and 35 DAT were maintained.

At the maturity stage harvesting was started. The harvest was done for three to four times, because fruits were of different sizes. The first marketable size was being first harvested and the last marketable size was harvested at the last stage. The relevant farmers were involved with all sorts of activities. Trial cost was bearded by MCC-B and finally the farmers took all the benefits.

Leaf extract preparation: Only the leaves of the shrub were harvested. 200g fresh tephrosia leaves were taken and crushed and it was mixed with 1 liter of fresh water and soaked in shade for 3-4 hours, than the mixture was strained by a fine cloth. Finally extracted water was mixed with 2 liter of fresh water to make the appropriate volume.

RESULTS AND DISCUSSION

The pest populations were counted at different stages during the trial period. The average number of eggs of epilachna beetle was counted from each plot (one square meter) in the first to fifth month, where it showed significant differences among the treatments. In this trial, the highest number of eggs of epilachna beetle was found in the control in every counted month. The Diazinon 60-EC controlled the epilachna beetle to lay eggs and got second position in every counted month. The tephrosia leaf extract kept the highest performance to control or to inhibit the epilachna beetle to lay their eggs. The lowest number of eggs was found in this treatment and this treatment showed statistical differences with the control (Table 1).

Table 1. Average number of eggs counted from each plot (one square meter) at different months

Treatments	1st Month	2nd Month	3rd Month	4th Month	5th Month
Tephrosia leaf extract	1.00 ±1.73 ^c	1.33 ±1.53 ^b	0.00 ±0.00 ^b	0.00 ±0.00 ^b	2.67 ±3.06 ^b
Diazinon	6.21 ±2.32 ^b	6.85 ±4.26 ^b	3.33 ±3.06 ^b	3.51 ±2.31 ^b	3.27 ±3.12 ^b
Control	12.94 ± 1.09 ^a	15.75±2.38 ^a	17.60 ±8.03 ^a	16.77 ±4.52 ^a	10.81 ±2.30 ^a
F- value	26.26	14.85	12.32	38.59	6.38
P- value	P<0.01	P = 0.01	P = 0.01	P<0.01	P = 0.05

The average number of larvae of epilachna beetle was counted from each plot (one square meter) in the first to fifth month, where it showed significant differences among the treatments in 3rd, 4th and 5th month. In this trial, the highest number of larvae of epilachna beetle was found in the control in every counted month. The Diazinon 60-EC controlled the larvae of epilachna beetle and got second position in every counted month in numerically. But in the 3rd month it was statistically difference to the control. The tephrosia leaf extract kept the highest performance to control or to inhibit the larvae of epilachna beetle. The lowest number of larvae was found in

this treatment and this treatment showed statistical differences with other two treatments in the 3rd, 4th and 5th month (Table 2).

Table 2. Average number of larvae counted from each plot (one square meter) at different months

Treatments	1st Month	2nd Month	3rd Month	4th Month	5th Month
Tephrosia leaf extract	0.00 ± 0.00	1.20 ± 1.31	0.00 ± 0.00 ^c	3.67 ± 3.79 ^b	1.67 ± 2.89 ^b
Diazinon	0.33 ± 0.58	9.33 ± 5.69	5.20 ± 3.30 ^b	13.60 ± 6.41 ^a	4.90 ± 3.44 ^a
Control	3.33 ± 3.06	11.60 ± 8.50	12.59 ± 2.26 ^a	14.92 ± 2.60 ^a	6.67 ± 4.04 ^a
F- value	2.67	2.06	34.59	7.46	25.01
P- value	NS	NS	P < 0.01	P < 0.05	P < 0.01

The average number of pupae of epilachna beetle was counted from each plot (one square meter) in the first to fifth month, where it showed significant differences among the treatments in the 3rd and 4th month. The highest number of pupae of epilachna beetle was found in the treatment control in every counted month but significant differences were found in the third and 4th month. The Diazinon 60-EC controlled the pupae of epilachna beetle and got mid position in every counted month in numerically. The tephrosia leaf extract kept the highest performance to control or to inhibit the pupae of epilachna beetle. The lowest number of pupae was found in this treatment compared with other treatments (Table 3).

Table 3. Average number of pupae counted from each plot (one square meter) at different months

Treatments	1st Month	2nd Month	3rd Month	4th Month	5th Month
Tephrosia leaf extract	0.33 ± 0.58	0.00 ± 0.00	2.33 ± 1.53 ^b	1.00 ± 1.73 ^b	0.00 ± 0.00
Diazinon	5.77 ± 1.66	4.07 ± 3.00	3.40 ± 3.15 ^b	8.67 ± 6.11 ^{ab}	2.85 ± 3.01
Control	8.00 ± 5.29	7.33 ± 6.43	14.33 ± 3.51 ^a	13.09 ± 1.66 ^a	2.92 ± 3.79
F- value	4.01	3.48	11.86	9.85	0.80
P- value	NS	NS	P < 0.05	P < 0.05	NS

The average number of adults of epilachna beetle was counted from each plot (one square meter) in the first to fifth month, where it showed significant differences among the treatments in the 5th month. In this trial, the higher number of adult of epilachna beetle was found in the control in every counted month. The Diazinon 60-EC controlled the adult epilachna beetles in every counted month and showed significant differences with the control in the 5th month. The tephrosia leaf extract kept the highest performance to control or to inhibit the adult epilachna beetle. The lowest number of adult was found in this treatment in every counted month and showed statistical differences with the control in the 5th month (Table 4).

Table 4: Average number of adult counted from each plot (one square meter) at different months

Treatments	1st Month	2nd Month	3rd Month	4th Month	5th Month
Tephrosia leaf extract	2.33 ± 2.08	0.33 ± 0.58	2.00 ± 1.00	3.33 ± 3.06	0.53 ± 0.91 ^b
Diazinon	4.33 ± 3.21	1.49 ± 1.29	6.52 ± 6.07	10.52 ± 3.35	2.06 ± 0.13 ^b
Control	6.16 ± 0.77	3.08 ± 3.12	6.64 ± 5.81	12.55 ± 4.36	9.21 ± 1.56 ^a
F- value	3.185	1.38	0.839	5.725	45.77
P- value	NS	NS	NS	NS	P < 0.01

Both the number of good fruits and bad fruits of this trial showed significant differences among the treatments. Incase of number of good and bad fruits, the highest number of good fruits and lowest numbers of bad fruits were found from the Tephrosia leaf extract and the lowest number of good fruits and highest number of bad fruits were found from the control. The Tephrosia leaf extract did better among all treatments where the Diazinon and control performed the second and third highest yield, respectively (Table 5).

Table 5: Yield and yield contributing characters of bitter gourd at different treatments

Treatments	Number of good fruit/plot	Number of bad fruit/plot	Yield (ton/ha)
Tephrosia leaf extract	104.30 ± 7.53 a	15.62 ± 6.45 c	9.84 ± 2.42
Diazinon	93.49 ± 16.14 b	27.51 ± 8.81 b	9.39 ± 2.08
Control	29.60 ± 7.40 c	73.51 ± 11.48 a	8.44 ± 0.37
F- value	29.186	136.931	0.319
P- value	P < 0.01	P < 0.01	NS

From this experiment it is easily mentionable that the tephrosia leaf extract is doing better among all the treatments for the control of epilachna beetle with its all stages. It is inhibiting or killing the beetle. So, we can say that the use of tephrosia leaf extract may be a method to control the epilachna like pest and to avoid the residual toxicity of the chemical insecticide. For more confirmation this trial is need to conduct further.

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