Progress. Agric. 22(1 & 2): 11 – 18, 2011 ISSN 1017-8139

EFFICACY OF MALATHION FOR CONTROLLING RED PUMPKIN BEETLE, *Aulacophora foveicollis* (LUCAS) IN CUCURBITACEOUS VEGETABLES

M. K. Hasan, M. M. Uddin and M. A. Haque
Department of Entomology, Bangladesh Agricultural University
Mymensingh-2202, Bangladesh

ABSTRACT

An experiment was conducted to study the efficacy of Malathion at different doses against red pumpkin beetle, *Aulacophora foveicollis* (Lucas) in Field Laboratory of the Department of Entomology, Bangladesh Agricultural University, Mymensingh. Three cucurbit hosts such as sweet gourd (Var. BARI sweet gourd1), bitter gourd (Var. Hybrid Nepali) and bottle gourd (Var. Kajla) were selected to conduct the research with three different doses viz. 0.4%, 0.5% and 0.6% of Malathion. Among the three doses of Malathion it was revealed that minimum number of leaf attack per plant, number of twig attack per plant, and average leaf area damage by red pumpkin beetle was found when the plants were treated with 0.5% and the maximum damage was observed in case of 0.4% Malathion application. The efficacy of the insecticide reduced with increasing time intervals of spraying. Considering the efficacy in reducing the leaf area damage at all the time intervals spraying 5% Malathion was found as the most effective in controlling red pumpkin beetle in three different cucurbit hosts. The efficacy of Malathion was similar on three different cucurbit hosts.

Key Words: Efficacy, Malathion, Control, Red pumpkin beetle, Cucurbit

INTRODUCTION

Cucurbits are one of the most important summer vegetables crop in Bangladesh. Cucurbits production is increasing day by day. Cucurbits have a good nutritive value as well as medicinal value too. All the cucurbits have a good market value which encouraged the farmer to cultivate gourds in large scale. Although cucurbits are summer crop but some of them can be grown throughout the year because of their photo insensitiveness. There are many insect pests of cucurbits in Bangladesh, among them red pumpkin beetle, *Aulacophora foveicollis* (Lucas) is one of the most important constraint to cucurbit production capable of 30-100% yield loss (Alam, 1969; Azim, 1966; Gupta and Verna, 1992 and Dillon *et al.*, 2005). It is polyphagous and attacks more than 81 plant species including pumpkin, squash, cucumber, bottle gourd, sweet gourd, bitter gourd, snake gourd, wax gourd, water melon, etc and a wide range of fruit crops (Doharey, 1983).

Both larval and adult stages of red pumpkin beetle are injurious to the crops. The adult beetles feed on leaves, flower buds and flowers. But the larvae feed on root tissue and cause direct damage to the newly developed seedlings (Narayanan, 1960). Damage is

severe since the beetles are difficult to control. At the advent of spring the beetles defoliate the cucurbit seedlings to such an extent that sometimes the crop has to be resown for 3 to 4 times (Alam, 1969; Rajak, 2001; Parsad and Kumar, 2002 and Mahmood *et al.*, 2005). Maximum population of the insect is observed during April and May and then it shows a downward trend; the population again exhibits on upward trend in July and August.

The most commonly used method for controlling red pumpkin beetle in Bangladesh is the application of insecticides (Alam, 1969 and Karim, 1992). But the main problem is indiscriminate application of the doses of synthetic pesticides. However, due to the unconscious use of synthetic insecticide development of insect resistance to insecticides, induction of resurgence to target pests, outbreak of secondary pests and undesirable effect on non target organisms as well as serious environment pollutions is occurred. Insecticide residues can exist in fruit which cause health hazard to consumers. To control this pest properly it is necessary to determine the extent of damage and to find out the accurate dose of the insecticide. Considering the above situations a study was undertaken to investigate the efficacy of Malathion for controlling red pumpkin beetle.

MATERIALS AND METHODS

The research work was carried out in the Field and Laboratory of the Department of Entomology, Bangladesh Agricultural University, Mymensingh. The experiment was conducted from 15 August 2010 to 20 January 2011 to evaluate the efficacy of different doses of Malathion. Three cucurbitaceous vegetables such as sweet gourd (Var. BARI sweet gourd1), bitter gourd (Var. Hybrid Nepali), and bottle gourd (Var. Kajla) were selected to conduct the research work. The seedlings of the plants were developed in the earthen pots and the 15 days old seedlings were transplanted to the main field. The field experiment was laid out in a Randomized Complete Block Design (RCBD) with 3 replications. The whole experimental field was 22.65 m × 7.05 m which was divided into 3 equal blocks. Each block was again divided into 9 plots and single treatment was allotted to each plot randomly. Thus, there were 30 (10 × 3) plots in the experiment including the control. The size of a unit plot was 2.15 m × 2.15 m. Distance of 1 m between blocks and 0.5 m between the plots was maintained to facilitate different intercultural operations. Plants were developed providing fertilizers, irrigation and all kinds of intercultural operation as and when necessary.

To find out the effectiveness of Malathion on adult *A. foveicollis* three doses viz. 0.4%, 0.5%, and 0.6% were applied on the plants in the field for two times at 15 days interval. A control treatment was always maintained. Insecticide was applied with a Knapsack hand pressurized sprayer. Spraying was done at 4.30 p.m. to avoid bright sun and drift caused by strong wind. The efficacy of the insecticide was determined depending on the number of attacked leaf, twig per plant and average leaf area damage (mm^2) at different time intervals. The infestation by adult beetle was recorded after 24 hrs, 48 hrs, 72 hrs, 5 days, and 7 days after insecticide spraying. Data were analyzed by using computer programme and the means were separated by LSD value.

RESULTS AND DISCUSSION

Effect of Malathion after 24 hrs of spraying

Leaf and twig of sweet gourd, bottle gourd and bitter gourd attacked per plant and the damage of leaf area after 24 hours of treatment are presented in Table 1.

Table 1. Effect of Malathion on the attack of red pumpkin beetle in cucurbitaceous plants after 24 hrs of spraying

Dose of Malathion (%)	No. of attacked leaf/plant			No. of attacked twig/plant			Average leaf area damage (mm^2)		
	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd
0.4	3.66c	3.11d	3.00d	4.33a	3.33d	2.00g	4.20b	3.20e	2.16h
0.5	1.66h	1.00g	0.66g	2.33f	1.32i	1.00j	3.00c	2.13f	1.49i
0.6	3.00f	2.33f	2.00e	3.00e	1.66h	0.66h	3.30e	2.53g	1.53i
Control	4.33a	3.50c	4.00b	5.11b	4.00c	3.33f	5.63d	4.90c	3.68a
$LSD_{0.05}$		0.2967			0.1767			0.2132	
CV%		6.18			4.13			3.91	

No. of leaf attack/plant

Malathion was applied in the field at three different doses and among the doses 0.4% was the least effective and 0.5% was the most effective. The highest number of leaf attack/plant were found on sweet gourd (3.66), bottle gourd (3.11), and bitter gourd (3.00) when plants were treated with 0.4% and the lowest number of leaf attack/plant were observed on sweet gourd (1.66), bottle gourd (1.00), and bitter gourd (0.66) when the plants were treated with 0.5%malathion.

No. of twig attack/plant

Among the doses 0.4% showed the lowest and 0.5% showed the highest efficacy against the beetle. The highest number of twig attack/plant were observed on sweet gourd (4.33), bottle gourd (3.33), and bitter gourd (2.00) when the plants were treated with 0.4% and the lowest number of twig attack/plant were found on sweet gourd (2.33), bottle gourd (1.32), and bitter gourd (1.00) in case of 0.5% Malathion treated plants.

Average leaf area damage (mm2)

Malathion of 0.4% concentration was found the least effective and 0.5% was the most effective in reducing the leaf area damage. The highest average leaf area damage were determined on sweet gourd (4.20), bottle gourd (3.20), and bitter gourd (2.16) when the plants were treated with 0.4% and the lowest average leaf area damage were found on sweet gourd (3.00), bottle gourd (2.13), and bitter gourd (1.49) in case of 0.5% Malathion treatment. So from above discussion the effective dosal rank of Malathion was 0.5% >0.6%>0.4%.

Effect of Malathion after 48 hrs of spraying

The result of Malathion treatment after 48 hours of spraying is presented in Table 2.

No. of leaf attack/plant

Similar efficacy of different doses of Malathion was found after 48 hrs of spraying on the plants. The highest numbers of leaf attack/plant were found on sweet gourd (4.44), bottle gourd (3.66), and bitter gourd (3.15) when the plants were treated with 0.4% Malathion and the lowest numbers of leaf attack/plant were observed on sweet gourd (2.00), bottle gourd (1.33), and bitter gourd (1.00) in case of 0.5% Malathion application.

No. of twig attack/plant

After 48 hrs of spraying the doses of Malathion showed similar effectiveness in case of leaf attack. The highest numbers of twig attack/plant were found on sweet gourd (4.66), bottle gourd (3.50), and bitter gourd (1.22) in case of 0.4% Malathion. The lowest numbers of twig attack/plant were observed on sweet gourd (2.96), bottle gourd (1.00), and bitter gourd (1.00) when the plants were treated with 0.5% Malathion.

Table 2. Effect of Malathion on the attack of red pumpkin beetle in cucurbitaceous plants after 48 hrs of spraying

Dose of Malathion (%)	No. of attacked leaf/plant			No. of attacked twig/plant			Average leaf area damage (mm^2)		
	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd
0.4	4.44b	3.66d	3.15f	4.66b	3.50e	1.22g	4.90f	3.63c	2.96d
0.5	2.00c	1.33e	1.00f	2.93g	2.00g	1.00f	3.63g	2.76e	2.20f
0.6	3.33b	3.00f	2.90f	3.33d	1.90e	1.00h	4.00f	2.93e	2.23h
Control	5.00a	4.78d	4.33e	4.89a	4.00c	2.33d	5.53a	4.47b	4.35a
$LSD_{0.05}$		0.1410			0.1410			0.1921	
CV%		5.13			3.83			4.14	

Average leaf area damage (mm2)

The highest leaf area damage was measured on sweet gourd (4.90), bottle gourd (3.63), and bitter gourd (2.96) when the plants were treated with 0.4% and the lowest leaf area damage was found on sweet gourd (3.63), bottle gourd (2.76), and bitter gourd (2.20) in case of 0.5% Malathion application. So from above discussion the effective dosal rank of Malathion was 0.5% >0.6%>0.4 %.

Effect of Malathion after 72 hrs of spraying

The result of Malathion treatment after 72 hours of spraying is presented in Table 3.

No. of leaf attack/plant

After 72 hrs of spraying the efficacy of different doses was similar to the efficacy of 48 hrs of application of Malathion. The highest no. of leaf attack/plant were found on sweet gourd (4.78), bottle gourd (4.10), and bitter gourd (3.66) when the plants were treated with 0.4% Malathion and the lowest no. of leaf attack/plant were found on sweet gourd (2.53), bottle gourd (2.33), and bitter gourd (2.00) in case of 0.5% Malathion treatment.

Table 3. Effect of Malathion on the attack of red pumpkin beetle in cucurbitaceous plants after 72 hrs of spraying

Dose of Malathion (%)	No. of attacked leaf/plant			No. of attacked twig/plant			Average leaf area damage (mm^2)		
	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd
0.4	4.78d	4.10f	3.66c	5.00b	4.00c	2.00h	5.78d	4.61e	3.30g
0.5	2.53g	2.33f	2.00g	3.50e	3.00h	1.33g	4.10h	3.80d	3.57i
0.6	4.00f	3.75d	3.66e	3.66c	2.66f	1.66f	4.51e	3.50f	3.00f
Control	5.61c	4.66a	4.00b	6.89a	4.78c	3.33d	6.00a	5.14c	4.43b
$LSD_{0.05}$	0.1599			0.1599			0.1685		
CV%	4.87			4.36			4.32		

No. of twig attack/plant

The highest number of twig attack/plant were found on sweet gourd (5.00), bottle gourd (4.00), and bitter gourd (2.00) in case of 0.4% and the lowest number of twig attack/plant were found on sweet gourd (3.50), bottle gourd (3.00), and bitter gourd (1.33) in case of 0.5% Malathion treatment.

Average leaf area damage (mm2)

The highest leaf area damage was measured on sweet gourd (5.78), bottle gourd (4.61), and bitter gourd (3.30) when the plants were treated with 0.4% Malathion and the lowest leaf area damage were observed on sweet gourd (4.10), bottle gourd (3.80), and bitter gourd (3.57) in case of 0.5% Malathion application. So from above discussion the effective dosal rank of Malathion was 0.5% >0.6%>0.4%.

Effect of Malathion after 5 days of spraying

The result of Malathion treatment after 5 days of spraying is presented in Table 4.

No. of leaf attack/plant

After 5 days of spraying 0.4% Malathion showed the lowest effectiveness and 0.5% was the most effective. The highest number of leaf attack/plant were found on sweet gourd (5.00), bottle gourd (4.50), and bitter gourd (4.00) when the plants were treated with 0.4% Malathion and the lowest number of leaf attack/plant were found on sweet gourd (3.33), bottle gourd (2.66), and bitter gourd (2.33) in case of 0.5% Malathion application.

Table 4. Effect of Malathion on the attack of red pumpkin beetle in cucurbitaceous plants after 5 days of spraying

Dose of Malathion (%)	No. of attacked leaf/plant			No. of attacked twig/plant			Average leaf area damage (mm^2)		
	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd
0.4	5.00d	4.50d	4.00b	5.50e	4.50e	3.00e	6.16c	4.94c	4.26e
0.5	3.33f	2.66e	2.33f	3.66f	3.15f	2.33g	4.60f	4.56d	3.69f
0.6	4.33f	4.00e	3.97d	4.33d	3.44g	2.67f	5.56d	5.00e	4.16e
Control	6.37c	5.00d	4.66a	6.66a	5.66c	4.00b	7.58a	6.32b	5.23c
$LSD_{0.05}$		0.1507			0.2064			0.1685	
CV%		4.34			5.14			5.83	

No. of twig attack/plant

The highest number of twig attack/plant were observed on sweet gourd (5.50), bottle gourd (4.50), and bitter gourd (3.00) in case of 0.4% and the lowest number of twig attack/plant; was found on sweet gourd (3.66), bottle gourd (3.15), and bitter gourd (2.33) when the plants were treated with 0.5% Malathion.

Average leaf area damage (mm2)

The highest leaf area damage was determined on sweet gourd (6.16), bottle gourd (4.94), and bitter gourd (4.26) when the plants were treated with 0.4% and the lowest leaf area damage was determined on sweet gourd (4.60), bottle gourd (4.56), and bitter gourd (3.69) in case of 0.5% Malathion treatment. So from above discussion the effective dosal rank of Malathion was 0.5% >0.6%>0.4%.

Effect of Malathion after 7 days of spraying

The result of Malathion treatment after 7 days of spraying is presented in Table 5.

No. of leaf attack/plant

After 7 days of spraying 0.4% Malathion was the least effective and 0.5% was the most effective. The highest number of leaf attack/plant were found on sweet gourd (5.50), bottle gourd (5.00), and bitter gourd (4.50) when the plants were treated with 0.4% and the lowest number of leaf attack/plant were observed on sweet gourd (3.63), bottle gourd (3.00), and bitter gourd (2.95) in case of 0.5% Malathion application.

No. of twig attack/plant

After 7 days of spraying 0.4% Malathion was the least effective and 0.5% was the most effective. The highest number of twig attack/plant were observed on sweet gourd (5.75), bottle gourd (5.00), and bitter gourd (4.00) when the plants were treated with 0.4% and the lowest number of twig attack/plant were found on sweet gourd (4.00), bottle gourd (3.66), and bitter gourd (3.33) when the plants were treated with 5% Malathion.

Table 5. Effect of Malathion on the attack of red pumpkin beetle in cucurbitaceous plants after 7 days of spraying

Dose of Malathion (%)	No. of attacked leaf/plant			No. of attacked twig/plant			Average leaf area damage (mm²)		
	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd	Sweet gourd	Bottle gourd	Bitter gourd
0.4	5.50d	5.00d	4.50b	5.75e	5.00e	4.00e	6.96c	5.21c	4.96e
0.5	3.63f	3.00e	2.95f	4.00f	3.66f	3.33g	4.90f	4.76d	3.99f
0.6	4.93f	4.66e	4.00d	4.75d	3.94g	3.67f	5.96d	5.20e	4.96e
Control	7.37c	6.00d	5.66a	7.66a	6.66c	6.00b	7.58a	6.32b	3.23c
$LSD_{0.05}$		0.1534			0.2507			0.1732	
CV%		4.65			5.57			5.58	

Average leaf area damage (mm2)

After 7 days of spraying 0.4% Malathion was the least effective and 0.5% was the most effective. The highest leaf area damage was determined on sweet gourd (6.96), bottle gourd (5.21), and bitter gourd (4.96) when the plants were treated with 0.4% and the lowest leaf area damage was determined on sweet gourd (4.90), bottle gourd (4.76), and bitter gourd (3.99) when the plants were treated with 0.5% Malathion. So, from above discussion the effective dosal rank of Malathion was 0.5% >0.6%>0.4%.

Therefore, it can be concluded that Malathion is effective to control the red pumpkin beetle and the effective dose is 0.5. Even above this dose significant effect of this insecticide was not found. This result is similar with the following findings. Thapa and Neupane (1992) reported that among the various insecticidal sprays evaluated on water melon seedlings, synthetic pyrethroids (deltamethrin at 0.004%, cypermethrin at 0.012%, and fenvelerate at 0.01%) were effective in controlling the red pumpkin beetle (8.188-96.88% mortality) for about a week. Khan and Jehangir (2000) conducted an experiment on the efficacy of sevin dust to control *A. foveicollis* in the muskmelon field and they reported that 2.0% concentration gave the best control of the pest followed by medium (1.0%) concentration. They also stated that high and medium concentrations were found non-significantly different in control of the pest.

REFERENCES

Alam, M. Z. 1969. Insect pests of vegetables and their control in East Pakistan. The Agricultural Information service, 3, R. K. Misson Road, Dhaka. 146p.

Azim, M. I. I. 1966. Studies on the biology of red pumpkin beetle, *Aulacophora foveicollis* (Lucas) (Chrysomelidae: Coleoptera) in East Pakistan. M. Sc. Thesis. Department of Entomology. Bangladesh Agricultural University, Mymensingh.

Dillon, M. K., Naresh, J. S., Singh, R. and Sharma, N. K. 2005. Evaluation of bitter gourd (*Momordica charantia* L.) genotypes for resistance to melon fruit fly, *Bactrocera cucurbitae*. *Indian J. Pl. Prot*. 33(1): 55-59.

Doharey, K. L. 1983. Bionomics of Red pumpkin beetle; *Aulacophora foveicollis* (Lucas) on some fruits. Indian Journal of Entomology. 45: 406-413.

Gupta, D. and Verma, A. K. 1992. Population fluctuations of the grubs of Red pumpkin beetle; *Aulacophora foveicollis* (Lucas) infesting cucurbitaceous crops. *Adv. Pl. Sci*., 5: 518-523.

Karim, M. A. 1992. Insect pests of vegetable crops and their management. ***In****: Vegetable production and Marketing*. Lopez, K. and E. Libas (eds.). Proc. National Review and Workshop held at BARI, Gazipur, Bangladesh on January 26-29. 1992. Asian Vegetable Research and Development Center, Shanhua, Tainan, Taiwan. Publication No. 92-379. pp. 110-112.

Khan, S. M. and Jehangir, M. 2000. Efficacy of different concentrations of sevin dust against red pumpkin beetle (*Aulacophora foveicollis* (Lucas) causes damage to muskmelon *Cucumis melo* crop. *Pakistan Journal of Biological Science*., 3(1): 183-185.

Mahmood, T. Khokhar, K. M. Hussain, S. I. and Laghari, M. H. 2005. Host preference of red pumpkin beetle, *Aulacophora (Raphidopalpa) foveicolis (Lucas)* among cucurbit crops. *Sarhad J. Agric.,* 21(3):473-475.

Narayanan, E. S. and Batra, H. N. 1960. Red pumpkin beetle and Their Control. Indian Council of Agricultural Research, New Delhi, India. 2: 1-68.

Parsad, K. and Kumar, P. 2002. Insect pest status on summer vegetables in hillytracts. *Karanataka J. Agric. Sci*., 15(1):156-157.

Rajak, D. C. 2001. Host range and food preference of the red pumpkin beetle, *Aulacophora foveicollis* Lucas (Chrysomelidae: Coleoptera). Agricultural-Science-Digest Karnal, India: Agricultural Research Communication Centre, 21(3): 179-181.

Thapa, R. B. and F. P. Neupane. 1992. Incidence, Host Preference and Control of the Red Pumpkin Beetle, *Aulacophora foveicollis* (Lucas) (Coleoptera: Chrysomelidae) on Cucurbits *J. Inst. Agric. Anim. Sci*., 13: 71-77.