EFFECTS OF NET BARRIER AND SYNTHETIC PESTICIDES ON RED PUMPKIN BEETLE AND YIELD OF CUCUMBER

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ABSTRACT

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The effect of net barrier and some synthetic pesticides on red pumpkin beetle and on yield of cucumber was investigated using farmer's field at one location, Madhupur, Tangail during the year 2005-2006. The treatments were control, mosquito net barrier, carbofuran (soil mixing pesticide) and foliar spraying of Diazinon-60EC. There were differences in case of overall performance of the treatments and in some cases it was more or less similar. However, in control there was a highest leaf and fruit infestation by the red pumpkin beetle but yield was very near to the highest yield performance because in net barrier plants were free from infestation but a month after removed of net barrier plants showed more susceptibility to the red pumpkin beetle and other insects also. The carbofuran performed well compared to other treatments.

Keywords: Synthetic pesticides, net barrier, 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. Cucumber is a popular and extensively cultivated cucurbitaceous vegetable in Bangladesh. People like it cooked and raw. Most people like to have it as a salad. On the other hand a good economic profit may come through its cultivation. But its production is severely affected by a number of insect pests. Among these insect pests, the red pumpkin

Beetle (RPB) and fruit flies are the most damaging and major pests (Alam, 1969; Butani and Jotwani, 1984). The RPB, *Aulacophora foveicollis* (Lucas), has been reported by Azim (1966) as the most destructive insect pest of cucurbitaceous vegetables, specially cucumber and melons, in Bangladesh. This insect pest is widely distributed all over the South-East Asia as well as the Mediterranean region towards the west and Australia in the east (Butani and Jotwani, 1984).

The adult beetle is red, oblong and approximately 6-8 mm long and lays its eggs at the base of the cucumber stem. A single female can lay 150 to 300 eggs (Srivastava and Butani, 1998). The adult beetles feed voraciously on the leaf lamina making irregular holes and also attack cotyledons and flowers (Butani and Jotwani, 1984). They eat seedlings, young and tender leaves and flowers. They normally occur in large numbers. The grubs are yellowish white and when in the soil cause injury to the roots (Maniruzzaman, 1981).

Presently the farmers are totally depended on the use of insecticides to control this pest. Control of RPB by applying insecticides has been reported by several workers in home (Alam, 1969; Karim,1992 ; Anonymous, 1992, 1993b, 1994) and abroad (Pawlacos, 1945 ; Butani and Jotwani , 1984; Nair, 1986; Chattopadhyay, 1992 and Saha, 1992).But indiscriminate use of pesticides 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). So always we are looking alternative and environment- friendly methods of pest control. The use of net barrier was found to provide adequate protection from RPB attack. A physical barrier preventing the adults from feeding on the leaves and from reaching the stem to lay their eggs is a potential control method and since mosquito netting is widely available in Bangladesh, it could be easily procured by farmers for such purpose. It is better to follow the need based applications of pesticides at action threshold and economic threshold.

There are objectives behind this trial, which are as follows: To see the effectiveness of net barrier to control the red pumpkin beetles at its seedling stage and finally at the production stage; to find an environment-friendly

technology which is less hazardous to the environment and friendly to the beneficial insects; and to see the effect of different synthetic pesticides on the yield of cucumber.

MATERIALS AND METHODS

The study was conducted at farmer's field of Jalchatra, Madhupur, Tangail under the jurisdiction of a partner organization, Jalchatra Mission from May to August, 2005. The treatments were laid out in RCB design with 5 replications. Treatments were as follows –

T1= Control
T2= Mosquito net barrier
T3= Use of Carbofuran (soil mixing pesticide) and
T4= Foliar spraying of Diazinon 60-EC.

Land was prepared by four ploughing and was leveled properly. Recommended doses of compost, 40kg/decimal and chemical fertilizers like urea: 460g, TSP: 460g and MP: 230g per decimal were mixed during final land preparation followed by MCC crop calendar (2003).The area of unit plot was 2mX 8m = 16m^2, where the total land was 64m^2 in size. The main plot was divided into 20 subplots. Three seeds were sown in each hill and hills were arranged in rows, where 1.5 m distance was kept between plant to plant and row to row. A drainage canal of 25cm between two rows was kept.

The mosquito net barrier was set just after seed sowing and it was funnel like to look at. At 30 days after sowing (DAS) the net barrier was removed. In each hill finally one plant was kept and uprooting the other two and at this time shoots and root length data were recorded. In the treatment Carbofuran (as a soil mixing chemical)- the pesticide was mixed with hill soil just before seed sowing. At 30 days, thinning of plants was done and keeping one per hill and at that time root and shoot length data were recorded. In the treatment using Diazinon 60EC as a folier spray, it was sprayed to the field and it was starting from the first week after emergence and it was continued once per week till harvest.

Necessary intercultural operations were done properly. Farmer was related with all kinds of trial activities. They were not so interested to do that and that is why our research assistant had to spend a lot time for this purpose. 50cm high bamboo sticks were posted around the hill and pesticides were sprayed to the field in every 8, 15 and 21 days.

Data was recorded at different stages during the cropping period. At each harvest, the number and weight of both infested and healthy fruits were recorded and the presence of fruit infestation was calculated. The cumulative plot yield of healthy and infested fruits was converted to yield per hectare. Fruit infestation was calculated using the following formula:

$$\text{Fruit infestation by number (\%)} = \frac{\text{Number of infested fruits}}{\text{Number of total fruits}} \times 100$$

All data were subjected to ANOVA and the treatment means were separated by applying SPSS (version 10.0).

Results and Discussion

Effect of different treatments on leaves of cucumber

Numbers of leaves at 27 DAS in three treatments (T_1, T_2 and T_4) were more or less same and statistically there were no significant differences among them. The highest number was 15.60 ± 10.06 in the T_3 (Carbofuran). A significant difference was found at 5% level, when the Carbofuran was compared with other three treatments. At 37 DAS the highest number of leaves were being 23.00 ± 11.68 in the Carbofuran. Other three treatments showed approximately same results and there were no significant differences among the treatments (Table 1).

Effect of different treatments on plant height of cucumber

Highest plant height showed by the Carbofuran while net barrier performance was statistically same (Table1).A significant difference in the plant height of these treatments and the other treatment did exist. The lowest plant height was performed by the control and Diazinon and these two treatments showed no significant differences between them.

Effect of different treatments on root length of cucumber

Highest root length was performed by the Carbofuran than the net barrier and lowest performance by the control and Diazinon. Statistically there were no significant differences among them (Table 1).

Table 1: Effect of net barrier and some synthetic pesticides on different agronomic characteristics of cucumber (plot wise data)

Treatments	No. of leaves at 27 DAS/plot ± SD	No. of leaves at 37DAS ± SD	Plant height (cm) at 27 DAS ± SD	Root length(cm) ± SD	Total no. of harvested fruits ± SD
Control	6.00 ± 2.12 [b]	13.80 ± 5.89	7.00 ± 2.92 [b]	5.35 ± 1.58	7.20 ± 4.02
Net barrier	6.20 ± 3.35 [b]	12.20 ± 7.85	22.20 ± 20.73 [ab]	17.544± 16.66	4.20 ± 2.39
Carbofuran	15.60 ± 10.06 [a]	23.00 ± 11.68	38.60 ± 28.79 [a]	19.80 ± 11.52	9.60 ± 5.18
Diazinon	6.20 ± 0.84 [b]	13.40 ± 4.22	7.70 ± 1.72 [b]	6.50 ± 2.78	4.80 ± 2.05
F – value	3.71	2.82	3.62	2.51	2.67
P – value	P< 0.05	NS	P< 0.05	NS	NS

Effect of net barrier and some synthetic pesticides on cucumber pest status

Data was collected from beetle infested leaves at 27 and 37 DAS. Where, at 27 DAS the control showed a highest number of leaf infestation and zero infestation was observed in the net barrier. At 37 DAS, the control also showed the highest infestation and lowest by the Carbofuran and it was significant at 5% level (Table 2).

There were significant differences among the treatments incase of fruit infestation. The highest fruit infestation was occurred by the T_1. Lowest infestation occurred by T_2 while the Carbofuran and Diazinon treated plants gave statistically the same results. (Table 2).

Table 2: Effect of net barrier and some synthetic pesticides on cucumber pest status

Treatments	No. of beetle infested leaves at 27DAS ± SD	No. of beetle infested leaves at 37DAS ± SD	No. of infested fruits ± SD
Control	3.00 ± 1.22 [a]	3.80 ± 1.30 [a]	2.20 ± 1.30 [a]
Net barrier	0.00 ± 0.00 [b]	2.40 ± 1.34 [ab]	0.60 ± 0.89 [b]
Carbofuran	0.20 ± 0.45 [b]	0.80 ± 0.84 [b]	2.00 ± 0.71 [ab]
Diazinon	0.60 ± 0.89 [b]	1.40 ± 2.61 [b]	1.00 ± 1.41 [ab]
F – value	11.82	3.79	3.47
P – value	P< 0.01	P< 0.05	P = 0.05

Yield records: To observe the yield performance data were collected from both infested and non infested fruits. During the harvesting period all harvested fruits were marketable size. Data was collected plot wise ($64m^2$) in kilogram and was converted to ton/hectare. The Carbofuran gave the highest yield (1.24 t/ha) and second highest was performed by the control (1.23 t/ha), where the Diazinon and net barrier yielded 0.55 t/ha and 0.41 t/ha, respectively (Fig.1).

Though there is a dramatic growth rate was occurred in the treatment net barrier but at the final stage yield was not at satisfactory level. Obviously it is true that plants remain free of infestation when it is in the net barrier, but a month after removed of net barrier, the plants showed more susceptibility to the red pumpkin beetle and other insects also. It may be that due to open condition plants of other treatments built a resistance against different natural threats and finally they gave an acceptable yield, but growth and yield was drastically reduced in the treatment net barrier. After removing the net barrier environment friendly materials like some botanicals had to be used to save the plants.

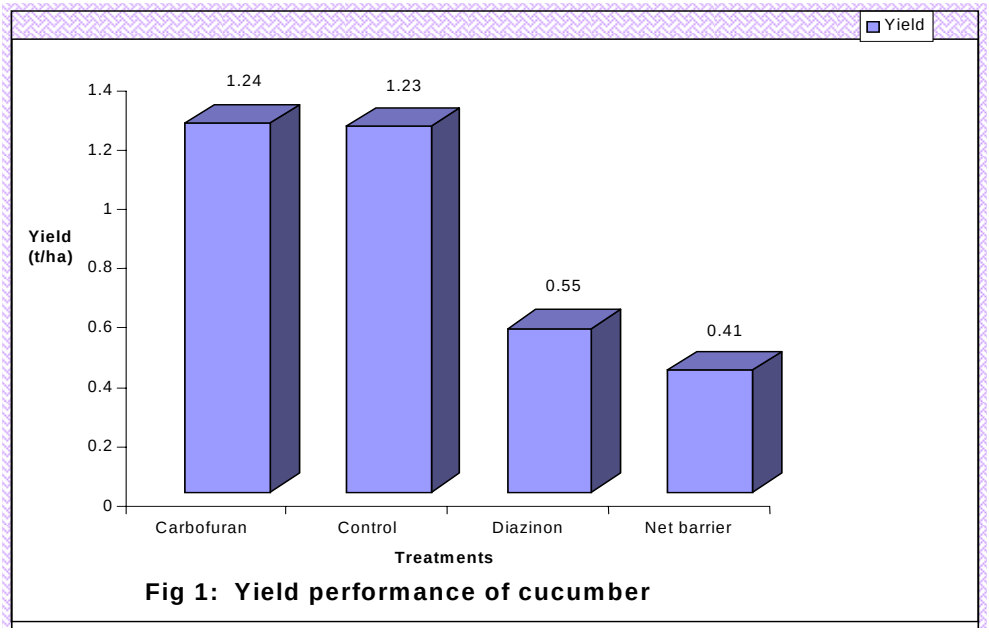

Fig 1: Yield performance of cucumber

REFERENCES

Alam, M. Z. 1969. Pest of cucurbit vegetables. In: Insect-Pests of vegetables and Their Control in East Pakistan. Agricultural Information Service, Department of Agriculture, Dacca, pp. 89-110.

Anonymous. 1992. Annual Research Report (1991-92), Entomology Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur. 137p.

Anonymous. 1993a. Research and development of vegetable crops. Paper presented in the workshop on March 9-10, 1993 at IPSA, Gazipur. pp. 1-7.

Anonymous. 1993b. Annual Research Report (1992-93), Entomology Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur. 112p.

Anonymous. 1994. Annual Research Report (1993-94), Entomology Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur. 132p.

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. pp. 1-95.

Bhaduri, M., Gupta, D.P. and Ram, S. 1989. Effect of vegetable oils on the ovipositional behaviour of *Callosobruchus maculatus* (Fab.). Proc. 2nd Intl. Symp. On Brouchids and Legumes (ISLB-2) held at Okyayamace (Japan), Sept. 6-9, 1989. pp. 81-84.

Butani, D. K. and M. G. Jotwani. 1984. Insects in vegetables. Periodical Expert Book Agency. Vivek-Vihar, Delhi (India). pp. 69-79.

Chattopadhyay, P. 1992. Keetatatta, keetadaman O Shasya Sanrakshan. West Bengal State Book Board, Arjo Mansion (9th floor), 6A, Raja Subodh Mollick Square, Calcutta-700013, India. 2nd Edition. 375p. (in Bangla).

Desmarchelier, Y.M. 1985. Bolivian of pesticide residues on stored grain, Aciar Prof. Series, Australian Centre Int. Agril. Res. 14: 19-29.

Devi, D.A., Mohandas, N. and Vistakshy, A. 1986. Residues of Fenthion, Quinphos and Malathion in paddy grains following surface treatment of gunny bags. Agril. Res. J. Kerala. 24(2): 222-224.

Fishwick, R.B. 1988. Pesticide residues in grain arising from post harvest treatments. Aspects Appl. Biol. 17(2): 37-46.

Hagen, K.S. and Franz, J.M. 1973. A history of biological control. pp. 433-467. *In*: Smith, R.F., Mittler, T.E. and Smith, C.N. (eds.). History of Entomology. Annual Rev. Inc., Palocetto, California. 872 p.

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.

Kavadia, V.S., Pareek, B.L. and Sharma, K.P. 1984. Residues of malathion and carbaryl in stored sorghum. Bull. Grain Tech. 22(3): 247-250.

Maniruzzaman, F.M. 1981. *Plant protection in Bangladesh*, National book center: Bangladesh, Purana Paltan, Dhaka: pp.249-251.

MCC Bangladesh Research Result, 2003. *The effects of a net barrier and thiamethoxam seed treatment on cucumber growth in the first four weeks after emergence at Mannan Nagar*, 29: 35-38.

Nair, M. R. G. K. 1986. Insects and Mites of Crops in India. Publication and Information Division, Indian Council of Agricultural Research. New Delhi. pp. 162-169.

Pawlacos, J. G. 1945. The biology and control of *Aulacophora foveicollis* (Lucas) in Greece. Rev. Appl. Ent. Ser. A. 33: 16-17.

Saha, L. R. 1992. Handbook of plant protection. Kalyani publishers, 1/1, Rajinder Nagar, Ludhiana-141008, India. First Edition, Reprinted. 928p.

Srivastava, K.P. and Butani, D.K. 1998. *Pest Management in Vegetables Part –I*, Research Periodicals and Book Publishing House Houston, Texas.