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ECONOMIC EVALUATION OF DIFFERENT MANAGEMENT PRACTICES OF CUCURBIT FRUIT FLY (*Bactrocera cucurbitae*) IN SWEET GOURD

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ABSTRACT

The experiment was conducted to know the economic effect of different management practices viz. application of Nimbicidine @ 5 ml /l, Secufon 80 SP @ 1 ml /l, Decis 2.5 EC @ 1 ml /l water and bagging of fruits at two days after anthesis on *Bactrocera cucurbitae* in sweet gourd (*Cucurbita moschata*). The evaluation of different management practices revealed that the bagging of fruits in scaffold showed the lowest level of infestation and demanded the highest cost (356.45 US $) per hectare. The highest yield (19.51 tones / ha) was obtained in the bagging treatment and resulted lowest benefit: cost ratio (06.89). It was concluded that bagging of fruits was found to be as a superior method in controlling the damage by fruit fly in sweet gourd.

Key words: *Cucurbit fruit fly, sweet gourd, economic management*

INTRODUCTION

Cucurbits are the major groups of vegetable in Bangladesh. They are infested by several insect pests which are considered to be the significant obstacles for economic production. Among them, cucurbit fruit fly, *Bactrocera cucurbitae* Coquillett (Diptera: Tephritidae) is the major one which cause up to 50% damage of cucurbits while 100% damage of melon (Atwal and Dhaliwal, 2005). This pest is found across Asia, part of Africa, the Pacific islands and in the Indian Ocean, and consists of 4000 species (Vayssieres *et al.*, 2006). Several methods are practicing for management of cucurbit fruit fly in the world. According to Akhtaruzzaman *et al*. (2003) mechanical and cultural such as field sanitation, infested fruit picking, bagging of fruits, ploughing of soils are very effective control measures of this pest. Klungness *et al*. (2005) reported that burying of damaged fruits 0.46 m depth in soil prevented adult fly eclosion and reduced population. A new protein bait GF-120 Fruit Fly Bait® containing spinosad as a toxicant have been found to be effective in the area wide management of *B. cucurbitae* in Hawaii (Prokopy *et al*., 2004). Therefore, it is important to evaluate the economics of the most common management practices of cucurbit fruit fly for selecting an ecofriendly and cost effective one.

MATERIALS AND METHODS

The study was conducted in the Field Laboratory of the Department of Entomology, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh during April - July, 2007. The experiment was laid out in Randomized Complete Block Design (RCBD) with 5 treatments and 4 replications. The treatments included; Nimbicidine (Azadiractin), Secufon 80 SP (Trichlorfon), Bagging of fruits, Decis 2.5 EC (Deltamethrin) and control. The land was divided into 20 plots (4.0 × 2.0 m^2) with an inter plot distance of 2 m. Each pit (40 × 40 × 40 cm^3) was dug per plot and each pit having two sweet gourd plants representing a replication. Nimbicidine was applied @ 5ml / l of water as cover spray at 10 days interval, starting from the flower initiation stage in the randomly selected plots in all the replications. The application of Nimbicidine was continued till the late fruiting stage. This was uniformly sprayed to ensure complete coverage of the plants. In the same way, Secufon 80 SP was applied @ 1 ml / l of water and Decis 2.5 EC @ 0.5 ml / l of water. The bagging of fruit was done by using polyethylene bags provided with holes made by an ordinary pin for proper aeration. During morning hours, the pollinated female flowers were bagged by hand at 2 days after anthesis and left for seven days. The mouth of the bag was wrapped and closed by thread near the peduncle of the fruit. After 7 days, the polyethylene bags were removed.

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At the end of reproductive period, harvesting was done. After harvesting, the healthy fruits and the infested fruits were separated by visual observation and weight was taken. Finally, the yield was converted in tons / ha.

RESULTS AND DISCUSSION

Different management practices of cucurbit fruit fly evaluated in this study needed different amount of cost / ha (Table 1). Among the treatments, bagging of fruits demanded highest amount of cost / ha (356.45 US $) followed by Nimbicidine @ 5 ml / l water at 10 days interval (209.81 US $), Decis 2.5 EC @1 ml / l water at 10 days interval (194.81 US $), Secufon 80 SP @ 1 ml / l water at 10 days interval (164.81 US $). The lowest amount of cost was involved in control (114.29 US $) treatment. Different management practices resulted in varied healthy and infested yields of sweet gourd (Table 2). The highest healthy yield (16.53 tones / ha) was obtained in the treatment of bagging of fruits followed by Secufon 80 SP (11.21 tones / ha), Decis 2.5 EC (9.30 tones / ha), Nimbicidine (9.29 tones / ha). The lowest healthy yield was obtained in the control treatment (6.32 tones / ha). On the other hand, the highest infested fruit yield was obtained in the control treatment (4.25 tones / ha) followed by Nimbicidine (3.89 tones / ha), Decis 2.5 EC (3.47 tones / ha), Secufon 80 SP (3.24 tones / ha). The lowest infested yield (2.98 tones / ha) was obtained in the treatment bagging of fruits. The benefit cost ratio (Table 2) showed that the treatment Secufon 80 SP accounted the highest ratio (10.29), followed by control (09.49), Decis 2.5 EC (07.93) and Nimbicidine (07.12). The lowest benefit: cost ratio was accounted by the treatment bagging of fruits (06.89).

Table 1: Costs involved / ha in management of cucurbit fruit fly

Treatment	Types of expenditure	Costs (US $)	
Nimbicidine @ 5 ml/litre water at 10 days interval	Labour for spraying	6 × 3 × 1.14	20.52
	Nimbicidine (3 times)	2500 × 3 × 0.01	75
	Other input cost	114.29	114.29
Total = 209.81			
Secufon 80 SP @ 1 ml/litre water at 10 days interval	Labour for spraying	6 × 3 × 1.14	20.52
	Secufon 80 SP (3 times)	1000 × 3 × 0.01	30
	Other input cost	114.29	114.29
Total = 164.81			
Bagging of fruits at 2 days after anthesis and left for 7 days in *Macha*	Total number of labour for bagging	150 × 1.14	171
	Total no. of poly bag	10000 × 0.001	10
	Labour for making *macha*	20 × 1.14	22.8
	Bamboo	50 × 0.71	35.5
	Plastic thread	2 × 1.43	2.86
	Other input cost	114.29	114.29
Total = 356.45			
Decis 2.5 EC @ 1 ml/litre water at 10 days interval	Labour for spraying	6 × 3 × 1.14	20.52
	Decis 2.5 EC	1000 × 3 × 0.02	60
	Other input cost	114.29	114.29
Total = 194.81			
Control	Other input cost	114.29	114.29
Total = 114.29			

Table 2: Benefit: cost ratio of different management practices on sweet gourd

Name of treatment	Yield (tones / ha)		Return (US $)		Benefit : cost ratio
	Healthy	Infested	Gross	Net	
Nimbicidine	9.29	3.89	1493	1284	07.12
Secufon 80 SP	11.21	3.24	1740	1571	10.29
Bagging of fruits	16.53	2.98	2489	2127	06.89
Decis 2.5 EC	9.30	3.47	1477	1291	07.93
Control	6.32	4.25	1085	970	09.49

Labour cost = 1.14 $ / day, Cost of single polyethylene bag = 0.001 $, Nimbicidine = 1 $ / 100ml, Secufon SP = 1.14 $ / 100g, Decis 2.5 EC = 1.71 $ / 100ml. Market price of sweet gourd = 0.14 $ / kg (healthy), 0.04 $ / kg (infested).

The results of this study showed that among the tested methods, application of Secufon 80 SP @ 1 ml / litre water is most profitable. But application of chemical insecticides for controlling vegetable and fruit pests are not desirable because of hazardous effect on human as well as ecosystem. Moreover, chemical insecticides are expensive and farmers need cash money for purchasing. Most of the farmers of the rural areas of Bangladesh are poor and they are unable to buy chemical insecticides whenever they needed. Therefore, this study indicated that the treatment bagging of fruits at 2 days after anthesis and left for 7 days might be considered as an economic treatment in reducing the percent of fruit infestation.

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