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EFFECTIVENESS OF SPRAYING TIME FOR JUDICIAL USE OF INSECTICIDES IN CONTROLLING OF FRUIT FLY

M A Rahaman[*1], M Jahan[2], K S Islam[2] and S N Alam[3]

[1]Sector Coordinator – Food Security, Mennonite Central Committee Bangladesh, 4/10, Iqbal Road, Block – A, Mohammadpur, Dhaka – 1207, Bangladesh
[2]Department of Entomology, Bangladesh Agricultural University, Mymensingh – 2202, Bangladesh
[3]Entomology Division, Bangladesh Agricultural Research Institute, Gazipur – 1700, Bangladesh

Abstract

A study on effectiveness of spraying time for judicial use of insecticides in controlling of fruit fly was conducted in farmers' filed during March to May, 2011 in Bogra district. The insecticide Nitro-505EC was selected as test insecticide and bitter gourd was as test crop for this experiment. The insecticide was sprayed three times as treatments viz. spraying early in the morning (7:00am to 8:00am), spraying at noon (12:00 noon to 1:00pm) and spraying before evening (4:00pm to 5:00pm) and was compared with the untreated control. The lowest infestation (26.80 %) by cucurbit fruit fly was found after spraying of insecticide in the afternoon (4:00pm to 5:00pm) and the maximum fruit infestation was found in the untreated control treatment (60.24%). Significant differences were found in percent of infested fruits immediate after three days, but after seven days there was no significant differences among the treatments.

Keywords: *Bactrocera cucurbitae*, insecticide spraying time, fruit fly, infestation, bitter gourd.

Introduction

The cucurbit fruit fly, *Bactrocera cucurbitae* (Coquillett) is an insect of the family Tephritidae, which has a major economic importance in the tropical areas. According to Vayssieres *et al.* (2006) it is distributed worldwide and consists of 4000 species and it is widespread in the Asian region. It has been reported to damage 81 host plants and is a major pest of cucurbitaceous vegetables. The extent of losses varies between 30% and 100 %, depending on the cucurbit species and season (Dhillon *et al.*, 2005 and Sapkota *et al.*, 2010).

For different reasons vegetable cultivation in Bangladesh has become an important means for reducing poverty in the rural areas. This vegetable sector has been important due to its contribution a lot in Bangladesh economy and which was about USD 718 million from gross domestic product in 2010 with reaching the production 3.2 million metric tons and covering the area 936,000 acres (Katalyst, 2010). More than 12 % of the rural population is employed in this sector (Katalyst, 2010).

Bitter gourd, *Momordica charantia* L. is a typical vegetable crop in Bangladesh which helps to generate valuable income for farmers and labors. It is a cross-pollinated plant belonging to the Cucurbitaceae family and a common vegetable grown in Asia and other parts of the world. It is considered one having medicinal properties and with a compound named 'Charantin' which is useful to reduce blood sugar for diabetic patients (Dhillon *et al.*, 2005). The production of bitter gourd is hindered due to several factors like disease and insect pests (Wasim *et al.*, 2010). In recent years, cultivation of bitter gourd has become costly and hazardous to farmers due to the increased use of chemical pesticides combating insect pests and especially for cucurbit fruit fly, *Bactrocera cucurbitae* (Coquillett) and it has been mentioned as a major pest of bitter gourd (Singh *et al.*, 2006).

Effectiveness of insecticides to control cucurbit fruit fly depends on several factors, where spraying time is important. Inappropriate time of spraying may cause the use of excess amount of insecticides, which is harmful to environment, human health, other beneficial living being and a cause of economic loss. On the other hand, poor application practices may allow the pests to survive which result in unsuccessful control of the pest. Insecticidal

***Corresponding author: M A Rahaman**, Sector Coordinator – Food Security, Mennonite Central Committee Bangladesh, 4/10, Iqbal Road, Block – A, Mohammadpur, Dhaka – 1207, E-mail: aref@mcc.org*

activity also depends on percent of active ingredient, temperature, relative humidity, leaf stomatal activity, adhesiveness, time of insect abundance in the crop field and others. Therefore, spray time influence the effectiveness of pesticide application and study regarding suitable spray time is important to control cucurbit fruit fly.

Materials and Methods

This study was undertaken at Sadar upazial of Bogra district from March to May 2011 to identify the most appropriate spraying time of insecticide in controlling cucurbit fruit fly of bitter gourd.

Treatments and replication: The insecticide Nitro-505EC was selected for this experiment from the result of efficacy study. The applied dose was 1 ml liter^{-1} of water. There were four treatments viz. T_1 = Control (untreated), T_2 = Spray early in the morning (7:00am to 8:00am), T_3 = Spray at noon (12:00 noon to 1:00pm) and T_4 = Spray before evening (4:00pm to 5:00pm) and each treatment had three replications. Spraying was started from the first incidence of the pest with the recommended dose.

Experimental design: Randomized complete block design (RCBD) was followed for setting experiment where, land size was 20 m x 19 m = 380 m^2 and the subplot size was 5.66 m x 2.75 m = 15.57 m^2. Planting distance 182 cm x 158 cm was maintained.

Cultural management: Between two plots 50 cm gap was maintained for proper irrigation and drainage. Whole of Compost of 1000 kg and the fertilizers TSP: 4 kg, MP: 2.5 kg, Boron: 250 g and Zinc: 250 g and one third of Urea: 1.25 kg plot^{-1} were applied. Rest two doses of urea were applied as top dressing and other management operations like irrigation, weeding, hoeing etc. were practiced as per recommendations.

Data collection and statistical analysis: For time efficacy, short duration is better to observe the efficacy. That is why data were recorded on level of infestation (%) at three and seven days after spraying (DAS) to find out the effective spraying time. The level of infestation was maintained up to zero before each spraying through proper sanitation like removing of infested and rotten fruits. The data collected from the study were arranged in tabular form in excel worksheet and processed for further analysis. All the statistical analyses was performed using SPSS statistical package 11.5 version, at 1 % level of significance.

Results and Discussion

Infestation status of CFF in bitter gourd after first application of insecticide at different time of the day: The time of spray caused significant difference ($p \leq 0.01$) among treatments as indicated by the percentage of infested fruits recorded after 3 days of spraying. The highest percent of infested fruits were found in the control treatment (60.24), followed by spraying at noon (58.49) and spraying in the morning (57.58). The lowest percent fruit infestation was found in the treatment spraying before evening (45.38). After 7 days of first spray no significant difference was found among the treatments (Table 1).

Table 1. Effect of spraying time on fruit fly infestation in bitter gourd after 3 and 7 days of first spray.

Spraying time	Percentage of infested fruit	
	After 3 days	After 7 days
Spray in the morning	57.58 ± 5.25[a]	47.82 ± 14.79
Spray at noon	58.49 ± 1.44[a]	45.83 ± 18.16
Spray before evening	45.38 ± 5.04[b]	54.17 ± 12.33
Control	60.24 ± 4.19[a]	47.78 ± 13.47
F - Value	6.07	0.14
P - Value	0.01	NS

Means in a column followed by same letter(s) are not significantly different at 1% level of DMRT

Infestation status of CFF in bitter gourd after second application of insecticide at different time of the day: After 3 days of second spray, spraying time of pesticides showed significant difference ($p \leq 0.05$) in percentage of

fruit infestation in bitter gourd (Table 2). The highest percent of infested fruits was found in the untreated control (56.67) and showed statistical similarity with the treatments spraying in the morning (52.63) and spraying at noon (43.06). The lowest percentage of fruit infestation was found in the treatment spraying before evening (38.73) and showed similar percentage of fruit infestation with the treatment spraying at noon (43.06).

After 7 days of pesticide spray, no statistical difference was found in the percentage of fruit infestation among the treatments (Table 2).

Table 2. Effect of spraying time on fruit fly infestation in bitter gourd after 3 and 7 days of second spray.

Spray time	**Percentage of infested fruit**	
	After 3 days	**After 7 days**
Spray in the morning	52.63 ± 4.56^{ab}	8.33 ± 1.53
Spray at noon	43.06 ± 5.81^{ab}	7.00 ± 1.00
Spray before evening	38.73 ± 4.89^{b}	6.00 ± 1.00
Control	56.67 ± 7.64^{a}	7.33 ± 0.58
F - Value	4.66	0.97
P - Value	0.05	NS

Means in a column followed by same letter(s) are not significantly different at 5% level of DMRT

Infestation status of CFF in bitter gourd after third application of insecticide at different time of the day: The time of spray caused significant difference ($p \leq 0.01$) among treatments as indicated by the percentage of infested fruits recorded after 3 days of spraying (Table 3). The highest percent of infested fruits were found in the treatment spraying in the morning (55.59) followed by the treatment spraying at noon (51.67). The lowest percentage of fruit infestation was found in the treatment spraying before evening (26.80) preceded by the untreated control (49.59).

After 7 days of third spray, statistically there was no significant difference in percentage of fruit infestation among the treatments (Table 3).

Table 3. Effect of spraying time on fruit fly infestation in bitter gourd after 3 and 7 days of third spray.

Spray time	Percentage of infested fruit	
	After 3 days	After 7 days
Spray in the morning	55.59 ± 2.28^{a}	47.62 ± 4.12
Spray at noon	51.67 ± 4.12^{ab}	41.76 ± 7.51
Spray before evening	26.80 ± 5.66^{c}	43.33 ± 12.41
Control	49.59 ± 3.57^{b}	57.21 ± 3.94
F - Value	75.20	3.78
P - Value	0.01	NS

Means in a column followed by same letter(s) are not significantly different at 1% level of DMRT

Discussion

Infestation status of CFF after application of insecticide at different time intervals: After 3 days of first spray the treatments untreated control, spray insecticide in the morning and spray insecticide at noon gave the highest percent of infested fruits. The results indicated that efficacy of insecticide might lost when it sprayed in the morning and at noon. After 1 week of insecticide spray statistically there was no significant difference(s) among the treatments in the case of percent of infested fruits which might be for environmental factors or pest population was lower in the experimental plot that enhanced about same level of infestation both in treated and untreated plot.

After 3 days of second spray it was found that the untreated control treatment was highly vulnerable to cucurbit fruit fly infestation. The results also indicated that spraying insecticide in the morning and at noon also ineffective to control cucurbit fruit fly infestation and give the same result like untreated control. After second spray it was also assumed that the efficacy of pesticides might lost when it was sprayed in the morning and at noon. When insecticide

was sprayed in the bitter gourd field in the morning it got scorching sun light afterwards and which might reduce the insecticide's efficacy and when pesticide was sprayed at noon it also got scorching sun light which may cause to loss its efficacy, but when it was sprayed at the evening its effectiveness lasted for a long time or it got enough time to penetrate into the plant parts before losing its efficacy. After 7 days of insecticide spray statistically there was no significant difference(s) among the treatments in the case of percent of infested fruits, which might be for environmental factors or the pest population was lower in the experimental plot that leaded to about same level of infestation both in treated and untreated plot.

After 3 days of third spray, the highest percent of infested fruits was found in the treatments spray pesticide in the morning and spray at noon which was similar to the untreated control. When insecticide was sprayed before evening in the bitter gourd plot to control cucurbit fruit fly, then a higher efficacy was found in controlling cucurbit fruit fly. It is assumed that after 3 days of third spray, the efficacy of insecticide might be lost due to spraying in the morning and at noon. After 1 week of third spraying, statistically there was no significant difference(s) among the treatments in the case of percent of infested fruits. From the results, it was revealed that spraying method was not followed properly or proper doses of insecticides were not maintained for this experiment. It may also happen due to weather causes like temperature, wind speed, relative humidity (RH %), etc. Nishida and Bess (1957) have found that both male and female melon flies seek shelter (roost) in vegetation bordering host areas at night. In the morning, primarily females move into the host crop area for oviposition into the host fruits, while the males mostly remain in the bordering vegetation. Inappropriate selection of insecticides, its doses and improper spray scheduling (Phillips *et al.*, 1990) may cause to the failure in controlling insect pests. Results of above mentioned authors support the findings of present study.

Efficacy of insecticide depending on spraying time was observed, where it was found that the lowest infestation (26.80 %) was in bitter gourd by cucurbit fruit fly after spraying of insecticide mostly in the afternoon (4:00pm to 5:00pm). The maximum fruit infestation was found in the untreated control treatment (60.24 %). Spraying both the upper and lower surface of trellis in the afternoon (4:00pm to 5:00pm) will give better effectiveness against cucurbit fruit fly. After a certain period of insecticide application its efficacy might not be effective, which is possible immediate after application.

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