J. Bangladesh Agril. Univ. 11(2): 189–192, 2013 **ISSN 1810-3030**

Effects of Cyperin 10 EC and Neem extract on pollinator abundance, fruit setting and quality of mango

S. Mohan, N. Nahar* and K. S. Ahmed
Department of Entomology, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh, *E-mail: nnaznin_entom@yahoo.com

Abstract

Effects of cyperin 10 EC and neem extract on pollinators, fruit setting and fruit quality of mango was investigated. Number of pollinators visited mango inflorescences was higher in morning in comparison to noon and afternoon. In control plants, average 25.67 pollinators visited within 30 minutes which was higher than cyperin 10 EC (20.00) and neem extract treated (24.34) plants. The pollinators were under the order Hymenoptera (26.31%), Diptera (52.42%), Odonata (5.26%) and unidentified (10.53%). Bloomed and fertilized flowers were lower in cyperin treated plants than neem treated and control plants. Highest average fruit weight was obtained from neem treated plants, whereas cyperin treated plants gave lowest percentage of infested fruit and control plants gave highest percentage of deformed fruit.

Keywords: Cyperin 10 EC, Neem extract, Pollinator abundance, Fruit quality, Mango

Introduction

Mango is an important fruit of Bangladesh which holds third position among all fruits (BBS, 2010). Almost every homestead of Bangladesh have mango trees and farmers cultivate in orchard as well. The cultivated area of mango is 31600 hectare and total production is 803000 metric tons (BBS, 2010). Mango is a big tree and bears a large number of flowers. A single panicle of mango consists of 200-4000 flowers and a mature tree has 600-1000 panicles (Manning, 1995). Because of huge flowers a large number of pollinators are attracted to mango trees and these pollinators play a vital role in mango production as it is cross-pollinated plant. According to different studies it is confirmed that 21 species of insects in India and 46 species in Israel visited mango trees under the order Diptera, Hymenoptera and Coleoptera (Singh, 1997; Dag and Gazit, 2000). Mango plants are infested with a number of insects too from time of flushing to harvest. Farmers of Bangladesh mainly use insecticides to manage these pests. Among the insecticides, cyperin 10 EC, a synthetic pyrethroid insecticide under cypermethrin group is popular to farmer for its rapid action to control various insects specially mango hoppers. But indiscriminate use of insecticides can cause death of pollinators and biocontrol agents. Hence, it is important to consider about pollinators while applying insecticides. Botanical insecticide might have no harmful effects on pollinators. Considering the availability and cheaper cost, neem, *Azadirachta indica* extract might be a good choice. Sufficient information about effects of insecticide on abundance of pollinators in mango is scanty in Bangladesh. This research work on insecticidal effects on pollinators would provide significant information to protect pollinators and encourage producers adopting safe means of pest control and thereby conserving pollinators and increase production. In this study, we observed the effect of cyperin 10 EC and neem extract on abundance of pollinators, fruit setting and fruit quality.

Materials and Methods

The study was carried out at the Germ Plasm Centre of Bangladesh Agricultural University, Mymensingh during the period from December, 2010 to June, 2011. Nine mango plants of Amrapali variety of 10 years old was selected. Of them three plants were randomly selected for each two treatments (Cyperin 10 EC 0.1%, Neem extract 10%) and a control using distilled water. Each treatment was sprayed three times. The first spraying was done before flower initiation, second on emergence of inflorescence but before flowering and the final spraying on after fruit setting. For pollinators movement, one flowering branch of each tree was observed for 30 minutes. Hand counter was used to count the number of pollinators. The data were recorded at morning (9.00-9.30 h), noon (14.000-14.30 h) and afternoon (16-16.30 h) for consecutive seven days. During peak blooming season, 5 sweepings/netting/treewere done from all nine

trees in three random days and captured pollinators were identified in the laboratory. Pollinators captured per netting counted and expressed as percentage. One inflorescence was randomly selected from each of the plant and the number of bloomed flowers were recorded by using a magnifying glass during first fortnight of March. After fertilization of flowers, the fertilized flowers were counted and the number of fertilized flowers indicates the fruit set of the inflorescence. Finally, fruits of one branch were harvested, counted and weighted. Average fruit weight was calculated by dividing the total wt. of fruit by the number of fruits. Data were recorded for nine plants separately.Statistical Packages for Social Science (SPSS) was used to analyze the data. F-test were performed to see the significant difference among treatments and DMRT for multiple comparison.

Results and Discussion

Effect of Cyperin 10 EC and Neem leaf extract on pollinators of mango

Results of pollinator abundance is presented in Table 1. It was observed that number of different pollinators visting the mango inflorescence was highest in morning and lowest in the noon in case of all the treatments. In morning, pollinator numbers was highest in control (25.67) which was significantly ($p<0.05$) higher than cyperin 10 EC (20.00) and neem extract treated (24.34) plants. Number of pollinators were lowest at noon. In this case, average 15.33 pollinators visited in control plant which was significantly higher than cyperin 10 EC (9.63) and neem leaf (15.33) treated plants. In the afternoon, there was also a significant difference of visiting pollinators among control and treated plants. It was clear that, insects prefer to visit flower in the morning time and they always visited more in control plant in comparison to treated plants. Mango flower blooms in the morning and nectar flow is high. For this reason, pollinators visited maximum in morning time.Cyperin 10 EC is a contact insecticide of cypermethrin group. It may have repellent effects on pollinators/ it may also reduce the floral odour and pollinators might avoid the flowers. A study by Delabie *et. al (*1985) proved that application of cymbush, a cypermethrin group insecticide, reduced the odour of flower and hence honeybees started to avoid the plant.

Table 1. Number of pollinators in treated and control plants at different time points

Treatments	Number of pollinators at different time points		
	9-9.30 h	14-14.30 h	16-16.30 h
Cyperin 10 EC	20b	9.63c	10.13b
Neem extract	24.34a	13.33b	14.00a
Control	25.67a	15.33a	15.00a
SE (±)	1.71	1.67	1.49

Means having different letters differ significantly.

Effectof Cyperin 10 EC and Neem leaf extract on pollinator species complex

A number of pollinators visited mango flowers during blooming season. Their identification and frequency have been presented in Table 2. Insects of Hymenoptera, Diptera and Odonata order visited the flowers. Among the hymenopteran foragers dwarf bee (*Apis florea*) was found very common in mango orchard. In the morning, 19 pollinators were captured; among them dwarf bees were 4 in number. Hymenopteran pollinators covered 26.31% among the total pollinators visited. Most of the pollinators foraging in mango flowers belonged to diptera order. One of the most attractive pollinator was Hover fly (*Episyrphus baltatus*) which covered 15.37% of the total pollinators. Other pollinators recorded in flower visiting was Blow fly (10.53%), House fly (10.53%), Horse fly (5.26%), Tachinid fly (5.26%) and mosquito (10.53%). Dipteran pollinators alone covered the great proportion (52.42%) of total pollinators. Unidentified pollinators was 10.53%. According to a study conducted by Sung *et. al* (2006) in a mango orchard of Taiwan, majority of the pollinators were under Hymenoptera order. Studies in India and Israel revealed that respectively 21 species and 46 species belonging to order diptera, hymenoptera.

Table 2. Pollinator species visiting mango flowers and their number with percentage

Order	Insects	Family	Genus	Species	Number of pollinators	Percent value (%)
Hymenoptera (26.31%)	Honeybee	Apidae	*Apis*	*Apis mellifera*	1	5.26
	Dwarf bee	Apidae	*Apis*	*Apis florea*	4	21.05
Diptera (52.42%)	Hover fly	Syrphidae	*Episyrphus*	*Episyrphus baltatus*	3	15.78
	Blow fly	Calliphoridae	*Calliphora*	*Calliphora sp.*	2	10.53
	House fly	Muscidae	*Musca*	*Musca domestica*	2	10.53
	Horse fly	Tabanidae	*Tabanus*	*Tabanus sp.*	1	5.26
	Tachinid fly	Tachinidae	*Tachinagrossa*	*Tachinagrossa canon*	1	5.26
	Mosquito	Culicidae	*Aedes*	*Aedes sp.*	2	10.53
Odonata (5.26%)	Damsel flies	Coenagrionidae	*Coenagrion*	*Coenagrion sp.*	1	5.26
Others (Unidentified)					2	10.53
Total					19	100

Effect of Cyperin 10 EC and Neem extract on flowering and fruit setting of mango

Flower and fruit setting of mango continues for about one and half months. Flowering started in the last week of February and the peak period of flowering and fruiting was the first fortnight of March, 2011. The data recorded is presented in Table 3. It was observed that flowering and fruiting were maximum at 15th March than that of at 1st or 7th March. Number of bloomed and fertilized flowers were lower in Cyperin treated plant in comparison to neem treated and control plants. This result might be due to less pollinator movement in insecticide treated plants.

Table 3.Number of bloomed and fertilized flowrs in treated and control plants

Treatment	Number of bloomed flowers/inflorescence at different dates			Number of fertilized flowers/inflorescence at different dates		
	1st March	7th March	15thMarch	1st March	7th March	15th March
Cyperin 10 EC	246.7b	407.3 ab	509.7 b	10.00 b	14.32 b	21.00 b
Neem extract	274.3a	452.3 a	703.4 a	12.00 a	18.33 a	27.00 a
Control	245.0 b	380.0 b	584.7 b	11.33 b	18.33 a	28.67 a
SE (±)	9.51	21.09	56.41	0.588	1.34	2.33

Means having different letters differ significantly.

At 15thMarch, number of bloomed flower per inflorescence in neem extract treated plants (703.67) were significantly higher ($P<0.05$) than that of control plants (584.67) as well as Cyperin 10 EC treated plants (509.67) and on the same day number of fertilized flowers corresponding to neem extract (27) and control plant (28.67) were significantly ($P<0.05$) higher than that of Cyperin 10 EC treated plants (21.00). From our observation, neem treatment seems positive for insect control as well as pollinator movement. All the results of fruit set per inflorescence in percentage ranges 3.89-4.86% were near the findings of Bhatia *et.al* (1995) where it was mentioned that 4% fruit sets per inflorescence found in opened pollinated mango flowers whereas for bagged inflorescence fruit set was zero.

Effect of Cyperin 10 EC and neem extract on fruit quality of mango

Data of fruit quality is presented in Table 4. Average fruit weight of neem extract treated plants (142gm) as well as control plants (140 gm) were significantly ($P<0.01$) higher than that of Cyperin 10 EC treated plants (118 gm). Percent infested fruit in neem extract treated plants (3.473%) was significantly ($P<0.05$) higher than that of cyperin 10 EC treated plants (2.830%) but significantly lower than that of control plants (4.500%).

Table 4. Fruit wt. and percentage of deformed and infested fruit in treated and control plants

Treatments	Average weight of fruits (gm)	Deformed fruits %	Infested fruits %
Cyperin 10 EC	118.0 b	4.070 b	2.830 c
Neem extract	142.0 a	4.470 ab	3.473 b
Control	140.0 a	4.670 a	4.500 a
SE (±)	7.69	0.176	0.486

Means having different letters differ significantly.

Mangoes are infested by a variety of insect pests. For immediate control, insecticide use is obvious in mango cultivation. We should have concern about pollinators while applying insecticides as they are very important for higher yield. Neem extract was found positive interaction with flowering, fruiting and in insect pest control. Considering the availability and low cost of neem, it could be suggested to minimize pest infestation, increase fruit production and thereby saving pollinators from insecticidal hazards.

References

Bangladesh Bureau of Statistics (BBS). 2010. Pocket Book, Statistics Division, Ministry of Planning, Government of the Peoples Republic of Bangladesh.

Bhatia, R., Gupta, D., Chandel, J.S. and Sharma, N.K. 1995. Relative abundance of insect visitors on flowers of major subtropical fruits in Himachal Pradesh and their effect on fruit set. *Indian J. Agric. Sci.,* 65: 907-912.

Dag, A. and Gazit, S. 2000. Mango pollinators in Israel.*J. Appl. Hort*., 2: 39-43.

Delabie, J., Christian, B., Fonta, C. and Masson, C. 1985. Toxic and repellent effects of cypermethrin on the honeybee: Laboratory, glasshouse and field experiments. Pesticide Science., 16(4): 409-415.

Manning, R.1995. Honeybee pollination technical data. Western Australia. Department of Agriculture, Bulletin No. 4298

Singh, G. 1997. Pollination, pollinators and fruit settings in mango.*Acta. Hort*. 455: 116-123.

Sung, I.H., Lin, M.Y., Chang, C.H., cheng, A.S., Chen, W.S. and Ho, K.K. 2006.Pollinators and their behaviors on mango flowers in Southern Taiwan.*Formosan Entomol.*, 26: 161-170.