



Integrated Management of Mango Stem Borer (*Batocera rufomaculata* Dejan) in Nepal

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Abstract

Mango Stem Borer (*Batocera rufomaculata*) Dejan) is a major insect pest of mango in Eastern Terai Region (ETR) of Nepal, mainly Saptari, Siraha, Sunsari, Morang and Udaipur district of the region. An experiment was carried out during 2010 and 2011 for management of mango stem borer at Regional Agricultural Research Station (RARS), Tarahara designed in Complete Randomized Design with eight treatments in four replications. Among eight treatments, Imidacloprid 17.8% SL, Thiamethoxame 25% WG and Trizophos 40% SL performed best in management of mango stem borer. For the verification of on station result another experiment was carried out in farmer's field of Rupnagar, Bastipur, Saptari District during 2011 and 2012 including five treatments in four replications. Among the treatments, Imidacloprid 17.8% SL, Thiamethoxame 25% WG was found best in management of mango stem borer.

Key word- Integrated Pest Management, Mango Stem Borer, Imidacloprid, and Thiamethoxame.

Introduction

Mango (*Mangifera indica* L.) a member of family Anacardiaceae is known as king of fruits, asking of fruits for its sweetness, excellent flavor, delicious taste and high nutritive value. This important tropical fruit is being grown in more than 100 countries (Sauco, 1997). It is also valuable environmental and shade tree, which contributes to the protection of soil against erosion and different medicinal virtues (D Almeida, 1995). A number of insect pest are known to attack the mango trees, which have been studied in detail (Sen, 1955; Giani, 1968; Herren, 1981; Tandon & Verghese, 1985). Mango stem borer (*Batocera rufomaculata* Dejan) is a major pest of mango in Eastern Terai Region (ETR) of Nepal; the grub is damaging stage and damages by cutting and chewing of newly twigs and shoots. Once grub enters in the shoot creates tunnel inside the stem and damages the stem resulting in drying of shoots. Severe infestation affects the whole shoots and tree looks like burned trees and causes heavy reduction in yield. The larvae of the pest live for long time (about 1 Year) and hibernate in winter inside the dry shoot, when climate warms up they activate and pupate inside then adults emerge and start egg laying from July-August. This pest was miner in the region before 10 years. Only few dry shoots were hanged over the tree but due to devoid of management tools including sanitation of orchard, timely pruning of dry shoots from trees multiplication of the mango stem borer took place and now a day's problem is severe not only in Saptari district, but it is moving towards other districts of the ETR in Nepal.

Mango stem borer is one of the major pests of mango orchards. The farmers are destroying the orchards in ETR due to the heavy infestation of this pest. A survey in Siraha and Saptari districts reported mango fruit fly, mango hopper and mango fruit borer as prevailing insect pests of mango (Regmi *et al.*, 2004). Chaudhary (1999) started to work in management of mango stem borer in RARS, Tarahara but could not complete. Mainali and Ojha (2001) found Thiodan 35EC@ 0.05% solution (2ml/hole of borer) little bit effective. Kerosene and petrol, metacid and thiodan in order were found effective control popular stem borer (*Apriona cinerea* Chevrollet) (Sagwal, 1987). Lack of knowledge on time of insect pest incidence and their nature of damage, insect pest management programs becomes less effective. The mango stem borer feeds internally and thus becomes difficult to control it once the larvae enter the mango stem/shoot. The past works at RARS, Tarahara did not give the required result (Chaudhary, 1999; Mainali and Ojha, 2001) because works were often started when the larvae matured and bored too deep in the stem/shoot.

Materials and Methods

1. Survey of mango stem borer damage in ETR

Survey on damage of stem borer in ETR was done by a questionnaire as well as by field observation in different stages of mango in Saptari, Siraha and Udaipur districts. The survey and field observation of the orchards indicated that Mango stem borer is a serious pest of mango in Saptari district and also shifting to Siraha and Udaipur districts respectively. A detailed farm and farmers' survey was conducted among 30 farmers in each district in ETR of Nepal during 2010-11 by using pre-tested semi-structured questionnaire. The survey assessed the information on insect pests incidence, their nature and extent of damage (Symptoms, plant-parts infested, time of attack and extent of damage due to insect pests) in different varieties of mango fruit and available management practices. Survey was also supported by focal group discussion and on farm verification through field inspection/observation, sample collection and insect pest, identification. The relative importance of insect pests was assessed in 1-4 scale. The team for survey of insect pest of mango in ETR led by Entomologist of RARS, Tarahara including, Regional Director, RARS, Tarahara, International Mango consultant Dr. Leo N Namuco from UPLB, Philippines and Horticulturist of RARS, Tarahara. The finding of the survey shows that the mango stem borer is the major problematic insect pest in ETR. In Saptari almost all orchards get damaged by the insect and mango growers are anxious with this pest due to lack of management tools and have started cutting the affected mango tree.

1.1. Life-Cycle study of mango stem borer

The Life Cycle study was done at RARS, Tarahara (Horticulture research unit) in borer infested Amrapali mango tree. The standing plant was covered by cloth net (mosquito net) and no any treatment was applied upon plant. The observation was taken at 15 days interval. Study was started from July 2011 to October 2012. The study showed that the mango stem borer adult starts egg laying upon the bark and dead shoots of mango tree from July – August and egg hatching takes place within 10- 15 days. Newly hatched larvae of the pest start feeding upon the newly flushed leaves and start boring onward. Once larva enters the shoot, it starts cutting and boring the shoots.

1.2. Insect pest management at RARS, Tarahara

The experiment was laid out in Complete Block Design (CRD) with four replications and 8 treatments-

1. Nimex	@5 ml/L of water
2. Sweet flag stolen extract	@5% solution
3. Lantana camera leaf extracts	@5% solution
4. Bordeaux- mixture	@ 5:5:5 (cuso4:Lime:Water)
5. Thiamethoxame 25% WG	1 gm/ L of water
6. Imidacloprid 17.8 %SL	1 ml/L water
7. Trizophos 40% EC	2 ml/L water
8. Control	(No treatmt)

All the above treatments were sprayed in individual mango trees 5 times at 15 days interval from egg laying time of pest (July-August). The spray covered leaves, stems as well as main trunk of the tree properly, the dried branches and twigs after boring by the insect was counted. The recorded data was transformed by square root transformation and analyzed.

1.3. On farm verification of treatments

The experiment was laid out in complete randomized design with four replications at problematic farmer's field of Rupnagar ward number 1 (Mr. Somnath Bhattarai and Mr. Rishiraj) in Saptari district Nepal The treatments were as follows-

- T1 Imidacloprid 17.8 % SL @ 1 ml/L of water
- T2 Thiamethoxame 25% WG @ 1 Gm/L of water
- T3 Trizophos 40% SL @ 2 MI/L of water
- T4 Chlorpyrifos 20 % EC @ 2 MI/L of water
- T5 Control (Untreated)

All the above treatments were sprayed in individual mango trees 5 times at 15 days interval from egg laying time of pest (July-August). The spray included leaves, stems as well as main trunk of the tree properly. the dried branches and twigs after boring by the insect was counted. The recorded data was transformed by square root transformation and analyze.

Result and Discussion

Mango Insect pest Survey

Mango stem borer was found as a major insect pest of mango in Saptari district. Almost all mango orchards were affected with this pest. On an average 30 % damage was recorded, in severe case about 60 % dry shoot was observed in Rupnagar orchard (Servey report RARS, Tarahara 2067-68). Mango stem borer is emerging as a major pest in Udaipur where 20 % damage was recorded from different orchards. In Udaipur, damage of fruit fly (*Dacus dorsalis*) was severe (>50 %). Almost all fruits were infested with fruit fly. In Siraha, incidence of mango stem borer was less. Almost farmers of these districts were unaware of the causes and their management. Mango growers were unknown regarding orchard sanitation, fertilization as well as time and dose of pesticide application to manage the damage.

Life cycle study of mango stem borer

Mango stem borer damages the young shoots of mango turning dry and no flowering and fruiting. This is very important to know the actual stage of insect that creates such type of damage. For this purpose, study of life cycle of insect plays a very important role to manage it, because once larvae enter inside the shoots, it is very difficult to control. It is also because that dry shoot does not carry any type of pesticides towards the dry shoot where larva remains. If we can know the actual egg laying time of the pest that will help kill them. The study revealed that emergence of adult takes place from May-June (Jestha) and it starts laying eggs upon dry shoots and dead barks from June-July (Asadh).

Management of mango stem borer at RARS, Tarahara

Management of mango stem borer was started at RARS, Tarahara during 2011-12(2068-69) in Amrapali block of Horticulture research unit where borer infestation was severe. Application of 8 different treatments including control (untreated)

The application of pesticides varied significantly for managing borer damage by reducing dry shoot in mango (Table 1). All the pesticides were superior to control in reducing the damage of borer. Imidacloprid 17.8 SL was the most effective in minimizing the borer damage followed by Thiomethoxame 25% WG and Trizophos 40% EC.

Table 1. Efficacy of different pesticides on reducing borer damage in mango at RARS Tarahara during 2011-12

SN	Treatment	Mean Dry Shoot Reduction over Control	Rank
1	Nimex	119.00	BC
2	Sweet flag stolen extract	135.50	B
3	Lantana camera	144.75	B
4	Bordo mixture	147.50	B
5	Thiamethoxame 25% WG	199.50	A
6	Imidacloprid 17.8 SL	199.50	A
7	Trizophos 40% EC	201.75	A
8	Control	0.00	
	F Test	**	
	LSD Value (alpha=0.05)	27.07	
	CV %	12.93	

Management of mango stem borer at Saptari**Table 2. Verification of pesticide for controlling mango stem borer at Rupnagar, Saptari during 2011-12**

The use of pesticides differed significantly in controlling the mango stem borer as measured by reduction in dry shoot in the farmer's field in Saptari (Table 2). Application of Imidacloprid 17.8% SL @ 1.0ml/L of water was the most effective in reducing the borer damage followed by Thiomethoxame 25% WG @ 1.0g/L of water.

SN	Treatment	Mean Dry Shoot Reduction over Control	Rank
1	Imidacloprid 17.8% SL @ 1 ml/ L of water	768.75	A
2	Thiomethoxame 25% WG @ 1 g/ L Of water	803.75	A
3	Trizophos 40% SL @ 2 ml/L Of water	724.50	AB
4	Chloropyriphos 2o% EC @ 2 ml/L Of water	694.50	BC
5	Control	0.00	
	F Test	**	
	LSD Value (alpha=0.05)	71.37	
	CV %	7.92	

Conclusion

Based on result we can conclude that mango stem borer, a major pest of mango in ETR could be managed by orchard sanitation and destruction of dry shoots from the tree followed by application of Imidacloprid 17.8% SL @ 1.0ml/L of water or Thiomethoxame 25% WG @ 1.0g/L of water for 5 times starting from 2nd week of Asadh (July) at 15 days interval.

Recommendation

Mango is a major commodity of ETR, but the mango orchard is being encountered by several harmful insect pest especially mango stem borer. Orchard sanitation followed by pruning of dry shoots and unwanted branches is key means for management of mango stem borer. Training on mango stem borer management to mango growers and concerned stakeholders is required.

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Annexure

