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PREVALENCE AND INTENSITY OF INSECT PESTS AND ITS SEASONAL FLUCTUATION ON SOME VEGETABLES

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ABSTRACT

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This study was carried out at Regional Agricultural Research Station, Bangladesh Agricultural Research Institute (BARI), Rangpur and at farmers' field surroundings five km from the RARS station in the Rabi season of 2016-17. Continuous monitoring of insect pests is essentially important to know its status on different crops (*viz*. vegetables, fruits, cereals etc.) subject to forecast their control measure. In this present study, in situ observation was made on some vegetables *viz*. eggplant, *Solanum melongena* L. (Solanaceae) countrybean *Phaseolus vulgaris* (Fabaceae), tomato *Solanum lycopersicum* L. (Solanaceae), field pumpkin *Cucurbita pepo* (Cucurbitaceae), cauliflower, *Brassica oleracea* (Cruciferae) and okra *Abelmoschus esculentus* (Malvaceae). Results revealed that all most all crops were attacked by aphid, *Aphis gossypii* Glover, whitefly, *Bemisia tabaci*, jassid, *Amrasca devastans* (Dist.), thrips, *Thrips palmi* Karny and red mite, *Tetranychus urticae* Koch. The highest number of aphid population was observed among the sucking insects during December-January (vegetative stage) on cauliflower (9.8 ± 0.9) and eggplant (8.2 ± 0.9). During February-March (flowering/fruiting stage), higher number of thrips and aphids were found all of the crops. At the month of April-May (maturing stage), higher number of thrips (from 2.9±0.3 to 9.5±0.8) was found all of the crops and higher number of jassid population (7.5 ± 0.5, and 5.1 ± 0.5) was found on eggplant and okra, respectively. A new insect *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) was found in tomato field and it is high intensity was observed in the month of March and April. These results provided important information about insect population dynamics with seasonal fluctuation on vegetables.

Key words: *sucking insects, Tuta absoluta, seasonal fluctuation, vegetables*

INTRODUCTION

Insect pest is one of the major constrain after establishment of crop getting optimum yield. Intensity of some insect pests increasing due to agricultural revolution in Bangladesh in recent years where some minor insect pests becoming major pests and also some new insect pests have been documented in some crops. The result of green revolution technology in agriculture is creating changing scenario of insects problems worldwide (Sharma *et al*. 2017; Dhaliwal *et al.* 2015; Dhaliwal and Koul, 2010; Kumar 2005; Puri and Mote, 2003; Singh *et al.* 2002). Furthermore, inappropriate use of pesticides has subjected to problems of pest resurgence and resistance as well as pesticide pollution of different components in the environment (Puri and Ramamurthy, 2009). Continuous trend of crop losses has been observed even with the application of diversified control measures against insect pests (Dhaliwal and Koul, 2010). The pest status has been further altering after the inauguration of GMO crops and the present situation of changing climate. Climate change shows a tremendous effect on the privilege of pest problems (Puri and Ramamurthy, 2009; Ramamurthy *et al*. 2009). Sucking insect pests like aphids, whiteflies, jassids, thrips and mites are economically important and major pests of vegetable crops in Bangladesh. It is also claim that the infestation of sap sucking insects in eggplant has increased in recent past few years due to adoption of *Bt* eggplant (Shelton *et al*. 2018). The scenario of present observation is showing that some of minor pests are becoming major. Tomato leaf miner, *T. absoluta* a devastating South American insect pest, is now in Bangladesh. In Bangladesh, it was first reported in 2016 from RARS, Burirhat, Rangpur (Shah *et al*. 2017). Recently it considered being a serious threat for tomato production in Bangladesh. It can breed up to 10-12 generations in a year. Each female can lay 250-300 eggs in her lifetime. This pest is crossing boarders and destructing tomato production in both protected and open fields. The infestation of *T. absoluta* also reported on potato, eggplants, sweet peppers, common beans and other cultivated plants. Since the first detection in Spain in 2006, this pest is spreading rapidly across Southern Europe and North Africa to engulf the whole of the Mediterranean countries (Souza *et al*. 1983, Larraín 1986; IAN 1994). At the end of 2008, the presence of *T. absoluta* has been reported in Italy, France, Malta, United Kingdom, Greece, Switzerland, Portugal, Morocco, Algeria, Tunisia, Libya and Albania (Arnó *et al*. 2009; Bech 2009). Just few years back, it was detected in India and Afghanistan. Therefore, it is assuming that this quarantine insect has introduced from India as the growers in the Northern part of Bangladesh cultivating some Indian hybrid tomato varieties.

To minimize the yield losses, insect management is essentially important for all of the crops. Bangladesh is situated on subtropical longitude where prevailing high temperature and high humidity which are favorable for most of the insect pest abundance. Status and population dynamic of insect pest is important to organize management approach. Continuous monitoring is a key tool for assessing the pest status and population dynamic. Thus, the present study has been undertaken to assess the insect pests' status and seasonal fluctuation of some insect pests on different vegetable crops.

MATERIALS AND METHODS

The present study was conducted at Regional Agricultural Research Station (RARS), Bangladesh Agricultural Research Institute (BARI), Burirhat, Rangpur and at farmers' field surrounding the RARS station during Rabi season of 2016-17. For sucking insects, eggplant *Solanum melongena* L. (Solanaceae), country bean *Phaseolus vulgaris* (Fabaceae), tomato *Solanum lycopersicum* L. (Solanaceae) field pumpkin *Cucurbita pepo* (Cucurbitaceae), cauliflower, *Brassica oleracea* (Cruciferae) and okra *Abelmoschus esculentus* (Malvaceae) were considered in this study. In situ data collection was carried out through randomly selected 40 plants of each plant species in a field. One leaf was considered from each of individual plant for data collection. Adult of each insect species was counted through eye observation and hand lens was used as when necessary. Data were collected at three growth stages of vegetable crop likely vegetative, flowering/ fruiting and maturing stage during December/ 2016-January/ 2017, February-March/ 2017 and April-May/ 2017, respectively. Tomato leaf miner *Tuta absoluta* a new insect pest of tomato also monitored using pheromone trap in this study. *T. absoluta* pheromone traps were installed in 15 December 2016 at different experimental tomato fields of Regional Agricultural Research Station (RARS), Burirhat, Rangpur. Two different kinds of lure viz. UK made pheromone lure (Russell IPM lure) and India made pheromone lure (TLM lure) were set in the trap, plastic made jar having triangular shaped opening on both sides. Traps were placed 40 meter far from one to another where maintaining trap height at tomato plants canopy level. Every seven days interval traps were observed and counted the number of *T. absoluta* adult in each trap.

Data analysis

For sucking insects, the data of insect number were calculated and subjected to one way ANOVA through IBM SPSS software version 19. For *T. absoluta*, data were calculated into mean value for all UK made pheromone lure and India made pheromone lure separately. Means were separated through the least significant difference (LSD) test at $P \leq 0.05$ when treatment effects differed significantly.

RESULTS AND DISCUSSION

In this study the sucking insects, aphid *Aphis gossypii* Glover, whitefly *Bemisia tabaci* Gennadius, jassid, *Amrasca devastans* (Dist.), thrips *Thrips palmi* Karny and red mite *Tetrany chusurticae* Koch were observed during experimental period.

In the month of December-2016 and January-2017: Result of the Insect pest infestation during December-January has shown in Table 1. The number of aphid populations varied among the vegetable crops. The highest number of aphid was found on cauliflower (9.8 ± 0.9) and eggplant (8.2 ± 0.9) than that of other vegetables crops. The number of adult whitefly varied among the crops. The highest number of individual was found on field pumpkin (3.4 ± 0.3) and cauliflower (3.3 ± 0.3) and the lowest of that was found on country bean (0.7 ± 0.2). The jassid population infestation at vegetative stage was negligible. On the other hand, the considerable number of thrips was observed on different vegetables. The highest number of thrips was observed on field pumpkin (6.0 ± 0.4), moderately on eggplant (4.3 ± 0.2), country bean (4.2 ± 0.4) and cauliflower (4.9 ± 0.3) where lowest was on tomato (0.7 ± 0.1). The largest number of mite was found on cauliflower (2.3 ± 0.3) and field pumpkin (1.9 ± 0.3) followed by eggplant and tomato but no mite infestation was observed on country bean.

Table 1. Incidence of insect pests of some selected vegetables at vegetative stage during December- 2016 to January- 2017

Crops	Mean number (± SE) of insects, mite- per leaf				
	Aphid	Whitefly	Jassid	Thrips	Mite
Eggplant	8.2 ± 0.9 a	2.1 ± 0.3 b	0.5 ± 0.2 a	4.3 ± 0.2 b	0.9 ± 0.2 b
Country bean	2.5 ± 0.5 b	0.7 ± 0.2 c	0.0 ± 0.0 c	4.2 ± 0.4 b	0.0 ± 0.0 c
Tomato	1.5 ± 0.6 b	0.9 ± 0.2 c	0.4 ± 0.1 b	0.7 ± 0.1 c	0.6 ± 0.1 b
Field pumpkin	2.5 ± 0.4 b	3.4 ± 0.3 a	0.0 ± 0.0 c	6.0 ± 0.4 a	1.9 ± 0.3 a
Cauliflower	9.8 ± 0.9 a	3.3 ± 0.3 a	0.0 ± 0.0 c	4.9 ± 0.3 b	2.3 ± 0.3 a
$F_{4,195}$	30.85	28.27	11.84	38.26	17.05
P	<0.001	<0.001	<0.001	<0.001	<0.001

Means having the different letter in the same column differed significantly among the treatments at $P \leq 0.05$, LSD

In the month of February and March-2017: The result of sucking insects, mite pests' incidence during February-March has shown in Table 2. The number of aphid was varied among the crops where the highest number aphids were found on cauliflower (10.2 ± 1.0) followed by eggplant (7.7 ± 1.0), country bean (3.8 ± 0.7), field pumpkin (2.6 ± 0.4) and tomato (1.9 ±0.7). The highest number of whitefly was observed on cauliflower (3.4 ± 0.3) and field pumpkin (3.4 ± 0.3) followed by eggplant (2.0 ± 0.3), tomato (1.0 ± 0.2) and country bean (0.7 ± 0.2). The largest number of jassid was observed on eggplant (4.5 ± 0.3) and the lowest was of that on tomato (0.4 ± 0.1) and country bean (0.2 ± 0.1) while field pumpkin and cauliflower showed mediocre

infestation. In the case of thrips populations, the highest number was observed on field pumpkin (8.7 ± 0.3) followed by eggplant (7.2 ± 0.7), country bean (5.1 ± 0.4), cauliflower (4.4 ± 0.5) and tomato (2.5 ± 0.3). In the case of mite, the highest number was observed on field pumpkin (2.1 ± 0.3) and the lowest was on tomato (0.4 ± 0.1) where no infestation was observed on cauliflower (Table 2).

Table 2. Incidence of insect pests of some selected vegetables at flowering/fruiting stage during February-March, 2017

Crops	Mean number (± SE) of insects, mite- per leaf				
	Aphid	Whitefly	Jassid	Thrips	Mite
Eggplant	7.7 ± 1.0 b	2.0 ± 0.3 b	4.5 ± 0.3 a	7.2 ± 0.7 b	0.7 ± 0.1 b
Country bean	3.8 ± 0.7 c	0.7 ± 0.2 c	0.2 ± 0.1 c	5.1 ± 0.4 c	0.5 ± 0.1 b
Tomato	1.9 ± 0.7 c	1.0 ± 0.2 c	0.4 ± 0.1 c	2.5 ± 0.3 d	0.4 ± 0.1 bc
Field pumpkin	2.6 ± 0.4 c	3.4 ± 0.3 a	2.3 ± 0.3 b	8.7 ± 0.3 a	2.1 ± 0.3 a
Cauliflower	10.2 ± 1.0 a	3.4 ± 0.3 a	2.0 ± 0.3 b	4.4 ± 0.5 c	0.0 ± 0.0 c
$F_{4,195}$	19.35	24.29	53.82	27.42	22.67
P	<0.001	<0.001	<0.001	<0.001	<0.001

Means having the different letter in the same column differed significantly among the treatments at $P \leq 0.05$, LSD

In the month of April and May-2017: Results of insect pests' infestation during April-May has given in Table 3. The highest number of aphid was observed on country bean (6.9 ± 0.8) followed by eggplant (3.8 ± 0.8), okra (1.8 ± 0.5), and tomato (0.7 ± 0.2) where no infestation was of that on field pumpkin. The highest number of whitefly was observed on eggplant (3.3 ±0.3) which was statistically similar with that of field pumpkin (3.2 ± 0.3) and moderate number was observed on okra and tomato while the lowest number was on country bean (0.6 ± 0.1). The highest number of jassid was found on eggplant (7.5 ± 0.5) followed by okra (5.1 ± 0.5), field pumpkin (2.5 ± 0.3), country bean (0.6 ± 0.2) and tomato (0.4 ± 0.1). In case of thrips, the highest number was observed on eggplant (9.5 ± 0.8) which was statistically similar with that of field pumpkin (8.9 ± 0.3) and the lowest was on okra (2.9 ± 0.3) which was statistically similar with country bean and tomato (Table 3).

Table 3. Incidence of insect pests of some selected vegetables at maturing stage during April-May, 2017

Crops	Mean number (± SE) of insects, mite- per leaf					
	Aphid	Whitefly	Jassid	Thrips	Mite	Pod Borer
Eggplant	3.8 ± 0.8 b	3.3 ± 0.3 a	7.5 ± 0.5 a	9.5 ± 0.8 a	0.0 ± 0.0	-
Country bean	6.9 ± 0.9 a	0.6 ± 0.1 c	0.6 ± 0.2 d	4.1 ± 0.3 b	0.0 ± 0.0	1.2 ± 0.2
Tomato	0.7 ± 0.2 cd	1.5 ± 0.2 b	0.4 ± 0.1 d	3.8 ± 0.4 b	0.0 ± 0.0	-
Field pumpkin	0.0 ± 0.0 d	3.2 ± 0.3 a	2.5 ± 0.3 c	8.9 ± 0.3 a	0.0 ± 0.0	-
Okra	1.8 ± 0.5 c	2.0 ± 0.3 b	5.1 ± 0.5 b	2.9 ± 0.3 b	0.0 ± 0.0	-
$F_{4,195}$	21.35	19.17	74.89	46.81		
P	<0.001	<0.001	<0.001	<0.001		

Means having the different letter in the same column differed significantly among the treatments at $P \leq 0.05$, LSD

Leaf miner in tomato:

In the year 2017, tomato leaf miner *T.absoluta* adult was first captured in 24 January at RARS, Burirhat, Rangpur. On an average, three to five numbers of adults were captured from January to February but in March the number of captured *T. absoluta* adult was increased rapidly. It was observed that UK made pheromone lure (Russell IPM) attracted *T. absoluta* effectively where no or few *T. absoluta* moth attracted by India made pheromone lure (TLM pheromone lure) (Figure 2). The highest number of *T. absoluta* adult was captured at first week of April 2017 in the trap of UK made pheromone lure (Figure 2). In this period temperature was 24-28°C and average rainfall was 50-60 mm (Figure 3). The number of adults reduced drastically when temperature rises near to 30°C and rainfall showered more than 100mm.

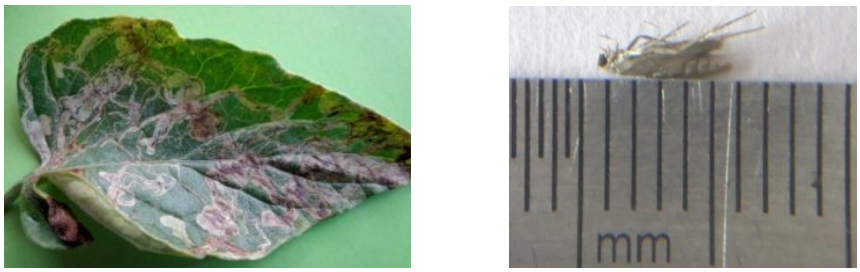

Fig. 1. Tomato leaf miner *T. absoluta* infestation in tomato leaf and its adult

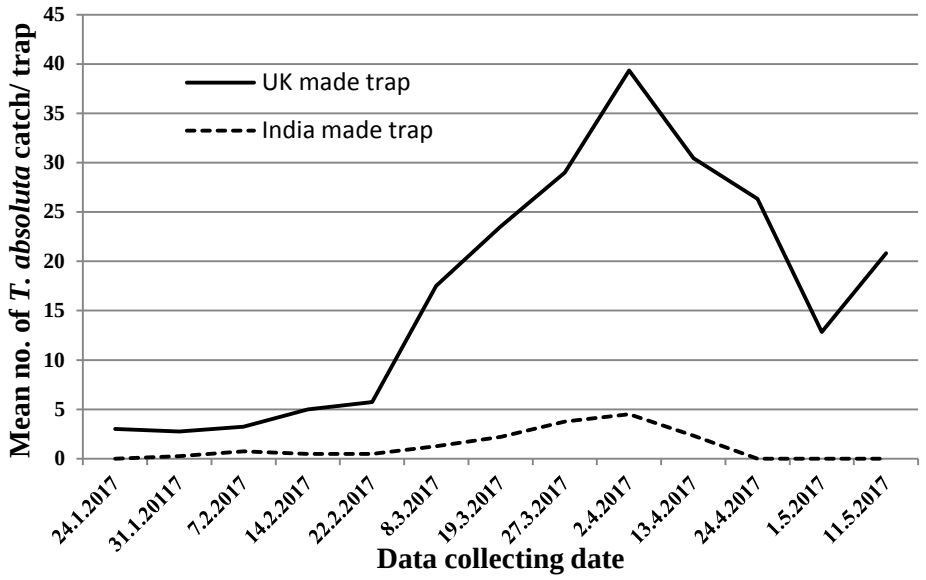

Fig. 2. Mean number of *T. absoluta* moths captured per trap from tomato field in 2017

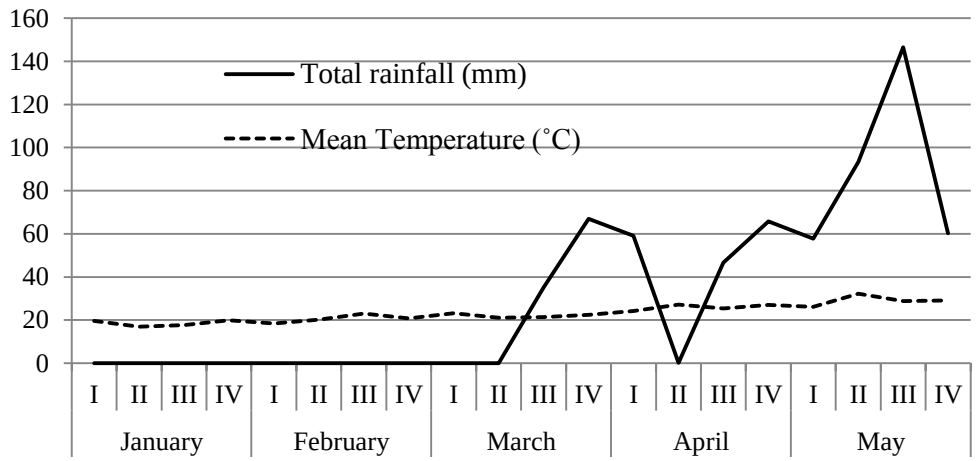

Fig. 3. Weekly mean temperature and total rainfall from January to May, 2017

CONCLUSION

In the month of December and January, aphid was the dominant insect which was found more number on cauliflower and eggplant. In February and March, thrips as well as aphid were dominant pests and jassid was promising one where in April and May, thrips and jassid were the leading insect pests on almost all of the crops. Tomato leaf miner, *T. absoluta* a new pest invasion occurred in Bangladesh. Its high intensity was prevailed in the month of March and April. Now days, this insect is spreading throughout the country.

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