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Extent of Leaf Damage in Guava Twigs of Different Strata and Different Leaf Position of Twig by Spiraling Whitefly, *Aleurodicus dispersus*

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Abstract: The present study was carried out to investigate indirect damage of guava leaf in the form of wax and honeydew covering by the spiraling whitefly (*Aleurodicus dispersus)* was investigated in a guava orchard, Mymensingh, Bangladesh. Extent of leaf damage in twigs of different strata indicated that the upper most twigs had minimum wax and honeydew-covered leaves than the other twigs of guava plants. The results of the study on variation of leaf damage in different leaf position of twig showed that at early attacking stage the mean percentage of wax and honeydew covered leaves, was significantly higher in upper leaf position than in the middle and the lower leaf position and had the lowest level of whitefly infestation in the lower leaf position of the guava twigs. Results showed that with the build up of population in the month of December and January, wax and honeydew covered leaves were more in middle leaf position. The lower wax and honeydew covering in upper position were recorded in the later months due to rain and rapid growth of new flush, which remained non-infested.

Key words: Spiraling whitefly, *Aleurodicus dispersus*, wax, honeydew covering

Introduction

Guava (*Psidium guajava*: Myrtaceae) is one of the most popular fruit, which is successfully grown in almost all the districts of Bangladesh. With the release of Kazipiara a surprising increase in the guava production has occurred in Bangladesh (Rashid *et al.,* 1987). Recently the spiraling whitefly, *Aleurodicus dispersus* Russel has become the most serious pest of guava in Bangladesh, causing enormous damage to the plants and fruits (Alam *et al.,* 1997). Severe infestation by this pest has been a great threat for guava cultivation. It is also one of the most economically pest to other agricultural and horticultural crops (Lauofo and Iwamoto, 1982; Kajita *et al.,* 1991). Mani and Krishnamoorthy (1996) reported severe infestation of guava by *A. dispersus* around Bangalore, Karnatake, India that is the first record of the pest on that region. It is suspected that this pest species has been introduced in Bangladesh through immigration and unchecked plant materials from other countries (Scanlan, 1995). The whitefly nymphs and adults cause severe damage directly by sucking sap from the leaves and indirectly by developing fungal mould on honeydew excreted by the insects on the upper side of the leaves which reduce the photosynthetic area of the leaf. Long delicate filamentous wax covering the upper side of leaves also reduces the photosynthetic area results in yield loss (Byrnee *et al.,* 1990; Kajita and Alam, 1996). Detailed information of *A. dispersus*, its distribution in the guava plants is scanty in Bangladesh. The present research work has been aimed at investigating the distribution pattern of whitefly secreted wax covered and honey dew covered leaf in the different strata of guava trees.

Materials and Methods

The research work on the extent of leaf damage by the spiraling whitefly on guava plant was conducted in some guava orchard at Mymensingh district. The experimental area was characterized by tropical rainfall during the month of June to August and scattered rainfall during the rest of the year. Monthly minimum and maximum temperature, relative humidity and total rainfall recorded during the period of the study. Average age of the plants was five years. Plants were not sprayed with insecticides during the study.

Extent of leaf damage in twigs of different strata: Five guava plants were selected to study the variation of leaf damage among twigs of different direction in guava plants caused by the spiraling whitefly. Five twigs from five different sides (East, West, North, South, and upper most) were selected from each guava plant and indicated as east twig, west twig, north twig, south twig and upper twig. For recording the data, 15 leaves from the top of the twig were observed monthly from January to March 1999. The percent white waxy covered area and black sooty mould covered area was recorded as the damaged area. Mean damage per leaf was calculated for all the twigs.

Extent of leaf damage in different leaf position of twig: Twenty-five twigs were selected randomly from five different guava plants. There was three leaf positions namely upper, middle and lower leaf position. Each leaf position of a twig had 6 leaves. Data were recorded monthly from 50 randomly selected leaves for each leaf position during Oct. 1998 to Feb. 1999. Mean percentage of damage per leaf was calculated for all the leaf positions. Both the experiments were designed in randomized complete block design (RCBD) in the standing guava orchard and replicated for 5 times. The data were analysed using analysis of variance in MINITAB. All percentage data were transformed to arc sine values before statistical analysis. The statistical significance of differences between pairs of treatments was determined by DMRT.

Results and Discussion

Extent of wax covered leaves in twigs of different strata: The results of the experiment on whitefly secreted wax covered leaves in different strata are presented in Table 1. The mean percentage of wax-covered leaves was significantly different ($P<0.05$) in twigs of different strata. The upper most twigs had significantly the lowest percentage of wax-covered leaves. This was probably due to that the upper twig faced more sunshine, wind and precipitation than other twigs. Gerling *et al.* (1986) showed that the extreme relative humidity, both high and low were unfavorable for the survival of immature stages of *Bemisia tabaci*. Horowitz (1986) reported that significant drop of whitefly population levels at heavy rainy condition. Salinas and Sumalde (1994) reported that the high temperature and rainfall appeared to have a descriptive effect on the population of whitefly.

Extent of honeydew covered leaves in twigs of different strata: The mean percentage of honeydew covered leaves significantly varied in different strata ($P<0.05$). Table 2 showed that a significantly lowest percentage of honeydew-covered leaves were obtained in the upper most twigs. The distribution of honeydew-covered leaf in different twigs followed the similar pattern in different months. The lowest percentage of honeydew-covered leaves in upper twigs might be due to the difference in microclimate as the upper twigs faced more sunshine, wind and precipitation than other twigs.

Variation of wax covering in different leaf positions of twig: Distribution of wax covering significantly varied ($P<0.05$) in leaves of different positions of a twig in all the occasions (Table 3). In the month of Oct. 98 the mean percentage of wax covered leaves (4.5 ± 1.2) was

Table 1: Percentage of wax covered leaves in twigs of different strata

Twig position	Mean±SE of wax covered leaves in different months		
	Jan. 98	Feb. 98	Mar. 98
West	20.73±1.2ab	11.56±0.9a	5.17±0.8a
East	22.89±2.3a	12.26±1.6a	4.24±0.8ab
North	20.14±1.0ab	13.02±0.6a	5.11±0.16a
South	21.58±0.8a	10.17±0.7a	4.59±0.14a
Upper	12.70±1.5b	6.22±0.8b	1.65±0.19b

Table 2: Extent of white fly secreted honeydew covered leaves in twigs of different strata.

Twing position	Mean±SE of honeydew covered leaves in different months		
	Jan. 98	Feb. 98	Mar. 98
West	30.52±2.6a	14.08±0.88a	7.02±0.6a
East	31.80±1.8a	16.08±0.15a	6.60±0.56ab
North	26.10±1.2a	16.74±0.8a	6.00±0.65ab
South	25.44±2.6a	13.13±0.84ab	5.73±0.04ab
Upper	15.01±1.5b	7.44±0.95b	2.10±0.05b

and lower leaf position had similar level of whitefly secreted wax covered leaves (1.0±0.4 and 0.75±0.32, respectively). Similar trend was found in the month of Nov. 98.

The mean percentage of wax covered leaves (25.44±4.41) was significantly higher in middle leaf position in the month of Dec. 98. Whereas upper leaf position had significantly intermediate level of whitefly secreted wax-covered leaves (11.80±1.68). The lower leaf position had the significantly lowest level of whitefly secreted wax-covered leaf (7.16±1.33).

In Jan. 99 the mean percentage of (24.84±4.57) wax covered leaves was also significantly higher in middle leaf position, but both lower and upper leaf position had similar level of whitefly secreted wax covered leaf (14.76±2.09 and 13.88±3.55, respectively). In Feb. 99 the mean percentage of wax covered leaves (18.20±0.23) was significantly higher in lower leaf position than middle and upper ones.

Variation of honeydew covering in different leaf position of twig: Whitefly secreted honeydew covering was significantly different ($P<0.05$) in different position of guava twig. The distribution varied from month to month (Table 4). In Oct. 98 the mean percentage of honeydew covered leaves (3.24±0.98) was significantly higher in upper leaf position, while both middle and lower leaf positions had significantly lower level of whitefly secreted honeydew covered leaves (0.96±0.25 and 0.45±0.13, respectively).

The mean percentage of honeydew covered leaves (7.3±2.25) was significantly higher in middle leaf position in the month of Nov. 98. Where as upper leaf position had significantly higher in upper leaf position, but both middle

Table 3: Percentage of wax covering in different leaf position of twig

Leaf position	Mean percentage ± SE of wax covered leaves in different months				
	Oct. 98	Nov. 98	Dec. 98	Jan. 99	Feb. 99
Upper	4.5±1.2a	8.6±2.91a	11.80±1.68b	13.88±3.55b	0.78±0.25c
Middle	1.0±0.4b	2.5±0.98b	25.44±4.41a	24.84±4.57a	14.40±0.21b
Lower	0.75±0.32b	2.16±0.46b	7.16±1.33c	14.76±2.09b	18.20±0.23a

Table 4: Percentage of honeydew covering in different leaf position of twig

Leaf position	Mean percentage ±SE of honey dew covered leaves in different months				
	Oct. 98	Nov. 98	Dec. 98	Jan. 99	Feb. 99
Upper	3.24±0.98a	2.4±0.79b	9.44±1.64b	13.60±2.90b	0.48±0.06b
Middle	0.96±0.25b	7.3±2.25a	25.00±3.3a	25.00±3.67a	15.80±3.56a
Lower	0.45±0.13b	0.95±0.33c	3.60±0.44c	8.50±2.97c	14.00±3.28a

Means in a column followed by same letter do not differ significantly (P<0.05) DMRT.

significantly intermediate level of whitefly secreted honeydew covered leaves (2.4±0.79) and lower leaf position had a minimum level of whitefly secreted honeydew-covered leaves (0.95±0.33). Similar trend of distribution of honeydew-covered leaves were observed in Dec. 98 and Jan. 99. The trend of honeydew covering was in the middle leaf > upper leaf > lower leaf position. Because, adult whiteflies laid eggs mainly on under side of the younger leaves and after hatching, adult whitefly and nymph sucking on leaves of lower side and secreted honeydew through their cornicles, which deposited on upper side of the lower leaves. So, upper leaves got less honeydew secretion.

In the month of Feb. 99 the mean percentage of honeydew covered leaves were significantly higher both in lower leaf and middle leaf positions (14.00±3.28 and 15.80±3.56, respectively) than upper leaf position (0.48±0.06). Lower level of honeydew covering in the upper position in Feb. was probably because of less infestation in the new flush of the twig. Krishna and Lingappa (1992) observed that oviposition of white fly was restricted mainly on the leaves of the youngest branches. They also found that nymph and pupa population was more on the middle leaves than on extreme leaves. Lynch and Simmons (1993) showed that the whitefly was most abundant on leaves 3, 4 and 5 and then numbers declined with an increase in leaf age of peanut. Alam *et al.* (1997) reported that the nymphs and adults of spiraling whitefly were significantly higher in the upper canopy than in the middle and the lower canopy.

The results thus concluded that wax and honeydew covered leaves were less in upper most twigs than other twigs of guava plants. Whitefly infestation of guava started from Sep./Oct. and the adult whiteflies laid eggs under side of the younger leaves. At that time wax and honeydew covered leaves were more in upper leaf position than middle and lower. In the later cold and dry months, the whitefly population build up and wax/honeydew covered leaves were more in middle leaf position. The least wax and honeydew covered leaves were observed in upper leaf position in the month of Feb.

References

Alam, S., M. N. Islam, M.Z. Alam and M.S. Islam, 1997. Identification of the whitefly in guava its spatial distribution and host susceptibility. Bangladesh J. Entomol.., 7: 67-73.

Byrnee, D.A., T.S. Bellows and M.P. Parrella, 1990. Whiteflies*:* their bionomics, pest status and management. Intercept Ltd., Andover, UK., pp: 348.

Gerling, D., A.R. Horowitz and J. Baumgartner, 1986. Autecology of *Bemisia tabaci.* Agric. Ecosys. Environ., 17: 5-19.

Horowitz, A.R., 1986. Population dynamics of *Bemisia tabaci* (Gennadius) with special emphasis on cotton field. Agric. Ecosys. Environ., 17: 37-47.

Kajita, H. and M.Z. Alam, 1996. Whiteflies on guava and vegetables in Bangladesh and their Aphelinid parasitoids. Appl. Entomol. Zool., 31: 159-162.

Kajita, H., I. M. Samudra and A. Naito, 1991. Discovery of the spiraling whitefly *Aleurodicus dispersus* Russel(Homoptera: Aleyrodidae)From Indonesia, with notes on its host plants and natural enemies. Appl. Entomol. Zool., 26: 397-400.

Krishna, N. I. and S. Lingappa, 1992. Distribution pattern of *Bemisia tabaci* (Gennadius) in cotton plant. Insect science and it's application (ICIPE), 13: 377-379.

Lauofo, T.P. and R. Iwamoto, 1982. American Soma and Guam-spiraling whitefly. Quarterly Newsletter, FAO Plant Protection Committee for the South East Asia and Pacific Region, 25: 8.

Lynch, R.E. and A.M. Simmons, 1993. Distribution of immature and monitoring of adult sweet potato whitefly, *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae), In: Peanut, *Arachis hypogaea*. Environ. Entomol., 22: 375-380.

Mani, M. and A. Krishnamoorthy, 1996. Spiraling whitefly and its natural enemies on guava in Karnataka. Insect Environ., 2: 12-13.

Rashid, M.M., M.A. Quadir and M.M. Hossain, 1987. Bangladesher Phal (Fruit). Rashid Publishing House, Bangladesh Agricultural Research Institute Campus, Joydebpur, Gazipur, Bangladesh, pp: 119-124.

Salinas, M.D. and A.C. Sumalde, 1994. Life history, seasonal abundance and host range of the wooly whitefly, *Aleurocanthus floccossus* (Maskell) (Homoptera: Aleyrodidae). Pest management council of the Phillippines, Inc., College, Laguna (Philippines). Integrated pest management: Learning from experience, College, Laguna (Philippines). PMCP, pp: 29.

Scanlan, F.M, 1995. Fruit Production Manual. Development Of Agricultural Extension, Bangladesh Agricultural Development Corporation, Dhaka, pp: 116-117.