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EFFICACY OF IMIDACLOPRID AND THIAMETHOXAM FOR THE MANAGEMENT OF YELLOW MOSAIC DISEASE OF OKRA

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ABSTRACT

Muqit A, Khalequzzaman KM, Muzahid-E-Rahman M (2016) Efficacy of imidacloprid and thiamethoxam for the management of yellow mosaic disease of okra. *Int. J. Sustain. Crop Prod.* 11(1), 1-3.

An experiment was conducted to test the efficacy of two insecticides and number of sprays to manage yellow mosaic of okra caused by *Okra yellow vein mosaic virus* in the field through vector management. The experiment was carried out in the research field of Plant Pathology Division, BARI, Joydebpur, Gazipur during summer (April to July) 2010 and 2011. Two insecticides Imidacloprid (Admire) and Thiamethoxam (Aktara) were sprayed 2 to 6 times at 7 day interval to reduce the vector population. Significant reduction in disease incidence and increase in yield was achieved due to application of chemicals. Disease was found to be reduced by 5 to 50% depending on number of sprays. There was no significant difference between the performance of two insecticides in managing the disease. Four to five sprays were required to achieve a good control of the disease.

***Key words**: Okra, yellow mosaic, virus, disease, imidacloprid, thiamethoxam, vector*

INTRODUCTION

Okra (*Abelmoschus esculentus*) is one of the important summer vegetables in Bangladesh. Okra is grown in 26 thousand acres of land with an annual production of 43 thousand metric ton (BBS 2011). Yellow mosaic caused by *Okra yellow vein mosaic virus* is the major constraint for okra production. The disease is vectored by whitefly (*Bemisia tabaci*). It causes substantial quantitative and qualitative yield loss every year. It can cause 50 to 94% yield loss depending on the time of infection (Sastry and Singh, 1974). The earlier the crop gets infected the higher is the loss. Cultivation of resistant variety is the most effective way to manage the disease. Previously released resistant varieties like BARI Dherosh-1 and IPSA Okra-1 has become susceptible long before and at present no resistant variety is available. Few okra lines have been reported to be resistant under field condition (Rashid *et al*. 2002). Therefore alternative management options are necessary. Virus diseases are mostly managed through controlling the vectors. For this purpose insecticides are widely used. Insecticides are generally discouraged for environmental hazard. But judicious use of pesticides is not detrimental. In this regard appropriate pesticide and dose is important. Besides, it is needed for the management of resistant variety. Even it is a part of integrated management in many vector-borne virus disease management. Neonicotinoid insecticides have been found to be very effective against sucking pests like whitefly, aphid and leaf hopper; hence reducing the virus diseases vectored by these insects (Ali *et al*. 2005, 2012, Mason *et al*. 2000 and Strausbaugh *et al*. 2012). These insecticides (imidacloprid) were introduced in Bangladesh in the late 90s and the second generation neonicotinoid insecticides (thiamethoxam) were introduced in early 2000s. These are systemic insecticides. Its performance against whitefly to control virus disease of okra has not been investigated. Therefore, the present experiment was designed to evaluate the efficacy of two insecticides (imidacloprid and thiamethoxam) and number of sprays to manage yellow mosaic disease of okra in the field.

MATERIALS AND METHODS

The experiment was conducted in the research field of Plant Pathology Division, BARI, Gazipur during summer (April-July) 2010 and 2011. The variety of okra was BARI Dherosh-1. Two insecticides namely Imidacloprid (Admire) and Thiamethoxam (Aktara) @ 0.1% were sprayed 2 to 6 times at 7 day interval. Spray was started 3 weeks after germination. The unit plot size was 2.5 x 2 m^2. Disease severity was calculated on a 1-4 scale where 1 = symptom observed in upper few leaves, 2 = symptoms observed up to mid canopy without apparent stunting, 3 = symptoms observed up to $3/4^{th}$ canopy with moderate stunting and 4 = symptoms observed in whole plant with severe stunting. Following formula was used for estimating disease incidence and severity:

$$\text{Disease incidence} = \frac{\text{Number of plants infected}}{\text{Total number of plants observed}} \times 100$$

$$\text{Disease Severity} = \frac{\sum \text{All rating}}{\text{Number of plants infected}}$$

The experiment was laid out in a factorial design (two factors) with 4 replications. Factor 1 was insecticide and factor 2 was number of sprays. Data were analyzed with R software for proper interpretation of results.

RESULTS AND DISCUSSION

Disease incidence and severity

Significant reduction in yellow mosaic disease incidence and severity was observed due to application of two insecticides (Table 1 and Table 2). In 2010 comparatively higher disease was observed than 2011. In the first year there was no significant difference between the performance of two insecticides but in the second year Thiamethoxam showed significantly higher reduction in disease incidence than imidacloprid. In the first year (2010) 2 to 4 sprays were conducted. These resulted in only 4 to 13% disease reduction although disease severity was significantly lowered (Table 1). Two sprays did not reduce the disease incidence significantly. At least 3 sprays were required to reduce the disease incidence significantly. Yield improvement was significant only after 4 sprays. In the second year (2011) 4 to 6 sprays were conducted which resulted in 29 to 48% reduction in disease incidence. In this trial all the sprayings caused significant reduction of yellow mosaic disease. Disease severity was also significantly reduced due to treatments. Considerable yield increase was found with the application of insecticides. Four to six sprays were required to improve the yield significantly. Imidacloprid and thiamethoxam has been reported to reduce the incidence of several virus diseases (Ahmed *et al*. 2001; Ali *et al*. 2005; Ali *et al*. 2012; Rubinstein *et al*. 1999). Findings of the present experiment are in agreement with the reports of the previous authors. However, generally it is observed that if more than 3 sprays are required to manage a disease it is not economically viable. In the present trial it was found that at least four to five sprays are required to manage the disease appreciably. One of the reasons for greater number of sprays required might be due to high disease pressure in the field. Solankey *et al*. (2014) reported that incidence of okra yellow mosaic disease is much higher in the rainy season than summer season. This emphasizes the need for other measures like roguing, early planting, cultivation of tolerant varieties etc. to be taken along with the pesticide applications. Another reason might be due to application method. Imidacloprid has been reported to produce better results when applied as soil drenching or seed treatment than foliar applications (Chatzivassiliou 2008; Mason *et al*. 2000; Strausbaugh *et al*. 2012). In the present trial the insecticides were used as foliar spray. In future trials it can be investigated.

Disease progress

Progress of yellow mosaic disease is presented in Fig. 1 and 2. In control plots disease appeared in the 3rd week after emergence and reached the peak after 8 weeks. In the sprayed plots disease was initiated in the 5th week and reached the peak after 8 weeks. In both cases rate of disease progress was highest in 6th to 8th week after emergence. Dahal *et al*. (1992) reported that after 6 to 8 weeks disease progress in sprayed and non sprayed plants were similar. In the current experiment it was shown that pesticide application delayed the initiation of disease by 2 weeks. Delayed infection results in reduced yield loss from virus disease. Ahmed *et al*. (2001) reported that application of imidacloprid protected the tomato plants for 12 weeks after sowing against tomato leaf curl virus. They also reported that imidacloprid was better than cyperrmethrin for disease control. In another experiment Rubinstein *et al.* (1999) showed that tomato plants could be protected from TYLCV for 25 days through application of imidacloprid.

Table 1. Effect of insecticides and number of sprays on yellow mosaic disease and yield of okra during summer 2010

Treatments		Dis incidence (%)	Dis reduction (%)	Dis severity (1-4)	Yield (t/ha)
Insecticides	Imidacloprid	92.06 a	6.30	2.12 a	7.42 a
	Thiamethoxam	90.58 a	7.81	2.02 a	5.47 b
No. of spray	2 spray	94.62 a	3.70	2.27 b	6.24 ab
	3 spray	87.33 b	11.12	1.73 c	6.38 ab
	4 spray	85.06 b	13.43	1.52 d	6.94 a
	No spray	98.26 a		2.77 a	6.23 b

Means followed by the same letter in a column are not significantly different at 5% level by Lsd.

Table 2. Effect of insecticides and number of sprays on yellow mosaic disease and yield of okra during summer 2011

Treatments		Dis incidence (%)	Dis reduction (%)	Dis severity (1-4)	Yield (t/ha)
Insecticides	Imidacloprid	65.67 a	25.68	1.81 a	14.30 b
	Thiamethoxam	56.44 b	36.13	1.76 a	15.59 a
No. of spray	4 spray	62.06 b	29.77	1.70 b	15.56 a
	5 spray	48.41 c	45.21	1.54 b	15.93 a
	6 spray	45.38 c	48.64	1.52 b	16.27 a
	No spray	88.37 a		2.38 a	12.03 b

Means followed by the same letter in a column are not significantly different at 5% level by Lsd.

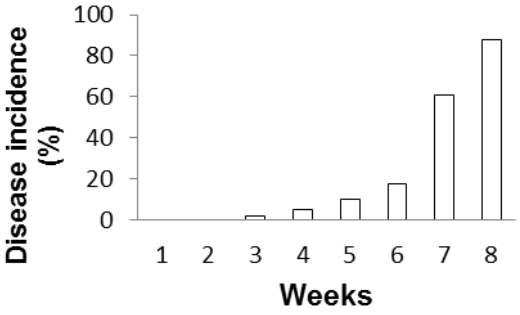

Fig. 1. Disease progress in control plot

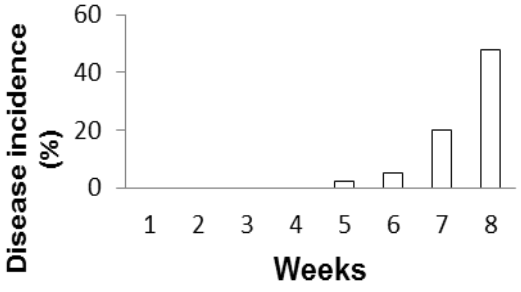

Fig. 2. Disease progress in sprayed plot

CONCLUSION

Results of the present investigation clearly demonstrated that neonicotinoid insecticides imidacloprid or thiamethoxam is effective for the management of yellow mosaic disease of okra in the field. For better performance at least 4 to 5 sprays are required.

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