

Original Research Article

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Effect of Border Crops and Insecticides on Management of Whitefly, *Bemisia tabaci* (Gennadius) Transmitted Yellow Mosaic Virus in Soybean

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ABSTRACT

Keywords

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The field experiments carried out to study the effect of border crops and insecticides against whitefly transmitted Yellow Mosaic Virus (YMV) in soybean during kharif 2015-16 and 2016-17. The treatment in combination of maize as border crop, seed treatment with thiamethoxam 30FS@5ml/kg seed, foliar application of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS and triazophos 40 EC @ 800 ml/ha at 45-50 DAS recorded lowest mean whitefly population (1.02 whiteflies/plant), which resulted in reduced YMV disease incidence (14.63%) and highest grain yield (19.42 q/ha) among treatments in soybean.

Introduction

Soybean [*Glycine max* (L.) Merrill] is recognized as an oil seed crop rather than a pulse because of its seed contains about 40 per cent protein and 20 per cent oil (Singh and Hymowitz, 1999). In India, it is cultivated in 11.07 m ha with total production and productivity are 8.64 m t and 781 kg/ha respectively (ICAR- IISR, 2016). India's average productivity (781 kg/ha) is low compared to the world's productivity (2.65 t/ha) due various biotic and abiotic constraints. Among biotic constraints, whitefly, *Bemisia tabaci* (Gennadius) besides causing direct damage as a sucking pest, it transmits a Gemini virus i.e. Yellow Mosaic Virus (YMV) in soybean. The YMV disease

causes 30-50% yield loss; however, in case of severe disease incidence yield loss may go up to 80% (Nene, 1972). The YMV disease is major threat to soybean cultivation in Northern India.

Among various strategies of Integrated Pest management (IPM), cultural practices and chemical control play an important role in management of whitefly population and consequent reduction in YMV disease incidence. Hence, the present investigations conducted to study the effect of combination of border crops and insecticides on management of whitefly transmitted YMV disease in soybean.

Materials and Methods

The field experiments conducted in randomised block design of eight treatments and three replications with plot size of 5m x 5m (25 sq. m) area at Norman E. Borlaug crop research centre, G. B. Pant University of Agriculture and Technology, Pantnagar during *kharif*, 2015-16 and 2016-17. The soybean variety JS 335 was sown after onset of monsoon and all standard agronomic practices were followed for maintenance of good crop stand. The treatments include combination of border crops like maize (BC1), sorghum (BC2) and pearl millet (BC3); insecticides like thiamethoxam 30 FS@5ml/kg (ST), imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS (SP1) and triazophos 40 EC @ 800 ml/ha at 45-50 DAS (SP2) and treatment details presented in table-1. The whitefly population recorded on three leaves *viz.*, top, middle and bottom of five randomly selected plants from each plot at weekly interval starting from 30 Days after Sowing

(DAS) to 103 DAS of crop. The per cent YMV incidence was recorded by counting the number of plants infected with YMV and the total number of plants in the plot and converted to per cent incidence. The soybean seed yield from each plot documented separately and converted to quintal per hectare (q/ha). Analysis of variance was done by using AGRISTAT statistical package.

Results and Discussion

The data pertaining to management of whitefly transmitted YMV in soybean presented in table-2. The pooled mean whitefly population of two seasons *i.e.* 2015-16 and 2016-17 ranged from 1.02 to 6.39 whiteflies per plant. The lowest mean population of 1.02 whiteflies/plant recorded in T4 (BC1+ST+SP1+SP2) followed by 1.14 whiteflies/plant in T5 (BC2+ST+SP1+SP2), 1.27 whiteflies/plant in T6 (BC3+ST+SP1+SP2) and T7 (ST+SP1+SP2) with 1.42 whiteflies/plant.

Table.1 Treatment details of whitefly *Bemisia tabaci* transmitted YMV disease in Soybean

Treatment	Description
T1: BC1+ST	Two rows of maize as border crop + Seed treatment with thiamethoxam 30% FS @ 10ml/kg
T2:BC2+ST	Two rows of sorghum as border crop + Seed treatment with thiamethoxam 30% FS @ 10ml/kg
T3:BC3+ST	Two rows of pearl millet as border crop + Seed treatment with thiamethoxam 30% FS @ 10ml/kg
T4: BC1+ST+SP1+SP2	Two rows of maize as border crop + Seed treatment with thiamethoxam 30% FS @ 10ml/kg + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS
T5: BC2+ST+SP1+SP2	Two rows of maize as border crop + Seed treatment with thiamethoxam 30% FS @ 10ml/kg + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS
T6: BC3+ST+SP1+SP2	Two rows of maize as border crop + Seed treatment with thiamethoxam 30% FS @ 10ml/kg + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS
T7:ST+SP1+SP2	Seed treatment with thiamethoxam 30% FS @ 10ml/kg + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS
T8: Control	-

Table.2 Effect of border crops and insecticides on management of whitefly, *Bemisia tabaci* (Gennadius) transmitted Yellow Mosaic Virus in soybean

Treatments	Whitefly population/plant*			% YMV disease incidence**			Soybean grain yield (q/ha)		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean	2015-16	2016-17	Mean
T1: Seed treatment with thiamethoxam 30% FS @ 10ml/kg + two rows of maize as border crop	2.70 (1.79)	2.48 (1.73)	2.59 (1.76)	32.28 (3.99)	27.76 (3.72)	30.02 (3.14)	15.67	15.03	15.35
T2: Seed treatment with thiamethoxam 30% FS @ 10ml/kg + two rows of sorghum as border crop	2.93 (1.85)	2.70 (1.79)	2.81 (1.82)	34.47 (4.11)	31.01 (3.95)	32.74 (3.28)	14.83	14.33	14.58
T3: Seed treatment with thiamethoxam 30% FS @ 10ml/kg + two rows of pearl millet as border crop	3.20 (1.92)	2.86 (1.83)	3.03 (1.88)	36.66 (4.21)	34.30 (4.14)	35.48 (3.41)	14.33	14.07	14.20
T4: T1 + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS	1.08 (1.26)	0.95 (1.20)	1.02 (1.23)	15.54 (2.74)	13.73 (2.64)	14.63 (2.19)	19.83	19.00	19.42
T5: T2 + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS	1.22 (1.31)	1.05 (1.25)	1.14 (1.28)	18.86 (3.00)	16.80 (2.90)	17.83 (2.42)	19.10	18.13	18.62
T6: T3 + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS	1.36 (1.36)	1.17 (1.29)	1.27 (1.32)	21.71 (3.22)	18.97 (3.06)	20.34 (2.58)	18.80	17.47	18.13
T7: Seed treatment with thiamethoxam 30% FS @ 10ml/kg + foliar spray of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS + spray of triazophos 40 EC @ 800 ml/ha at 45-50 DAS	1.51 (1.42)	1.32 (1.35)	1.42 (1.38)	22.83 (3.28)	20.24 (3.13)	21.54 (2.66)	18.37	17.13	17.75
T8: Control	6.77 (2.70)	6.02 (2.55)	6.39 (2.62)	66.78 (5.74)	63.38 (5.74)	65.08 (4.63)	13.13	12.73	12.93
S.Em±	0.05	0.05	0.04	0.07	0.09	0.06	0.73	0.95	0.71
CD (P=0.05)	0.14	0.15	0.13	0.23	0.26	0.18	2.23	2.90	2.16

*Figures in parentheses are square root transformed values

** Figures in parentheses are angular transformed values

The highest population of 6.39 whiteflies/plant recorded in control plot with sole soybean crop (T8). The YMV disease incidence showed significant variation among treatments during 2015-16 and 2016-17. The pooled mean of disease incidence ranged from 14.63% to 65.08%. The per cent disease incidence followed the same trend like whitefly population among treatments. The highest disease incidence of 65.08% observed in T8 and lowest 14.63% recorded in T4 followed by T5 with 17.83% disease incidence.

The mean seed yield varied from 12.93 to 19.42 q/ha among treatments. The following was decreasing order of yield obtained from different treatments T4 (19.42 q/ha) > T5 (18.62 q/ha) > T6 (18.13 q/ha) > T7 (17.75 q/ha) > T1 (15.35 q/ha) > T2 (14.58 q/ha) > T3 (14.20 q/ha) > T8 (12.93 q/ha).

The treatment T4 (BC1+ST+SP1+SP2) found effective in management of YMV disease; in this treatment the border crop maize acts as a barrier for the movement of viruliferous whiteflies into the field, seed treatment with thiamethaxam 30FS (10ml/kg seed) protect the young plants upto 30 DAS and foliar application of imidacloprid 17.8 SL @ 500ml/ha at 30-35 DAS and triazophos 40 EC @ 800 ml/ha at 45-50 DAS reduced the whitefly population with subsequent reduction in spread of disease and increased grain yield in soybean.

The results are in conformity with Raghupathi and Sabitha (1994) who observed the maize and pearl millet as border crops reduced 9.88% and 9.81% YMV disease incidence in soybean as compared to control. The treatments with maize and pearl millet as border crop recorded less whitefly population i.e. 2.36 and 2.46 whiteflies per plant as compared to 8.62 whiteflies per plant in control. The treatment with border crop (BC)

of African tall maize + seed treatment (ST) with imidacloprid 70% WS (5.0 gm/kg seed) + reflective mulch (RM) + spraying of triazophos 40 EC at 0.175% at 30 days after sowing (DAS) (SP1) + spraying with thiamethoxam 25WDG at 0.05% at 45 DAS (SP2) recorded the lowest YMV incidence (7.4%), whitefly count (1.0 per plant) and highest yield of 32t/ha in polebean (Jyothi *et al.*, 2013).

Contrary to these results, Salam *et al.*, 2009 reported that treatment with maize as border crop recorded more number of whiteflies (6.20 whiteflies/plant) and 44.51% Mungbean Yellow Mosaic Virus (MYMV) disease in mungbean and the treatment found ineffective in management of MYMV disease in mungbean.

References

- ICAR-IISR. 2016a. All India Coordinated Research Project on Soybean. Director's report and summary tables of experiments 2015-16, Indian Institute of Soybean Research, Indore, Madhya Pradesh, pp i-ii.
- Jyothi, V., Nagaraju, N., Padmaja, A.S. and Rangaswamy, K.T. 2013. Transmission, detection and management of yellow mosaic virus in polebean (*Phaseolus vulgaris* L.). *J. Mycol. Plant Pathol.*, 43(2): 229-236.
- Nene, Y.L. 1972. A survey of viral diseases of pulse crops in Uttar Pradesh, G.B. Pant University of Agriculture & Technology, Pantnagar, India. *Res. Bull.*, 4: 191.
- Raghupathi, N. and Sabitha, D., 1994, Effect of barrier crops, mulching and yellow sticky traps in the management of yellow mosaic virus disease of soybean. In: Sivaprakasam, K. and Seetharaman, K., *Crop Diseases - Innovative Techniques and Management*. Kalyani Publishers, New Delhi, pp 419-420.

Salam, S.A., Patil, M.S. and Byadgi, A.S. 2009. IDM of mung bean yellow mosaic disease. *Ann. Pl. Protec. Sci.*, 17(1): 157-160.

Singh, R.J. and Hymowitz, T. 1999. Soybean genetic resources and crop improvement, *Genome*, 42(4): 605-616.

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