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Short communication

Efficacy of novel insecticides and biopesticides against whitefly on okra

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ABSTRACT

The experiment was conducted at the farmer's okra field in Randomized Block Design with 8 treatments replicated thrice. The bio-efficacy of different novel insecticides against white fly revealed that among the treatments, seed treatment of imidacloprid 5 g/kg seed + neem Azal @ 5000 ppm spray + indoxacarb 75 g a.i/ha spray + *Bacillus thuringiensis* (Biolep) @1 kg/ha spray was significantly most effective treatment and reduced whitefly count by 63.01 - 52.13 and 52.45 - 42.34% at one and seven days after first and second spraying, respectively. However, imidacloprid 5 g/kg seed + neem Azal @ 5000 ppm + indoxacarb 75 g a.i/ha + *Bt* @ 1 kg/ha combination was not so much effective treatment after 3rd spray as that was after 1st and 2nd spray of the insecticides and biopesticides.

Key words: Okra, whitefly, imidacloprid, indexocarb insecticides and biopesticides

Okra (*Abelmoschus esculentus* (L.) Moench) is the single largest green vegetable exported to many parts of the world accounting for 60% of vegetable exports, excluding onion. In Jammu, okra is grown in an area of 2,210 ha from sub-tropical to high altitude intermediate zone with an annual production of 31,788 metric tonnes (Anon, 2). The major problem in limiting the productivity of okra crop is its susceptibility to a large number of insect pests including vectors. Over 37 insect pests have been recorded causing damage to okra crop. Most important insect pest infesting okra is the whitefly, *Bemisia tabaci* Genn. which is a vector of Yellow Vein Mosaic Virus disease. Vegetable farmers by and large depend on chemical pesticides to counter the problem of insect pests. The judicious use of insecticides in combination with botanicals/bio-pesticides resulting in lower insect pest population, lower infestation, higher fruit yield and favourable cost:benefit ratio constitutes an ideal management against the insect pests of okra. Keeping this in view, the present experiment was undertaken to investigate new insecticide molecules and biopesticides.

The experiment was conducted during rainy season at farmer's field at Jammu. for one years. Okra variety 'Pusa Sawani' was grown following recommended cultural practices. To control white fly application of different chemicals were sprayed in different combinations. The experiment was laid in Randomized Block Design with eight treatments (T_1 = Neem Azal®@ 5000 ppm, T_2 = *Bt* (Biolep) @ 1kg/ha, T_3 = Endosulfan 35 EC (thiodan) @0.05%, T_4 = Indoxacarb® 15 SC (Avaunt), T_5 = Spinosad® 48 SC (Tracer) @75 g a.i /ha, T_6 = imidacloprid® 600 FS (Gaucho) @ 5 g/kg of seed + neem Azal 5000 ppm + indoxacarb 15 SC (Avaunt) + *Bt* (Biolep) @ 1 kg/ha, T_7 = Acetamiprid® 20 SP (Pride) @ 5 g/kg of seed + Neem Azal @ 5000 ppm + Spinosad 48 SC (Tracer) @75 g a.i/ha + *Bt* (Biolep) @ 1 kg/ha, T_8 = control) replicated thrice. The population counts on each of the tagged plants in each plot one day before spraying formed the pre-treatment count for the first spraying. The post treatment counts were taken at 1, 7 and 14 days of each spray. The 14th day count formed the pre-treatment count for the subsequent spraying. The per cent reduction in the insect pest population over control was calculated using modified Abbott's formula (Fleming and Retnakaran, 5). The data recorded in the rainy season regarding the population of leafhoppers and whiteflies at each spray were subjected to square root transformation. These transformed values were statistically analysed.

Data presented in Tables 1 & 2 indicates that during first year, seed treatment of imidacloprid + Neem Azal + indoxacarb was most effective treatment and reduced whitefly count by 63.01 + 52.13 and 52.45 + 42.34% at one and seven days after second spraying, respectively. The Table 3 depicted that after third spray; imidacloprid (seed treatment) + Neem Azal + indoxacarb + *Bt* combination did not proved as the most effective treatment. Alves *et al*. (1) found that application of imidacloprid resulted in 92.59% reduction in *B. tabaci* population in greenhouse experiment on bean plants. Imidacloprid 70 WS at 5 + 10 g/kg seed provided effective control of early sucking pest complex of okra. Imidacloprid 20 SL at 100-125 ml/ha was also equally effective against the sucking

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Table 1. Effect of different treatments on nymphal population of whitefly (1st spray) during *kharif* season.

Treatment + Dose	Pre-treatment nymphs/ 15 leaves	1 DAS nymphs/ 15 leaves	% Reduction over control	7 DAS nymphs/ 15 leaves	% Reduction over Control	14 DAS nymphs/ 15 leaves	% Reduction over control
T_1 + 5 ml/litre of water	45.02 (6.78)	31.01 (5.65)	38.11	40.32 (6.43)	20.98	43.33 (6.65)	20.95
T_2 + 1 kg product/ha	44.32 (6.73)	42.19 (6.57)	14.19	42.66 (6.60)	14.05	49.30 (7.02)	8.64
T_3 + 700 g a.i./ha	44.30 (6.73)	29.35 (5.50)	40.43	39.00 (6.32)	21.39	42.00 (6.55)	22.13
T_4 + 75 g a.i/ha	46.08 (6.85)	24.04 (4.99)	53.09	26.33 (5.22)	48.98	39.66 (6.38)	29.31
T_5 + 75 g a.i/ha	44.38 (6.73)	25.98 (5.16)	47.36	26.35 (5.21)	46.98	39.98 (6.40)	26.01
T_6 + 5 g product/kg seed + 5 ml/l of water + 75 g a.i /ha + 1 kg product/ha	35.68 (6.05)	14.68 (3.95)	63.01	19.00 (4.45)	52.45	29.33 (5.49)	32.48
T_7 + 5 g product/kg seed + 5 ml/l of water + 75 g a.i /ha + 1 kg product/ha	38.04 (6.24)	17.30 (4.26)	59.11	21.33 (4.71)	49.93	31.66 (5.70)	31.64
T_8	44.35 (6.73)	49.33 (7.09)	-	49.67 (7.12)	-	54.00 (7.41)	-
$CD_{0.05}$	0.28	0.49		0.60		0.58	

Figures in parenthesis are square root transformed values; DAS = Days after spraying

Table 2. Effect of different treatments on nymphal population of whitefly (2nd spray) during *kharif* season.

Treatment + Dose	Pre-treatment nymphs/ 15 leaves	1 DAS nymphs/ 15 leaves	% Reduction over control	7 DAS nymphs/ 15 leaves	% Reduction over control	14 DAS nymphs/ 15 leaves	% Reduction over control
T_1 + 5 ml/litre of water	43.33 (6.65)	30.01 (5.56)	32.00	36.05 (6.08)	24.76	47.33 (6.95)	7.34
T_2 + 1 kg product/ha	49.30 (7.02)	45.99 (6.84)	8.14	48.99 (7.06)	9.18	56.66 (7.59)	2.51
T_3 + 700 g a.i./ha	42.00 (6.55)	28.34 (5.40)	33.75	32.66 (5.80)	29.69	44.30 (6.73)	10.52
T_4 + 75 g a.i/ ha	39.66 (6.38)	24.03 (4.99)	40.51	27.66 (5.35)	36.93	40.00 (6.40)	14.44
T_5 + 75 g a.i/ ha	39.98 (6.40)	25.33 (5.12)	37.79	28.64 (5.43)	35.22	41.00 (6.48)	12.96
T_6 + 5 g product/kg seed + 5 ml/l of water + 75 g a.i./ha + 1 kg product/ha	29.33 (5.49)	14.30 (3.91)	52.13	18.70 (4.42)	42.34	29.05 (5.47)	15.98
T_7 + 5 g product/kg seed + 5 ml/l of water + 75 g a.i/ha + 1 kg product/ha	31.66 (5.70)	18.01 (4.35)	44.14	21.33 (4.68)	39.99	31.90 (5.73)	14.53
T_8	54.00 (7.41)	55.00 (7.48)	-	59.72 (7.78)	-	63.66 (8.03)	-
$CD_{0.05}$	0.58	0.40		0.51		0.45	

Figures in parenthesis are square root transformed values; DAS = Days after spraying

Table 3. Effect of different treatments on nymphal population of whitefly (3rd spray) during *kharif* season.

Treatment + Dose	Pre-treatment nymphs/ 15 leaves	1 DAS nymphs/ 15 leaves	% Reduction over control	7 DAS nymphs/ 15 leaves	% Reduction Over Control	14 DAS nymphs/ 15 leaves	% Reduction over control
T_1 + 5 ml/litre of water	47.33 (6.95)	29.01 (5.47)	39.69	36.05 (6.08)	27.64	45.33 (6.80)	13.37
T_2 + 1 kg product/ha	56.66 (7.59)	50.00 (7.60)	13.81	56.98 (6.84)	4.46	60.30 (7.80)	3.73
T_3 + 700 g a.i./ha	44.30 (6.73)	25.33 (5.13)	43.74	32.33 (5.77)	30.66	42.00 (6.55)	14.24
T_4 + 75 g a.i/ha	40.00 (6.40)	21.35 (4.72)	47.48	27.66 (5.35)	34.30	34.70 (5.96)	21.52
T_5 + 75 g a.i/ha	41.00 (6.48)	23.30 (4.93)	44.48	29.70 (5.53)	31.18	36.66 (6.13)	20.57
T_6 + 5 g product/kg seed + 5 ml/litre of water + 75 g a.i/ha + 1 kg product/ha	29.05 (5.47)	20.33 (4.59)	31.14	32.66 (5.78)	6.80	30.30 (5.56)	5.65
T_7 + 5 g product/kg seed + 5 ml/litre of water + 75 g a.i/ha + 1 kg product/ha	31.90 (5.73)	22.66 (4.83)	30.10	35.66 (6.02)	5.83	36.68 (6.12)	4.00
T_8	63.66 (8.03)	64.70 (8.10)	-	67.01 (8.24)	-	70.38 (8.44)	-
SEm (±)	0.14	0.22		0.22		0.23	
$CD_{0.05}$	0.45	0.68		0.70		0.74	

Figures in parenthesis are square root transformed values; DAS = Days after spraying

pest complex of okra was also reported by Dey *et al*. (4). Many workers have reported that foliar application of imidacloprid was effective in suppressing the buildup of whitefly population, resulting in lowest average pest count on cotton crop compared to control (Gupta, 6). Kfoury *et al.* (7) studied that foliar application of imidacloprid showed a repellent effect on *B. tabaci* adults and nymphs. This phenomenon, in addition to the usual mode of action might have been responsible for significant reduction in whitefly population in these plots.

The present result is consistent with the findings of Bharpoda *et al.* (3) who also found effectiveness of indoxacarb in comparison to some of the conventional synthetic insecticides, *i.e.* cypermethrin, chlorpyriphos and acephate, alone and in mixture with indoxacarb against insect pests (*Aphis gossypii*, *Amrasca biguttula biguttula* and *Bemisia tabaci*) of 'H 6' upland cotton (*Gossypium hirsutum*). These findings are in agreement with Sonalkar and Sonalkar (8) who evaluated four doses of acetamiprid against the whitefly, *Bemisia tabaci* on okra and found that Acetamiprid at 20 g *a.i.*/ha reduced the pest population significantly (94.42%). However, at 15 g *a.i.*/ha, the mortality was only 54.34%. Lower doses failed to control the pest effectively.

The foliar spray of neem products effectively reduced the whitefly population at one and three days after spraying. However, in comparison to the insecticides mentioned above, the performance of neem products was relatively less. Among the neem products, the bioefficacy of Neem Azal® was significantly better than *Bt*. Application of Neem Azal resulted in 38.11 and 20.98 per cent reduction in whitefly count at one and seven days after spraying, while the corresponding values in case of Biolep were 14.19 at one day and 14.05 at seven days, respectively. The present results are in general agreement with the findings of Gupta (6).

It is evident from the data that, seed treatment of (T_6) imidacloprid + Neem Azal + Indoxacarb and (T_7) Acetamiprid (seed treatment) + Neem Azal + spinosad, showed good efficacy in reducing the whitefly population (Tables 1 & 2). Whereas, indoxacarb (T_4) and spinosad (T_5) were found to be the most effective treatments in suppressing the white fly population after third sprays (Table 3). It was observed that the neem products could not provide adequate protection to the crop as compared to *Bt*, which was not found effective against whitefly in okra.

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