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Evaluation Of Some Novel Vegetable Oil - Insecticide Schedules For Okra Leaf Hopper Management

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ABSTRACT
A field experiment was conducted to find out the efficacy of certain vegetable oils and novel chemicals as sequential spray against okra leafhopper, Amrasca biguttula biguttula (Ishida) at NBPGR Regional Station, Rajendranagar during summer, 2015 and 2016. Mean data showed that, among the treatments foliar spray of spinosad 45 SC excelled over the other foliar treatments by recording the lowest leaf hopper population followed by acetamipride 20 SP. Sequential spray of sesame oil @ 5% and spiromesifen 240 SC recorded the highest leaf hopper population. Foliar spray of spinosad 45 SC proved to be the best treatment by providing highest percent protection folllowed by acetamiprid 20 SP. Sequential spray of sesame oil @ 5% followed by spiromesifen 240 SC reported the lowest percent protection.
***Key words**: Amrasca biguttula biguttula, Sequential spray*

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INTRODUCTION

Okra (*Abelmoschus esculentus* L.), commonly known as bhendi, belongs to the family malvaceae. It is also known as lady's finger. It is an important vegetable crop in many parts of the world. Okra is a very good source of vitamins A, B, C and is also rich in minerals, protein and iodine. Okra fruit contains 80 % water (Chaudhary *et al.*, 2016). The production and quality of okra fruits are affected by array of sucking pests from sowing until harvest. Among the reported insect pests of okra, leaf hopper (*Amrasca bigutulla bigutulla* Ishida) is one of the most important sucking pests (Srinivasa and Rajendran, 2003). Leaf hopper is quite a devastating pest on okra that sucks the cell sap and injects toxic saliva into leaves resulting in yield loss (Singh *et al.*, 2008). Krishnaiah (1980) estimated the loss due to leafhopper in okra was 40-56 per cent in untreated plot.

Insecticides are the only options for the vegetable growers to manage insect pests in the developing countries. To control the insect pests, farmers follow a frequent and enormous use of insecticides such as synthetic pyrethroids and organophosphates has posed the resistance problem and resurgence of pests (Mehrotra, 1990). Therefore, an attempt have been made to evaluate various vegetable oils and novel insecticide schedules in newer combinations against the against okra leafhopper, *Amrasca biguttula biguttula*.

MATERIALS AND METHODS

The field trial was carried out at NBPGR Regional Station, Rajendranagar during summer, 2015 and 2016 on variety Arka Anamika in a randomized block design with three replications. Popular variety, Arka Anamika was sown with a spacing of size of 60 X 30 cm in a plot size of 4.8 X 3 m. Arka Anamika seeds were properly treated with imidacloprid 70 WS and thiomethoxam 70 WS@ 5 g/kg seed and later shade dried and sown for seed treatment experiments. The crop was raised as per the guidelines of package of practices except the plant protection practices. Based on ETL the spray foliar treatments were imposed (Table 1). Two sprays were imposed on 15 days interval. These treatments were compared with untreated control. Observations on leaf hoppers were recorded one day before and 3, 7, 10 days after spraying, on five randomly selected plants covering three leaves, one each from top, middle and bottom portion of the plant. The data were subjected to statistical analysis.

Table 1: Details of treatments

T1	Seed treatment with imidacloprid 70 WS @ 5 g /kg seed
T2	Seed treatment with thiomethoxam 70 WS@ 5 g /kg seed
T3	First spray neem oil @ 2% + second spray buprofezin 25 SC@ 0.04%
T4	First spray of mustard oil @ 5% + second spray pyriproxifen 0.5 GR @ 0.5%
T5	First spray of sesame oil @ 5% + second spray spiromesifen 240 SC @ 0.02%
T6	First spray of bifenthrin 10 EC @ 0.04 % + second spray imidacloprid 200 SL @ 0.05 %
T7	First spray of lambda cyhalothrin 5 EC @ 0.5% + second spray of thiamethoxam 25 WG @ 0.05%
T8	2 sprays of acetamiprid 20 SP @ 0.2 %
T9	2 sprays of spinosad 45 SC @ 0.015%
T10	Untreated check

RESULTS AND DISCUSSION

Results on efficacy of vegetable oils and novel chemicals on the leaf hopper population during summer, 2015 presented in table 2 indicates that, among the treatments, at 3 DAS of first spray, spinosad 45 SC recorded the lowest population of leafhopper (8.20 leaf hoppers/3 leaves) and maintained its superiority at 10 DAS also followed by acetamiprid 20 SP (9.32 leafhoppers/3leaves). Mustard oil @ 5% (20.00 leaf hoppers/3 leaves) and sesame oil @ 5% (17.19 leaf hoppers / 3 leaves) recorded highest leaf hopper population. Similar trend was followed at 10 DAS also.

At 3 DAS of second spray, spinosad 45SC (2.00 leaf hoppers / 3 leaves) followed by acetamiprid 20 SP (4.26 leaf hoppers /3 leaves) and buprofezin 25 SC (5.2.3 leaf hoppers /3 leaves) were superior over other treatments. All the three treatments maintained their superiority till 10 DAS.

Mean data showed that , among the treatments sequential spray of spinosad 45 SC excelled over other foliar treatments by recording the lowest leaf hopper population population of 10.16 leaf hoppers per 3 leaves followed by acetamiprid 20 SP (12.28 leaf hoppers/3 leaves) and sequential spray of neem oil @ 2% buprofezin 25 SC (14.90 leaf hoppers/3 leaves). Sequential spray of sesame oil @ 5% and spiromesifen 240 SC exhibited poor efficacy in suppressing the leaf hopper population (25.64 leaf hoppers/3 leaves). Seed treatment with thiomethoxam 70 WS (16.36 leaf hoppers/3 leaves) and imidacloprid 70WS (18.02 leaf hoppers / 3 leaves) also recorded low leaf hopper population.

Highest percent protection of 94.63 % was shown by spinosad 45 SC followed by
acetamiprid 20 SP (90.92%). Seed treatment with imidacloprid 70 WS (61.45%) and thiomethoxam 70 WS (62.44 %) reported the lowest percent protection followed by sequential spray of sesame oil @ 5% and spiromesifen 240 SC (75.72 %).

Similar trend was observed during summer, 2016 also. Mean data on the leaf hopper population showed that, among the treatments, sequential spray of spinosad 45SC excelled over other foliar treatments by recording the lowest leaf hopper population population of 15.57 leaf hoppers per 3 leaves followed by acetamiprid 20 SP (17.84 leaf hoppers/3 leaves) and sequential spray of neem oil @ 2% buprofezin 25 SC (19.80 leaf hoppers/3 leaves). Sequential spray of sesame oil @ 5% and spiromesifen 240 SC exhibited poor efficacy in suppressing the leaf hopper population (33.13 leaf hoppers/ 3 leaves). Seed treatment with thiomethoxam 70 WS (23.32 leaf hoppers/3 leaves) and imidacloprid 70WS (25.24 leaf hoppers/3 leaves) also recorded the lowest leaf hopper population.

Highest percent protection of 86.29 % was shown by spinosad 45 SC folllowed by acetamiprid 20 SP (83.20 %). Seed treatment with thiomethoxam 70WS (43.97 %) and imidacloprid 70 WS (47.54 %) reported the lowest percent protection followed by sequential spray of sesame oil @ 5% and spiromesifen 240 SC (75.75 %).

Results obtained from the present study indicated that sequential spray of vegetable oils and insecticides was less effective against the leaf hopper as compared to the sequential spray of newer insecticides like spinosad 45 SC and acetamiprid 20 SP. The present findings are in agreement with those of Sunil and Kaushik (2015) who opined that at seven and eleven days after spraying, among the bio-pesticides, Spinosad 45 SC was found very effective against okra leafhopper (75.34% suppression and 69.17% suppression respectively). Ghosh *et al*. reported in 2009 that Spinosad 45 SC @ 1.0 ml/ 3 L was very effective against another sucking pest, aphid on ladysfinger achieving 71.76 % suppression.

This results are in contray with the findings of Day *et al.,* (2005) who reported that all the dosages of imidacloprid 70 WS *viz.*, 5, 7.5 and 10 g/kg seed provided excellent protection against, leaf hoppers up to 45 days after sowing. Kale *et al*. (2005) also reported that seed treatment with thiamethoxam @ 5 g a.i./ha followed by alphamethrin 0.05% spray was the most effective treatment in reducing leaf hopper populations in okra with higher yield and cost benefit ratio.

Table 2: Effect of various vegetable oils and insecticide schedules on population of *Amrasca biguttula biguttula* on okra during summer, 2015.

Treatments	Number of leafhoppers/3 leaves First spray				Number of leafhoppers/3 leaves Second spray				Mean	Percent protection
	1DBS	3 DAS	7DAS	10 DAS	1 DBS	3 DAS	7 DAS	10 DAS		
T1 - Imidacloprid 70WS @ 5 g /kg seed	9.00	9.87	12.86	16.45	16.96	20.54	27.94	30.54	18.02	61.45
T2 -Thiomethoxam 70WS @ 5 g /kg seed	7.34	8.24	12.00	14.20	15.78	19.41	24.15	29.76	16.36	62.44
T3 –First spray neem oil @ 2% + second spray buprofezin 25SC@ 0.4%	31.42	10.12	14.19	20.23	22.16	5.23	7.61	8.29	14.90	89.53
T4 – First spray of mustard oil @ 5% + second spray pyriproxifen 0.5 GR @ 0.5%	29.96	17.19	21.72	32.28	33.87	12.19	12.93	14.92	21.88	81.17
T5- First spray of sesame oil @ 5% + second spray spiromesifen 240 SC @ 0.2%	31.42	20.00	25.27	37.48	40.46	15.21	16.14	19.21	25.64	75.72
T6- First spray of bifenthrin 10EC @ 0.4 % + second spray imidacloprid 200 SL @ 0.2 %	32.14	12.42	15.16	22.60	24.10	8.19	9.21	11.25	16.88	85.80
T7- Firstspray of lambda cyhalothrin 5 EC @ 0.5% + second spray of thiamethoxam 25 WG @ 0.2%	34.20	12.97	17.18	25.10	25.92	9.29	10.82	11.97	18.43	84.89
T8- 2 sprays of acetamiprid 20 SP @ 0.2 %	32.24	9.32	10.00	14.26	15.81	4.26	5.21	7.19	12.28	90.92
T9- 2 sprays of spinosad 45SC @ 0.015%	30.46	8.20	8.96	11.90	12.16	2.00	3.43	4.21	10.16	94.63
T10- Untreated check	30.87	42.00	51.64	60.00	63.54	68.18	71.21	79.24	58.33	-
S.Em±	NS	0.06	0.06	0.70	0.03	0.09	0.09	0.08	-	-
C.D at 5 %	NS	0.18	0.20	0.20	0.10	0.27	0.28	0.23	-	-

Table 3: Effect of various vegetable oils and insecticide schedules on population of *Amrasca biguttula biguttula* on okra during summer, 2016.

Treatments	Number of leafhoppers/3 leaves First spray				Number of leafhoppers/3 leaves Second spray				Mean	Percent protection
	1DBS	3 DAS	7DAS	10 DAS	1 DBS	3 DAS	7 DAS	10 DAS		
T1 - Imidacloprid 70WS 70WS @ 5 g /kg seed	11.50	14.33	17.1	20.2	27.06	30.2	37.43	44.13	25.24	47.54
T2 -Thiomethoxam 70WS@ 5 g /kg seed	10.30	12.16	15.26	16.63	24.13	28.16	32.83	47.16	23.32	43.97
T3 –First spray neem oil @ 2% + second spray buprofezin 25SC@ 0.4%	34.56	12.46	20.13	28.23	29.16	9.23	10.46	14.2	19.80	83.12
T4 – First spray of mustard oil @ 5% + second spray pyriproxifen 0.5 GR @ 0.5%	35.03	22.3	34.26	44.26	49.1	15.1	19.86	20.16	30.00	75.75
T5- First spray of sesame oil @ 5% + second spray spiromesifen 240 SC @ 0.2%	37.06	27.3	40.3	49.13	51.12	17.5	20.56	22.1	33.13	76.03
T6- First spray of bifenthrin 10EC @ 0.4 % +	34.64	16.23	30.13	41.6	44.1	10.13	12.8	15.12	25.59	82.02

second spray imidacloprid 200 SL @ 0.2 %										
T7- Firstspray of lambda cyhalothrin 5 EC @ 0.5% + second spray of thiamethoxam 25 WG @ 0.2%	37.2	16.03	34.13	42.2	45.1	12.16	14.46	15.72	27.12	81.31
T8- 2 sprays of acetamiprid 20 SP @ 0.2 %	37.5	12.33	15.36	22.26	23.73	7.2	10.23	14.13	17.84	83.20
T9- 2 sprays of spinosad 45SC @ 0.015%	38.86	10.46	12.36	19.9	21.06	4.13	6.3	11.53	15.57	86.29
T10- U ntreated check	35.66	48.2	62.76	69.16	70.1	71.06	79.76	84.13	65.10	-
S.Em±	NS	0.12	0.03	0.12	0.09	0.07	0.09	0.04	-	-
C.D at 5 %	NS	0.38	0.12	0.37	0.29	0.22	0.28	0.15	-	-

CONCLUSIONS

The foliar spray of spinosad 45 SC followed by acetamiprid 20 SP gave highest percent protection against the okra leaf hopper. Hence, we conclude that foliar sprays of these newer insecticides can be incorporated in future IPM programme in okra cultivation.

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