Madras Agric. J. 89 (10-12) : 590-593 October-December 2002
https://doi.org/10.29321/MAJ.10.A00267

Evaluation of certain plant products against sesame pod bug, *Elasmolomus sordidus* Fabricius

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Abstract: Six plant products namely, neem oil (20%), neem seed kernal extract NSKE (5%), leaf extracts of *Prosopis juliflora* (5%), *Ipomoca carnea* (5%), *Vitex negundo* (5%) and *Azadirachta indica* (5%) were evaluated with a standard insecticide, carbaryl 10 D for their efficacy against sesame pod bug (SPB) incidence, pod damage and yield during Summer '96 and *Kharif'* 96 by applying them twice at 75 and 90 days after sowing at Agricultural Research Station, Virinjipuram. The data on this experiment were subjected to pooled analysis. Among the botanicals evaluated NSKE (5%), neem oil (2%) leaf extracts of *V. negundo* (5%), *P. juliflora* (5%), *I.carnea* (5%) and *A.indica* (5%) were effective in descending order. However NSKE and neem oil were most effective treatments in cost wise than the insecticidal check. Hence these two botanicals can be used economically in IPM programme.

Key words: Sesame, Elasmolomus sordidus, Plant products, Evaluation.

Introduction

Sesame pod bug (SPB), *Elasmolomus sordidus* Fabricius (Lygaeidae : Hemiptera) is found to be the most destructive insect pest on sesame crop in India. This bug is commonly known as 'Ekkadayan or Yelkudayan' in Tamil, since it sucks the oil from the seeds of sesame both under field and storage condition and caused reduction in seed weight and oil content (Mohanasundaram and Sundara Babu, 1987). Since this crop is cultivated mostly under rainfed condition, the cost of plant protection measures are to be minimised by adopting alternative methods to insecticides. To evolve ecofriendly low cost technology, some of locally available plant products were evaluated against this pest. A number of effective plant products have been reported in several field crop pests by many workers including Muralibaskaran *et al.* (1993) and Ramasubramanian (1996).

Materials and Methods

Six plant products along with carbaryl 10 D as check were evaluated for their efficacy against SPB under field condition. Two trials, one during Summer'96 and another during *Kharif'96* were conducted at Agricultural Research Station, Virinjipuram in a Randomised Block Design with three replications with sesame variety TMV 3. The plot size was 5x3 m with a spacing of 30 x 30 cm. The details of plant products evaluated are furnished in Table 1.

Kernel and leaf powder

Leaves of neem, *Prosopis juliflora, Ipomoea canea and Vitex negundo* and neem seeds were collected and dried in shade for three days. The dried leaves and neem seed kernels were powdered separately using electric mixer-grinder, and sieved and stored in airtight plastic containers before use. A day before the treatment, the required quantity in each of the plant product was taken separately in a thin muslin cloth bag and soaked in water over night in plastic bucket. The next day the muslin cloth bags were squeezed to get maximum extract. In case of neem oil, khadi soap solution was used as an emulsifier.

Two rounds of treatments, the first on 75 days after sowing (DAS) and the second on 90 DAS were given, using a hand operated knapsack sprayer. Water spray was given to the untreated control. Pre-treatment counts on bug population and pod damage on 10 randomly selected plants in each plot were recorded 24 hr prior to the treatment. Post treatment observations on bug population and pod damage were recorded on 1, 3 and 7 days after first spray under the field condition. The bug incidence on sesame heaps was also recorded at the threshing floor on 1, 3 and 7 days after second spray. The treatment-wise yields were recorded and the data collected on the two seasons were subjected to pooled analysis.

Table 1. The details of plant products evaluated against *E.sordidus*

Treatment	Formulation	Concentration (%)	Dosage (kg ha^{-1})
Azadirachta indica	oil emulsion	2	10 lit
Azadirachta indica	Seed kernel extract	5	25
Prosopis juliflora	Leaf extract	5	25
Ipomoea carnea	Leaf extract	5	25
Vitex negundo	Leaf extract	5	25
Azadirachta indica	Leaf extract	5	25
Carbaryl	Dust	10	25

The cost benefit ratios were worked out for the plant products except *Vitex negundo, Prosopis juliflora, Ipomoea carnea* and neem leaf using the methods described by Heinrich *et al.*(1981).

$$\text{Cost benefit ratio} = \frac{\text{Value of Treated crop} - \text{Value of untreated crop}}{\text{Cost of plant protection}}$$

Results and Discussion

The results of pooled analysis of the data indicated that the mean bug population ranged from 77.3 to 85.9 per ten plants in the plots. Prior to treatment one day after I spray (1DASPI), the bug incidence was very much reduced in all the treatments over the control. The population in ascending order were 6.0, 6.4, 9.0, 12.0, 12.1, 12.5 and 14.9 bugs against carbaryl 10D, NSKE (5%), neem oil (2%), *V negundo* (5%), *P. juliflora* (5%), *I. carnea* (5%) and neem leaf extract (5%). The untreated check recorded a mean population of 87.8 bugs. The treatments, NSKE (5%) and carbaryl 10D were found to be on par and *V. negundo, P. juliflora and I. carnea* were next in merit and found to be on par with each other in reducing the bug population (Table 2).

On 3 DASPI, carbaryl 10D recorded the lowest bug population followed by NSKE (5%), neem oil (2%), *V. negundo* (5%), *P. juliflora* (5%), *I. carnea* (5%) and neem leaf (5%). It indicated that the bug population slightly increased in all the treatments as compared to the bug population at 1 DASPI except in carbaryl 10D and NSKE (5%) which reduced the bug incidence further. On 7 DASPI, all the treatments maintained the same trend in their efficacy on the bug population over the control. It also indicated that there was further increase in the bug population in all the treatments on 7 DASPI. The bug population in the untreated plot showed a gradual increase.

The pretreatment pod damage ranged from 28.85 to 34.47 per cent in various plots. On 7 DASPI, the pod damage recorded in ascending order were 30.35, 30.54, 31.37, 32.46, 32.83, 33.07, and 36.37 per cent in carbaryl 10D, NSKE (5%), neem oil (2%) *V.negundo* (5%), *P.juliflora* (5%), *I.carnea* (5%) and neem leaf extract (5%) treated plots as against 73.68 per cent in the untreated control.

After the second round of spray, the bug incidence was recorded only on the sesame heaps at the threshing floor. The insecticides exhibited the same trend in their efficacy. On one DASP II, the bug population was drastically reduced by all the treatments as compared to untreated check. The treatments, carbaryl 10D and NSKE (5%) were found to be superior to others and on par with each other followed by neem oil (2%) and *V.negundo* (5%). The next in order was *P.juliflora and I.carnea* which were equally effective and the neem leaf extract was the least effective among the treatments. On 3 DASP II also, the bug incidence on sesame heaps, slightly increased in all the treatments except carbaryl 10D and NSKE (5%) as noticed in the 3 DASP I. On 7 DASP II, also the treatments maintained their efficacy against SPB.

Table 2. Efficacy of plant products against *E. sordidus**

Treatment	I Spray (75 DAS)						II Spray (90 DAS)					
	Bug population in field				Pod damage in field (%)		Bug population in sesame heaps in threshing floor				Yield	
	PTC	POTC			PTC	POTC	PTC	POTC			kg/plot	kg/ha
	1 DBSP I	I DASP I	3 DASP I	7 DASP I	1 DASP I	1 DASP I	1 DASP II	1 DASP II	3 DASP II	7 DASP II	(15 m²)	
Neem Oil 2%	77.3	9.0b	10.9c	12.1c	24.76(29.83)	27.12(31.37)b	16.3c	5.0b	6.2b	9.06c	0.87b	580b
Neem seed kernel extract 5%	79.0	6.4a	5.1b	8.9a	23.2(28.85)	25.84(30.54)a	13.5b	4.6a	3.5a	8.0b	0.92a	613a
Prosopis juliflora leaf extract 5%	81.8	12.1c	13.9d	16.1e	27.35(31.50)	29.40(32.83)d	20.1e	8.1d	9.7c	12.0e	0.81b	540b
Ipomoea carnea leaf extract 5%	77.6	12.5c	14.3e	16.3e	25.46(30.30)	29.78(33.07)e	22.3f	8.3d	10.4d	12.2e	0.78c	520c
Vitex negundo leaf extract 5%	83.5	12.0c	13.4d	14.4d	25.95(30.60)	28.81(32.46)e	19.9d	7.5c	9.2c	11.6d	0.84b	560b
Neem leaf extract 5%	85.9	14.9d	17.1f	20.0f	25.7(30.38)	35.2(36.37)f	23.9g	11.6e	14.5e	16.3f	0.75c	500c
Carbaryl 10 D	80.9	6.0a	4.9a	8.4a	25.46(30.29)	25.55(30.35)a	12.9a	4.5a	3.7a	7.7a	0.93a	620a
Control	84.6	87.8e	92.9g	111.0g	32.45(34.47)	70.25(73.68)g	133.1h	135.0f	148.13f	150.0g	0.62d	413.3d

* Pooled analysis of Summer and *Kharif*, 1996

DAS Days after sowing ; DBSP : Days before spraying ; DASP : Days after spraying

PTC : Pretreatment count ; POTC : Post treatment count

Figures in parentheses are angular transformed values

In a column, means followed by same letter are not significantly different at the 5% level by DMRT

All the treatment recorded significantl higher yield than th control. The treatment carbaryl 10D recorded the highest yield of 62(kg ha^{-1}, followed by NSKE 5 per cent (61: kg ha^{-1}), neem oil 2 per cent (580 kg ha^{-1}), *V.negundo* 5 per cent (560 kg ha^{-1}), *P.juliflora* 5 per cent (540 kg ha^{-1}), *I.carnea* 5 per cent (520 kg ha^{-1}) and neem leaf extract 5 per cent (500 kg ha^{-1}) as against 413 kg ha^{-1} in the control. The cost benefit analysis of the plant products showed that the gross return per hectare was maximum in NSKE (5%) (Rs.12,260) followed by neem oil (2%) (Rs.11,600), *V.negundo* (5%) (11,200), *P.juliflora* (5%) (10,800), *I.carnea* (5%) (10,400) and neem leaf extract (5%) (10,000). In the untreated control, the gross return was the lowest (Rs.8,260). The cost of treatment per ha for two rounds worked out to Rs.1000 and Rs.1100 for neem oil and NSKE respectively. The cost-benefit of NSKE (1:3.64) and neem oil (1:3.34) was almost the same (Table.3).

The trials conducted to evaluate the efficacy of botanicals against SPB indicated that NSKE (5%) was found to be superior to other botanicals in reducing SPB population,

Table 3. Cost - Benefit ratio of plant products

Treatments	CB ratio	Returns (Rs.)	Cost of treatment (Rs.)
NSKE 5%	1:3.64	12,260	1,100
Neem oil 2%	1:3.34	11,600	1,000
Untreated control	-	8,260	-

and thereby increasing the yield. It was on par with standard insecticide carbaryl 10 D. followed by neem oil (2%). Muralibaskaran *et al.* (1993) reported that neem oil (2%) was better in reducing the damage of *A. catalaunalis* on sesame than the NSKE (2%) and neem leaf extract 10.0 per cent. The efficacy of neem oil in controlling rice black bug and establishing higher yield in paddy was reported by IRRI (1986). Saroja *et al.* (1993) also reported the efficacy of neem oil and NSKE against black bug. Contrary to this, in the present investigation NSKE was found to be superior to neem oil. Attri (1975) reported that neem oil was less effective than aqueous extract of neem seed kernels. Ramasubramanian (1996) evaluated neem formulations against black bug and reported that neem oil was less effective than neem seed kernel extract. These findings are in conformity with the present findings.

Among the leaf extracts, *V negundo, P. juliflora and I.carnea* were found to be equally effective against SPB but neem leaf extract was less effective. Ramasubrainanian (1996) reported that the *V. negundo* gave better control than *I.carnea* against rice black bug. In the present study the cost-benefit ratios of NSKE and neem oil were almost same and they were 1:3.64 and 1:3.34, respectively. Ramasubramanian (1996) worked out the cost-benefit ratio of neem formulations against rice black bug and reported that the NSKE recorded the highest ratio of (1:22.38), followed by neem oil (1:14.83), Neem Azal-F (5%) (1:13.17) and Neem Azal T/S (1%) (1:8.62). The present study clearly indicated that, among the plant products NSKE and neem oil out-performed others in managing the pest, increasing the yield and providing higher returns.

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(Received : December 2001 ; Revised : June 2002)