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Efficacy of Different IPM Techniques for Suppression of Sucking Pests of Okra

RAB DINO KHUHRO
IMRAN ALI RAJPUT
Department of Entomology
Sindh Agriculture University, Tandojam
Sindh-Pakistan
FARHAN AHMAD
Entomology Section
Central Cotton Research Institute, Sakrand
Sindh-Pakistan
MUHAMMAD HANIF LAKHO
Department of Statistics
Sindh Agriculture University Tandojam
Sindh- Pakistan
SHAH NAWAZ KHUHRO
Entomology Section
Central Cotton Research Institute, Sakrand
Sindh-Pakistan
KHALID HUSSAIN DHILOO
Department of Entomology
Sindh Agriculture University, Tandojam
Sindh-Pakistan

Abstract:

Various IPM techniques were evaluated against major sucking pests on okra atexperimental Latif Farm during 2013. The results showed that sucking insect pests jassids, thrips, whiteflies and mites were present on okra. The study showed that maximum reduction percent of jassid was found through drop cloth methods (59.42±2.57) followed by Dhatura (55.58±2.49), Neem oil (33.44±4.98%) and Trooh (32.165±1.90%). Drop cloth and Dhatura gave better results against jassids than neem oil and trooh. The drop cloth IPM technique was first time tested and compared with other bio-pesticides. In the

condition of agricultural pest management, botanical pesticides are best suited for use in organic food production in industrial countries but can take part in a better role in the production and post-harvest protection of food in Pakistan. Developing countries are rich in endemic plant biodiversity where these bio-pesticides may ultimately have their greatest impact in future integrated pest management (IPM) programmes, given their safety to non-target organisms and the environment.

Key words: Neem oil, drop cloth, trooh, dhatura, sucking pests and okra

Introduction

Okra (*Abelmoschus esculentus* L.) or Lady finger or Bhindi is a warm season annual crop and is one of the most common, widely grown vegetables of Pakistan (Javed*et al.*, 2009). It provides vitamin A, B and C and also rich source of minerals, carbohydrates, protein, iron and iodine (Norman, 1992) among the varied vegetables and is cultivated almost throughout the year due to favorable climatic conditions (Memon *et al*., 2002).
The okra plants are attacked by a number of insect pests like *Bemisia tabacim, Thrips tabaci, Aphis gossypii, Amrasca devastans*, *Earias vittella, Dysdercus koengii, Helicoverpa armigera, Acrocercops bifasciata, Podagrica, Anomisflava, Sylepta derogata, Haritalodes derogata,* and *Nezara viridula* (Basu, 1995; Lohar, 2001; Mani *et al.,* 2005).These insect pests complex damages the crop during their different growth stages, right from germination to harvest (Jagtab *et al*., 2007) and results in getting lower yields (Kumarand Sherma 1993; Gulati, 2004). The yield losses due to insect pests have been reported up to 69 percent (Mani *et al.,* 2005). Insect pests not only reduce the growth and production but also transmit pathogenic diseases (Sheedi, 1980; Dhaliwal *et al*., 1981).

Among sucking insect pests, *Amrasca devastans*, *Aphis gossypi, Thrips tabaci,* and *B. tabaci*, are the major sucking pests and cause extensive damage in the early stage of crop (Atwal, 1994; Dubey *et al*., 1999; Lohar, 2001; Mani *et al.,* 2005).

These pests are managed by the massive use of insecticides, as it is an immediate solution to control the pests (Mehmood *et al*., 2001). It has estimated that 27% of the total insecticides are being used on fruit and vegetables in Pakistan (Hussain *et al*., 2002). This approach has contributed to the environmental pollution on large scale. There is a need to explore alternatives, available pest control techniques to reduce the use of insecticides.

Integrated pest management could be the safe, cheapest and appropriate approach to achieve sustainability in okra (Dhaliwal *et al*., 1981; Dubey *et al*., 1999; Kumawat *et al*., 2000; Ahmad *et al*., 2003; Ahmad *et al*., 2011; Khuhro *et al*., 2014). In this regard encouragement of bio-pesticides such as plant extracts occupies a central position in integrated pest management (Akbar *et al*., 2012). Plant extracts have been reported ecofriendly options for management of insect pests of okra (Bindu *et al.,* 2003; Singh and Brar, 2004; Paulraj and Ignacimuthu, 2005). The research have reported the usefulness of plant extracts in controlling different sucking pests of okra including jassid, (Akbar *et al*., 2007) aphid (Akbar *et al*., 2008), whitefly (Akbar *et al*., 2009) and spider mite, (Kumar and Sherma 1993; Singh and Singh, 1999)

Keeping in view the hazardous nature of insecticides the current study was planned to evaluate some non-insecticidal options, plant extracts along with the drop cloth methods aiming to develop the best package of management practices for control the sucking pests of okra.

Methodology

The subz pari variety of okra was grown on 5 equal sized plots (80×80sq ft) separately on ridges at Latif experimental farm on March 5, 2013. All the cultural practices like weeding, fertilizer and irrigations were given as per agronomic recommendations. No pesticides were applied. There were 5 treatments i-e T1= Neem oil, T2= Datura, T3= Trooh, T4= Drop cloth method and control (No treatment). The doze of Neeem oil was 100ml/16 liters water in knapsack sprayer. Biopesticides Dhatura and Trooh 15 kg each were chopped and boiled in 15 liters water. When 5 liters boiled water was left it was drained through muslin cloth the doze of biopesticides was 200 ml/tank. Drop cloth 30×2 sq ft yellow in color was applied grease with brush and kept in between 2 rows of okra and plants were shacked with hands and the pests dropped due to shacking were attached on greased drop cloth. The control plot was not applied any treatment. Pre treatment and post treatment observations were recorded on the same date before application of treatments. Finally reduction percentages of sucking pests were calculated using Abbot Formula.

Result

Jassids:

The data shows (Table 1a) that maximum jassid population was in neem oil (2.79±0.56) followed by Trooh (2.57±0.53), drop cloth (2.40±0.52), Dhatura (2.17±0.49) and as compare to control (6.70±0.66) was recorded against jassid on okra.

The data of reduction percent of jassid (Table 1b) indicate that overall maximum mean reduction (59.42±2.57) was recorded in drop cloth method followed by (55.58±2.49%) in dhatura, (33.44±4.98%) in neem oil and (32.165±1.90%) in trooh. Further results showed that better performance of drop

cloth methods and dhatura biopesticides than other biopesticides.

Table-01 (a) weekly mean population of Jassid on okra

Date of Observation/weeks	T1 (Neem Oil)		T2 (Dhatura)		T3 (Trooh)		T4 (Drop cloth)		T5 (Control)	
	Pre	Post	Pre	Post	Pre	Pos	Pre	Post	Pre	Post
01-04-2013	6.37	3.30	3.36	1.45	3.06	2.60	1.93	0.73	6.50	6.46
08-04-2013	4.16	3.50	5.20	1.25	3.11	2.20	1.56	0.83	6.60	6.57
15-04-2013	4.23	3.38	6.16	1.21	3.14	1.43	2.96	1.20	6.12	6.08
22-04-2013	4.81	2.69	4.46	1.33	6.20	2.73	2.20	0.56	8.52	8.40
29-04-2013	3.03	2.53	6.06	2.52	3.19	2.30	2.16	0.50	8.80	8.67
06-05-2013	4.06	2.30	5.26	2.36	4.25	2.36	2.23	0.86	7.25	7.22
13-05-2013	3.76	2.56	4.56	3.63	4.69	3.93	3.70	1.30	5.60	5.52
20-05-2013	4.83	2.73	5.30	2.52	3.89	2.06	3.43	1.30	5.80	5.76
27-05-2013	4.23	2.16	5.21	3.22	4.01	3.56	1.46	0.83	5.90	5.58
Mean+ S.E	**4.39±0.70**	**2.79±0.56**	**5.06±0.75**	**2.17±0.49**	**3.95±0.66**	**2.57±0.53**	**2.40±0.52**	**0.90±0.32**	**6.79±0.87**	**6.70±0.66**

Table-01 (B) Reduction %age of jassid

Date of Observation	T1 (Neem Oil)	T2 (Dhatura)	T3 (Trooh)	T4 (Drop cloth)
1-.04-2013	47.88	56.69	14.48	61.96
08-04-2013	15.48	75.85	28.93	46.59
15-04-2013	19.57	80.25	54.17	59.20
22-04-2013	43.29	69.76	55.36	74.19
29-04-2013	15.53	56.69	26.80	65.41
06-05-2013	43.13	54.94	44.24	61.31
13--05-2013	26.97	19.27	15.00	64.35
20--05-2013	43.09	52.13	46.70	61.83
27-05-2013	46.02	34.68	8.18	39.93
MEAN±S.E	**33.44±1.93**	**55.58±2.49**	**32.65±1.90**	**59.42±2.57**

Whitefly:

The data indicated (Table 2a) showed that the best results were in drop cloth (1.15±0.63) followed by dhatura (1.64±0.43), neem oil (2.33±0.58), Trooh (2.61±0.54) and in control (5.35±0.66) was recorded on okra after the use of post applications. Similarly,

the data of reduction percent of whitefly (Table 2b) indicate that overall maximum mean reduction (66.86±2.73%) was recorded in drop cloth method followed by (47.76±2.30%) in dhatura, (40.11±1.81%) in neem oil and (29.36±1.81%) in trooh.

Table- 02 (A) weekly mean population of whitefly on okra

Date of Observation/ weeks	T1 (Neem Oil)		T2 (Dhatura)		T3 (Trooh)		T4 (Drop Cloth)		T5 (Control)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1-.04-2013	5.23	1.96	4.27	1.25	4.69	2.10	5.46	0.86	5.6	5.3
08-04-2013	3.39	2.23	3.12	1.45	3.18	2.60	3.40	1.10	5.50	5.24
15-04-2013	3.24	2.26	3.03	1.26	3.12	2.23	3.26	1.46	5.60	5.20
22-04-2013	4.07	3.36	3.18	1.56	4.13	3.06	2.90	1.70	4.80	4.48
29-04-2013	3.91	2.90	3.02	1.33	5.12	2.83	3.40	0.90	5.80	5.24
06-05-2013	5.15	2.30	3.11	2.39	4.26	2.50	3.66	1.16	6.25	5.98
13-05-2013	3.84	1.56	4.37	1.44	4.19	2.63	4.83	1.50	6.12	5.86
20-05-2013	4.88	1.83	3.78	1.58	3.79	2.20	4.16	0.70	5.50	5.15
27-05-2013	4.52	2.60	4.10	2.54	3.56	3.36	3.90	0.96	5.80	5.70
Mean+ S.E	**4.25±0.69**	**2.33±0.58**	**3.55±0.63**	**1.64±0.43**	**4.00±0.67**	**2.61±0.54**	**3.89±0.66**	**1.15±0.36**	**5.66±0.79**	**5.35±0.66**

Table- 02 (B) Reduction %age of whitefly

Date of Observation	T1 (Neem Oil)	T2 (Dhatura)	T3 (Trooh)	T4 (Drop cloth)
1-.04-2013	60.50	69.10	52.70	83.41
08-04-2013	31.00	51.31	14.35	66.10
15-04-2013	26.94	55.32	23.18	51.00
22-04-2013	11.62	47.55	20.71	37.20
29-04-2013	17.91	13.00	38.90	70.75
06-05-2013	53.41	19.70	37.85	66.90
13--05-2013	57.61	56.60	34.52	67.61
20--05-2013	60.00	55.42	38.00	83.80
27-05-2013	42.00	61.80	4.00	75.00
MEAN±S.E	**40.11±2.11**	**47.76±2.30**	**29.36±1.81**	**66.86±2.73**

Thrips:

The results shows (Table 3a) that maximum thrips population was in neem oil (1.93±0.46) followed by dhatura (1.39±0.38), Trooh (1.32±0.35), drop cloth (1.00±0.33) as compare to control

(4.40±0.70) recorded against the thrips on okra. However, the data of reduction percent of thrip (Table 3b) indicate that overall maximum mean reduction (50.31±2.36%) was recorded in drop cloth method followed by (43.58±2.00%) in trooh, (37.49±2.04%) in neem oil and (34.54±1.96%) in dhatura.

Table- 03 (A) weekly mean populations of thrips on okra

Date of Observation/ weeks	T1 (Neem Oil)		T2 (Dhatura)		T3 (Trooh)		T4 (Drop Cloth)		T5 (Control)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1-.04-2013	3.12	2.63	3.16	1.26	2.09	0.86	1.86	0.36	4.41	4.38
08-04-2013	2.61	2.33	3.21	1.24	2.07	1.10	1.73	0.50	3.65	3.55
15-04-2013	2.18	1.56	2.19	1.15	2.16	1.60	2.23	0.90	5.32	5.29
22-04-2013	3.74	2.30	2.21	1.39	2.14	1.63	1.44	0.80	4.12	4.11
29-04-2013	3.36	2.21	2.69	1.41	2.15	1.73	1.86	0.50	6.32	6.30
06-05-2013	3.96	2.36	2.87	2.21	2.13	1.03	2.36	1.20	3.25	3.15
13--05-2013	2.51	0.93	2.32	1.29	2.31	1.46	1.96	1.43	4.52	4.40
20--05-2013	3.32	1.36	2.14	1.30	2.24	1.70	2.36	1.63	4.25	4.20
27-05-2013	3.25	1.65	2.96	1.34	2.36	0.80	2.03	1.70	4.36	4.25
Mean+ S.E	**3.12±0.59**	**1.93±0.46**	**2.64±0.54**	**1.39±0.39**	**2.18±0.49**	**1.32±0.38**	**1.98±0.47**	**1.00±0.33**	**4.47±0.70**	**4.40±0.70**

Table. 03 (B) Reduction %age of Thrips

Date of Observation	T1 (Neem Oil)	T2 (Dhatura)	T3 (Trooh)	T4 (Drop cloth)
1-04-2013	15.5	60.91	58.74	80.79
08-04-2013	8.51	6.89	14.85	71.80
15-04-2013	28.64	47.20	45.40	59.52
22-04-2013	38.89	37.85	70.91	44.60
29-04-2013	34.91	47.90	24.10	74.12
06-05-2013	40.19	20.10	51.00	48.56
13--05-2013	62.67	43.51	35.50	26.94
20--05-2013	59.90	38.53	24.92	30.81
27-05-2013	48.17	7.96	66.78	15.63
MEAN±S.E	**37.49±2.04**	**34.54±1.96**	**43.58±2.20**	**50.31±2.36**

Mites:

The data indicated (Table 4a) showed that after the use of post applications best treatment was in Trooh (3.83±0.56) followed

by drop cloth (2.37±0.51), neem oil (2.26±0.50), dhatura (1.13±0.35) and in control (4.28±0.69) was recorded on okra. Similarly, the data of reduction percent of mites (Table 4b) indicate that overall maximum mean reduction of mites (53.27±2.43%) was recorded in dhatura followed by (43.62±2.20%) in neem oil, (30.97±1.86%) in trooh and (24.52±1.65%) was recorded on drop cloth method.

Table- 04 (A) weekly mean population of mite on okra

Date of Observation/ weeks	T1 (Neem Oil)		T2 (Dhatura)		T3 (Trooh)		T4 (Drop Cloth)		T5 (Control)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1-.04-2013	3.96	2.20	2.55	1.60	3.21	1.80	3.06	2.33	4.14	3.84
08-04-2013	3.92	3.21	2.65	1.66	2.33	1.20	3.96	2.13	3.39	3.25
15-04-2013	4.37	2.16	0.87	0.25	3.14	2.40	3.23	2.60	2.52	2.25
22-04-2013	4.51	2.63	3.14	1.47	3.25	2.50	3.53	2.50	4.69	4.57
29-04-2013	4.15	2.36	2.83	1.40	5.32	3.30	2.53	1.80	5.75	5.66
06-05-2013	3.71	2.73	2.76	2.21	4.71	3.20	3.70	2.53	4.89	4.58
13--05-2013	3.96	2.30	3.01	0.15	4.57	3.70	4.20	3.83	5.16	5.14
20--05-2013	3.65	1.93	2.87	0.19	5.09	4.03	3.93	2.36	4.19	4.11
27-05-2013	4.16	0.80	2.84	1.25	4.96	3.36	3.30	2.60	5.11	5.08
Mean+ S.E	**4.04±0.67**	**2.26±0.50**	**2.61±0.54**	**1.13±0.35**	**4.06±0.67**	**3.83±0.56**	**4.16±0.67**	**2.37±0.51**	**4.43±0.70**	**4.28±0.69**

Table- 04 (B) Reduction %age of Mites

Date of Observation	T1 (Neem Oil)	T2 (Dhatura)	T3 (Trooh)	T4 (Drop cloth)
1-04-2013	48.60	41.91	48.10	20.82
08-04-2013	14.70	35.92	42.73	44.90
15-04-2013	43.25	68.50	14.51	9.85
22-04-2013	40.89	54.23	26.31	29.30
29-04-2013	47.63	49.10	36.48	28.15
06-05-2013	26.80	19.50	30.10	27.92
13--05-2013	41.71	95.01	19.60	8.81
20--05-2013	46.90	54.50	20.35	29.69
27-05-2013	82.10	60.80	40.58	21.22
MEAN±S.E	**43.62±2.20**	**53.27±2.43**	**30.97±1.86**	**24.52±1.65**

DISCUSSION

Bio-insecticides and drop cloth methods are environment friendly IPM techniques and looks to have some supremacy over synthetic insecticides (Grainge and Ahmed, 1988). These techniques are believed to be safe and are renowned for their diverse pest control properties as compared to synthetic insecticides. Although, their use is limited due to the instability, so needs its application at short intervals. The study showed that maximum reduction percent of jassid was found through drop cloth methods (59.42±2.57) followed by dhatura (55.58±2.49), neem oil (33.44±4.98%) and trooh (32.165±1.90%). Drop cloth and dhatura gave better results against jassid than neem oil and trooh. The drop cloth IPM technique was first time tested and compared with other biopesticides. The cost of biopesticides and drop cloth methods is cheaper and environment friendly for the control of jassid as compared to synthetic pesticide chemicals. The biopesticides dhatura, trooh and neem are commonly grown in fields. The processing of biopesticides is easier whereas, the neem oil is pressed in machines and available in the market. These results are in the line of many researchers. According to Khattak *et al.* (2001) plant extracts found very effective against jassid and whitefly up to 12 days after application. Adiroubane and Letchoumanane (1998) evaluated efficacy of plant extract against jassid and found effective results.Dhingra *et al.* (2008) also examined bio pesticides against the pests of okra including jassid and whitefly and found neem based insecticide effective up to 7 days.

Similar trend of reduction percent was seen for the control of whitefly with maximum reduction by drop cloth followed by dhatura, neem oil and least reduction percent was observed in trooh. However, in case of thrip maximum

reduction was observed in drop cloth method followed by trooh, dhatura and neem oil. The results further showed different patterns against mites. Dhatura and neem oil gave better performance for the control of mites than trooh and drop cloth. The drop cloth showed poor performance against mites could be due to their small size and feeding in colonies under webs. These results are supported by many researchers reported that integrated treatments were more effective against insect pests in okra as compared to insecticide. Adilakshmi *et al.,* (2008) and Ahmad *et al.,* (2011) verified bio-insecticides against sucking pests and they found the plant extracts comparatively less effective than insecticide, but it gave good control during initial or low infestation. Mudathir and Basedow (2004) found that neem based insecticides significantly reduced insect pest infestation in okra.

These IPM techniques are safest for human beings and beneficial insects. According to Caboni *et al.,* (2006) the plant based insecticides are safest for humans and biological control agents due to its lesser residual toxicity. The plant extracts are safer against coccinellid predators (Gowri*et al.,* 2002; Mishra and Mishra, 2002), *C. carnea* and *T. chilonis* (Praveen and Dhandapani 2001; Rao and Raguraman, 2005) and might be contribute to preserve the natural enemy biodiversity in crop ecosystem (Rao and Raguraman, 2005).

In conclusion, it is suggested that drop cloth method and plant based insecticide (dhatura, neem oil and trooh) are the cheapest and safest techniques for the control of sucking insect pests of okra and can be applied during lower infestations, whereas during heavy infestations we might be required chemical control. The validity of this experiment needs further perceptiveness of the IPM approaches by integrating drop cloth method, plant extracts, biological control and chemical control for developing effective and efficient strategies for sucking insect pest of okra.

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