



Pest status of leaf miner, *Acrocercops syngamma* M. on common varieties of cashew in Puttur region of Karnataka

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ABSTRACT: Studies were conducted in a cashew plantation at Puttur, Karnataka, India during 2011 - 14 using 11 common cashew varieties during post monsoon flushing period to determine the pest status of leaf miner, *Acrocercops syngamma* M. Maximum number of larvae in a single leaf ranged between 15 and 45 among the varieties. Least larval density was recorded on NRCC-Sel-2 followed by Vengurla-4, while, highest was recorded on Ullal-4, V-7 and MDK-2. In most of the varieties, there was no significant relationship between the leaf area and the number of leaf miner larvae. Considering the average leaf area of infested leaves and the average leaf area damage, the number of larvae required for a complete leaf was calculated between 17.4 and 29.1. Which was highest for Bhaskara and lowest for V-1. Distribution of number of leaf miner larvae against the percentage of infested leaves revealed that, nearly 90 percent of infested leaves had number of larvae between 1 and 10. During the four years, the leaf miner pest status remained as low to medium in all cashew varieties.

Keywords: *Acrocercops syngamma*, cashew, leaf miner, pest status

INTRODUCTION

Cashew (*Acrocercops syngamma* M.) is a major cash crop grown in many tropical countries including India. More than 180 insect pests attack cashew, of which cashew leaf miner, *Acrocercops syngamma* M. (Lepidoptera: Gracillariidae) is of considerable importance (Sundararaju, 1984, Beevi *et al.*, 1993). Leaf miner is one of the important pests of cashew during post monsoon period all over the country. The larvae after hatching from the eggs, start mining the epidermal layer on the upper surface of the tender cashew leaves as well as tender shoots. As a result of feeding, the affected area form blistered patches of greyish white colour. As the infested leaves mature, the damage manifest as big holes. Young plants are observed to be more prone to attack by this pest. Up to eight and 15 caterpillars have been observed on a single leaf by Rai (1984) and Athalye and Patil (1999) respectively. During the developmental period, leaf miner larvae are dull white and turn pinkish before pupation. After full development, the larvae fall off to the soil where they pupate and emerge after 7-9 days. The adult is a silvery grey moth, lays eggs on tender leaves. The incubation, larval and pupal periods lasted for 4.57, 9.35 and 8.35 days, respectively and the total life cycle varied between 20 to 40 days (Athalye and Patil, 1999).

In general, leaf damage of 2.2 to 80.0 per cent by leaf miner have been recorded on cashew depending on

the age of the tree, season and place in different cashew growing regions of the country (Sundararaju, 1984; Ayyanna *et al.*, 1985; Jena *et al.*, 1985, Chatterjee, 1989). While in the changing scenario, proper determination of pest status for the pests on a particular crop variety is important to evolve suitable control measures. Earlier, Jacob (1993) had developed a simple method for assessing the pest status of the cashew leaf miner. But until now, there is no information on varietal impact of cashew on the pest status of leaf miner. Hence, the present investigation aimed to find out differences in pest status of leaf miner on certain cashew varieties based on larval density and the damage inflicted on leaves.

MATERIALS AND METHODS

The study was conducted in 11-14 years-old cashew plantations of DCR, Puttur from 2011 to 2014. The leaf miner incidence was noticed from initial infestation till their disappearance. To assess the pest status, eleven cashew varieties were selected and in each variety, a total of 100 laterals were observed randomly. In each lateral, total number of leaves and the number of leaf miner infested leaves with counted for computing per cent incidence. During November, when peak infestation occurs, 100 number of miner infested leaves were collected randomly from the laterals and brought to laboratory and the leaf area was calculated following the simple regression equation developed by Rao and Sebastian (1994). The equation developed for calculating

cashew leaf area is, $Y = 0.71 * x$. where x is the product of leaf length (l) and maximum width (w), with R^2 value of 0.96. After taking the total leaf area of each variety, the blotch area formed due to the complete development of a leaf miner from hatching to pupation was calculated variety wise using the trace paper method. A set of 40 to 50 such blotches were measured for each variety.

To assess the pest status of leaf miner in the field by non-destructive means, a method developed by Jacob (1993) was adopted as follows. The number of sample leaves observed was 150 in each variety. The total number of larvae present in the sample leaf population was counted to work out the number of larvae in 50 leaves by using the formula: $J = 50 X/n$. Where, 'X' is the total number of larvae in the sample leaves, 'n' is the number of leaves in the sample. Then, minimum number of larvae required to cause a 10% loss (J_1) and 5% loss (J_2) in the photosynthetic area of 50 leaves was calculated. The value of 'J' is then compared to those of ' J_1 ' and ' J_2 ' for fixing the status of the pest. If 'J' is equal to or higher than J_1 , the pest status was considered as high, if less than J_2 , then pest status as low; and if between J_1 and J_2 , as medium.

RESULTS AND DISCUSSION

After the cessation of South-West monsoon, flushing of new shoots occurs on cashew from August onwards. Initial leaf miner infestation occurs on those

new flushes, feeds on the leaf epidermal portion resulting in blisters, and gradually builds-up. It is an established fact that the yield of a crop is directly related to the total leaf area available for photosynthesis. But in case of leaf miner, damage seldom results in destruction of the entire leaf area, and the undamaged portion continues with normal photosynthetic activity. Four years observation (2011-12 to 2014-15) on the cashew plantations revealed regular occurrence of leaf miner infestation in all the varieties of cashew. The population build-up of leaf miner shows a gradual increase from August till October, reaching the peak during mid-November and then declining abruptly. Hence, leaf miner infestation in terms of percent infested leaves was high during November (Fig. 1). A maximum per cent leaf infestation of 18.31 per cent was recorded during the month of November during 2011-12. Among the four years, percent infested leaves was found to be more during 2011-12 and 2014-15, hence varietal observations were made during those particular years.

Number of leaf miner larvae per infested cashew leaf varied widely among the varieties. A maximum of 45 larvae/leaf was recorded on Ullal-4 followed by V-7 (44 larvae), VRI-3 (41) and MDK-2 (40). But, only up to 15 and 16 larvae was seen on NRCC-Sel-2 and V-4 respectively. Within a single blotch, even up to five larvae were seen. Correlation studies showed that there was no uniform correlation between leaf area/length/breadth

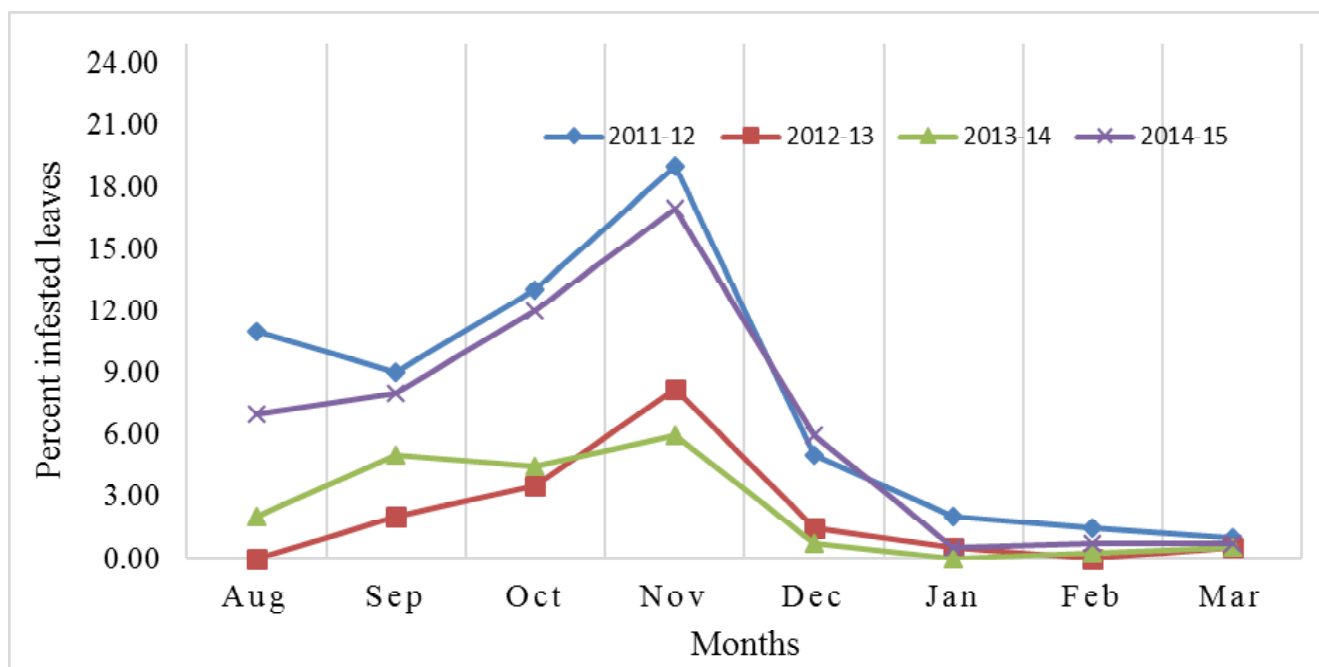


Fig. 1. Percent infestation of cashew leaf miner from 2011-12 to 2014-15

and number of leaf miner larvae among the varieties (Table 1). As observed by Jacob and Belavadi (1990), in most cashew varieties, there was no positive relationship between the size of the leaf and the number of larvae, except Ullal-1, Ullal-4, Dhana and MDK-2. There was no significant relationship between the number of leaf miner larvae and any of the leaf measurements in Ullal-3, V-1 and VRI-3.

The distribution of leaf miner larvae per cashew leaf revealed that, invariably in all varieties, majority of infested cashew leaves (> 90 %) had larvae between 1 and 10. During 2011, leaf miner population did not

exceed 10/ leaf only in V-4. While in nine varieties, population exceeded even beyond 20 in considerable number of leaves. This is in contrast with Jacob and Belavadi (1990), who recorded only one leaf (0.5 %) in the whole sample had high density of eight larvae/leaf, while 59.18 percent of the leaves had 1 larva/leaf, 27.04 percent had 2 larvae/leaf.

To assess the pest status, assessment of the leaf area is important. Wide variation in leaf area was observed among the varieties (Table 2). Average leaf area of miner infested leaves ranged from 47.23 (V-1) to 80.1 cm² (V-7). In the same way, there was a marked variation

Table 1. Correlation between number of leaf miner larvae and length, width and area of infested leaves among cashew varieties

Variety	Range of leaf miner larvae/leaf	Correlation coefficient		
		Leaf length	Leaf width	Leaf area
<i>Ullal-1</i>	1-24	0.236	0.306*	0.273*
<i>Ullal-3</i>	1-29	0.031	-0.172	-0.043
<i>Ullal-4</i>	1-45	0.564**	0.082	0.356**
<i>V-1</i>	1-35	0.014	0.041	0.001
<i>V-4</i>	1-16	-0.210	-0.272*	-0.245
<i>V-7</i>	1-44	0.271*	0.264*	0.247
<i>NRCC -2</i>	1-15	0.252	0.295*	0.285*
<i>Bhaskara</i>	1-32	0.304*	0.005	0.169
<i>VRI-3</i>	1-41	0.080	0.026	-0.007
<i>Dhana</i>	1-26	0.584**	0.225	0.437**
<i>MDK-2</i>	1-40	0.510**	0.373**	0.477**

Table 2. Variation in average leaf area and leaf area damage per leaf miner among cashew varieties.

Variety	Average leaf area of infested leaves (cm ²) mean ± SEM	Average leaf area damage/leaf miner (cm ²) mean ± SEM	No. of larvae required for a complete leaf damage
<i>Ullal-1</i>	63.42±5.82	3.16±0.18	20.1
<i>Ullal-3</i>	72.85±4.79	2.73±0.25	26.7
<i>Ullal-4</i>	67.10±3.86	3.06±0.10	21.9
<i>V-1</i>	47.23±3.49	2.71±0.13	17.4
<i>V-4</i>	75.03±8.41	2.71±0.14	27.7
<i>V-7</i>	80.10±5.24	3.09±0.11	25.9
<i>NRCC-2</i>	69.55±5.63	2.95±0.12	23.6
<i>Bhaskara</i>	80.05±6.24	2.75±0.16	29.1
<i>VRI-3</i>	62.98±4.20	3.11±0.09	20.3
<i>Dhana</i>	75.21±4.69	2.94±0.14	25.6
<i>MDK-2</i>	74.47±4.51	3.11±0.16	24.0

Table 3. Pest status of leaf miner among cashew varieties in 2011 and 2014

Variety	J1	J2	Pest status in field (2011)			Pest status in field (2014)		
			X	J	Status	X	J	Status
<i>Ullal-1</i>	97.85	48.92	249	64.93	Medium	233	60.68	Medium
<i>Ullal-3</i>	130.04	65.02	214	55.77	Low	213	55.43	Low
<i>Ullal-4</i>	106.90	53.45	184	47.79	Low	187	48.72	Low
<i>V-1</i>	85.07	42.54	260	67.79	Medium	133	34.74	Low
<i>V-4</i>	134.91	67.45	115	29.91	Low	103	26.82	Low
<i>V-7</i>	126.29	63.15	191	49.80	Low	169	44.11	Low
<i>NRCC -2</i>	114.92	57.46	176	45.77	Low	113	29.50	Low
<i>Bhaskara</i>	141.84	70.92	270	70.22	Low	199	51.78	Low
<i>VRI-3</i>	98.73	49.36	245	63.69	Medium	109	28.51	Low
<i>Dhana</i>	124.66	62.33	253	65.85	Medium	219	57.07	Low
<i>MDK-2</i>	122.64	61.32	214	78.63	Medium	213	49.72	Low

of leaf area damage by individual miner among the varieties. Average leaf area damage (i.e., a blotch) caused by individual leaf miner larva upon full development varied from 2.71 (V-1, V-4) to 3.16 cm² (Ullal-1). Based on the average leaf area and the average leaf area damage per leaf miner, number of larvae required for a complete leaf damage was found between 17.4 (V-1) to 29.1 (Bhaskara) (Table 2). But Jacob (1993) has recorded the average area of a cashew leaf was 58.84 cm² and the mean blotch area was 3.58 cm², but the study did not state on which cashew variety the experiment was conducted. Since, average leaf area of V-1 variety itself was less compared to all other varieties, less number of larvae (17.4) would be sufficient for complete leaf damage followed by Ullal-1 and VRI-3. However in Bhaskara, average leaf area was more (80.05cm²), while, the leaf area damage per leaf miner was less (2.75 cm²), indicating that Bhaskara succumbs to less leaf miner damage followed by V- 4 and Ullal-3. Under Andaman conditions, leaf area of infested leaves varied from 10 to 224 cm² and the number of larvae per leaf ranged from 1 to 14 (Jacob and Belavadi, 1990).

According to Jacob (1993), in Andaman, the minimum number of larvae required to cause a 10% loss (J₁) and 5% loss (J₂), in the photosynthetic area of 50 leaves of cashew was found to be 82.18 and 41.09 respectively. But the present investigation revealed J₁ of 85.07 to 141.84 and J₂ of 42.54 to 70.92 among the cashew varieties in Puttur (Table 3). Hence, location as well as varietal based differences are evident. During 2011, the leaf miner pest status was low in Ullal-3, Ullal-4, V-4, V-7, NRCC-2 and Bhaskara, whereas, it was

medium in the remaining five varieties. However during 2014, the pest status was low in all varieties except Ullal-1 (Table 3).

In nature, leaf miner population is taken care by three eulophid larval parasitoids that brings down the population even up to 50% under field conditions (Vanitha, 2015). Besides, it was noticed that initial larval density has an effect on percent larval survivorship in a leaf. Compared to less larval density, the number of larvae that reaches pupal stage was comparatively less at high larval density. Similar results were also reported earlier by Jacob and Belavadi (1990). Hence, management of this pest is required only during severe incidence especially on young plants.

Need based applications of 0.05 percent triazophos, and cyper methrin were found effective against leafminers (Athalye and Patil, 1999). The study revealed the pest status of leaf miner on different cashew varieties and hence, in the locations having severe endemic incidence of leaf miner the varieties which have less incidence would be suitable.

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