

**DISTRIBUTION PATTERN OF SUGARCANE WOOLLY APHID ON SUGARCANE PLANT BASED ON LEAF COLOUR**

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**ABSTRACT**

Sugarcane Woolly Aphid (SWA; *Ceratovacuna lanigera* Zehntner; Homoptera: Aphididae), a serious pest of sugarcane in Sri Lanka since 2006, has caused a significant reduction of sugarcane yield and juice quality. Information on the bio-ecology of this pest is required to plan population management strategies. This study examined the distribution pattern of SWA and its association with leaf colour in sugarcane cultivation in Sri Lanka. Distribution of SWA within the plant was studied at the research farm of the Sugarcane Research Institute, Uda Walawe, and sugarcane plantations at Sevanagala and Pelwatte in the Monaragala district, and Kahataruppa in the Badulla district of Sri Lanka, representing all agro-ecological regions where sugarcane is commercially cultivated. The association of SWA with leaf colour was observed with the variety SL 97 1442 planted in the research farm. The SWA was not evenly distributed within a sugarcane plant as the population levels on young, mature and old leaves were significantly different ( $p < 0.01$ ). The highest population level of SWA was found on mature leaves. The SWA was often found on leaves with greyish green colour than on those of yellowish green colour.

**Keywords:** Leaf colour, Sri Lanka, Sugarcane Woolly Aphid, within-plant distribution

**INTRODUCTION**

Sugarcane Woolly Aphid (SWA; *Ceratovacuna lanigera* Zehntner; Homoptera: Aphididae), is a serious sap-sucking pest of sugarcane, causing heavy losses to sugar yield. In 2006, it caused severe economic losses to cane growers, small-scale sugarcane processors and large scale sugar-manufacturing companies in Monaragala and Badulla districts of Sri Lanka. In Maharashtra, India, 7-39 % reduction in cane yield and 1.2 to 3.43 unit reduction in sugar recovery has been recorded (Patil and Nerkar, 2004). In Sri Lanka, though the extent of damage

has not yet been estimated, observations have shown that all sugarcane plantations in Passara area of the Badulla district were completely destroyed while in other sugarcane-growing areas, the crop was badly damaged causing a significant loss of sugarcane yield and sugar contents in cane.

The physiological development of the host plant would influence the pattern of aphid infestation within a plant (Ibbotson and Kennedy, 1950). In Japan, narrow and erect leaves were affected to a great extent and soft, broad and drooping leaves were more suitable for aphid build up

(Takano, 1941). Holopainen *et al.* (2009) have reported a significant positive correlation between the intensity of yellow colouration in leaves and the number of aphid species in plants. The knowledge of the distribution pattern of SWA within a plant, which also has some association with the leaf colour, is important in managing the pest.

This study was conducted to examine the distribution pattern of SWA in sugarcane plants and its association with leaf colour in the sugarcane plantations in Sri Lanka.

## MATERIALS AND METHODS

### *Within-plant distribution of SWA*

A study on within-plant distribution of SWA were carried out from June to August 2010 at the research farm of Sugarcane Research Institute (SRI), Uda Walawe, and in sugarcane plantations at Sevanagala and Pelwatte of Monaragala district, and Kahataruppa in Badulla district of Sri Lanka, representing all commercial sugarcane-cultivating areas in different agro-climatic conditions. The SWA-infested plants were randomly selected from 100 plants of the sugarcane variety SL 97 1442 from Uda Walawe, 85 plants of variety Co 775 from Sevanagala, 75 plants of variety Co 775 from Pelwatte and 65 plants of variety Co 527 from Kahataruppa.

Six SWA-infested leaves (young, mature and old) were selected randomly from each plant. The number of aphids present on five spots, each having an area of 2.5 cm x 2.5 cm, was counted from each selected leaf. The mean and median of the number of SWA per 2.5 cm x 2.5 cm area was estimated and the significance in differences in distribution within a plant was analyzed using Kruskal-Wallis Test

using SAS.

### *Response of woolly aphid to leaf colour of sugarcane*

An experiment was conducted using the variety SL 97 1442 planted in the research farm of Sugarcane Research Institute, Uda Walawe during June-August 2010 to study the leaf colour preference of SWA. Sixty five SWA-infested plants and six opened green leaves from each plant representing two from young, mature and old were randomly selected. Infestation levels of SWA were categorized into four groups according to Padul *et al.* (2008). The total number of different colour spots for each infestation level was recorded using the Mansell colour chart. The percentage of each colour code for each SWA infestation level was calculated.

## RESULTS AND DISCUSSION

### *Distribution of SWA within a plant*

The population levels on top, middle and lower leaves were statistically significant ( $p < 0.01$ ) in plants in all four sites (Table 1). The highest population level of SWA was found on mature leaves followed by old and young leaves. The SWA was not evenly distributed within a sugarcane plant.

These findings agree with Uichanko *et al.* (1928) who reported that mature leaves are more prone to aphid attack than the young leaves. Kennedy (1958) stated that the apex leaves, as sites of protein synthesis, and the oldest leaves that are undergoing leaf proteolysis, were frequently preferred sites for aphid attack due to high soluble nitrogen levels. However, in sugarcane, mature leaves (middle position of the plant) are more prone to SWA build up than the young and

old leaves, and hence further researches are needed to identify reasons for this phenomenon.

**Table 1. Population levels of SWA on sugarcane leaves at Uda Walawe, Sevanagala, Pelwatte and Kahataruppa from June to August in 2010**

Location	SWA population on leaves (Median and Mean values)		
	Young	Mature	Old
Uda Walawe	1.0 <sup>a</sup> (5)	22.6 <sup>b</sup> (28)	14.8 <sup>c</sup> (19)
Sevanagala	7.3 <sup>a</sup> (16)	30.9 <sup>b</sup> (34)	20.3 <sup>c</sup> (21)
Pelwatte	0.8 <sup>a</sup> (7)	15.1 <sup>b</sup> (17)	9.3 <sup>c</sup> (11)
Kahataruppa	4.4 <sup>a</sup> (8)	28.2 <sup>b</sup> (31)	8.7 <sup>a</sup> (14)

Figures in parentheses are mean values of SWA population. Within a row, the median followed by the same letters are not statistically significant at p=0.01

**Response of sugarcane woolly aphid to leaf colour**

The leaves of SL 97 1442 plants had 18 different colour codes including the SWA-free leaf spots. Among them colour codes recorded in SWA infested leaf spots and those related to different infestation levels are shown in Table 2. The colour codes related to the different infestation levels shown in Table 2. The SWA was often found on greyish green leaves than on yellowish green leaves. This finding agrees

with the results of within-plant distribution of SWA as higher population on mature leaves that are greyish green colour than the young and old leaves that are yellowish green in colour. An experiment in India reported that highly susceptible varieties for SWA are with dark green leaves and highly resistant varieties with yellowish green leaves (Fernando, 2009). This relationship can be used in selecting sugarcane varieties for SWA resistance.

**Table 2. Recorded colour codes related to the different SWA infestation levels**

SWA Infestation Level	Recorded Colour Codes	Most prominent colour code
Low	5 GY 5/8, 7.5 GY 4/4, 7.5 GY 4/6, 7.5 GY 5/8, 7.5 GY 5/10, 7.5 GY 6/8	7.5 GY 4/4
Moderate	7.5 GY 4/6	7.5 GY 4/6
High	7.5 GY 4/6, 10GY 4/4	7.5 GY 4/6

**CONCLUSIONS**

The distribution of SWA populations in a sugarcane plant is uneven with the highest

level found on mature leaves, which are greyish green colour.

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