

Short Communication

A study of the larval instars of the green acalypha mealybugs in Ogbomoso, Oyo State Nigeria

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Accepted 10 July, 2016

The biology and description of various developmental stages of the mealybug found on the green acalypha plant in Ogbomoso, Southern Guinea Savanna was evaluated. The study shows that the stylets of the 1st and 3rd instars as well as adult stages are straight while that of the 2nd instar is somewhat coiled up. Furthermore, identification key chart was prepared using the characters which are peculiar to each instar. The third instar can be identified using the tip of abdomen that is broad with inconspicuous setae and body length that is 13 mm. The adult stage is peculiar with its tip of abdomen which is narrow with 2 short setae and a body length usually 13 mm.

Key words: Acalypha, antenna, instar, Rastrococcus, savanna, stylet.

INTRODUCTION

Mealybugs are tiny insects of the order Hemiptera and family Psuedococcidae which can be found on ornamental plants such as hibiscus plants, acalypha plants, croton, cassava and fruit plants such as mango and guava (Agounke et al., 1998). They are usually covered with white cottony substance known as mealy wax, and are oval in shape with different colours such as creamy, pink, purple depending on the species. Mealybugs are usually soft bodied insects with distinct segmentation. The adult female many measure from 1-9 mm long, but the common length for most specie is about 1.5-4 mm long and often with series of 1- 18 short wax filaments around the body margin; those at the posterior end are usually larger than the others (Williams, 1986). Green acalypha – *Acalypha torta* (F: Euphobiaceae) is an ornamental plant. It is grown for the purpose of beautifying the environment and also for medicinal purposes (Okanla et al., 1990). The plant has contoured leaves which are curl shaped, olive green in colour with a creamy margin at the edge. It has a serrated edge with obvious mid-ribs and veins on the surface of the leaves.

The young leaves are succulent and their stalks are sappy but they tend to lose their sappiness with development or age. Acalypha plant is prone to mealybug attack (Greensil, 1992). The Acalypha plant blooms with the onset of spring with a peak in the bloom from mid April to mid May and the blooming period last for a long period or time, i.e. June to October. Mealy bugs are usually abundant on the green acalypha plant during the dry season and more or less absent during the raining season (Valuli and Kosol, 1992; Boavida and NeuenSchwander, 1995).

The objective of this work is to determine and describe the larval instars of the green acalypha mealybugs in Ogbomoso, Oyo State Nigeria – a southern guinea savanna ecological zone and using available information to construct identification key that is useful for field recognition of various developmental stages.

MATERIALS AND METHODS

The Acalypha plants used for this experiment were obtained from the Parks and Garden of Ladoke Akintola University of technology Ogbomoso. The plants were treated according to the method of Okiti (2001) and were later infested with acalypha mealy bug juvenile/crawlers and the development of the mealybugs was monitored. Monitoring was to determine the change from one stage.

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Table 1. Measurement of body appendages (mm).

Body appendage	1 st Instar	2 nd instar	3 rd instar	Adult
Body length	7.23±0.35 ^a (6.88 – 7.58)	10.13±0.35 ^b (9.78 – 10.48)	11.30±0.35 ^c (10.95 – 11.65)	13.47±0.35 ^d (13.72 – 13.82)
Body Width	4.27±0.56 ^a (3.71 – 4.83)	5.73±0.56 ^b (5.17 – 6.29)	6.80±0.56 ^{bc} (6.24 – 7.36)	7.43±0.56 ^c (6.87 – 7.99)
Length of Antenna	2.03±0.38 ^a (1.65 – 2.41)	2.03±0.38 ^a (1.65 – 2.41)	2.13±0.38 ^a (1.75 – 2.51)	2.33±0.38 ^a (1.95 – 2.71)
Length of stylet	1.10±0.13 ^a (0.97 – 1.23)	1.20±0.13 ^a (1.07 – 1.33)	1.40±0.13 ^a (1.27 – 1.53)	1.45±0.13 ^a (1.32 – 1.58)
Prothoracic leg	2.30±0.36 ^a (1.94 – 2.66)	3.80±0.32 ^b (3.48 – 4.12)	3.90±0.32 ^b (3.58 – 4.22)	4.07±0.32 ^b (3.75 – 4.39)
Mesothoracic Leg	3.00±0.62 ^a (2.38 – 3.62)	4.33±0.62 ^a (3.71 – 4.95)	4.46±0.62 ^a (3.84 – 5.08)	4.50±0.62 ^a (3.88 – 5.12)
Metathoracic leg	2.77±0.79 ^a (1.98 – 3.56)	4.70±0.79 (3.91-5.49)	4.73±0.79 ^b (3.94 – 5.52)	4.83±0.79 ^b (4.04 – 5.62)

Values are (x +SD) followed by range in parenthesis.

Values with the same letters represent those with no significant difference, while those with different letters represent those with significant differences.

to the other such that the period from the first instars to the adult was determined. Insect of each stage was collected i.e. from the first instars to the adult stage and slide preparations were made.

The insects were placed in 10-20% KOH and heated for about five minutes or longer depending on the level of sclerotization. They were then removed and placed on a glass dissecting block to expel body content by gentle pressure keeping the insect pressed dorso-ventrally. They were then placed in alcohol to remove the wax crystal which usually forms inside the body of the mealybug. The mealy bugs were then transferred into carbon-xylene for about 10 min. They are placed in alcohol again to remove carbol -xylene and stained in acetocamine for 30 min. They were further transferred into alcohol for complete dehydration and then in clove of oil for about 0.5 h. The specimen was then placed on microscope slide and surplus clove oil was removed with fine filter paper. A drop of Canada balsam filter was then placed on specimen and cover slip was gently lowered. Each specimen was then viewed under the microscope. The measurements of the body appendages of each instar were done in millimeter under a dissecting microscope fitted with a graduated graticle. Morphometric measurements of the following were taken: body length, body width, length of antenna and number of segments, prothoracic, mesothoracic and methathoracic legs and length of stylet (modified mouth part).

Taxonomic keys for identification (of each stage of development from first instar to the adult) were then developed based on the characters observed and the measurements of the appendages. All values got were subjected to statistical analyses (one way ANOVA) and the means compared with Duncan Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

The body length showed significant differences amongst the instars hence the reason for the difference in Table 1. The body width also showed significant differences between the instars except in the third instar. There is no significant difference in the length of antenna amongst all

the instars. The length of stylet also did not show any significant difference as well. For prothoracic legs, there is significant difference only in the first instar i.e. (2.30±0.36 mm), while the second, third and adult stages shows no significant difference i.e. (3.80± 0.32, 3.90 ± and 4.07 ± 0.32 M, respectively) . The metathoracic leg does not show any significant difference during the different instars. There is a significant difference only in the first instar in relation to metathoracic leg, while the other instars do not show any significant difference.

There were significant differences between the four instars based on some characters such as the body length, width, the prothoacic leg and the metathoracic leg. These are good characters or keys which can be used to identify different instars. There were no significant differences in the length of antenna, stylet and mesothoracic leg. Those characters showing significant differences in Table 1 are represented with different alphabets signifying the differences.

In Table 2, the body length of the first instar is rarely above 8 mm, in the second instar it is never below 10 mm and hardly up to 11 mm, the third instar shows a body length ranging between 11 and 13 mm and rarely above 13 mm, while the adult ranges between 13 and 14 mm. The mean body length of the first instar is never up to 5 mm while the other instars show the same range of 4 mm or above. Also the length of the metathoracici leg in the first instar is about 3 mm and never above 3.5 mm while the other instars have the same range of 5 mm or more. The ventral abdominal segment is inconspicuous in both the first and the second instars and conspicuous in both the third and adult stages. They also possess short and slender marginal setae which occur in pairs around the

Table 2. Comparison chart for the character of each development stage.

Character	1st instar	2nd instar	3rd instar	Adult
Body length	Rarely above 8 mm	Never below 10 mm and hardly up to 11 mm	Ranging between 11 and 13 mm; rarely above	Ranging between 13 and 14 mm; about 7 mm
Body width	Never up to 5 mm	About 7 mm	About 7 mm	About 7 mm
Length of prothoracic leg	About 2 mm	4 mm or above	4 mm or above	4 mm
length of metathoracic leg	About 3 mm, never above 3.5 mm	5 mm or above	5 mm or above	5 mm
Tip of the abdomen	Broad with about 5 setae	Broad with inconspicuous setae	Broad with inconspicuous setae	Narrow with a 5 setae
Ventral Abdominal segments	Inconspicuous	Inconspicuous	Conspicuous	Conspicuous

abdominal region. The antenna of the *Acalypha* mealy bug has seven segments which are club shaped with the last segment being the longest of all.

The stylet of the mealybug at the 1st, 3rd and adult stages are straightened out while in the 2nd instar it is somewhat coiled up. Also the abdomen of the adult is narrow, protruding with two setae. The *acalypha* mealy bug at all stages is dorsoventrally flattened and oval in shape. Also the identification key chart describes the characters which are peculiar to each instar. The third instar can be identified using the tip of abdomen that is broad with inconspicuous setae, body length of 13 mm or below. The adult stage is peculiar with its tip of abdomen which is narrow with about 2 short setae, with a body length usually above 13 mm (Table 2).

ACKNOWLEDGEMENT

Becka Glory is acknowledged for her assistance during laboratory work.

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