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BIOLOGY OF SUGARCANE WOOLLY APHID (*Ceratovacuna lanigera*) UNDER LABORATORY CONDITIONS

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ABSTRACT

The Aphids are major pest for several crops including sugarcane in tropical region of the world. There we studied SWA biology. This pest deteriorating quality of sugarcane and economic loss predicted through infestation. The findings of the study might be useful for both farmers and management planners. The comparison of present findings may also provide scope for further investigations in laboratory under varied abiotic and biotic interactions on the pest.

Keywords: SWA, nymphal instars, alate, apterous, morphometry.

INTRODUCTION

The Sugarcane crop is attacked by several insect species as stem-borers, white grab, mealy bug, scale insect etc and previous study showed insects viz. tissue-borers, white grabs, mealy bugs, scaly insects, white clies etc. and previous study showed 20% and 15% in cane yield and sugar recovery due to attack by various pests (David and Nandgopal, 1986; Awasthy, 1977). Among them, sugarcane wooly aphid (SWA) *Ceratovacuna lanigera* is a new several parts of oriental region. Some of the minor pests like sugarcane wooly aphid have attained the status of major pests of sugarcane in India.

The SWA was first recorded in West Bengal and Bihar in different part of the North East India as a minor port. The pest incidence in severe firm was recorded from the first time in Maharashtra in July 2000 and in Karnataka during September 2002 (Joshi and Viraktamath, 2004). Sugarcane is the primary host as reported by Hill (1993) and bamboo is the secondary host (Aoki et al, 1994). Gupta and Goswami (1995) reported 15%, while Patil et al (2003) reported 7 to 39 percent reduction in cane yield, whereas reduction in sugar recovery

was 1.2 to 3.43 through heavy infestation of Sugarcane aphids. The attack of the pest is noticed on all the stages of the crop.

There is scarce study upon pest biology on sugarcane under laboratory condition. Therefore, this study might provide clue for pest management and planners to control pest population. The present finding gives insight about further investigations in controlled and field environments.

METHODS AND MATERIALS

The SWA biology was studied in PG Department at ZA Islamia College, siwan during 2017 under cage made up by plastic of about 15 x 9.5 x 4.5 cm ventilated through a small hole on the top surface. The cotton pad fixed to the cut margins of sugarcane leaf to aphids establishment on the lower leaf surfaces suspended from stand inside box. The sugarcane leaf continuously replaced and cotton pad wetting maintained in 20 such boxes in the laboratory. In such plastic boxes two freshly laid nymphs were released.

Freshly laid nymphs were detected and collected and released on sugarcane leaf. The same method was employed to study the different instars of SWA. Once in twelve hours the nymphs were examined to record the time to complete instars.

The time and date of release of nymphs were recorded. The summation of total nymphs period and adult period gave the total life cycle of the aphid. At an interval of twelve hours the adults were examined to record nymphs laid by adult aphid. The viviparous potentiality was recorded until the death of adult aphid. The biology was studied in different months under laboratory condition. The meteorological data were study period.

RESULTS AND OBSERVATIONS:

The SWA biology was studied in laboratory during the months of November 2016 to may 2017 under laboratory conditions.

First instar nymph: The freshly laid nymphs of apterous females were pale yellowish in color without woolly matter cover and have elongated ovoid bodies; antenna was shorter than the total body length but, longer than the width of the body. It has 4 segments and pale yellowish in color. The compound eyes were small, situated behind the base of the antenna and are black in color. The rostrum extended up to foreleg coxae. The cephalic horns were elongated and situated besides the antennae.

Second instar nymph: The second instar nymphs of apterous were pale yellow to green in color without woolly matter cover. Antenna was shorter than the total body length but longer than head. The compound eyes were of similar in structure as compared to first instar nymph and are blackish in color. The rostrum extended up to foreleg coxae. The cephalic horns were smaller as compared to first instar nymph.

Third instar nymph: The aphid was light brown in color. The waxy filaments were developed on the body, which were compact and cover the entire body except head region. The compound eyes were round and slightly bigger than those of the second instar. Rostrum extended just behind the foreleg coxae. The cephalic horns were reduced compared to first and second instar.

Fourth instar nymph: Fourth instar nymph was brown to dark brown in color with elongated pyriform body. The woolly matter on dorsum was loose thread like, densely covered the body and not so compact as compared to third instar. Antenna in four segmented and was smaller than total body length but as long as width of the head. The compound eyes were blackish in color. Rostrum extended up to fore-coxae. The cephalic horns of the fourth instar were smaller in size compared to rest of the instars.

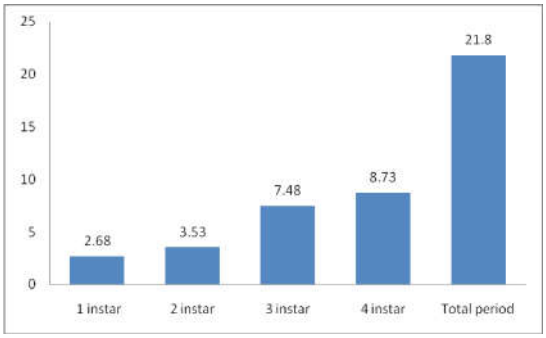

Figure 1. Biology of SWA under laboratory conditions during 2014-2015.

Total nymphal duration: Total nymphal duration of the apterous aphid under laboratory conditions ranged from 18.00 to 23.50 days with an average of 20.80 ± 1.55 days during July- August 2013 (Figure 1) and 24.00 to 29.00 days with an average of 26.91±1.17 days during July- August 2014 (Figure 2).

The longevity plotted in figure 3 and seasonal developmental period in figure 1 and 2, respectively for all nymphs.

Apterous adult: The apterous adult was elongate with laterally depressed body and dark brown in color. The densely covered filamentous woolly matter found throughout the body except head region and woolly matter was dense at posterior of abdomen. Antenna was four segmented. The rostrum extends up to first fore coxae.

The longevity of adult ranged from 1.60 to 1.70 mm with an average of 1.66±0.02mm and width varied from 0.90 to 1.00mm with an average of 0.94±0.05mm (Figure 3).

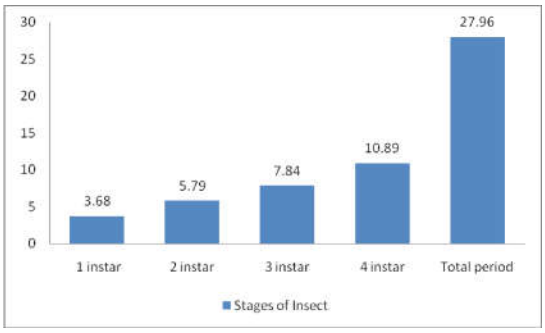

Figure 2. Biology of SWA under laboratory conditions during study period.

Alate form: The body length and width of alate form ranged 2.6 to 2.70 mm with an average of 2.63 ± 0.05 mm and width ranged from 0.90 to 1.20 mm with an average of 1.09 ± 0.10mm, respectively. The wings were transparent and the vein was green in color. The forewing was large and had three oblique veins emerging from sub costal vein. First and second oblique veins almost join at their bases. The stigma was large and dark green. The length of forewing ranged between 2.60 and 2.70mm with a mean of 2.63±0.05mm and width of 0.90 and 1.20mm with a mean of 1.09±0.10mm at its widest part. Hind wing was small with two oblique veins, which were run parallel and almost join at their bases. Hind stigma was large and dark green.

DISCUSSIONS:

The bio-ecology of SWA was studied both in laboratory and field during the months of July-November 2013 and 2014 for all life stages of sugarcane wooly aphid. There is paucity of pertinent literature on first instar SWA to avoid critical discussion. However, Patil et.al., (2004) reported that first instar nymphs are yellowish or greenish yellow in color and are very active and move fast on lower surface of leaf, under Indian conditions which is closer to the present observations.

The present observations about different nymphal periods are comparable with those of Takano (1941) who reported that nymphal stages occupied 23 to 32 days. Similarly, studies conducted by Patil et al (2004) indicated that nymphal stage ranged from 6 to 22 days. Although there is a slight deviation in present findings from that of Takano (1941) and Patil et al. (2004) which might be due to variation in the weather parameters under laboratory and field conditions.

The present findings about apterous adults are consistent with Takano (1941), who reported that the average longevity of apterous adults was 36 days. This variation may be due to the climatic factors.

The alate form of SWA was black in colour. The longevity of alate form in laboratory ranged with an average of 7.88 ± 0.58 days during July-August 2013 (Figure 3). Different findings slightly are in agreement with Takano (1941) from Japan, who reported that longevity of alate aphid was 8.3 days, this variation may be due to topographical and weather parameters.

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