

**SEASONAL PREVALENCE AND TIME RELATIVE POPULATION
TREND OF THE SUGARCANE SOFT SCALE, *PULVINARIA
TENUIVALVATA* (NEWSTEAD) (HOMOPTERA: COCCIDAE)
IN GIZA GOVERNORATE**

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Abstract

The changes in the seasonal population fluctuations as well as population of nymph and adult stages of the sugarcane soft scale *Pulvinaria tenuivalvata* (Newstead) were studied throughout 1997 and 1998 sugarcane growing seasons. *P. tenuivalvata* is a considered occasional insect pest attacking sugarcane plantations. It appeared in few numbers by the 3rd week of May. Dynamics of the nymphal stage showed three district peaks occurred in May, September and November. Fluctuations of adult stage demonstrates three peaks occurred at 19th July, 20th September and 1st November 1997, while three peaks were shown by 1st August, 26th September and 22nd November in 1998 season. In general, insect population was significantly higher in 1998 than in 1997. Monthly variation rates (MVR) of *P. tenuivalvata* ensured that this insect species may develops three overlapping generations annually.

INTRODUCTION

Sugarcane is the major crop for producing sugar in Egypt. It occupies about 318.900 feddan concentrated in Upper Egypt districts. Recently, sugarcane plantations are invaded by a coccid scale pest, *Pulvinaria tenuivalvata* (Newstead) (Ali *et al.* 1997 & 2000). Karam and Abu El-Kheir (1992) recorded *Pulvinaria elongata* Newstead for the first time on sugarcane leaves at Alexandria, in the same year Maareg *et al.*, (1992) mentioned that, the same species in his preliminary survey of the scale insects attacking sugarcane in Egypt. In other countries, sugarcane is severally attacked by around 35 species of hard and soft scale insect

belonging to the families: Aderidae, Asterolecaniidae, Coccidae and Diaspididae (Rao and Bhaskar, 1960; Tembhekar, 1965; Rao and Sankaran, 1969; Moholkar and Ranadive, 1973 and Karam, 1990).

In 1996, *Pulvinaria tenuivalvata* appeared for the first time in sugarcane plantations at Attfieh, Giza as sporadic increasing trend (Ali *et al*, 1997). An extensive and severe occurrence in Upper Egypt governorates particularly Quena, Luxor and Aswan in 1998-2000 took place thus proving the beginning of a new increasing trend in the survival of this insect pest.

Unfortunately, quite little descriptive information about the population developmental rates and population trend of *P. tenuivalvata* under Egyptian agro ecosystem are available, therefore, the present work carried out monitoring studies the fluctuations of the population density.

MATERIALS AND METHODS

Population estimates

Monitoring the changes in the population density of *P. tenuivalvata* (Newstead) (Homoptera: Coccidae) was estimated in sugarcane fields at Attfieh/ Giza governorate during two successive seasons 1997 & 1998. To perform these estimates, field of about one feddan (4200 m²) was chosen. Weekly random samples each of 10 plants were picked, from the four field borders and the center of the field were investigated. Three plant leaves, representing the three plant levels (low, median and upper) were carefully examined. The number of different insect stages via nymph and adult, scales existing on upper and lower surfaces of leaves were counted and recorded.

Meteorological records

Meteorological records mainly day maximum, day minimum and daily mean temperature (°C) daily, average relative humidity (%) and wind velocity at Giza district in the tested seasons (1997 & 1998) were obtained from The nearest

Meteorological station. These records were considered representing the field experimental circumstances.

RESULTS AND DISCUSSION

Monitoring the changes in the seasonal fluctuations and population dynamics of the sugarcane soft scale *P. tenuivalvata* individual attacking sugarcane plantations at Attfieh were investigated throughout two sugarcane growing seasons 1997 and 1998. Intensity of insect population was estimated as weekly average number of scales (nymph and adult stages) per plant leaf.

Virgin cane (plant cane) is harvested after 14-15 months and raton cane every 14 months approximately. The growing season extends from February-March to June (spring cane) or from September-October to January (autumn cane) demisters most rapid growth the changes in the rate population occurring in both hot and wet months.

1-Density of nymphs

Monitoring the fluctuations in the population density of this insect species, under natural field conditions, reveal that this insect was first appeared in few numbers by late May. (24th May, 1997 and 30th May, 1998). During that time insect appeared as 1st and 2nd nymph instars and remained on this form until the third week of June, while no adults occurred during this period. The density of nymphs ranged between 2 and 4 individuals per cane plant leaf. Air temperature figures ranged from 26-29°C and relative humidity 84-87 % throughout May-June were recorded. By increasing air temperature and relative humidity during the following months (July-September), nymph population progressively increased thus reaching the maximum (81 individuals/leaf in 1997 and 105 nymphs/leaf in 1998) by the third and fourth weeks of September Table 1. Temperature and relative humidity in September ranged between 20.3-40.0°C, 76-84 % R.H. Hot season of 1998 was responsible for governing higher nymph population intensity than in 1997-season,

however three peaks of nymphs population took place in each of 1997 and 1998 seasons Table 2. These peaks were recorded on 19th July, September and 22nd November 1997 while they existed on the early August, late of September and 1st week of November 1998.

Table 1. Mean number of nymph and adult stages of *P. tenuivalvata* on inhabiting sugarcane plant leaves,(Attfih, 1997- cane season).

Sampling date	Av. No. of insects/leaf			Weather factors			
	Nymph	Adult	Total	Max.T.	Min.T.	R.H.	Wind velocity
24/05/97	2	0	2	34.25	19	86	3.12
31/5	3	0	3	33.64	19.42	86.85	3.51
7/6	3	0	3	34.05	19.71	85.42	3.7
14/6	4	0	4	33.67	18.71	87.71	4.2
21/6	4	1	5	34.71	21.57	82.57	2.64
28/6	4	2	6	35.68	22.28	84.28	3.67
5/7	5	4	9	36.87	23.07	86.85	2.8
12/7	8	5	13	35.71	22.27	84.85	2.12
19/7	10	7	17	36.04	21.25	84.85	3.27
26/7	10	10	20	36.32	21.55	84.57	3.28
2/8	9	13	22	35.32	22.45	84	2.8
9/8	7	18	25	35.02	21.97	84	2.8
16/8	12	29	41	35.27	22.08	81.71	3.2
23/8	28	24	52	34.14	21.08	83.42	3.8
30/8	47	20	67	33.62	21.14	84.28	2.4
6/9	62	16	78	32.82	20.48	84.28	8.3
13/9	75	11	86	33.84	21.4	84.28	5.9
20/9	81	17	98	32.51	20.3	84	8.8
27/9	69	37	106	32.27	19.08	84	13.6
4/10	54	58	112	30.01	15.1	84	6.3
11/10	48	75	123	36.41	20.07	84.28	5
18/10	35	95	130	33.38	20.74	86	6
25/10	27	114	141	29.94	13.65	84	4.2
1/11	45	104	149	29.58	17.01	85.14	5.1
8/11	61	91	152	27.17	14.91	85.57	8
15/11	64	68	132	27.18	15.44	85.57	5.3
22/11	52	59	111	25.98	11.2	72.85	3.2
29/11	39	44	83	26.14	10.51	85.42	4.7
6/12	22	32	54	24.27	6.91	85.42	3.2
13/12	14	20	34	24.34	9.44	86.57	6.6
20/12	6	9	15	17.7	7.31	86.57	3.4
27/12	0	3	3	23.3	7.47	86.85	0

Table 2. Mean number of nymph and adult stages of *P. tenuivalvata* on sugarcane plant, Atfih, during 1998- cane season.

Sampling date	Av. No. of insects/leaf			Weather factors			
	Nymph	Adult	Total	Max.T.	Min.T.	R.H.	Wind velocity
30/5	4	0	4	35.01	19.94	85.14	0
6/6	3	0	3	39.72	23.1	84.85	6.4
13/6	5	0	5	35.75	21.54	87.14	8.8
20/6	3	1	4	37.74	22.12	84.28	9.4
27/6	6	2	8	38.18	23.35	84	6.7
4/7	8	3	11	38.8	23.02	84.28	2.3
11/7	9	3	12	37.66	25.64	86.57	3.6
18/7	10	4	14	37.11	21.57	84.85	3.1
25/7	11	5	16	37.72	23.52	84.28	2.8
1/8	14	7	21	40.74	24	84.57	3.2
8/9	10	17	27	41.02	25.47	85.42	3.8
15/8	9	32	41	39.58	25.81	84	3
22/8	28	28	56	37.4	24.31	83.4	2.7
29/8	47	24	71	37.52	24.41	84	4
5/9	63	18	81	37.42	24.78	83.71	3.5
12/9	83	15	98	39.62	25.31	79.85	3.3
19/9	104	11	115	40.12	23.67	76.62	3.4
26/9	105	22	127	33.68	20.88	78	4
3/10	103	36	139	35.3	20.61	76.85	2.3
10/10	90	62	152	35.7	21.3	76.28	4.9
17/10	74	91	165	36.91	21.82	76.14	2.1
24/10	66	103	169	31.48	19.31	75.85	0
31/10	73	102	175	30.34	16.15	76	0
7/11	99	93	192	30.52	15.22	76.57	0
14/11	94	69	163	28.21	14.45	76.57	0
21/11	70	52	122	28.32	15.24	74.85	0
27/11	56	39	95	28.71	16.3	74.57	0
5/12	37	28	65	25.65	12.34	76.57	0
12/12	23	19	42	25.61	15.27	78	0
19/12	16	13	29	20.98	11.61	76.6	0
26/12	7	4	11	22.07	8.08	77.3	0

2- The changes in population density of adult population

The fluctuation of adult population density, throughout two cane growing seasons 1997 & 1998, results in Tables (1 & 2) manifest that adults were active in the third week of June with few numbers at a temperature ranged of 22-35°C and 82.5-84.3 % RH. Samples of the successive weeks showed considerable increase of adult survivors. The period extended from August to November represented the highest population density of adults. Weather factors ranged 22-31°C, 74-85 % R.H. and 2.8-5.3 km/h. as wind velocity. Two distinct of adult population were observed on mid August and late October either in 1997 or 1998 cane cropping seasons. Adult density gradually decreased after November monitoring and onwards. No nymphs or adult individuals could be detected in sugar fields during the period lasted from January to mid-June. These results indicate that *P. tenuivalvata* may pass winter as over wintering or hibernating adults.

3- The changes in the population density of *P. tenuivalvata*

Monitoring the changes as the monthly fluctuation *P. tenuivalvata* in sugarcane fields reveal the presence of the reliable density of both nymphs and adults throughout September -October. Population density of nymphs and adults was 15 and 3 individuals/leaf in 1997 and these numbers rapidly increased to reach the maximum (261 and 366 scales/leaf) during November. Similar trend was achieved during 1998-season, however density of scales was insignificantly higher. Temperature and relative humidity through September-October ranged 24-26°C and 76-84 % R.H. These results infer that weather of mild temperature and with high relative humidity seems to be quite favorable conditions for *P. tenuivalvata* development and accordingly build up of its population.

Monthly fluctuations in insect population Table, 2 during the two successive cane seasons (1997 & 1998) reveal the proportionally increase of *P. tenuivalvata* numbers from May to November and the greatest increment was evident in October. However, the rate of increase by which the insect population changes from month to the next month was the highest during June. In June 1997, insect population

multiplied 3.6 times of that existed in May; while the rate of population increase in June 1998 was 5-times that occurred during May of the same year. Prevailing high temperature (27.9- 30.2°C) and relative humidity during June may be partially responsible of that substantial increase of the insect population.

Sugarcane crop is attacked by about 35 species of hard and soft scale insects belonging to the families Acleridae, Asterolecaniidae, Coccidae and Diaspididae in different countries (Rao and Sankaran, 1969). Most of *Pulvinaria* species are known as pests of fruit trees and ornamental plants. In Egypt, Maareg *et al.*, (1992) recorded *Pulvinaria elongata* on the leaves of sugarcane in Alexandria, while our present species, *P. tenuivalvata* was first record on sugarcane foliage in plantations at Upper Egypt (Ali *et al.*, 1997).

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التواجد الموسمي وكثافة جمهور حشرة القصب القشرية الرخوة
بولفيناريا تنو فلفاتا في محافظة الجيزة

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تم دراسة التواجد الموسمي والكثافة العددية لاطوار المختلفة لحشرة القصب القشرية الرخوة "بولفيناريا تنو فلفاتا (*Pulvinaria tenuivalvata*(Newstead)) التابعة لرتبة متشابهة الاجنحة Homoptera ، وفصيلة الحشرات القشرية الرخوة Coccidae في حقول القصب بمركز الطفيح بمحافظة الجيزة خلال موسمي ١٩٩٧ ، ١٩٩٨ على التوالي . اوضحت الدراسات البيئية والعينات الحقلية الاسبوعية ان هذه الافة تعتبر آفة جديدة في مصر تهدد محصول قصب السكر في مناطق زراعته في مصر . تبدأ ظهور الاصابة بالحشرة في الاسبوع الثالث من شهر مايو باعداد قليلة كحوريات في العمر الثاني ، ثم لاثبت هذه الأعداد أن تآخذ في الزيادة تدريجيا مع ارتفاع درجة الحرارة و الرطوبة النسبية.

يوجد ثلاثة قمم لنشاط طور الحورية في مايو ، سبتمبر ، ونوفمبر . كما دلت نتائج نشاط الحشرات البالغة (الاناث) وجود ثلاثة قمم أيضا تأتي متتفة مع قمم الحوريات . تم تسجيل قمم للحشرات البالغة في شهر نوفمبر . دلت الدراسات الحقلية والمتابعة الموسمية لنشاط اطوار هذه الحشرة أن لها ثلاثة أجيال في العام خلال فترة نشاطها التي تمتد من مايو الى ديسمبر وأن الحشرة تقضى فترة الشتاء في حالة سكون على هيئة اناث حاملة للبيض حيث لم تشاهد اى من أطوار الحشرة خلال الفترة من يناير حتى نهاية شهر مارس.