

# FACTORS AFFECTING POPULATION OF SOFT SCALE INSECT, *Pulvinaria tenuivalvata* (NEWSTEAD) (HOMOPTERA: COCCIDAE) IN QUENA SUGARCANE FIELDS

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## ABSTRACT

The current study was carried out at two localities (Esna and El-Namasa) in Quena governorate (Upper Egypt) during 2005/2006 growing season, in order to study the effect of two irrigation systems (the drown and the surface irrigation development systems) on the population density of the red stripped soft scale insect *Pulvinaria tenuivalvata*. The population density of *P. tenuivalvata* in drown system was 88 and 87 individual/30 leaves in Esna and El-Namasa regions, while by using the surface irrigation development system, the population density was lower significantly with a mean of 38 and 41 individual/30 leaves in Esna and El-Namasa regions.

Three sugarcane varieties and a commercial variety were evaluated for their susceptibility to infestation with *P. tenuivalvata*. The varieties were pH/8013, F/160 and G.47/87, and the commercial one was C9/54. Results showed that C9/54 was significantly the most susceptible to infestation with *P. tenuivalvata*, with a mean of 14.6 individuals in Esna, while it was 17.6 individuals/100 leaves in El-Namasa. Followed by G47/87 with mean of 8.7 and 10.3 individuals/10 leaves in Esna and El-Namasa. F/160 recorded a mean of 6.1 and 6.55 individuals/10 leaves in Esna and in El-Namasa. PH/8013 was the least susceptible variety to infestation with a mean of 4.4 and 4.6 individuals/10 leaves in Esna and El-Namasa.

## INTRODUCTION

The soft scale insect; *Pulvinaria tenuivalvata* (Newstead) is considered one of the main sugarcane pests in Egypt. It was recorded for the first time on sugarcane in Giza governorate by Ali *et al.*, 1997. It attacks many of sugarcane fields causing severe damage for the foliage due to its feeding and fungi growing (Ali *et al.*, 2000). Since many years we started to develop the irrigation method in the field of sugarcane for the aim to use a little quantity of water to decrease the atmospheric moisture by using surface irrigation development system and to escape from using a drawn system method of irrigation (Parsana *et al.*, 1994 and Saleh, 2005).

Therefore it was necessary to study the level of infestation in both irrigation (the drown and surface irrigation development systems) methods. The new methods of irrigation depend on pushing a quantity of forward this rows, and the irrigation was applied in limited time, by little quantity of water than the normal irrigation. (Singh *et al.* 1985; Tripathi *et al.* 1987; Shalaby, 2002 and Saleh, 2005).

The aim of the present work is to find a new variety less susceptible to the infestation by the red striped soft scale insect with high yield.

Therefore four varieties of sugarcane were used to study the susceptibility of these varieties to the infestation with *P. tenuivalvata*; these

varieties are G47/87, F/160, pH/8013 and C9/54. Also to evaluate for two irrigation systems (drown and the surface irrigation development ) to avoid infestation with the soft scale insect and to minimize the quantity of irrigation water.

## **MATERIALS AND METHODS**

Two experiments were conducted at two localities (Esina and El-Namsa), in Quena governorate during one growing season (2005/2006) in order to study the population fluctuation of the red-striped soft scale insect, *Pulvinaria tenivalvata* (Newstead), under field conditions. This work also pointed mainly to investigate the effect of two methods of irrigation systems.

For the first experiment to study two methods of irrigation system, an area of about half feddan for each locality was divided into four equal plots with 10 m a part between each other, planted with C9/54 variety of sugarcane in March 15<sup>th</sup> (2005) in randomized complete block design with 3 replicates. All agricultural practices were done as recommended and no insecticides were applied, 30 leaves were examined from each area every time 15 days intervals.

The second experiment was carried out to evaluate 4 varieties G47/87, F/160, pH/8013 and C9/54 to the infestation with *P. tenivalvata*. The experiments was conducted in randomized complete block design with 3 replicates; the plot size was (70cm<sup>2</sup> for each). Planting took place about half feddan, agricultural practice were done as recommended and no insecticides were applied, 10 leaves were examined from each plot every time (15 days) interval.

All data were statistically analyzed by ANOVA and Duncan's multiple range tests.

## **RESULTS AND DISCUSSION**

### **1- Irrigation systems:**

Effect of irrigation systems of sugarcane plants (Drown and surface irrigation development systems) were investigated in this work to determine the optimum system of irrigation which can reduce the population density of *Pulvinaria tenivalvata*, It was evident in Table (1) that, the population of *P. tenivalvata* was high in drown system which recorded (88 and 87) as total number of individuals per 30 leaves during the whole season compared with modern system which recorded (38 and 41) per 30 leaves, in Esna and EL-Namasa regions.

In India, Parsasna *et al.* (1994) studied the effect of different levels of drip irrigation with traditional flood methods on the incidence of the insect pests, *Melanaspis glomerata* and *Saccharicoccus sacchari*, attacking sugarcane in India. They found that high population levels were recorded in the traditional flood method of irrigation and it was low in treatment of (0.4 CPE) and treatment of (0.8CPE) gave significantly higher yields than the other treatments. In Egypt, Saleh (2005) reported that, in two successive

season, the population of *P. tenuivalvata* was high in the drawn system in both seasons which recorded 136 and 44 individuals/90 leaves for 1<sup>st</sup>, 2<sup>nd</sup> seasons, respectively, compared with modern system which recorded 108 and 38 individuals/90 leaves.

## **2- Effect of sugarcane varieties:**

As shown in Table (2), the data indicated that, C<sub>9</sub>/54 sugarcane variety was the most susceptible to *P. tenivalvata* infestation with mean (14.6 and 17.7) individuals /10 leaves at Esna and EL- Namasa regions followed by G 47/87 variety which received (8.7 and 10.3) individuals /10 leaves in the same location . While F/160 variety received (6.1 and 6.5) individuals /10 leaves, PH/ 8013 was the least susceptible variety to infestation which received (4.4 and 4.6) individuals/10 leaves for both regions. Data in the same previous tables indicated that, for both locallites significant differences were detected between treatments.

As shown in Table (2) the obtained data exhibited that, C<sub>9</sub>/54 variety recorded the highest infestation levels with *P. tenivalvata*, (14.6 and 17.0 individuals/10 leaves) at Esna and El-Namasa regions. While, *P. tenivalvata* exhibited the lowest preferably to PH / 8013 variety (4.4 and 9.6) followed by F / 160 (6.1 and 6.5) and 47/87 varieties (8.7 and 10.3) in Esna and Elnamasa regions, respectively. However, the population density of *P. tenivalvata* was significantly decreased in comparison with C<sub>9</sub>/54 variety. The reduction percentages reached to 69.9%, 58.2% and 40.42% on PH/ 8013, F/ 160 and 47/87 variety in comparison with the commercial one (C<sub>9</sub>/54) respectively. Also, Saleh (2005) found that, C<sub>9</sub>/54 was the most susceptible sugarcane variety to *P. tenivalvata* infestation in comparison with F/ 160 and PH/ 8013 varieties. Sugarcane varieties exhibited different degrees of susceptibility to infestation with *P. tenivalvata*.

In India, Singh and Nigan (1985) found that, the establishment percentage of nymphs was significantly greater on varieties BO70, BO72, CoJ64 and LG7204 (71.0, 68.3, 72.6 and 57.1%, respectively), than on the other tested varieties and lowest on COS7717 (10.1%). Than results confirmed with those obtained in the present study. Also in India, Tripath *et al.* (1987) added that, all the six sugarcane varieties showed loss in germination due to infestation by sugarcane scale insect *Melanaspis glomerata*.

In Egypt, Shalaby (2002) studied that the susceptibility of three sugarcane cultivars (C<sub>9</sub>/54, 47/84 and 37/85) to infestation with the soft scale insect, *P. tenuivalvata*. He reported that the sugarcane cultivars 37/85 seemed to be resistant to infestation, while 47/84 cultivars proved to be highly susceptible and the commercial cultivar C<sub>9</sub>/54 ranked as int

Table (1): Population density of *P. tenuivalvata* in two localities (Esna and EL- Namasa) by using two methods of irrigation.

Date of exam	Modern System		Drown system	
	Esna	Al-Namsa	Esna	El-Namsa
16/6/2005	0	0	0	0
2/7	3	0	11	8
17/7	2	3	6	6
2/8	0	3	4	9
17/8	4	2	10	7
2/9	3	3	6	8
17/9	7	5	11	9
2/10	4	5	7	11
17/10	8	9	16	14
2/11	7	11	17	15
Total no. of insect/30 leaves	38	41	88	87
Av. no. of insect/10 leaves insect/10 leaves	12.7	13.7	29.3	29

T- Calculated= 4.31\*

Table (2): ): Population density (no. of insects / 10 leaves) of *P. tenuivalvata* on four sugarcane vareities in two localities [Esna (A) and EL- Namasa(B)] during 2005/2006 growing season.

Date of exam	Sugarcane varieties							
	G. 47/87		F/160		PH/8013		C <sub>9</sub> /54	
	A	B	A	B	A	B	A	B
16/6/2005	0	0	0	0	0	0	0	2
2/7	0	0	0	0	0	0	3	4
17/7	3	6	0	2	0	1	5	9
2/8	6	8	2	4	0	2	8	11
17/8	7	11	4	6	2	3	12	14
2/9	9	13	7	9	4	4	15	17
17/9	12	15	8	10	6	6	19	20
2/10	16	18	12	12	10	11	25	28
17/10	25	22	22	16	18	15	44	54
Total	78	93	55	56	40	42	131	159
Av. no.	8.7b	10.33b	6.1c	6.55c	4.4cd	4.66cd	14.6a	17.66a

L. S. D. (p = 5%) = 2.45 (in Esna) & 2.94 (in EL- Namasa).

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## العوامل المؤثرة في تعداد الحشرة القشرية الرخوة في حقول قصب السكر بمحافظة قنا

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يعتبر محصول قصب السكر من المحاصيل الهامة التي يعتمد عليها في تصنيع السكر في مصر ، وتعتبر الحشرة القشرية الرخوة من اهم الآفات الحشرية التي تصيب هذا المحصول وتسبب له خسارة كبيرة ولقد اجريت تجربتين في منطقتين هما مدينة( اسنا - والنسا ) بمحافظة قنا في صعيد مصر موسم ٢٠٠٥/٢٠٠٦

كانت التجربة الاولى لدراسة نظم الري وهما نظامان الاول الري بالغمر والثاني الري السطحي المطور الذي يتم عن طريق دفع مياه الري خلال انابيب معدنية لها فتحات معينة امام راس كل خط تفتح وتغلق وفق نظام معين من التحكم مما يؤثر علي تعداد الحشرة داخل حقول القصب ولقد اظهرت النتائج ما يلي :-

الكثافة العددية لمتوسط افراد الحشرة في نظام الري بالغمر هو (٨٨ فرد/٣٠ ورقة في منطقة اسنا بينما كان متوسط اعداد الافراد ٨٧ فرد/٣٠ ورقة في منطقةالنسا) — في نظام الري السطحي المطور (في منطقة اسنا كان متوسط عدد الافراد ٣٨ فرد/٣٠ ورقة وكانت ٤١ فرد/٣٠ ورقة في منطقةالنسا)... ومن هذا يظهر ان الري السطحي المطور عمل علي تقليل كمية المياه وبالتالي ادي الي تقليل الرطوبة النسبية المحيطة بالنباتات مما ادي الي تقليل تعداد حشرة القصب القشرية الرخوة.

كانت التجربة الثانية اختبار حساسية اربعة اصناف من محصول قصب السكر للاصابة بهذه الحشرة ايضا في المنطقتين السابقتين (اسنا والنسا) وكانت النتائج المتحصل عليها كالآتي :-

الصنف C9/54 كانت اكثر الاصناف حساسية بالاصابة بالحشرة القشرية حيث سجلت (١٤,٦ فرد/١٠ أوراق في اسنا بينما كانت ١٧,٦ فرد/١٠ أوراق في النسا) ... والصنف G47/87 حيث سجل (٨,٧ فرد / ١٠ أوراق في اسنا بينما ١٠,٣ فرد/١٠ أوراق في النسا)... والصنف F/160 سجل ( ٦,١ فرد/ ١٠ أوراق في اسنا بينما كانت ٦,٥ فرد/١٠ أوراق في النسا) وسجل الصنف الاخير PH80/13 اقل الاصناف حساسية للاصابة بهذه الحشرة بمتوسطات بلغت (٤,٤ فرد/١٠ أوراق في اسنا و ٤,٦ فرد /١٠ أوراق في النسا)...

ومن هذا تلاحظ وجود اختلاف في نسب الاصابة في التجربة الاولى بين نظامي الري بالغمر والري السطحي المطور وكذلك تلاحظ ان اكثر الاصناف حساسية للاصابة هو صنف C9/54 بينما سجل الصنف PH80/13 اقل الاصناف حساسية للاصابة بهذه الحشرة.