

LAND SNAILS ATTACKING SUGAR BEET FIELDS: I- POPULATION DENSITY, DAMAGE AND LOSSES CAUSED BY *Monacha cantiana* SNAILS AT KAFR EL-SHEIKH GOVERNORATE.

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ABSTRACT

This study was conducted at Kafr El-Sheikh Governorate during two successive seasons, 2005 / 2006 and 2006 / 2007 to determine the population densities of the dominant land snails and estimate damage and losses due to *M.cantiana* on foliage, roots yield and reduction in sugar contents.

Results revealed that the population density of *M.cantiana* snails on sugar beet in the three times of plantation were slightly [(2.6, 3.6 and 2.8) and (2.3, 1.8 and 7.4)] and [(6.9, 6.0 and 13.5) and (3.2, 3.6 and 10.6)] individuals / m² at Kafr El-Sheikh and El-Hamol districts, in the beginning of seasons 2005 / 2006 and 2006 / 2007, respectively. Then, population increased gradually until reached maximum numbers in the end of seasons with values of [(26, 51 and 62) and (26, 66.2 and 60)] and [(29, 22 and 70) and (29.6, 30.4 and 76.5)] individuals / m² at two districts in the three times of plantations at the two successive seasons 2005 / 2006 and 2006 / 2007, respectively.

Results indicated that the damage and losses assessment due to different levels infestations of *M.cantiana* (10,20,30,40 and 50 snails / plant) resulted in considerable damage to sugar beet under field conditions. The general mean of reduction to foliage, root weight and sugar yield were (0, 0.128 and 1.06), (4.30, 1.41 and 3.19), (9.09, 1.92 and 9.57) , (19.13, 2.56 and 11.17) and (23.44, 3.46 and 12.23) for infestation levels of 10,20, 30, 40 and 50 individuals / plant, respectively during 2006 / 2007 season.

INTRODUCTION

Land snails are consider as an extremely injurious pest to ornamental flowers and shrubs and a wide variety of vegetables, agronomic, fruits and citrus in most areas of their distribution (Miller, *et al.* 1988, Hashem *et al.* 1992). Snails attack plants at different growth stages and consequently reduces its yield, (El-Okda, 1980).

Monacha cantiana (Montagu,1803) severely attacks sugar beet fields in Kafr El-Sheikh and Dakahlia Governorate. Published reports in most instances were based on survey information only. No one estimated damage and losses or reduction sugar content due to land snails on foliage or root yield.(AbdEl-Gawad, (2005), Zedan *et al.*(2005).

Pest-induced crop losses are feature of both primitive and modern agricultural systems involved in food or fiber production. It is common knowledge among agricultural scientists that "yield gaps" exist among countries and even among farms in the same locality with comparable management and environment (Teng and Shane, 1983).

This work will be the first paper of research series " land snails attacking sugar beet fields" therefore, the objectives of this study were to :

determine the population densities of the dominant land snails and estimate damage and losses due to *M.cantiana* on foliage, roots crop and reduction in sugar contents.

MATERIALS AND METHODS

This study was conducted at Kafr El-Sheikh Governorate during the two successive seasons, 2005-2006 and 2006-2007, respectively.

1- Population density :

Beta vulgaris saccharifera L. var. Kawmira was sown at three times : mid-August, mid-October and mid-November in both seasons at Kafr El-Sheikh and El-Hamol districts.

One feddan was chosen from each previous plantation in each district after one month of plantation. The trial was randomized complete block design. Each block consisted of 25 plots. Five plants per meter (as a sample) were examined. All snails on foliage or soil surface were counted. Ten samples were chosen randomly every 15 days from each plot. Samples were taken in early morning. All agricultural practices were applied from sowing till harvesting except pests control was neglected (natural infestation) in the three experimental areas.

2- Damage and losses assessments:

Field experimental was carried out to estimate damage and losses estimation caused by *M.cantiana* on sugar beet at Kafr El-Sheikh district. Half feddan cultivated with variety Kawmira at mid-October 2006. one month after germination 30 plants were chosen randomly. 30 plastic screen cages (60 × 80 × 100 cm) were placed on chosen plants. Six treatments were conducted and replicated 5 times. Six levels (treatments) of adult snails infestation 0, 10, 20, 30, 40 and 50 individuals were placed under each cage. Soil under cages was examined carefully and clutches were removed periodically. Harvesting carried out at the end of April 2007. Data were recorded and percent reduction of foliage or roots were calculated using the following formula:

$$\% \text{ Reduction} = \frac{\text{Control} - \text{infested}}{\text{Control}} \times 100$$

Sugar beet roots were pulled, cleaned and weighted. Sucrose in fresh sugar beet roots was determined by Saccharimeter apparatus using lead acetate basic according to (Le- Docte,1927).

RESULTS AND DISCUSSION

Population density:

The experimental was conducted to determine the population density of *M.cantiana* infesting sugar beet on the three plantation times first, mid August, second, mid-October and third mid-November in tow seasons of 2005 / 2006 and 2006 / 2007 at two districts of Kafr El-Sheikh Governorate.

Data presented in Table (1), showed that the initial infestations of *M.cantiana* were recorded in the beginning of November on sugar beet with a

relatively low numbers of (2.3 & 1.8) snails / m² (average of five plants) in first and second plantation, respectively at El-Hamol district. While no infections at Kafr El-Sheikh district in this time. However, the initial infestation was appeared later in the beginning of December with low values of (2.6, 3.6 and 2.8) snails / m² to the three plantation respectively, in successive season 2005/ 2006 at Kafr El-Sheikh district. It was clear that individuals were slightly increased until reached maximum numbers in the end of the growing season with population density of (26, 51 and 62) and (26. 66.2 and 60) individuals / m² for the three times plantation in Kafr El-Sheikh and El-Hamol districts, respectively.

Table (1): Average numbers of *Monacha cantiana* snails on sugar beet fields during the growing season 2005 / 2006 in three time plantations at Kafr El-Sheikh Governorate.

Exam. Date	Kafr El-Sheikh			El-Hamol		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd
Oct.	-	-	-	-	-	-
Nov.	-	-	-	2.3	1.8	-
Dec.	2.6	3.6	2.8	6.0	9.3	7.4
Jan.	4.4	6.2	4.3	4.9	11.0	10.0
Feb.	20.0	30.0	41.0	12.0	30.0	30.2
Mar.	26.0	36.6	37.0	26.0	37.2	33.0
Apr.	-	51.0	61.2	-	66.2	60.5
May	-	-	62.0	-	-	60.0
G. mean	13.25	25.4	34.7	10.24	25.9	33.5
± S.E	± 5.7	± 3.6	± 6.2	± 4.3	± 6.7	± 6.9
L.S.D ₀₅	1.01	1.50	1.29	0.8	1.3	1.9

Each value is an average of 10 replicates (50 plants)

Table (2): Average numbers of *Monacha cantiana* snails on sugar beet fields during the growing season 2006 / 2007 in three time plantations at Kafr El-Sheikh Governorate.

Exam. Date	Kafr El-Sheikh			El-Hamol		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd
Oct.	-	-	-	-	-	-
Nov.	-	6.0	-	3.2	3.6	-
Dec.	6.9	11.0	13.5	10.0	10.9	10.6
Jan.	5.2	4.0	10.0	6.0	3.6	12.5
Feb.	12.4	15.3	30.0	14.0	20.6	28.9
Mar.	29.2	18.0	41.7	29.6	17.2	46.2
Apr.	-	22.0	52.2	-	30.4	62.0
May	-	-	70.0	-	-	76.5
G. mean	13.4	12.7	36.2	12.5	14.4	39.4
± S.E	± 5.1	± 3.1	± 7.1	± 4.3	± 4.7	± 10.3
L.S.D ₀₅	0.9	0.76	1.2	0.64	0.66	1.46

Each value is an average of 10 replicates (50 plants)

In contrast, numbers of *M.cantiana* in the second season 2006 / 2007, Table (2), showed that the population density was slightly increased in

comparison with the first season. The population were (6.0) snails /m² at the beginning season on the second plantation at kafr El-Sheikh district. While it was (3.2 & 3.6) individuals / m² in the first and second plantation at El-Hamol district. In the end of growing season, population reached its maximum numbers, with values of (29.2, 22 and 70) and (29.6, 30.4 and 76.5) individuals / m² for the three plantations times at kafr El-Sheikh and El-Hamol districts, respectively.

These results are in agreement with those findings by Mortada, (2002) who found that *Monacha cartusiana* attacks sugar beet with range of (30 - 42 snails / m²) in El-Mansoura and Sherbien district Dakahlia Governorate. Idress, (2003) recorded that *M.cantiana* snails attacking sugar beet with heavy infestation (more than 30 snails / 50 × 50 cm) at Kafr El-Sheikh Governorate. AbdEl-Gawad, (2005) reported that the population density of *M. cartusiana* were (more than 30 snails / m²) on sugar beet crop in Belkas district, Dakahlia Governorate.

2- Damage and losses assessments:

Field trial was conducted to assessment losses and reduction caused by five artificial infestation levels of adult *M.cartusiana* snails on sugar beet crop. This levels were (10,20, 30, 40 and 50 individuals / plant) under plastic screen cages besides 0 level (control). According to Zedan et al. (2005) with some modifications.

Data in Table (3) indicated that the general mean of reduction to foliage, root weight and sugar yield were (0,0.128 and 1.06), (4.30, 1.41 and 3.19), (9.09, 1.92 and 9.57) , (19.13, 2.56 and 11.17) and (23.44, 3.46 and 12.23) for infestation levels of 10,20, 30, 40 and 50 individuals / plant, respectively during 2006 / 2007 season.

Table (3): Weight losses and reduction caused by different infection levels of *Monacha cantiana* snails on sugar beet under field conditions during 2006 / 2007 season at Kafr El-Sheikh Governorate.

Level infes. Snails / plant	Foliage		Roots		Sugar / plant		Reduc. Kg / Fed.
	Weight (gm.)	% Reduc.	Weight (gm.)	% Reduc.	%	%	
					Sugar (gm)	Reduc.	
Check	209	0	780	0	18.8	0	0
10	209	0	779	0.128	18.6	1.06	79.71
20	200	4.3	769	1.41	18.2	3.19	239.88
30	190	9.09	765	1.92	17.0	9.57	719.66
40	169	19.13	760	2.56	16.7	11.17	839.98
50	160	23.44	753	3.46	16.5	12.23	919.69
Mean	189.5 ± 8.6	-	767.66 ± 4.42	-	-	-	-
L.S.D. ₀₅	1.0		0.5		-		-

On the other hand, damage caused by different artificial infestation levels of *M.cantiana* (10, 20, 30, 40 and 50 snails / plant) were reduced the sugar yield / feddan with values of (79.71, 239.88, 719.66, 839.98 and 919.69 Kg. / feddan), respectively.

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القواقع الأرضية تهاجم حقول بنجر السكر:

١- الكثافة العددية والخسارة والفقد التي يسببها القواقع *Monacha cantiana* في محافظة كفر الشيخ.

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أجريت هذه الدراسة في مركزى كفر الشيخ والحامول بمحافظة كفر الشيخ خلال الموسمين ٢٠٠٥ / ٢٠٠٦ و ٢٠٠٦ / ٢٠٠٧ م وذلك لتقدير الكثافة العددية للقواقع الأرضى *Monacha cantiana* على محصول بنجر السكر وكذلك لتقدير الفقد والخسارة التي يحدثها القواقع بمستويات إصابة مختلفة على إنتاجية الفدان من السكر ، وهذا ليبحث بداية سلسلة بحوث عن إصابة القواقع الأرضية لمحصول بنجر السكر .

وكانت النتائج كما يلي :

١-الكثافة العددية للقواقع خلال الثلاث عروات في بداية الموسم كانت [(٢,٦ ، ٣,٦ ، ٢,٨) و (٢,٣ ، ١,٨ و ٧,٤)] و [(٦,٩ ، ٦,٥ و ١٣,٥) و (٣,٢ ، ٣,٦ ، ١٠,٦)] فوقع /م^٢ فى مركزى كفر الشيخ والحامول خلال موسمى ٢٠٠٥ / ٢٠٠٦ و ٢٠٠٦ / ٢٠٠٧ على الترتيب . وازدادت الكثافة العددية تدريجيا حتى وصلت الى أقصى تعداد للقواقع فى نهاية الموسم حيث كانت [(٢٦ ، ٥١ ، ٦٢) و (٢٦ ، ٦٦,٢ ، ٦٠)] و [(٢٩ ، ٢٢ ، ٧٠) و (٢٩,٦ ، ٣٠,٤ ، ٧٦,٥)] فوقع /م^٢ خلال الثلاث عر وات فى المركزين السابقين موسمى ٢٠٠٥ / ٢٠٠٦ و ٢٠٠٦ / ٢٠٠٧ على الترتيب .

٢-تأثير العنوى بمستويات إصابة مختلفة (١٠ ، ٢٠ ، ٣٠ ، ٤٠ ، ٥٠) فوقع / نبات قد سبب نسبة خفض فى وزن العرش ومحصول الجذور وكمية السكر للفدان كما يلي (صفر ، ٠,١٢٨ ، ١,٠٦) ، (٤,٣٠ ، ١,٤١ ، ٣,١٩) ، (٩,٠٩ ، ١,٩٢ ، ٩,٥٧) ، (١٩,١٣ ، ٢,٥٦ ، ١١,١٧) و (٢٣,٤٤ ، ٣,٤٦ ، ١٢,٢٣) لمستويات الإصابة السابقة على الترتيب خلال موسم ٢٠٠٦ / ٢٠٠٧ .