

INFLUENCE OF CLIMATIC FACTORS ON POPULATION DENSITY OF LAND SNAILS INFESTING SOME CROPS AND THEIR DAMAGE QUESNA DISTRICT (MINUFYA GOVERNORATE).

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ABSTRACT

This study was conducted under field conditions at Quesna district, Monufya Governorate during two successive seasons 2009 and 2010. The present work aimed to throw light on the effect of climatic factors temperature degree and relative humidity on land snails population and their damage to some stand crops(Clover, Lettuce and Navel orange).

The obtained results could be summarized as follows:-

- 1)- *Monacha cartusiana* (Muller) and *Eobania vermiculata* (Muller) were only observed infesting Clover, Lettuce and Navel orange during the experimental period. Also, the ecological studies indicated that *M. cartusiana* was found in abundance on Clover and Lettuce both, meanwhile Navel orange had *E. vermiculata* more than the another, snail.
- 2) - Clover was the most attractive to *M. cartusiana* followed by Lettuce and Navel orange, whereas, the last crop was the most attractive to *E. vermiculata* than Clover and Lettuce.
- 3)- The land snails population was fluctuated during the experimental crop life from month to month due to variations in temperature degree and relative humidity. The results indicate that there is a positive correlation between snail population and the relative humidity, meanwhile it is negative with the temperature degree. The highest population (115.5 individuals) was recorded in February (16 C & 59.9 % R.H.) and the lowest one (33 individuals) in May (29 C & 54.7% R.H.).
- 4)- The obtained results showed that the highest infestation of land snails (0.89%, 0.83% and 0.64%) and the lowest (0.45%, 0.49% and 0.19%) for Clover, Lettuce and Navel orange were recorded in March (18.6C & 59.7% R.H.) and in May (29 C & 54.7% R.H.), respectively.
- 5)- The obtained results proved that the most suitable geographical conditions to increase the population of land snails are low temperature degree and high relative humidity. Also, it is added that, there is a positive correlation between population of land snails and their damage to the three tested crops.

INTRODUCTION

The phylum Mollusca is probably the third most important animal group after the arthropods and vertebrates. Snails and slugs belong to the class Gastropoda.

Few species of snails and slugs appear to have been adversely affected by human activities, apart from the localized effects of habitat destruction, while several species have extended their geographical distribution. Snails and slugs have become considerably more abundant as the result of agricultural and horticultural activities.

The great damage of gastropod to many agricultural and horticultural crops in Egypt has become increasing apparent over the past 30 or 40 years. Data indicated that the damage caused by gastropods are common after the warm wet summer and autumn, although gastropods populations are reduced under dry conditions. However accurate information on the economic importance of gastropods are difficult to be obtained due to its negligence and tends to be more unreliable than that for many important insect pests.

Mollusca are important pest of fruit trees , vegetables, medical plants, ornamental plants and field crops (El-Okda, 1984). The main damage caused by *M. cartusiana* to fresh plant of the Egyptian clover was found to be about 5.65% (5.082 tons/ feddan) four consecutive cutting (Okka, 2003).

The aim of the present study is throw light on effect of climatic factors on the population density of some land snails infesting some crops and their damage.

MATERIALS AND METHODS

Population density of land snails infesting some field crops:

The population density of the land snails was studied some field in crops; Egyptian clover lettuce and navel orange at Begarim, village, Quessina district at Minufiya, Governorate during two successive years 2009-2010.

An area of about one Feddan was selected for each crop. Five replicates (traps) of quadrate sample size (50cmx50cm) were randomly examined in each chosen area twice per month during the growing season of each crop. Examination was done during early morning before sunrise.

All snails found on either plants or soil surface in the quadrate were counted and left in their initial places (Baker, 1988). Data concerning temperature and relative humidity during the period of study were obtained from metrological station of Minufiya Governorate

Land snails damage estimation:

Estimation of damage caused by land snails to the Egyptian clover, lettuce and navel orange was conducted at Begarim locality, Quessina district, Minufiya, Governorate. All leaves and stems of plant (for lettuce and clover) or 20 leaves of the nearest branch of the tree (for navel orange trees) were examined in the tested area one per month during the two successive growing seasons 2009 -2010. Temperature degree and relative humidity during the period of study were recorded through out the collecting time. The obtained data were calculated according to the following equation.

$$\text{Damage \%} = \frac{\text{Total No. of damaged leaves}}{\text{Total No. of inspected leaves}} \times 100$$

The land snails damage was calculated in other two ways by applying the next formula:

$$\text{Rate of damage (for crops)} = \frac{\text{General mean of damage \% of crop}}{\text{General mean of damage \% of navel orange crop}} \times 100$$

$$\text{Rate of damage (for month)} = \frac{\text{Damage\% of month}}{\text{Damage\% of May}} \times 100$$

RESULTS AND DISCUSSION

This study deal with the land snails population and their damage to different field crops (Clover, Lettuce and Navel orange) under field conditions:

The tabulated data in Table (1) illustrated that *Monacha cartusiana* (Muller) and *Eobania vermiculata* (Muller) were only observed on each of clover, lettuce and navel orange during the experimental period. The recorded figures cleared that *M. cartusiana* was found in more number on clover and lettuce mean while navel orange trees has *E.vermiculata* more than *M. cartusiana*. The calculated population density of *M. cartusiana* and *E. vermiculata* on the previous mentioned crops for February month was (87% and 13%), (100% and 0.0%) and (33.3% and 66.7%) on clover, lettuce and navel orange, respectively. Also, the presented data in Table (2) confirmed with the former results. Besides the presented figures of the rate of collected snails from varied crops were confirmed with the previous results. The studied crops could be arranged in a descending order according to the rate of the collected snails for February month as follow:-

Clover (2.26)> lettuce (1.34)> Navel orange (1). The arrangement of the crops was similar for the rest months. As well as, the data in Table (2) proved that Lettuce (100%) was more attractive to *M. cartusiana* followed by Clover (91.3) and Navel orange (33.3%), meanwhile *E. vermiculata* was more attractive to Navel orange (66.7%) followed by Clover (13%) and Lettuce (0.0%) for February month. Moreover, the recorded results in Table (1) proved that the population of snails was fluctuated during the experimental crops from month to month because of the variations in each of temperature degree and the relative humidity. The snails population for February month (16C° and 59.9% R.H.), had the highest mean number of the collected land snails from Clover (115.5 individuals), Lettuce (68.8 individuals) and Navel orange (51 individuals), meanwhile, the lowest mean number was recorded in May month (29 C° and 54.7% R.H.) 33, 20 and 17 individuals respectively for the same mentioned crops formally. These findings indicate that there is appositve link between snails population and Relative humidity, mean while it is negative with temperature degree. The experimental months and their recorded temperature degree and relative humidity could be arranged discerningly according the rate of snail populations follow:-

February month (16C° & 59.9 % R.H.) 3.5> January (15.1 C° &59.9%R.H.) 2.79 > March (18.6 C°&59.7%R) 2.36> December (19 C° &59.9% R.H.) 2.15 > April (22.3 &59.7%R .H.) 1.79> May (29 C° & 54.7% R.H.) 1 for Clover crop Month arrangement for Navel orange corresponding to rate of snails population took the same trend approximately.

Table (2): Host plant preference in relation to land snails population during two successive years 2009-2010.

Month	Crop	Ave.of Total collected snails 5/traps/ 3 nights	Rate(to navel orange)	<i>M. cartusiana</i>		<i>E. vermiculata</i>	
				Av. No.	%	Av. No.	%
November	Clover	53.5	2.15	51.5	96.26	2	3.74
	Lettuce	29.6	1.2	27.3	92.2	2.3	7.8
	Navel orange	24.8	1	7.0	28.3	17.8	71.7
December	Clover	71.5	2.2	66.5	93	5	7
	Lettuce	35.4	1.14	35.4	100	0.0	0.0
	Navel orange	31	1	10	32.3	21	67.7
January	Clover	92	2.2	81	88.5	11	12
	Lettuce	58	1.4	55	94.8	3	5.2
	Navel orange	42	1	18	42.9	24	57.1
February	Clover	115.5	2.26	105.5	91.3	10	8.7
	Lettuce	68.8	1.34	68.8	100	0.0	0.0
	Navel orange	51	1	17	33.3	34	66.7
March	Clover	78.2	2.3	70.2	89.8	8	10.2
	Lettuce	37.6	1.1	34.6	92	3.0	8.0
	Navel orange	34	1	12	35.3	22	64.7
April	Clover	58.5	2.9	52	88.8	6.5	11.2
	Lettuce	28.8	1.4	24	83.3	4.8	16.7
	Navel orange	20.4	1	7	34.3	13.4	65.7
May	Clover	33	194	32	97	1	3
	Lettuce	20	1.17	19	95.0	1.0	5
	Navel orange`	17	1	8	47	9	53

Ismail (1997) and El-Deeb *et al.*, (1999) indicated that the highest population density values of *M. cartusiana* were found during spring months as compared with other ones. Also, Abdel-Aal (2001) reported that the population density of *M.cartusiana* increased during spring Month. Sebay *et al.*, (2009) recorded that the population density of *E. vermaculata* on Navel orange fluctuated on soil surface and tree trunks during the year months.

The presented data in Table (3) show the land snails damage percentages to Clover, Lettuce and Navel orange and its relation to each of land snails population and the dominant geographical conditions (Temperature and Relative Humidity). The obtained figures (table 3) cleared that the highest damage was recorded in March (18.6 C° &29.7% R. H.), 0.89%, 0.83%% and 0.64% for Clover, Lettuce and Navel orange, respectively. Meanwhile, the lowest damage observed in May (29 C° &54.7% R. H.), 0.45%, 0.49% and 19% for the same crops arrangement previously. The tabulated data in Table(3) also added that the rate of damage of the tested crops during month related to May proved that the tested crops had survey damage during March (in rate 1.98). The rates of the other months ranged between them because of increasing land snails population.

The experimental month could be arranged them in descending order according to the rate of land snail damage as follows :- March 1.98 > April 1.9 > February 1.7 > December 1.38 > January 1.27 > May 1.0 >

November 0.76 for Clover crop. The arrangement of the rest tested crops was similar.

Table (3): Damage percentage for different crops caused by *Monacha cartusiana* and *Eobania vermiculata* land snails At Quessna district; Minufya Governorate during two successive years 2009-2010

Month	Year	Average of		Clover		Lettuce		Navel orange	
		Temp. d C	R.H%	Damage %	Rate	Damage %	Rate	Damage %	Monthly Rate(to May)
November	2009	21.4	62.3	0.22	0.76	0.16	0.86	0.14	0.84
	2010	16.5	57.5	0.45		0.21		0.18	
	mean	19	59.9	0.34		0.19		0.16	
December	2009	16.1	65.7	0.42	1.38	0.25	0.63	0.20	1.1
	2010	14.8	63.7	0.82		0.36		0.22	
	mean	15.5	64.7	0.62		0.31		0.21	
January	2009	15.9	63.7	0.41	1.27	0.33	0.8	0.12	1.89
	2010	14.3	55.4	0.73		0.44		0.18	
	mean	15.1	59.6	0.57		0.39		0.15	
Febraury	2009	15.8	66.3	0.83	1.71	0.78	1.53	0.29	0.8
	2010	16.2	53.4	0.71		0.72		0.43	
	mean	16	59.9	0.77		0.75		0.36	
March	2009	18.2	65.9	0.95	1.98	0.86	1.69	0.72	3.37
	2010	19	53.4	0.82		0.79		0.56	
	mean	18.6	59.7	0.89		0.83		0.64	
April	2009	21.4	59.2	0.80	1.9	0.58	1.63	0.70	3.62
	2010	23.1	51.0	0.89		0.91		0.53	
	mean	22.3	55.1	0.85		0.75		0.62	
May	2009	31.7	56.0	0.56	1.0	0.50	1.0	0.21	1.0
	2010	26.2	53.4	0.33		0.47		0.16	
	mean	29.0	54.7	0.45		0.49		0.19	
General mean				0.64		0.53		0.33	
Crop rate to navel orange				1.9		1.6		1.0	

This results agree with Ismail (2004), and Ghada Refaat (2004) mentioned that the percentages of damage were increased or decreased according to temperature and air humidity during the growing season, and the highest percentages were recorded in winter and spring months especially in March.

In General, low temperature and high relative humidity due to increase in land snail population, therefore the caused damage to different crops will also increase. These findings proved also that the increasing in damage appears obviously in month later than increased in population; February had highest population and March had the highest damage

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دور بعض العوامل المناخية على الكثافة العددية للقواقع الأرضية والضرر التي تسببه لمحاصيل معينه بمركز قويسنا بمحافظة المنوفية .
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لقد نفذت هذه الدراسة تحت الظروف الحقلية لمركز قويسنا محافظة المنوفية خلال عامي 2009 و 2010 وذلك خلال فترة نشاط القواقع من نوفمبر حتى مايو ، وركزت الدراسة على تأثير الظروف الجوية (وخاصة درجات الحرارة والرطوبة النسبية) على تعداد القواقع ونسبة الإصابة الناتجة عنها لمحاصيل البرسيم والخس والبرتقال أبو سره .
وأمكن تلخيص النتائج في النقاط التالية :-

- (1) أوضحت النتائج أن قوقع البرسيم *Monacha cartusiana* وقوقع الحدائق البني *Eobania vermiculata* الأكثر تواجدا في مكان الدراسة ، وكان قوقع البرسيم الأكثر تواجدا على محصول البرسيم والخس بينما كان قوقع الحدائق البني أكثر تواجدا على الموالح
- (2) كما أكدت الدراسة ان محصول البرسيم أكثر جذبا لقوقع البرسيم يليه الخس ثم البرتقال ابو سره بينما كان الاخير أكثر جذبا لقوقع الحدائق البني يليه البرسيم ثم الخس.
- (3) تعداد القواقع الأرضية طوال فترة النشاط كان متذبذبا من شهر الى شهر وذلك وفقا لدرجة الحرارة والرطوبة النسبية وكان اعلى تعداد للقواقع (115.5 قوقع) خلال شهر فبراير (16 درجة مئوية و59.98% رطوبة نسبية) واطلها (33قوقع) فى شهر مايو (29 درجة مئوية و54.78% رطوبة نسبية) وهذا يؤكد ان هناك علاقة موجبة لتعداد القواقع مع الرطوبة النسبية وسالبة مع درجة الحرارة.
- (4) اعلى الخسائر سجلت فى شهر مارس حيث بلغت نسبة الإصابة 0.89% ، 0.83% و0.64% لمحصول البرسيم والخس والبرتقال ابو سره على التوالي حيث كانت درجة الحرارة 18.6 درجة مئوية والرطوبة النسبية 59.7% وكانت اقل الخسائر فى شهر مايو 0.45% للبرسيم و0.49% للخس و 0.16% للبرتقال ابو سره حيث كانت درجة الحرارة 29 مئوية والرطوبة النسبية 54.7% .
- (5) أكدت النتائج المتحصل عليها ان أكثر الظروف الجوية ملائمة لزيادة تعداد القواقع الأرضية هي درجات حرارة منخفضة ورطوبة نسبية عالية بالإضافة إلى ذلك فانه يوجد علاقة موجبة بين تعداد القواقع والخسائر الناتجة عنها للمحاصيل المختلفة الثلاثة.

قام بتحكيم البحث

كلية الزراعة – جامعة المنصورة
مركز البحوث الزراعية

أ.د / عمر عبد الحميد نصار
أ.د / فاطمة شوقي المحروقى

Table (1): Effect of temperature degree and relative humidity on the population density of land Snails infesting different field crops at Quessina district , Minufya governorate during two successive year 2009-2010

Month	Year	Average of		Clover						Lettuce						Navel orange					
				Total Colle.	Rate to may	<i>M. cartusiana</i>		<i>E. vermiculata</i>		Total Colle.	Rate to may	<i>M. cartusiana</i>		<i>E. vermiculata</i>		Total Colle.	Rate to may	<i>M. cartusiana</i>		<i>E. vermiculata</i>	
						C	R.h	No.	%			No.	%	No.	%			No.	%	No.	%
November	2009	21.4	62.3	44.3	1.61	44	100	-	-	28.4	1.34	28.4	100	-	-	28.4	1.45	7.4	26	21	74
	2010	16.5	57.5	62.7		58	93.5	4	6.5	30.8		26.2	85	4.6	15	21.2		6.6	31.1	14.6	68.9
	mean	19.0	59.9	53.5		51	96.2	2	3.8	29.6		27.3	92.2	2.3	7.8	24.8		7	28.5	17.8	71.5
December	2009	16.1	65.7	69	2.15	65	94.2	4	5.8	33.5	1.77	33.5	100	-	-	28	1.82	10	35.7	18	36.4
	2010	14.8	63.7	74		67	91.8	6	8.2	37.3		37.3	100	-	-	34		10	29.4	24	70.6
	mean	15.5	64.7	71.5		66	93	5	7	35.4		35.4	100	-	-	31		10	32.5	21	67.5
January	2009	15.9	63.7	89	2.79	79	88.8	10	11.2	59	2.9	58	98.3	1	1.7	43	2.47	20	46.5	23	53.5
	2010	14.3	55.4	95		83	87.4	12	12.6	57		52	91.2	5	8.8	41		16	39	25	61
	mean	15.1	59.6	92		81	88	11	12	58		55	94.8	3	5.2	42		18	42.9	24	57.1
February	2009	15.8	66.3	110	3.5	96	87.3	14	12.7	61.6	3.44	61.6	100	-	-	50	3.0	21	42	29	58
	2010	16.2	53.4	121		105	86.8	16	13.2	76		76	100	-	-	52		13	25	39	75
	mean	16.0	59.9	115.5		100.5	87	15	13	68.8		68.8	100	-	-	51		17	33.3	34	66.7
Marsh	2009	18.2	65.9	68.2	2.36	68	100	-	-	34.7	1.88	30.2	87	4.5	13	29	2.0	7	24.1	22	75.9
	2010	19.0	53.4	88.2		72	81.8	16	18.2	40.5		39	97.5	1.5	3.7	39		17	43.6	22	56.4
	mean	18.6	59.7	78.2		70	89.7	8	10.3	37.6		34.6	92	3	8	34		12	35.3	22	64.7
April	2009	21.4	59.2	59	1.79	54	91.5	5	8.5	32	1.44	26.4	82.5	5.6	17.5	19.3	1.2	3.8	19.7	15.5	80.3
	2010	23.1	51.0	58		50	87.7	7	12.3	25.6		21.6	84.3	4	15.7	21.5		10.2	47.5	11.3	52.5
	mean	22.3	55.1	58.5		52	89.7	6	10.3	28.8		24	83.4	4.8	16.6	20.4		7	34.3	13.4	65.7
May	2009	31.7	56.0	30	1	30	100	-	-	19	1	18	94.8	1	5.2	15	1	7	46.7	8	53.3
	2010	26.2	53.4	36		34	94.4	2	5.6	21		20	95.2	1	4.8	19		9	47.4	10	52.6
	mean	29.0	54.7	33		32	97	1	3	20		17	95	1	5	17		8	47	9	53