

**FACTORS AFFECTING THE POPULATION FLUCTUATIONS OF TERRESTRIAL SNAILS *Monacha cantiana* (MÜLLER) AND *Succinea putris* (LINNAEUS) AT FARASKOUR DISTRICT, DAMIETTA GOVERNORATE**

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**ABSTRACT**

These studies were carried out at Faraskour district in four locations differed in its soil such as Sharabass which located very closely to Nile river coast with fine loamy clay soil and highly infested with land snails to El-Rodda with heavy clay soil reclaimed from Manzala Lake. Ecological factors were studied by measuring the population in moist and dry soil in the same village under all field conditions. Also, toxicological studies were conducted on these land snails under field conditions to know, the best compound which effective and cheaper in addition to avoid environmental pollution and harmful residues on plants, animal and human health. Tested compounds stated that superphosphate mixed with hyderated lime by percentage of 3:1 and foliar fertilizer improved plant growth and quality in addition to limiting individuals of these pests in relatively similar effect of some pesticides. Data showed high differences between moist and dry soil which recorded (64.6/34.8), (35.5/15.9), (35.8/18.0) and (38.5/17.4) respectively , also stated that high recorded individuals in moist soil of clover fields (64.8 per m<sup>2</sup> at sharabass).

**INTRODUCTION**

In recent years, land snails became very important pests to field, horticultural and ornamental plants and caused great damage not only to plants but also animal, bird and human health, in addition acting as intermediate hosts of parasitic worms such as Fasciola, Monizea, Shistosoma and nematodes. Also, spread fungal, bacterial and viral diseases, Godan (1983), Bishara *et al.* (1968), and El-Okda (1979), (1984) who reported about these pests, their dispersal, activity, economic importance and their control by pesticides or plant extracts. Many investigators reported about their biology, ecology and control, Hashem *et al.* (1993), and Ghamry *et al.* (1991). The present work aimed to find the best and suitable way for controlling these pests without chemical pesticides which caused environmental pollution and harmful for human and animal health due to residual effect in field, vegetable and fruit crops which treated with these pesticides. So, fertilizers such as superphosphate mixed with hydrated lime and Foliar fertilizer were used as tested compounds against these land snails to study their effect in comparison with Metaldhyde bait as recommended molluscicides .

## MATERIALS AND METHODS

### 1- Population dynamic of land snails:

- a) Population of individuals measured at four locations of Faraskour district by counting individuals in four types of soil differed from moist and dry loamy sand to heavy clay soil. Also, samples were taken from two types of soil, numbers from wet soil collected after 5 days from irrigation while the other collected 15 days after irrigation.
- b) Seasonal fluctuation of snails was measured through autumn, winter and spring of (2006/2007), Godan (1983), Port and Ester (2002), and Satoshi (2003).

### 2- Land snail control:

Control under field condition divided into three treatments two of them were fertilizers such as:

- a) Superphosphate 15 % provided by agricultural fertilizers (Abo Qure Factory for Fertilizers) mixed with hydrated lime by percentage of 3:1. (100Kg / feddan)
- b) Foliar fertilizer which contains coppersulphate manganese, zinc and phosphore in sort of aquatic case (one litre/ fedan), according to Kloos and Cullough (1982).
- c) Metaldhyde bait in recommended dose provided by Kafr ElZayyat for insecticides used in special bait station designed to avoid pollution Godan (1983).

### 3- Technique used:

- a) Samples from field and vegetable crops in three successive seasons which recorded snail's activity through autumn, winter and spring of (2006/2007), Godan (1983), El-Okda (1979, 1980, 1981 and 1984), Hashem *et al.* (1993). these samples of snails population were taken from clover, wheat, patata and lettuce per m<sup>2</sup> for each crop and five replicates for each sample from moist and dry soil monthely, according to Godan, (1983).
- b) Control measurement:  
Three treatments of control were considered as follows:
  - Using superphosphate 15 % mixed with hydrated lime (3:1) as dust on treated plants in plots of 1 m<sup>2</sup> for each replicate. (100kg/feddan)
  - Foliar fertilizer as spry on treated replicates. (one litre / feddan)
  - Metaldhyde bait stations in the same area of treated replicates. (2kg/ feddan)
  - Affected individuals collected and counted according to Henderson and Tilton formula, (1925) and corrected by Abott (1925).

## RESULTS AND DISCUSSION

Data obtained in table (1) showed that, samples of individuals which collected from field and vegetable crops such as clover, wheat, patata and lettuce showed high variation between moist and dry soil were recorded (64.6/34.8), (35.5/15/9), (35.8/18.0) and (38.5/17.1) for (moist/dry) in clover,

wheat, patata and lettuce infested by *M. cantiana* at Sharabass coast of Faraskour district. Also, Faraskour city, El Dahra village and El-Rodda city showed that the data obtained from these locations were similar to that obtained from Sharabass coast, the highest number of individuals was in clover moist soil at Sharabass and El-Dahra villages which recorded (64.8 and 62.0), respectively. While, the lowest number was recorded in wheat dry soil (15.9) followed by dry soil of lettuce at Faraskour city (14.6). Wet or moist soil showed high number of individuals in most tested locations which agreed with that reported by Godan (1983) and El-Okda (1979, 1980). Also, the highest number was recorded in clover in most samples of studied locations, which recorded (64.6, 62.0, 57.9 and 57.1) at Sharabass in clover moist soil at El-Rodda village by lettuce at the same village 50.6 followed by patata which recorded (49.8 and 48.9) at El-Rodda and Faraskour, respectively. It was noticed that land snail *Succinea putris* was more affected by soil moisture than *M. cantiana* which showed more resistance for dryness that also affected by the shelter of plants such as in case of clover makes soil moist and warm for long time followed by potato, lettuce and finally wheat. This shelter for these snails agreed with that reported by Godan (1983), El-Okda (1980), Satoshi (2003), Duncan (1983) and Coote (2003).

## **2- Land snail control:**

### **a- Control of *S. putris***

Three tested compounds were used against land snails under field conditions. Data of table (2) indicated that metaldehyde was more effective in each of lettuce with 85 % reduction on *S. putris* followed by wheat 83 % at El-Dahra village. Also, on patata and wheat at El-Rodda city 80 % recorded for each. Its efficiency on lettuce 77 % and 75 % on patata but in most replicates was similar or closely to the result of tested fertilizers, foliar fertilizer recorded 71 % reduction in snail individuals on lettuce at Faraskour followed by 69 % on patata at El-Dahra village and in lettuce and clover 68 % for each. It was observed that locations which treated with Foliar and Superphosphate improved clover and it was clear on lettuce, patata and wheat, respectively beside its efficiency on individuals of *S. putris* which agree with that reported by Godan (1983) and Marston and Hostetmann (1985).

### **b) Control of *M. cantiana***

Tested compounds were less effective than in *S. putris* as shown in table (3) which stated that Metaldehyde bait recorded satisfied results in all cases of reduction percentages after 15 days of treatment 81, 79, 76 and 75 % on potato, wheat and lettuce at El-Rodda, El-Dahra, El-Rodda and Faraskour, respectively. The lower effect of metaldehyde was on individuals under clover crop 63 % and 64 % at Sharabass and Faraskour, respectively. Also, mean of reduction percentages due to the effect of superphosphate and foliar were less than in *S. putris* specially on clover plant where recorded 50 % and 53 % at Sharabass, respectively.

T1

T2-3

The highest effect of superphosphate was on lettuce 69 % at Sharabass followed by 64 % on lettuce at El-Dahra. Clover plant showed less efficiency for tested compounds due to the heavy plants of clover as shelter save protection and recovery to land snails also clover as suitable for hidden and food sources, that agree with that investigated by Godan (1983) and Kloos, (1982).

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## العوامل المؤثرة علي تعداد القواقع الأرضية *Monacha cantiana* (Müller) and *Succinea putris* (Linnaeus) في مركز فارسكور محافظة دمياط.

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أصبحت القواقع من الآفات الخطيرة التي تهدد المحاصيل الحقلية والبستانية ونباتات الزينة وتسبب لها خسائر فادحة ليس فقط بالنسبة للنبات ولكن أيضاً للحيوان والإنسان والتي تعتبر عوامل وسيطة للدندان الطفيلية مثل الفاشيولا والبهارسيا والنيماطودا وأيضاً الفطريات والبكتيريا والفيروسات. وتهدف هذه الدراسة إلى تحديد العوامل المحددة لأعداد القواقع ونشاطها على المحاصيل الحقلية مثل البرسيم والذي يصاب بشدة بسبب هذه الآفات حيث يصعب استخدام المبيدات الحشرية ومبيدات الآفات ضدها على البرسيم تجنباً لمخاطر إصابة الحيوانات التي تتغذى عليه وكذلك المحافظة على البيئة من التلوث. تم إجراء هذه التجربة في منطقة فارسكور بمحافظة دمياط في أربعة مواقع تختلف في نوع التربة وهي منطقة شرباص القريبة من نهر النيل ومنطقة الروضة ذات التربة الثقيلة والمقطعة ومستصلحة من بحيرة المنزلة. وتم دراسة بعض العوامل بقياس عدد القواقع في تربة مبتلة وتربة جافة في بعض القرى وتحت نفس الظروف. وتم أيضاً دراسة تأثير بعض المركبات تحت الظروف الحقلية لدراسة مدى تأثيرها واقتصادياتها بالنسبة للبيئة .

تم استخدام سوبرفوسفات ١٥% مختلطاً مع الجير المطفي بنسبة ٣ : ١ واستخدام سماد فوليار محسناً لنمو النبات بالإضافة لتحديد أعداد القواقع ومقارنتها نسبياً بتأثير مبيدات الآفات. وفي هذه الدراسة محاولة لتحديد أنسب وأفضل الطرق لمكافحة هذه الآفات بدون استخدام المبيدات الكيميائية الباهظة التكاليف بالإضافة إلى تأثيرها المميت على البيئة وصحة الإنسان والحيوان بما تخلفه من متبقيات في الحقل وفي نباتات الخضر والفاكهة وغيرها.

وقد تم أخذ العينات من المواقع المحددة بعد ٥ أيام من الري وبعد ١٥ يوماً من الري خلال فصول الخريف والشتاء والربيع في الموسم الزراعي ٢٠٠٦/٢٠٠٧ م. وقد أوضحت النتائج أن العينات المأخوذة من البرسيم والقمح والبطاطس والخس أن هناك اختلافاً كبيراً فيما بين الأرض المبتلة والجافة حيث كانت النتائج (٣٤,٨/٦٤,٦) و (١٥,٩/٣٥,٥) و (١٨,٠/٣٥,٨) و (١٧,١/٣٨,٥) لكل من الأرض الرطبة والجافة على الترتيب في البرسيم والقمح والبطاطا والخس حيث تأثرت بـ *Monacha cantiana* في منطقة شرباص على حدود فارسكور وكذلك منطقة فارسكور وقرية الضهرة ومدينة الروضة حيث أعطت نتائج مشابهة لنتائج منطقة شرباص ، وكانت أعلى النتائج في البرسيم في الأرض الرطبة في شرباص وقرية الضهرة حيث كانت النتائج ٦٤,٨ و ٦٢,٠ على الترتيب. وكانت أقل النتائج في القمح في الأرض الجافة ١٥,٩ ثم الأرض الجافة في الخس بمنطقة فارسكور ١٤,٦ وعموماً الأرض الرطبة أو المبتلة أعطت أعلى النتائج في معظم مناطق البحث. وقد ظهر من البحث أن قواقع *Succinea putris* تتأثر أكثر بالتربة الرطبة من قواقع *Monacha cantiana* والتي أظهرت مقاومة للجفاف وكذلك تأثرها بالحماية بالنبات كما في حالة البرسيم والتي تجعل التربة رطبة ودافئة لفترة طويلة كذلك توفر الأمان والغذاء الكافي والذي يجعل القواقع الأرضية قليلة الحركة وبالتالي تقل فرص تعرضها للمبيد ثم يليها البطاطا والخس ثم القمح.

كما توصي الدراسة بزيادة الفترات بين الري حيث يؤدي ذلك الي تقليل أعداد القواقع وكذلك يجبرها علي الحركة السريعة بحثاً عن الرطوبة مما يجعلها عرضة للمبيد بالملاسة أو تصحيح في متناول الأعداء الحيوية التي تتغذى عليها.





Table 1: Population fluctuation of *Monacha. cantiana* and *Succinea. putris* on field and vegetable crops through two successive seasons in different locations at Faraskour district, Damietta Governorate

Location	Seasons	Number of individuals of																Climatic Factors	
		<i>M. cantiana</i>								<i>S. putris</i>									
		Clover		Wheat		Potato		Lettuce		Clover		Wheat		Potato		Lettuce		°C	RH %
Moist	Dry	Moist	Dry	Moist	Dry	Moist	Dry	Moist	Dry	Moist	Dry	Moist	Dry	Moist	Dry	Moist	Dry		
(1)	Au.	68.8	34.2	36.4	12.8	32.4	18.8	36.2	20.4	34.4	18.2	40.8	26.0	42.6	24.2	34.4	18.6	22	68
	Wi.	40.6	21.6	22.0	8.0	28.4	10.4	30.4	12.2	20.8	6.4	30.4	14.4	27.8	9.8	14.6	7.8	18	58
	Sp.	84.6	48.6	48.0	26.8	46.6	24.8	48.8	18.6	66.8	28.4	48.4	28.0	54.4	24.6	48.2	18.8	24	64
<b>Total</b>		193.8	104.4	106.4	47.6	107.4	54.0	115.4	51.2	122.0	53.0	119.6	68.4	124.8	58.6	97.2	45.2		
<b>Mean</b>		64.6	34.8	35.5	15.9	35.8	18.0	38.5	17.1	40.7	17.7	39.9	22.8	41.6	19.5	32.4	15.1		
(2)	Au.	56.4	26.6	44.8	24.6	38.2	18.2	34.6	14.8	48.8	28.4	36.8	16.4	48.2	20.4	34.6	14.6	22	64
	Wi.	36.6	18.8	32.6	12.6	24.4	19.4	22.4	8.8	34.8	12.6	24.2	8.6	36.0	16.0	26.8	8.8	19	56
	Sp.	78.2	38.4	70.6	40.8	54.6	14.4	48.6	18.6	64.2	24.8	52.2	24.8	62.4	32.4	64.6	24.6	26	68
<b>Total</b>		171.2	83.8	148.0	77.8	117.2	52.0	105.6	42.2	147.4	65.8	113.2	49.8	146.6	68.8	126.0	48.0		
<b>Mean</b>		57.1	27.9	49.3	25.9	39.1	17.6	35.2	14.6	49.1	21.9	37.7	16.6	48.9	22.9	42.0	16.0		
(3)	Au.	58.6	28.8	46.4	28.2	38.4	18.6	36.2	18.0	48.6	29.8	34.4	10.4	42.8	18.6	32.0	12.8	20	64
	Wi.	46.4	26.4	32.8	14.4	24.2	10.8	28.4	10.0	26.4	14.8	18.8	12.0	28.6	10.4	18.8	8.4	18	66
	Sp.	82.0	34.0	64.2	28.4	48.8	26.4	54.6	24.6	64.8	28.4	48.2	18.0	58.4	28.6	48.2	21.2	24	58
<b>Total</b>		186.0	89.2	143.4	81.0	111.4	55.8	119.2	52.6	139.6	73.0	101.4	40.4	129.8	57.6	99.0	42.8		
<b>Mean</b>		62.0	29.7	47.8	27.0	37.1	18.6	39.7	17.5	46.5	24.3	33.8	13.4	43.3	19.2	33.0	14.3		
(4)	Au.	56.6	28.4	48.4	26.8	46.4	18.6	48.2	28.4	42.2	22.2	40.8	20.8	56.4	28.4	46.6	18.8	21	62
	Wi.	36.4	12.2	36.2	11.4	34.2	14.0	32.4	18.6	28.4	18.0	26.4	8.6	24.2	8.6	24.4	10.2	19	58
	Sp.	80.6	34.4	68.8	22.8	66.8	26.6	68.6	22.4	86.8	46.2	64.2	41.3	68.8	28.2	80.8	42.6	26	64
<b>Total</b>		173.6	75.0	153.4	61.0	146.4	59.2	149.2	69.4	167.4	86.4	131.4	70.7	149.4	65.8	151.8	71.6		
<b>Mean</b>		57.9	25.0	51.1	20.3	49.1	19.7	49.7	23.1	55.8	28.8	43.8	23.3	49.8	21.9	50.6	23.9		
<b>LSD 5%</b>		2.46		4.28		2.36		2.48		2.28		4.42		2.48		2.18			

Keyword: (1) = Sharabass, (2) = Faraskour, (3) = El-Dahra, (4) = El-Roda, Au= Autumn, Wi=Winter, Sp=Spring  
 Moist = Moist soil sampled 5 days after irrigation, Dry= Dry soil sampled 15 days after irrigation

**Table 2: Effect of tested compounds against *Succinea putris* on certain field and vegetable crops at Faraskour district, Damietta Governorate**

Location	Tested compounds	Number of affected individuals of <i>Succinea Putris</i>											
		Clover			wheat			Patata			Lettuce		
		No.	Red.	Red.%	No.	Red.	Red.%	No.	Red.	Red.%	No.	Red.	Red.%
Sharabass village	Treatment 1	39.8	26.2 C	65.8	42.6	24.2 C	57	44.6	26.4 C	59	37.4	24.6 C	66
	Treatment 2	59.2	40.8 B	68.9	61.0	38.6 B	63	54.6	36.8 B	67	51.2	34.8 B	68
	Treatment 3	64.2	48.4 A	75	67.6	48.8 A	72	62.2	46.4 A	75	63.4	48.6 A	77
Faraskour city	Treatment 1	45.8	28.4 C	62	39.0	20.4 C	52	31.2	18.6 C	58	30.2	19.8 C	66
	Treatment 2	55.0	36.4 B	66	59.2	32.8 B	55	51.0	34.4 B	67	48.4	34.2 B	71
	Treatment 3	65.0	44.8 A	69	70.0	49.4 A	71	69.0	46.2 A	71	60.8	44.8 A	74
El-Dahra village	Treatment 1	42.8	24.6 C	57	43.4	22.8 C	51	43.2	26.4 C	61	38.2	22.6 C	59
	Treatment 2	63.0	38.2 B	61	58.6	38.4 B	66	50.4	34.8 B	69	56.8	39.4 B	66
	Treatment 3	73.0	48.4 A	66	65.4	54.6 A	83	74.2	56.4 A	76	57.4	48.6 A	85
El-Roda city	Treatment 1	40.8	24.2 C	59	39.0	22.8 C	58	44.2	26.8 C	61	39.0	22.4 C	57
	Treatment 2	57.2	36.8 B	64	57.4	34.6 B	60	54.2	32.6 B	60	56.8	34.4 B	61
	Treatment 3	74.2	48.4 A	65	60.4	48.4 A	80	60.6	48.4 A	80	69.6	48.8 A	70

Treatment 1= Superphosphate 15 % + hydrated lime by percentage of 3:1

Treatment 2= Liquid of foliar fertilizer by dose of 1 kg/feddan

Treatment 3= Metaldhyde bait in special station

A : Signi. B = ns. C= ns.

No = Natural number of individuals (control).

Red. = Reduction of treated individuals.

Red. %= Reduction Percentage.

**Table 3: Effect of tested compounds on land snail *Monacha cantiana* on certain field and vegetable crops at Faraskour district, Damietta Governorate through seasons of 2006/2007**

Location	Tested compounds	Number of affected individuals of <i>Succinea Putris</i>											
		Clover			wheat			Patata			Lettuce		
		No.	Red.	Red.%	No.	Red.	Red.%	No.	Red.	Red.%	No.	Red.	Red.%
Sharabass village	Treatment 1	46.6	23.4 C	50.2	45.0	24.6 C	54.7	39.2	22.4 C	56.6	41.2	28.6 C	69
	Treatment 2	67.6	36.4 B	53.8	59.0	32.8 B	55.6	41.4	28.8 B	69.6	53.2	32.4 B	61
	Treatment 3	60.8	38.4 A	63.2	67.8	44.4 A	65.5	65.2	48.4 A	74.0	71.0	46.6 A	66
Faraskour city	Treatment 1	44.6	20.2 C	45.3	42.0	21.6 C	51.0	39.2	20.4 C	52.0	40.6	21.8 C	54
	Treatment 2	60.8	28.4 B	46.7	47.2	30.4 B	64.4	46.0	29.4 B	65.0	45.2	26.4 B	58
	Treatment 3	75.4	48.6 A	64.4	71.2	46.8 A	66.0	69.2	46.4 A	67.0	64.6	48.6 A	75
El-Dahra village	Treatment 1	46.6	24.4 C	52.3	47.2	24.4 C	52.0	48.4	28.8 C	59.0	41.0	26.4 C	64
	Treatment 2	64.6	36.8 B	57.0	59.0	32.6 B	55.0	54.4	30.4 B	56.0	63.4	36.8 B	58
	Treatment 3	71.2	48.4 A	68.0	59.2	46.4 A	79.0	70.2	49.4 A	63.0	64.8	46.8 A	72
El-Roda city	Treatment 1	48.4	26.4 C	54.5	44.4	22.8 C	51.0	44.8	21.8 C	49.0	40.4	20.4 C	50
	Treatment 2	64.8	38.8 B	60.0	64.6	36.4 B	56.0	63.0	35.8 B	57.0	66.6	38.6 B	58
	Treatment 3	67.0	46.4 A	69.3	63.2	48.4 A	76.6	61.2	49.4 A	81.0	62.2	46.2 A	74

Treatment 1= Superphosphate 15 % + lime by percentage of 3:1

Treatment 2= Liquid of foliar fertilizer by dose of 1 kg/feddan

Treatment 3= Metaldhyde bait in special station

A : Signi. B = ns. C= ns.

No.= Number of natural individuals ( control)