

# POPULATION DYNAMICS AND TILLAGE PROCESS ON LAND SNAIL *COCHLICELLA ACUTA* (MULLER) INFESTING CERTAIN FRUIT TREES AT DUMYAT AND KAFR SAAD DISTRICTS OF DUMYAT GOVERNORATE.

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## Abstract

Field studies were conducted under different conditions of Dumyat governorate (Dumyat and Kafr Saad districts) to study some ecological aspects associated with *C. acuta* as a serious pest of date palm, lemon, orange and guava trees and the performance of tillage process on population reduction of *C. acuta* on date palm and citrus trees during four successive seasons. Obtained data showed that date palm is the most preferable one for land snail infestation, followed by lemon, orange and guava trees respectively. The high number of individuals was found under shelter of fibers which cover date palm trunk and recorded during the whole year, also found on lower leaves and trunk through spring and autumn seasons while, found only under shelter of trunk and soil around root of tree in winter season. *C. acuta* was found also on citrus trees, recorded with high number particularly on trunk of citrus trees digging a hole and hiding in it or under outer cortex of the trunk though winter and summer seasons but active through spring and autumn seasons distributed on leaves and all branches of the citrus tree.

Dumyat district was more infested than Kafr Saad and increased with soil moisture and relative humidity. The efficacy of tillage process cultural control method is dependent on season. It was more effective in spring and summer than autumn and winter seasons with reduction percentages in population density, so the population density of *C. acuta* was obviously increased during spring and summer seasons as compared to population density during winter and autumn seasons. Also, the effect of certain climatic factors (temperature and relative humidity) on population density.

## INTRODUCTION

The land snails are one of the main and most spectacular gastropods, comprised a large number of species which might be found as a terrestrial species caused a serious economic problems to fields, vegetable crops and fruit trees. In Egypt, studies were conducted on some land snails injurious to agriculture (Bishara *et al.*, 1968) also,

land snails of economic importance at Alexandria region with some notes on the morphological features, classification economic damage and population stated by El-Okda (1979, 1980). Ecological and morphological studies of certain land snails at Sharkia governorate by Ghamry *et al.*, (1993) Seasonal fluctuations in population of the land snails on citrus trees in the Northern reclaimed lands was stated by Hashem *et al.*, (1993) also, Kassab and Daoud (1964) Studied the biology of economic importance land snails to field crops, vegetables and fruits also, snails are economic importance pest in agriculture horticulture plants. In addition they are importance as medical and veterinary pests. Where they serve as intermediate hosts for certain parasitic worms of man and his animals (Godan, 1983) later the recent history and population structure of the mandarin snail species from subtropical Ogasawara (Bonin Island in Japan) was studied by Davison and Ghibs (2006). This present paper was carried out at Dumyat governorate, (Dumyat and Kafr Saad districts) to determine the population density of *C. acuta* as a date palm pest. It cause an economic damage to the plant specially the youngest palms which become an important crop for most farmers at Dumyat governorate, infested palms did not yielded and if it yield, date lose its size and quality. This manuscript aimed to throw a light on certain ecological aspects which cleared the right way to minimize the snails' damage.

## **MATERIALS AND METHODS**

### **1- Population dynamics of *C. acuta***

Samples of *C. acuta* were taken from two sites of Dumyat governorate under field conditions on date palm, lemon, orange and guava trees from Dumyat district and Kafr Saad district, ecological factors such as temperature and relative humidity were measured gradually as soon as obtained data of population. Population density of *C. acuta* was conducted monthly on the different fruit trees which located in a mixed gardens of each region, five trees were chosen to getting data, these trees were marked by flu master paint, snail individuals were counted every month from January 2004 to December 2006, individuals were handily collected from soil, trunk, branches and leaves.

### **2-Efficacy of tillage process**

From each location 3 Faddens (date palm or citrus trees) were chosen and 5 trees from each Fadden were subjected to tillage process as well as one fadden was left without tillage as an untreated check. The population of snails was assessed in the early morning (El-Okda, 1980), monthly beginning 2004 till the end of year 2006. The months were divided into four seasons, the first one as a winter season (December,

January and February), and the second as a spring season (March, April and May), the third as a summer season (June, July and August) and the fourth as an autumn season (September, October and November). All snails found on trees or on soil surface were count. The percent of the reduction in population density of land snail was calculated by using Henderson and Tilton formula (1955).

## RESULTS AND DISCUSSION

### 1- Population dynamic of *C.acuta*

Population dynamic of the land snail *C.acuta* on certain fruits (date palm, lemon, orange and guava trees) at Dumyat and Kafr Saad districts during 2004 to 2006. Data presented in Table(1) showed that the initial infestations of *C.acuta* was recorded in the beginning of December on all tested plants with low population density ( 108.2, 58.6, 28.4 and 10.6 individuals, 48.2, 24.4,16.4 and 8.4 individuals at Dumyat and Kafr Saad districts, respectively. However, during January, February, March and April the population density was noticeably increased on all plants with low temperature and relative humidity, while population dynamic decreased at high temperature and relative humidity in May, June, July and August, respectively because land snail *C. acuta* fluctuated from month to another according to temperature and relative humidity. Number of snails was slightly increased in September, October and November on all plants, respectively when the temperature degree was decreased. Also in Table (1) obtained data showed that the number of snails differed according to the host plant which recorded 1982.8, 1147.7, 513.4 and 314.6 this is the mean number of individuals as total of all two years at Dumyat district on palm, lemon, orange and guava trees respectively, while, number of individuals on the same hosts of Kafr Saad district differed from the case of Dumyat district which recorded 936.4, 428.0, 284.6 and 210.8 individuals on palm, lemon, orange and guava, respectively. April was the highest month of snail occurrence which recorded 316.2 and 189.6 individuals of *C.acuta* on palm tree followed by lemon tree which recorded 200.2 and 68.4 individuals, orange 66.4 and 42.4 individuals and less infestations in guava 52.6 and 38.6 individuals at Dumyat and Kafr Saad districts, respectively, while August recorded the lowest number of individuals in both districts which recorded 96.4, 42.2, 20.6 and 16.2, 48.4, 16.4, 16.0 and 10.2 on palm, lemon, orange and guava trees at Dumyat and Kafr Saad districts, respectively. Generally, comparing numbers of *C.acuta* on the whole tested plants at Dumyat and Kafr Saad districts, it is clear that date palm contained the elevated number followed by lemon and orange, but guava included the lowest number of the snail. The changeable population dynamic of *C.acuta* from month to another is according to temperature degree and relative humidity. These

results are in agreement with the findings of Kassab and Daoud (1964) and Bishara *et al* (1968) surveyed *C. acuta* on fruit orchards of north of Delta region also studied by El-Okda *et al* 1980 and 1984, at Alexandria governorate, Baker *et al.*, (1991) reported that land snail *Cochlicella acuta* was more common in pastures than in crops, especially in spring and summer while, in autumn, the number of snails decreased. Hashem *et al* (1993) studied abundance of *C. acuta* on fruit crops of orchards at El-Beheira governorate.

## **2- Effect of tillage process on population reduction of land snails under field conditions**

Data in Table (2) showed considerable variation in snail numbers during the different investigated periods. Tillage process drastically reduced the snail populations 71.3, 76.9, 79.7 and 73.2 % in winter, spring, summer and autumn seasons, respectively after tillage process on date palm at Dumyat district, while the reduction was 76.0, 85.8, 86.5 and 83.1 % on citrus trees at the same seasons, respectively. This reduction in snail population reached the maximum of 77.1, 87.0, 89.6 and 82.5 % on date palm at Kafr Saad district in four seasons, respectively and 75.6, 87.5, 93.1 and 85.9 on citrus trees in the same region, respectively.

Generally, it is clear that efficacy of tillage process as a cultural control method is dependent on season. It was more effective in spring and summer than in autumn and winter. The tillage process is considered the simplest and effective method for reducing the numbers snail and protecting the trees from the damage caused by them.

These results go in line with those obtained by El- Masry (1997) mentioned that the ploughing process decreased the population of *Helicella vestalis* immediately after one day. El-Deeb, *et.al* (2003) studied that the effect of some plant traps i.e. lettuce, cabbage, broad bean and sweet potato, tillage process and hand collection on population reduction of two species of land snails *Eobonia vermiculata* and *monacha obstructa* under semi-field conditions.

Table 1. Population dynamics of *C.acuta* on some fruit trees at Dumyat governorate during 2004 to 2006.

Months	Dumyat district				Kafr Saad district				Mean of	
	Palm	Lemon	Orange	Guava	Palm	Lemon	Orange	Guava	Temp °C	RH %
December	108.2	58.6	28.4	10.6	48.2	24.4	16.4	8.4	14.7	52.8
January	112.5	66.4	40.4	18.2	64.6	40.2	21.2	14.4	12.6	21.6
February	215.5	110.2	68.2	36.2	86.4	48.6	36.4	20.2	14.4	54.6
March	228.4	180.4	88.2	40.4	188.2	54.4	38.2	20.4	14.6	56.8
April	316.2	200.2	66.4	52.6	189.6	68.4	42.4	38.6	17.8	61.4
May	210.2	140.1	48.2	48.2	98.4	52.4	28.6	20.2	20.4	60.8
June	180.4	98.2	42.4	30.2	62.4	28.4	18.4	16.4	24.8	62.9
July	121.2	66.4	18.4	20.4	32.8	20.2	16.2	12.2	28.2	58.6
August	96.4	42.2	20.6	16.2	48.4	16.4	16.0	10.2	28.2	56.4
September	101.2	38.6	29.6	16.4	36.8	14.2	14.2	8.4	24.6	54.6
October	130.2	62.2	30.4	18.6	48.4	28.2	16.2	14.2	23.8	51.4
November	162.4	48.2	32.2	22.4	52.2	32.2	20.4	18.2	19.8	52.6
Total	1982.8	1147.7	513.4	314.6	936.4	428.0	284.6	210.8		
Average	165.2	95.6	42.8	26.2	78	35.7	17.6	20.3	56.2	

Table 2. Effect of tillage process on population reduction of land snail *C.acuta* on date palm and citrus trees during two successive years (2004-2006) under field conditions.

Seasons	Dumyat district						Kafr saad district					
	Date palm			Citrus trees			Date palm			Citrus trees		
	Untilled Trees	Tilled trees	Population Reduction %	Untilled Trees	Tilled trees	Population Reduction %	Untilled Trees	Tilled trees	Population Reduction %	Untilled Trees	Tilled trees	Population Reduction %
Winter	145.4	41.8	71.3	124.1	29.8	76.0	66.4	15.2	77.1	62.4	15.2	75.6
Spring	251.6	58.2	76.9	241.0	34.2	85.8	158.7	20.6	87.0	94.8	11.9	87.5
Summer	132.7	26.9	79.7	96.0	13.0	86.5	41.2	4.3	89.6	33.3	2.3	93.1
Autumn	131.3	35.2	73.2	90.8	16.0	83.1	45.8	8.0	82.5	41.8	5.9	85.9
Mean	165.3	40.5		138.0	23.3		78.0	12.0		58.1	8.8	
L.S.D	9.30	6.68		6.32	5.60		7.37	3.59		5.46	2.96	

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## دراسات بيئية على قوقع النخيل الارضى *Cochlicella acuta* الذي يصيب بعض أشجار الفاكهة في منطقتي دمياط و كفر سعد بمحافظة دمياط

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أجريت هذه الدراسة تحت الظروف الحقلية في مناطق مختلفة بمحافظة دمياط بهدف تقدير خطورة قوقع النخيل على نخيل البلح و بعض أشجار الليمون و البرتقال و الجوافة . وقد أسفرت الدراسة عن النتائج التالية:-

### (١) الكثافة العددية القوقع النخيل الارضى *C. acuta*

- أن نخيل البلح كان أكثر النباتات إصابة بقوقع النخيل يليه أشجار الليمون ثم البرتقال و أخيرا أشجار الجوافة
- أعلى كثافة عددية للقواقع كانت موجودة تحت الألياف التي تغطي ساق النخيل و سجل هذا التعداد طوال العام و كان تعداد القواقع اقل على الأوراق و الساق خلال فصلي الربيع والخريف أما الشتاء فكانت القواقع يختبئ على الساق و حول جذور النخيل
- أما أشجار الليمون و البرتقال و الجوافة فقد سجلت أعلى كثافة عددية على الساق حيث يقوم القواقع بعمل حفر أو جحور يختبئ بها تحت اللحاء أو القشرة الخارجية للساق طوال فصلي الشتاء و الخريف و لكنه ينشط خلال فصلي الربيع و الصيف ويكون موزع على الأوراق و كل الفروع و الأغصان و للأشجار

### (٢) تأثير عملية العنيق على تعداد القواقع

أجريت عملية العنيق بسيطة حول الأشجار مرة كل شهر التشميس التربة حول الجذور و التخلص من البيض و الأفراد الصغيرة الموجودة و اقل التربة و أوضحت النتائج :- أن عملية العنيق لها دور كبير في خفض تعداد القواقع و بالتالي انخفاض الإصابة حيث وصلت شبه الخفض في التعداد إلى ٧١,٣ و ٧٦,٩ و ٧٩,٧ و ٧٣,٢ % و ٧٦,٠ و ٨٥,٨ و ٨٣,١ % على النخيل البلح و الموالح خلال الفصول الأربعة في منطقة دمياط أما في منطقة كفر سعد فكان الانخفاض في التعداد التالي:- ٧٧,١ و ٨٧,٠ و ٨٩,٦ و ٨٢,٥ % على نخيل البلح أما الموالح فكان الانخفاض ٧٥,٦ و ٨٧,٥ و ٩٣,١ و ٨٥,٩ % على التوالي خلال الفصول الأربعة.