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SEASONAL ACTIVITY OF LAND SNAILS AND SLUGS ON LEMON AND GUAVA TREES AT DUMYATT AND KAFER EL-BATIKH DISTRICTS, DUMYATT GOVERNORATE. EGYPT.

Awad, M.H.M
Plant Protection Research Institute, Agric, Res.c.Doki Giza, Egypt.

ABSTRACT

The present investigation has been achieved as an attempt to study the influence of climatic change on the population density of land snails *Monacha cartusiana* ,*Monacha cantiana , Cochilicella acuta , Succinea putris , Succinea oblonga and gray garden* slug *Deroceras reticulatum* under lemon and guava trees at ElSenania and Kafr El-Batikh districts, Dumyatt Governorate 2011/2012 and 2012/2013 seasons .

The results revealed that the mean of populations density were higher throughout spring season followed by autumn and lower in winter seasons which estimating by 35.8, 29.3 and 18.5 snails/sample for *M. cartusiana*, respectively . *C.acuta* recorded the higher number on lemon trees 57.2 in spring season while recorded 45.2 in autumn season followed by winter season which recorded 25.6 snails/sample.

The population fluctuations of land snails varied according to crop , temperature , relative humidity and season to another . The snails were more active during spring and autumn .The snails *C.acuta* were the highest number of individuals on lemon and guava trees.

Key words: seasonal, fluctuation of land snails and slugs, lemon , guava trees , Dumyatt**.** Temperature.

INTRODUCTION

Land snails and slugs became very dangerous pests on field corps , vegetables and orchards , they are found in high numbers under dead leaves , vegetables , especially sweet potato and cucumber causing great damage to almost leafy vegetables such as lettuce , cabbage . Bishara et al (1968) also field crops such as Egyptian clover, wheat and maize in addition to citrus trees and mango was injurious El Okda (1980) .

Climatic factors, rain, temperature and relative humidity were effective on land snail's daily activity, egg laying, egg-clusters and finally egg number of each cluster. Ismail (2008) population dynamic was studied by Awad and Mahmoud (2009).

Land snail's vulnerability to climatic conditions variation Port and Ester (2002) and Gheoca and Costea (2012). Climatic change takes the form of changes in patterns and the reduction in rainfall is thought to cause increased mortality of juvenile snail .Gerlach (2007) and (2012) the importance of moisture in the activity patterns of the arid-dwelling land snail *Iberas gualtieranus* , reported by Moreno , Rueda (2012), weather patterns , like months with drought or occasional flooding , are likely influence the population dynamic of land snail , the higher temperature results in a longer

activity period of the snails and in an up slope shift of the vegetation was reported by Baur and Baur (1993) and (2013).
The present study designed to study the influence of temperature and relative humidity as climatic factors on land snail and slug populations along two successive seasons (2011/2012and2012/2013).

MATERIALS AND METHODS

1 -Population density and fluctuation of land snails and slugs

The population density of *M .cartusiana,M. cantiana,S. Putris,S.oblonga ,C. acuta* and gray garden slug *D. reticulatum* were studied on lemon and guava trees at El Senania , Dumyatt district and KafrEl Batikh district of Dumyatt Governorat, during 2012 and2013 seasons.

Five trees from three locations (garden) of each district (ElSenania and Kafr El-Batikh) were examined on lemon and guava crops. All snails and slugs on five branches of the different directions of the tree, 1meter high of tree trunk and on soil around tree trunk were counted. Snails were counted one time every month in the early morning as mean number of three locations . All alive snails and slugs were counted and left in their initial places. Air temperature and relative humidity during the period of study were obtained of Agriculture Metreological station of Dumyatt. Awad, (1994) and Mortada, (2002) .

RESULTS AND DISCUSSION

1-Population fluctuation of some land snails and slug on lemon and guava trees .

Population density and fluctuation of *M.cartusiana* , *M cantiana , C .acuta S.putris*, *S. oblonga* land snails and *D. reticulatum* land slug were tabulated in table (1-4) at El-Senania and Kafr El Batikh, Dumyatt district, Dumyatt governorate, during September to August at two successive growing seasons 2011 /2012 and 2012/2013.

Population fluctuation of *M.cartusiana* and *M.cantiana* on lemon and guava trees.

The infestation started with low numbers (25.5 and 18.4) and (24.8 and 16.2) snails /sample on lemon and guava trees (table 1) there after increase gradually to reached its peak (42.4 and 32.9) and (46.4 and 30.6) snails/sample in May on lemon and guava trees during 2011/2012 seasons ,respectively .The population density of *M.cartusiana* and *M.cantiana* was relatively hight numbers of snails in Autumn and Spring seasons followed by Winter and Summer seasons . It is noticeable to temperature degrees and relative humidity were (22.4^0 c and 76.4 %) during the peak of snails .
On the other hand , while the population density was the lowest (14.2 and 12.6) on lemon , (16.4 and 14.2) snails /sample on guava ,the temperature degree and relative humidity were lowest too . (17.8^0c and 68.6%) table (1).

Population fluctuation of *S.putris* and *S.oblonga* on lemon and guava trees .

Individuals started with low numbers (8.8 and 4.8) and (8.4 and 6.4) snails/sample on lemon and guava respectively ,increased to reach its peak

(18.5 and 11.1) and (18.8 and 12.6) snails/sample in May month of 2011/2012 on lemon and guava trees respectively spring season recorded the highest numbers followed by autumn ,summer and lowest in winter (6.9 and 3.8) and (6.4 and 5.4) snails/sample on lemon and guava trees , respectively . table (1).

population fluctuation of *C.acuta* on lemon and guava trees .

Number of individuals increased gradually , where recorded the highest number through Spring season on lemon and guava ,(57.2 and 34.4) snails/sample followed by Autumn season (45.2 and 32.4) snails/sample on lemon and guava ,respectively followed by Summer season (36.3 and 34.7) on lemon and guava , respectively and the lowest number was winter which recorded (25.6 and 24.5) .

The population density of *C.acuta* reached the peak of individuals through May month which recorded (66.8 and 42.6) on lemon and guava respectively. table (1).

Population fluctuation of land slug *D.reticulatum* on lemon and guava trees .

Gray garden slug *D.reticulatum* abundant in mixed gardens and weedy gardens With high number specially under dead weds, these number of individuals affected by air temperature and relative humidity

High numbers were noticed under lemon and guava trees specially through spring season (26.7 and 31.6) fallowed by autumn season (22.4 and 16.4) slug / sample lowest numbers through winter season (15.6 and 10.6) slug /sample . we noticed more individuals under guava trees at El.Senania, Dumyatt district , also Summer season recorded equal numbers of Autumn season . no significant differences between all seasons except Winter season . table (1).

2-Population fluctuation of *M.cartusiana* and *M.cantiana* on lemon and guava trees.

The same pattern of table 1 ,noticed more individuals of *M.cartusiana* under lemon and guava trees in spring season (35.3 and 31.9) snails/sample followed by *M.cantiana* (27.0 and 33.6) snails/sample for that season, Summer season recorded (31.8 and 31.2) snails for *M.cartusiana* and (17.7 and 24.5) for *M.cantiana* on lemon and guava trees respectively . while Autumn season recorded (18.4 and 20.8) and (15.1 and 17.7) for *M.cantiana* on (lemon and guava trees) respectively. Number of *M.cartusiana* increased to reach its peak in May (44.6 and 42.6) on lemon and guava trees . table (2).

population fluctuation of *S.putris* and *S.oblonga* on lemon and guava trees .

Number of individuals recorded high number on (lemon and guava trees) through Spring season {17.3 ; 11.4 and 17.8 ;8.7 } followed by summer season {10.6 ; 9.8 and 11.8 ; 11.3 } equal with Autumn season , while Winter season recorded lowest number of individuals {6.5 ; 3.9 and 6.6 ; 4.8 } for (*S.putris* and *S.oblonga*) on lemon and guava trees respectively. table (2).

1

2

Population fluctuation of *C.acuta* on lemon and guava trees .

Population fluctuation of *C.acuta* recorded high number through summer season (40.3 and 33.5) snails /sample on lemon and guava followed by spring season (34.7 and 28.5) on lemon and guava respectively .

Relatively same number through autumn season(31.5 and 25.6) snail /sample ,while the lowest number of individuals was recorded through winter season .

2-population fluctuation of land slug *D.reticulatum* under lemon and guava trees .

Gray garden slug *D.reticulatum* recorded high number under lemon and guava trees in spring season (27.8 and 25.3) followed by summer season (20.3 and 22.3) and autumn season (15.6 and 22.4) slug / sample under lemon and guava trees respectively , while winter season recorded lowest number (14.5 and 13.2) under lemon and guava trees . relative humidity was effective on land slug fluctuation . table (2).

3-population fluctuation of *M.cartusiana* and *M.cantiana* on lemon and guava trees .

Number of individuals were measured through the second season on lemon and guava trees at El.Senania . Spring season recorded high number {(25.6;and 18.6) and (27.6 , and 28.8)} snails/sample on {lemon and guava trees } for (*M.cartusiana* and *M.cantiana*), followed by Autumn season {(20.3 and 15.1) and (19.8 and 18.3)} equal with Summer season , while Winter season was the lowest number {(12.9 and 11.9) and (13.4 and 12.5)} for *M.cartusiana* and *M. cantiana* on lemon and guava trees , respectively . table (3).

population fluctuation of *S. putris* and *S.oblonga* on lemon and guava trees .

Population of individuals started low on lemon and guava tree (6.6 and 8.0) and (8.6 and 8.2) for *S.putris* and *S.oblonga* respectively , increased to reach its peak (22.8 and 18.0) and (16.8 and 26.2) through may month on lemon and guava trees respectively . table (3).

population fluctuation of *C.acuta* on lemon and guava trees

C.acuta was recorded in high number on lemon trees (33.7) snails / tree through spring season (16.5) and summer season 14.5 , reached its peak in may (40.4) while on guava trees the number of individuals were less than in case of lemon tree which recorded (20.5) through spring season followed by autumn season (17.6) and summer season (15.2) close to winter season (15.0) . table (3).

population fluctuation of land *D.reticulatum* under lemon and guava trees

Gray garden slug *D.reticulatum* land under dead weeds of mixed gardens at El.Senania , recorded high numbers of individuals in Spring season (27.7 and 31.6) on lemon and guava trees respectively , followed by Autumn (24.2 and 24.6) and Summer season (21.5 and 19.7) land slug /sample , while Winter season recorded lowest member of individuals (15.8 and 19.0) on lemon and guava trees , gray garden slug not affected with air temperature but affected by relative humidity due to its behavior where is found under dead leaves and weeds under lemon and guava trees . table (3).

3

4-population fluctuation of *M.cartusiana* and *M.cantiana* on lemon and guava trees

Population density of individuals reached its peak in spring season specially may month which recorded (28.4 and 26.4) and (26.4 and 20.2) on lemon and guava trees for *M.cartusiana* and *M.cantiana* respectively , followed by Autumn season (25.6 , and 16.3) on lemon trees and (23.1 and 18.4) on guava trees ,

followed by Summer season (22.7 and 15.8) and (26.9 and 14.1) followed by Winter season which recorded lowest number of individuals(19.2and15.9) and 19.7 and 18.7) snails /sample of *M.cartusiana* and *M.cantiana* on lemon and guava trees respectively . table (4).

population fluctuation *S.putris* and *S.oblonga* on lemon and guava trees

Population fluctuation *S.putris* and *S.oblonga* were measured in the second year of this study on lemon and guava trees , noticed high numbers through Spring season which recorded (17.0 and 16.4) and (16.3 and 17.2) snails/sample followed by Autumn season (14.0 and 11.1)and (12.3 and 9.2) on lemon and guava followed by Summer season (11.7 and 10.3) and (12.4 and 10.5) snails /sample Winter season recorded lowest number of these land snails on lemon and guava trees (9.8 and 7.9) and (7.8 and 10.3) .

It is noticeable that , number of these individuals affected by air temperature and relative humidity also , there is significant differences between population from season to another and from first year than in case of second year table (4)..

Population fluctuation of *C.acuta* on lemon and guava trees.

Number of individuals reached its peak in May month (32.4) on lemon trees , and (22.4) on guava trees Spring season recorded the highest number of individuals (29.0 and 22.0) snails /sample on lemon and guava trees , respectively , followed by Autumn season (27.4 and 22.3)then Summer season (20.4 and 16.7) snails / sample on lemon and guava trees while , Winter season recorded (18.6 and 17.8) on lemon and guava trees respectively . table (4).

population density of gray garden slug *D.reticulatum* on lemon and guava trees .

Same number of *D.reticulatum* under lemon and guava trees in May month which recorded (32.6 and 32.4) slug /sample table 4 so , Spring season was the suitable season for slug abundance and activity which recorded (29.0 and 27.0) under lemon and guava trees followed by Autumn season (24.4 and 25.0) under guava trees followed by Summer season (20.2 and 22.3) slug / sample under lemon and guava trees respectively .

There is no significant differences between number in case of Winter season due to their behavior and life activity under shelter of dead weeds avoiding cold air temperature .

4

Climatic factors has a great role for limiting number of these land snails and slugs specially air temperature and relative humidity which recorded (19.1, 18.0 and 21.4) and (67.8, 66.4 and 75.8) for (autumn – winter – spring) seasons of (2011-2012) air temperature and relative humidity respectively while the last year recorded (18.0, 15.8 and 20.8) and (64.6, 69.7 and 70.2) for air temperature.and relative humidity . Air temperature of first year more than in the last year which encourage land snail's activity and its movement in addition to high RH% which act as a suitable habitat for these land snails and slugs (Godan, 1983) . These results are in agreement with those reported by many authors , where as (Ismail 2008) and (Baur and baur 1993 and 2013) also , weather patterns , like monthes with drought which reported by Moreno Rueda 2012 .Data revealed that the occurrence of the studied snail species on lemon and guava trees with variable population densities through out the whole studied period .

Statistical analysis showed variable degrees of significantly between seasons and snails population for instance significant effects where noticed between number of snails at Autumn and Summer season .Similar significant effects between population density of snails were noticed during various tested seasons on lemon and guava trees .Simelar results were obtained during the second season . table (4).

CONCLUSION

According to obtained data relatively higher Population of these land snail and slug for first year, side-by-side to air temperature and relative humidity of the first year which recorded more than in case of the last year specially soil temperature .These studies showed the effect of soil temperature on land snail and slug populations,activities and egg laying.

We noticed slightly higher of soil temperature as mean of three studied seasons of the first year (2011-2012) than the case of the second year (2012-2013) in both two studied locations at El Senania and Kafr El Batikh.

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النشاط الموسمي للقواقع الأرضية والبزاقات على أشجار الليمون والجوافة في منطقتي السنانيه وكفر البطيخ بمحافظه دمياط.

محمد حامد محمد عوض

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الجيزة – مصر

هدف الدراسة: دراسة تأثير التغيرات الموسمية على أعداد القواقع الأرضية والبزاقات على أشجار الجوافة والليمون في محافظه دمياط ...

أقيمت هذه الدراسة على القواقع الأرضية *M.cantiana, Monachatheba, cartusiana,* والبزاقات الرمادية *Succineaelegansf,Succineapeitris, Coctucella, acuta Deroceras,retiutatum*, تحت أشجار البساتين المختلطة بمنطقة السنانيه و كفر البطيخ بمحافظه دمياط و ذلك في ثلاثة مواسم أساسية وهى: الخريف / الشتاء / الربيع من العامين الزراعين 2011-2012 و كذلك 2012-2013.

وقد اثبتت نتائج البحث ان متوسط الاعداد لهذه القواقع و البزاقات كان اعلى خلال موسم الربيع فعلى سبيل المثال نلاحظ ان زياده اعداد القواقع لنوع ال *M. cartusiana* كانت 35.8 في موسم الربيع ..... تعدادها في موسم الخريف 29.3 و الشتاء سجل 18.5 فرد للشجرة الواحدة في العام الأول من الفحص – كذلك متوسط اعداد القواقع لنوع *C.acuta* كان قد سجل 75.2 فرد في موسم الربيع بينما سجل 45.2 في فصل الخريف اما في الشتاء فكانت 25.6 فرد في الشجرة الواحدة.

وقد بينت النتائج المستخلصة من الجداول (1 -4) بارتفاع متوسطات اعداد القواقع والبزاقات للعام الأول مرتبطا ذلك مع ارتفاع طفيف في درجات الحرارة عن العام الثاني مخلفة تأثير الدفء وارتفاع درجة الحرارة على تعداد الأنواع حيث يعتبر عامل مناخيا مشجعا للنشاط وزيادة تعداد القواقع الأرضية.

و تخلص هذه الدراسة الى ان هناك تأثير مباشر للتغيرات المناخية والموسمية والمتمثلة في درجات الحرارة والرطوبة الأرضية في زيادة نشاط القواقع ودفئ المهد الخاص بهذه القواقع مما يزيد من اعدادها أكثر .

Table 1: Population fluctuation of land snails and slugs on lemon and guava trees at EL-Senania , Dumyatt district , Dumyatt Governorate .2011/2012 .

Season	Month	Number on individuals on fruit trees at EL Senania												*Climatic factors*	
		Lemon trees						Guava trees							
		M. car.	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*M. car.*	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*C.*	*Rh.*
Autumn	September	25.5	18.4	40.8	8.8	4.8	20.2	24.8	16.2	30.2	8.4	6.4	14.2	19.6	78.41
	October	30.2	20.2	46.6	10.4	5.2	22.4	28.6	18.4	32.9	8.6	8.2	18.2	19.2	74.6
	November	32.4	24.4	48.2	14.8	6.2	24.6	30.4	22.2	34.6	10.4	8.4	16.8	18.4	68.6
	Mean	29.3	21.0	45.2	11.3	5.4	22.4	27.3	18.9	32.4	9.1	7.8	16.4	19.1	67.0
	L.SD	6.4	4.2	8.2	2.4	1.6	4.4	5.6	3.8	6.8	2.7	2.4	3.2		
Winter	December	24.6	20.2	30.2	6.2	4.0	18.2	22.4	21.4	30.2	7.4	6.2	12.2	18.2	66.4
	January	16.8	14.8	26.4	8.0	3.6	14.4	18.2	16.8	24.4	6.2	4.8	1.4	18.0	64.2
	February	14.2	12.6	20.2	8.6	3.2	14.2	16.4	14.2	18.8	6.0	4.6	8.8	17.8	68.6
	Mean	18.5	15.8	25.6	6.9	3.8	15.6	19.0	17.5	24.5	6.4	5.4	10.6	18.0	66.4
	L.SD	3.8	3.0	5.2	2.2	1.2	3.0	3.8	3.6	5.2	2.2	2.0	2.8		
Spring	Marsh	28.8	18.8	46.4	16.8	8.4	22.4	26.8	20.2	24.2	10.4	6.6	24.2	20.4	72.4
	April	36.4	22.4	58.6	18.4	10.6	26.8	34.6	24.4	36.4	16.2	10.2	34.9	21.6	78.6
	May	42.4	32.9	66.8	18.8	14.4	30.8	46.4	30.6	42.6	18.8	12.6	36.4	22.4	76.4
	Mean	35.8	24.5	57.2	18.0	11.1	26.7	35.8	25.0	34.4	15.1	9.8	31.6	21.4	75.8
	L.SD	6.9	5.2	8.8	3.8	2.8	5.6	6.8	5.4	6.6	3.5	2.8	6.4		
Summer	June	35.2	28.4	36	10.4	10.4	24.6	28.4	22.6	32.8	10.4	8.4	22.6	24.2	78.2
	July	28.4	18.2	34.6	12.4	8.4	24.4	26.8	23.8	36.8	12.8	8.6	20.4	28.4	76.2
	August	28.2	16.4	38.2	10.2	6.8	20.2	28.6	21.4	36.4	14.6	8.2	20.6	30.2	78.2
	Mean	30.7	21.4	36.3	11.2	8.5	23.2	27.9	22.6	34.7	12.6	8.4	21.5		
	L.SD	6.9	5.2	8.8	3.8	2.8	5.6	6.8	5.4	6.6	3.5	2.8	6.4		

M. car=Monacha cartusiana - M.ca.=Monacha cantiana - C.acuta =Cochilicella acuta - S.putris=Succinea putris - S.obl=Succinea oblonga - D.retic=Deroceras reticulatum

Table 2 : Population fluctuation of land snails and slugs on lemon and guava trees at Kafr El Batikh district , Dumyatt Governorate .2011/2012 .

Season	Month	Number on individuals on fruit trees at Kafr El Batikh												*Climatic factors*	
		Lemon trees						Guava trees							
		M. car.	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*M. car.*	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*C.*	*Rh.*
Autumn	September	16.6	14.4	28.6	10.2	8.4	12.4	18.6	16.9	24.2	8.2	6.2	20.2	19.6	78.41
	October	18.4	14.8	32.4	12.4	8.8	16.6	18.8	18.2	26.4	8.6	8.8	22.4	19.2	74.6
	November	20.2	16.2	34.4	14.2	8.8	18.4	22.4	18.6	26.8	10.2	12.4	24.0	18.4	68.6
	Mean	18.4	15.1	31.5	12.6	8.6	15.8	20.8	17.7	25.6	9.4	9.6	22.4	19.1	67.0
	L.SD	3.6	3.0	6.7	2.6	2.8	3.8	3.8	3.6	5.2	2.8	2.8	4.4		
Winter	December	18.4	16.8	36.2	6.8	4.8	16.2	18.6	18.4	32.2	8.6	5.2	14.8	18.2	66.4
	January	16.8	16.6	28.4	6.6	3.8	14.6	18.2	16.4	26.4	6.2	4.4	12.2	18.0	64.2
	February	16.4	14.8	22.6	6.2	3.2	12.8	16.8	14.2	24.2	5.4	4.2	12.6	17.8	68.6
	Mean	17.4	15.6	29.0	6.5	3.9	14.5	17.9	16.4	27.6	6.6	4.8	13.2	18.0	66.4
	L.SD	3.6	3.2	6.2	1.8	1.9	3.6	3.7	3.2	5.6	1.8	1.2	2.4		
Spring	Marsh	28.6	22.4	24.8	16.6	8.4	24.2	24.8	26.2	22.6	18.8	6.6	22.6	20.4	72.4
	April	32.8	26.4	38.6	18.8	12.2	26.8	28.4	30.2	30.4	18.9	8.6	24.8	21.6	78.6
	May	44.6	32.4	40.8	16.6	13.8	32.4	42.6	44.4	32.6	18.2	10.8	28.6	22.4	76.4
	Mean	35.3	27.0	34.7	17.3	11.4	27.8	31.9	33.6	28.5	17.8	8.7	25.3	21.4	75.8
	L.SD	6.9	5.5	6.8	3.6	2.8	5.6	6.2	6.4	5.8	3.7	2.4	5.4		
Summer	June	32.4	18.6	38.4	10.4	8.4	28.4	30.8	24.6	32.4	12.4	10.2	20.2	24.2	78.4
	July	32.6	16.4	44.2	11.4	10.6	27.6	32.4	26.4	33.6	10.8	12.4	22.4	28.4	76%
	August	30.4	18.2	38.4	10.2	10.8	26.4	30.4	22.6	34.4	12.4	11.2	20.6	30.2	78%
	Mean	31.8	17.7	30.4	10.6	9.8	20.3	31.2	24.5	33.5	11.8	11.3	22.3		
	L.SD	6.9	5.5	6.8	3.6	2.8	5.6	6.2	6.4	5.8	3.7	2.4	5.4		

M. car=Monacha cartusiana - M.ca.=Monacha cantiana - C.acuta =Cochilicella acuta - S.putris=Succinea putris - S.obl=Succinea oblonga - D.retic=Deroceras reticulatum

Table 3 : Population fluctuation of land snails and slugs on lemon and guava trees at EL-Senania , Dumyatt district , Dumyatt Governorate .2012/2013 .

Season	Month	Number on individuals on fruit trees at EL Senania												*Climatic factors*	
		Lemon trees						Guava trees							
		M. car.	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*M. car.*	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*C.*	*Rh.*
Autumn	September	18.4	12.4	14.2	6.6	8.0	22.2	16.2	14.2	14.8	8.6	8.2	21.6	18.4	62.4
	October	20.2	14.2	16.8	8.4	8.2	24.2	18.9	18.4	16.4	18.2	14.4	10.2	18.2	68.4
	November	22.4	18.6	18.4	10.2	10.4	26.4	22.4	24.2	20.4	18.2	12.4	28.2	17.4	62.2
	Mean	20.3	15.1	16.5	8.4	8.8	24.2	19.0	18.3	17.6	18.6	10.3	24.6	18.0	67.3
	L.SD	4.2	3.2	3.4	1.6	1.8	4.8	3.8	3.6	3.4	2.6	2.4	4.8		
Winter	December	16.2	12.2	16.2	8.4	8.2	20.4	14.4	12.2	14.2	6.8	4.8	20.4	16.2	67.4
	January	10.4	11.3	14.2	6.6	8.4	16.8	14.4	14.6	18.4	10.2	8.2	1.4	18.8	58.2
	February	12.2	12.2	10.4	8.2	10.2	10.2	12.4	10.8	12.4	10.4	10.2	18.4	16.4	68.4
	Mean	12.9	11.9	13.6	7.8	8.9	15.8	13.4	12.5	15.0	9.0	7.7	19.0	15.8	64.7
	L.SD	2.6	2.4	2.4	1.4	1.6	3.1	3.2	2.4	3.2	1.8	1.6	3.8		
Spring	Marsh	20.2	16.2	28.6	10.2	12.4	24.4	24.2	24.2	18.6	16.2	16.4	28.4	18.6	67.6
	April	26.4	18.4	32.2	18.4	16.4	26.4	26.8	28.4	20.4	18.4	24.2	32.2	21.4	72.4
	May	30.2	21.2	40.4	22.8	18.0	32.4	28.4	34.2	22.0	16.8	26.2	34.4	22.9	76.8
	Mean	25.6	18.6	33.7	17.0	15.7	27.7	27.6	28.8	20.5	17.1	22.0	31.6	20.8	75.2
	L.SD	5.4	3.8	6.8	3.8	3.2	5.4	5.2	5.8	4.2	4.2	4.4	6.4		
Summer	June	16.4	16.2	18.4	10.2	8.8	22.6	18.4	16.6	18.6	12.4	10.8	24.4	25.4	78.2
	July	12.4	18.4	10.8	10.8	10.8	20.6	16.4	18.4	12.4	10.4	12.4	18.4	28.4	78%
	August	14.8	14.6	14.4	12.4	12.4	21.4	20.8	18.6	14.6	8.6	8.6	16.4	31.4	78%
	Mean	14.5	16.4	14.5	11.1	10.7	21.5	18.5	17.8	15.2	10.5	10.6	19.7		
	L.SD	5.4	3.8	6.8	3.8	3.2	5.4	5.2	5.8	4.2	4.2	4.4	6.4		

M. car=Monacha cartusiana - M.ca.=Monacha cantiana - C.acuta =Cochilicella acuta - S.putris=Succinea putris - S.obl=Succinea oblonga - D.retic=Deroceras reticulatum

Table 4 : Population fluctuation of land snails and slugs on lemon and guava trees at Kafr El Batikh district , Dumyatt Governorate 2012/2013 .

Season	Month	Number on individuals on fruit trees at Kafr El Batikh												*Climatic factors*	
		Lemon trees						Guava trees							
		M. car.	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*M. car.*	*M. ca.*	*C. acuta*	*S. putris*	*S. Obl.*	*D. retic.*	*C.*	*Rh.*
Autumn	September	26.6	14.2	24.4	12.2	8.8	22.4	18.6	14.4	20.2	14.4	10.8	22.4	18.4	62.4
	October	24.6	18.4	16.4	26.2	14.4	10.4	28.4	26.2	18.4	22.4	8.6	28.6	18.2	68.4
	November	26.8	18.2	32.4	16.8	14.2	32.6	24.8	22.9	24.2	10.4	8.9	24.4	17.4	62.2
	Mean	25.6	16.3	27.4	14.6	11.1	24.4	23.1	18.4	22.3	12.3	9.2	25.0	18.0	67.3
	L.SD	3.8	3.2	5.4	2.8	2.2	4.8	4.6	3.8	4.2	2.4	1.8	5.2		
Winter	December	24.6	12.4	22.4	10.4	8.6	28.4	20.2	16.4	20.2	16.2	10.2	20.4	16.2	67.4
	January	18.6	18.8	18.6	8.6	8.6	6.4	22.2	18.6	18.2	18.2	6.6	18.4	18.8	58.2
	February	16.2	16.8	14.4	10.4	8.2	24.4	20.4	21.4	24.2	18.4	12.4	22.4	16.4	68.4
	Mean	19.2	15.9	18.6	9.8	7.9	18.3	19.7	18.7	20.9	17.8	10.3	20.5	15.8	64.7
	L.SD	3.8	3.2	3.8	1.8	1.6	3.2	3.8	3.6	4.2	1.6	2.4	4.2		
Spring	Marsh	22.4	20.4	18.2	16.4	14.2	26.2	21.4	14.4	21.4	14.2	12.2	22.4	18.6	67.6
	April	24.8	22.6	22.4	18.4	14.8	28.4	24.2	16.4	22.2	16.2	16.4	26.2	21.4	72.4
	May	28.4	26.4	32.4	16.2	20.4	32.6	26.4	20.2	22.4	18.6	22.8	32.4	22.9	76.8
	Mean	25.1	23.2	29.4	17.0	16.4	29.0	24.0	17.0	22.0	16.3	17.2	27.0	20.8	75.2
	L.SD	5.2	4.6	4.8	3.2	3.2	5.4	4.8	3.2	4.4	3.2	3.6	5.4		
Summer	June	24.8	16.4	20.2	12.4	10.8	26.8	24.6	14.6	18.8	12.4	10.6	14.8	25.6	78.2
	July	22.4	14.4	18.4	10.2	11.6	24.2	24.2	16.0	16.4	13.2	12.2	13.8	28.4	76
	August	20.8	16.8	22.6	12.4	8.4	22.6	26.4	11.8	14.8	11.6	8.6	15.4	31.4	78.4
	Mean	22.7	15.8	20.4	11.7	10.3	24.5	26.9	14.1	16.7	12.4	10.5	11.3		
	L.SD	5.2	4.6	4.8	3.2	3.2	5.4	4.8	3.2	4.4	3.2	3.6	5.4		

M. car=Monacha cartusiana - M.ca.=Monacha cantiana - C.acuta =Cochilicella acuta - S.putris=Succinea putris - S.obl=Succinea oblonga - D.retic=Deroceras reticulatum