

Logical control and population density studies on land snails in south district of Port Saied, portsaied Governate,

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ABSTRACT

Survey and population studies were carried out in south district of Port Saied region, Port Saied governorate during 2010-2012. The survey revealed the existence of four species of land snails *Monacha theba cartusiana*, *Monacha cantiana*, family Helicidae and *Succinea putris*, *Succinea elegans*, family Succinidae on Egyptian clover, wheat and sugar beet. The population density of these land snails were observed on the soil, stems and leaves of tested crops, the results showed that the highest population were recorded on the soil around plants and under dead leaves and shelter of weeds and some on stems and leaves. The population density of all observed land snails was heavier on Egyptian clover followed by wheat and sugar beet, also recorded highest numbers through spring season followed by Autumn and Winter, also their egg clutches which affected by copper sulphate, super phosphate and low moisture of soil which irrigated after 25 days., Druart *et al.* 2011.

On other hand, laboratorial studies were conducted on *M. cantiana* and *S. putris* in El-Serw Agricultural Research Station for measuring the influence of copper sulphate, super phosphate 15% and low moisture of substrate comprised by lannate 90 as recommended insecticides under laboratory conditions after one day initial effect and 3,5,10 and 15 days. The obtained data revealed that lannate 90 was more effective on *S. putris* than in case of *M. Cantiana*, copper sulphate recorded 72.8% and 65.6% on *S. putris* and *M. catiana* followed by superphosphate 15%, 65.6% and 56.8% respectively. While the lowest number of dead individual was recorded in dry substrate or low moisture (32.8% and 26.4) for *S. putris* and *M. cantiana* respectively.

So, using safe materials such as copper sulphate and super phosphate 15% were more effective and acts as fertilizers, improving crop fields and quality without environmental pollution.

Keywords: *Monacha* sp., *Succinea* sp., Egyptian clover, wheat and sugar beet.

INTRODUCTION

The gastropoda is the largest class of mollusks have also invaded freshwater and pulmonate (over 2,000 species) mainly herbivorous, some acts as vector for helminthes parasites and others are serious agricultural pests causing great damage to field and vegetable crops such as clover, wheat, sweet potato, lettuce, cabbage, cucumber and sugar beet, more damage was manifested in chewing soft vegetative parts such as flowers, fruits, Godan (1983) and El -Okda (1980). Using molluscicides in high concentrations has a toxic effect on man and farm animals and cause environmental pollution, El-Wakil and Radwan (1991).

In recent years, many researchers tried to find new agricultural, biological, mechanical and ecological control methods that are safer, cheaper and more readily available, chemical materials such as copper sulphate and super phosphate act as

fertilizers and also irritated for land snails and change the habitat of these land snails which effect on land snails and their egg clutches, Druart *et al.*, (2011) and (2012).

Under laboratorial conditions, lannate 90 as recommended mollus-cicides for comparison, copper sulphate, super phosphate and low moisture were examined for measuring their effect on land snails at El-Serw Agricultural Research Station, Damitta governorate.

Copper sulphate, super phosphate and low moisture as ecological factor reducing numbers of land snails under field conditions, obtained data in table 3 showed a significant differences on land snail populations and their egg clutches which effected by these safe materials in addition to their role in improving plant growth and quality.

MATERIALS AND METHODS

Survey and population of land snails and their egg clutches:

Survey and population of land snails and their egg clutches of *M. cantiana*, *M. theba cartusiana*, *S. putris* and *S. elegans* were carried out in south district of Port Saied region at Port Saied governorate during the years 2010 and 2011, on field crops Egyptian clover, wheat and sugar beet. Samples were taken from each field by using five feddans cultivated with Egyptian clover, wheat and sugar beet crops. Samples of about five plots (m²) for each were randomly distributed in every selected field and surveyed seasonally through the two years, Cowie, (2001.)

The collected snails from each host in the surveyed areas were immediately taken to the laboratory. The population density of predominant snail species were estimated at south district region of Port Saied-portsaied governorate five replicates of quadrature sample size (1x1m) from each field and vegetable crop were randomly chosen, then left far from pesticide contamination Asran and Fawkyia, (2001). All species of land snails found with in a quadrature were recorded and counted in the field according to their species .Sampling was carried out during the morning in the absence of rain and sun rise Baker, (2008).

Number of tested land snails and their egg clutches were recorded per a season during two years and statistically analyzed using F. test (L.SD).

Efficacy of chemical materials against two species of land snails under laboratory conditions:-

Tested chemical compound:-

- Lannate 90 (methomyl)S.methyl.n-(methyl carrbomoy –loxy thioctimidate)
- Copper sulphate (in liquid form by concentration 0.5%)
- Superphosphate(as a sort of dust)

Tested land snails:-

- *Monacha cantiana* (family: Helicidae)
- *Succinea putris* (family Succinidae)

Adult land snails of *M. contiana* and *S. elegans* were obtained from different infested fields at south Port Saied region. Twenty five adults of each species were confined in plastic terrarium (18x12x36cm). The bottom of each terrarium was substrate with certain mixture of moist clay, peat and sand (1:1:1) of about 8-10 cm height. The cage was sprayed daily with water. Some lettuce leaves were added as a source of food and covered with muslin closed with rubber band to prevent snails from scaping, Gray *et al.*, (1985).

Techniques:-

Tested compounds used as follows:-

Lannate 90 used in concentration of 2% on lettuce leaf by dipping lettuce leaves for five minutes and put in fresh air for one hour, introduced to land snail for on day (24 hours) then left far from substrate and feeding land snails on normal lettuce leaves for 3,5,10 and 15 days, dead individuals recorded and taken out from substrate. Amal Hilmy, (2010) and Essawy *et al.*, (2011). Copper sulphate was used in concentration of 0.5% and the same technique or method of lannate 90 Super phosphate 15% used as powder by spraying 2 gram for each substrate. In addition to effect of soil moisture after 15 days, after irrigation the substrate and 15 days experimental period. Accumulation effect after 30 days of dryness.

Tested chemical compounds under field conditions:-

Copper sulphate 0.5% and super phosphate 15% were used as fertilizers on clover, wheat and sugar beet by using special sprier, individuals were recorded and counted after 15 days .Averages of temperature and relative humidity were recorded monthly, the reduction percentages of the samples were calculated according to formula of Abbot, (1925) and statically analysed using F. test (L.SD)% Reduction

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

RESULTS AND DISCUSSION

Under laboratory conditions:

Data in table (1) reveald that the highest mortality percentages of lannate 90 (2%) on *M.cantiana* recorded 49.6 % and 85.6 as effect of one day initial effect and residual effect of 15 days after treatment followed by copper sulphate which recorded 48.8 and 65.6 and 15 days respectively while supperphosphate recorded 45.6 and 56.8 % on the same land snail after 1 and 15 days respectively lowest mortality of tasted *M.cantiana* effected by low moisture when recorded 8.4 % and 26.4 % after one and 15 days respectively .

Table 1: The effect of lanate 90, copper sulphate and superphosphate in controlling land snails under laboratory conditions comprised with effect of dry period during 2010- 2011in Elserow. A. R. St. Damitta governorate:

Tested Compound	Tested Animals (25)	Dead individuals after					Total dead Ind.	One Day (%) Initial (%)	15 Days (%) residual effect (%)	Climatic factors	
		1 day	3 dayS	5 dayS	10 days	15 days				°C	Rh%
lannate 90	<i>M. cantiana</i>	12.4	14.6	16.8	20.2	21.4	21.4	49.6	85.6%	18.4	72.4
	<i>S. putris</i>	14.6	16.8	16.8	20.4	22.6	22.6	58.4	90.4%	20.2	74.2
Copper sulphate	<i>M. cantiana</i>	12.2	12.4	14.8	14.8	16.4	16.4	48.8	65.6%	20.2	68.2
	<i>S. putris</i>	12.0	12.4	12.4	16.4	18.2	18.2	48.0	72.8%	19.4	66.4
Super phosphate	<i>M. catiana</i>	10.4	10.4	12.2	14.2	14.2	14.2	45.6	56.8%	19.6	68.2
	<i>S. putris</i>	10.	12.0	12.4	12.8	16.4	16.4	40.0	65.6%	18.4	68.6
15days after irrig	<i>M. catiana</i>	2.1	4.6	4.6	4.8	6.6	6.6	10.4	26.4%	18.6	70.4
	<i>S. putris</i>	4.2	4.8	6.4	6.4	8.2	8.2	16.8	32.8%	20.4	70.2
Control	<i>M. cantiana</i>	1.8	2.6	2.6	4.2	4.2	8.8	7.2	35.2%	21.2	78.2
	<i>S. putris</i>	1.2	1.4	3.2	4.2	4.8	4.8	4.8	19.2%	20.4	76.4
	L.SD	4.16	1.48	0.88	0.80	0.76	-	-	-		

On the other hand more mortality were recorded on *S. putris* effected by lannate 90 (2 %) 58.4 and 90.4 after one and 15 days respectively followed by copper sulphate 48.0 and 72.8 % after one and 15 days respectively while super phosphate recorded 40.0 and 65.6 % after one and 15 days respectively while lowest mortality was recorded in case of low moisture 7.2 and 35.2 % after one and 15 days respectively.

Under field conditions:-

Two experiments were carried out under field conditions on field crops Egyptian clover wheat and sugar beat at south district of Port Saied governorate. Randomized samples were taken as samples af each feddan of pervious crops through the period of autumn, winter and spring seasons of 2010 – 2011.

Data in table (2) revealed that the number of individuals of *M.theba cartusiana* and *M.cantiana* in addition to their egg clutches which effected by three levels of soil moisture irrigated after 15, 20 and 25 days 66.4, 42,2 and 15.4 on clover fields after 15,20 and 25 days after irrigation and its egg clutches were 4,8, 1.0 and 0.0 clutches in soils of 15,20 and 25 after irrigation while *M. cantiana* recorded 68,2, 40,4 and 12,2 undivided population density in sails irrigated after 15,20 and 25 days respectively with number of egg clutches 4, 2, 2,0 and 0,0 respectively.

Table 2: Effect of soils moisture on land snail populations and On their egg clutches Lied in heavy salt soil of south district of Port Saied during Autumn, winter and spring seasons of 2011 – 2012 Port Saied governorate Effected individuals.

Season	Treatment	clover				wheat				Sugar beat				clover				wheat				Sugar beat			
		Mt Cbrzu	Egg clut	M. Can.	Egg clut	Mt Cbrzu	Egg clut	M. Can.	Egg clut	Mt Cbrzu	Egg clut	M. Can.	Egg clut	S. Put.	Egg clut	S. ele.	Egg clut	S. Put.	Egg clut	S. ele.	Egg clut	S. Put.	Egg clut	S. ele.	Egg Clut
Autumn	Treat1	66.4	4.8	68.2	4.2	46.4	4.2	36.2	2.4	40.8	4.8	42.4	2.4	48.2	4.2	48.6	4.6	36.4	2.8	44.2	4.6	40.8	4.2	38.2	2.4
	Treat2	42.2	1.0	40.4	2.0	18.2	2.4	16.4	1.0	20.4	2.4	18.6	1.2	32.4	2.0	24.2	2.4	20.6	2.2	18.2	2.0	22.4	2.0	24.2	1.2
	Treat3	15.4	0.0	12.2	0.0	12.4	1.0	14.2	0.0	16.8	1.0	10.2	0.0	16.2	0.0	14.8	1.0	18.4	1.0	10.4	0.0	12.2	0.0	10.8	0.0
	control	68.6	4.2	72.4	3.2	30.2	2.8	38.4	2.6	42.8	4.6	44.6	4.2	46.4	6.2	42.4	4.4	38.6	6.2	44.4	4.2	42.4	4.4	36.8	2.4
	L.S.D	5.2	0.41	4.6	0.31	5.4	0.42	3.41	0.32	3.6	0.43	4.2	0.31	3.5	0.41	3.8	0.41	3.6	0.31	4.4	0.44	0.61	0.42	4.2	0.3
Winter	Treat1	42.4	4.2	38.6	2.2	32.4	3.2	28.2	2.4	38.4	3.0	38.2	2.4	34.2	2.2	34.4	1.2	40.2	2.2	38.2	4.2	32.2	2.0	34.8	3.6
	Treat2	24.6	2.0	22.4	2.1	24.2	2.2	20.2	2.0	22.4	2.1	20.2	1.2	28.4	1.2	26.2	1.2	22.4	1.2	20.4	2.1	24.4	2.4	22.6	2.0
	Treat3	10.4	0.0	12.2	0.0	18.6	0.0	10.4	0.0	16.8	0.0	14.2	0.0	16.2	1.2	12.2	0.0	16.4	0.0	10.4	0.0	16.4	0.0	18.4	1.2
	control	44.8	4.2	40.2	3.2	36.4	3.2	32.6	2.4	40.4	3.4	44.2	2.4	44.6	3.2	38.6	2.2	42.8	4.2	44.4	2.4	40.2	3.4	38.2	3.2
	L.S.D	2.8	0.41	3.6	0.31	2.4	0.32	3.21	0.41	2.81	0.32	3.41	0.31	2.4	0.42	3.4	0.41	2.8	0.32	2.4	0.33	3.6	0.31	2.6	0.3
Spring	Treat1	80.4	4.8	84.4	3.6	48.6	6.2	66.4	6.4	68.4	2.4	66.4	4.4	68.4	2.4	66.2	4.2	64.6	3.2	66.4	4.2	38.2	2.4	68.6	4.8
	Treat2	66.2	2.4	58.2	2.2	36.2	4.2	42.4	4.2	24.2	1.2	40.2	2.4	40.2	2.2	38.4	3.2	40.2	2.4	20.4	3.2	36.4	2.2	34.2	3.2
	Treat3	40.4	2.2	36.4	1.4	18.4	1.8	21.2	1.2	18.4	0.0	48.4	0.0	16.6	2.1	20.8	1.2	18.4	1.2	14.2	1.0	24.4	1.0	22.4	1.2
	control	82.2	4.2	88.6	4.2	52.4	4.8	68.6	4.2	66.4	2.8	68.6	4.2	68.4	3.2	68.8	4.2	88.4	2.4	88.2	2.2	84.4	2.6	68.2	4.2
	L.S.D	3.42	0.32	4.61	0.53	5.42	0.84	4.36	0.62	4.24	0.48	3.36	0.44	2.48	0.46	4.8	0.64	2.6	0.32	4.2	0.42	2.8	0.31	4.6	0.4

Treat 1 = Irrigation after 15 day .

Treat 2 = Irrigation after 20 day

Treat 3 = Irrigation after 25 day.

Control = Soil irrigated after 20 day.

M.t.cartu. = *Monacha theba cartusiana*

M.can. = *Monacha cantiana*

Egg clut. = Egg clutches

S. put. = *Succinea putris* *S.ele.* = *Succinea elegans*

Number of effected individuals show significant effect of soil moisture through autumn season more than in case of winter season. While little effect through spring season on Egyptian clover and wheat crop and significant effect on populations of *M. theba cartusiana* and *M. cantiana* in addition to their egg clutches.

S. putris and *S. elagans* records high numbers through spring season on wheat crop 88,4 and 88,4 for *S. putris* and *S. elegans*, respectively followed by numbers on sugar beet which recorded 84.4 and 68.2 for *S. putris* and *S. elegans* respectively . Lowest number of egg clutches were recorded from soils irrigated after 25 followed by which recorded after 20 and 15 days respectively.

Data in table (3) stated that, there is a significant differences between population density of land snails *M. theba cartusiana* and *M. cantiana* and their egg clutches from season to another, spring season recorded a highest number of individuals 88.6 and 86.4 on clover crop, also their clutches 6.8 and 4.2 followed by autumn season which recorded 48.4 and 46.6 for land snails while egg clutches recorded 4.2 and 3.4, respectively.

Table 3: Effect of Copper sulphate, super phosphate and low moisture of soil on land snail populations and their egg clutches Lied in heavy salt soil of south district of Port Saied during Autumn, winter and spring seasons of 2011-2012 Port Saied governorate Effected individuals

Season	Treatment	clover				wheat				Sugar beet				clover				wheat				Sugar beet			
		<i>M.t. Cartu.</i>	Egg clut	<i>M. Can.</i>	Egg clut	<i>M.t. Cartu.</i>	Egg clut	<i>M. Can.</i>	Egg clut	<i>M.t. Cartu.</i>	Egg clut	<i>M. Can.</i>	Egg clut	<i>S. Putr.</i>	Egg clut	<i>S. ele.</i>	Egg clut	<i>S. Putr.</i>	Egg clut	<i>S. ele.</i>	Egg clut	<i>S. Putr.</i>	Egg clut	<i>S. ele.</i>	Egg Clut
Autumn	Treat1	24.8	2.2	26.4	2.2	20.2	2.1	21.6	2.0	18.6	1.8	20.4	1.4	12.4	2.0	14.4	1.4	14.2	2.6	16.8	2.4	12.2	1.8	14.6	1.6
	Treat2	42.6	1.6	28.6	1.8	28.4	1.4	24.2	1.6	26.4	1.6	28.6	1.6	18.6	1.8	18.2	1.8	16.4	2.0	18.4	1.8	14.8	2.4	16.4	2.2
	Treat3	20.4	2.4	24.8	1.2	30.4	2.6	32.4	2.8	28.6	1.0	30.2	1.2	20.4	0.6	24.2	2.0	18.8	1.8	20.4	1.6	20.2	2.6	18.2	2.8
	control	66.4	4.6	64.2	3.8	58.6	3.8	66.2	3.6	64.2	3.2	58.6	3.4	34.8	3.2	36.4	4.2	46.4	4.2	44.2	3.4	36.8	4.2	43.4	3.4
	L.SD	4.2	0.62	4.4	0.31	5.4	0.44	3.6	0.44	3.46	0.42	3.4	0.32	4.44	0.42	3.6	0.31	4.6	0.62	4.8	0.42	4.8	0.42	3.8	0.7
Winter	Treat1	20.8	2.1	20.2	2.2	24.2	2.4	20.6	1.2	18.2	2.2	20.4	2.4	16.2	2.4	18.4	2.2	14.6	2.2	16.8	2.0	14.6	2.2	18.4	2.0
	Treat2	28.4	2.6	22.4	2.4	26.8	2.8	22.4	1.4	21.8	1.6	21.6	1.8	14.8	1.0	16.4	1.6	16.8	1.6	18.2	1.8	16.2	1.8	18.2	1.6
	Treat3	36.2	2.2	30.2	1.8	30.4	2.6	28.6	1.4	28.6	2.0	28.4	1.8	20.4	2.0	22.4	1.8	20.4	2.4	24.2	2.0	18.6	1.4	20.2	1.8
	control	48.4	4.2	46.6	3.4	46.8	3.8	48.6	2.8	46.8	4.2	44.6	3.4	40.2	4.2	46.4	3.8	48.4	3.2	46.4	3.0	26.4	2.8	28.2	1.8
	L.SD	5.4	0.42	4.2	0.32	5.4	0.71	4.8	0.32	4.8	0.31	5.4	0.42	40.6	0.82	3.4	0.31	4.2	0.46	4.2	0.31	5.4	0.81	4.2	0.7
Spring	Treat1	28.2	2.2	22.4	2.1	24.2	1.8	25.2	2.2	20.4	2.2	21.6	2.2	18.2	2.2	20.4	2.1	20.4	1.4	21.6	2.2	21.4	2.2	22.8	2.4
	Treat2	36.2	3.2	34.4	2.4	30.3	2.2	30.4	2.2	22.2	2.6	22.2	1.6	20.4	1.4	22.8	1.4	24.2	1.6	22.4	1.4	22.4	2.8	24.6	2.6
	Treat3	40.4	3.4	38.2	2.8	34.6	2.0	34.3	2.4	28.6	3.4	30.4	1.6	22.6	2.4	26.8	2.6	30.2	3.2	28.4	2.2	30.2	2.8	32.4	3.2
	control	88.6	6.8	86.4	4.2	66.8	3.6	68.2	3.8	64.2	4.2	66.8	3.8	66.8	4.6	64.2	3.8	46.2	3.8	18.4	4.2	44.2	4.8	46.4	4.6
	L.SD	4.8	0.82	3.4	0.71	5.4	0.63	4.2	0.32	4.8	0.62	5.4	0.81	4.2	0.62	4.4	0.52	4.6	0.81	3.8	0.51	4.4	0.80	3.8	0.7

Treat 1 = copper sulphate

Treat 2 = super phosphate

Treat 3 = irrigated soil after 25 day.

Control = Soil irrigated after 20 day.

M.t.cartu. = *Monacha theba cartusiana*

M.can. = *Monacha cantiana*

Egg clut. = Egg clutches

S. putr. = *Succinea putris* *S. ele.* = *Succinea elegans*

Under field conditions, copper sulphate recorded high mortality 66% and 65% when used by 0.5% on clover crop against *M.theba cartusiana* and *M.cantiana* more effective in spring season same results obtained case of super phosphate and fields of clover which irrigated after 25 days(3.2 and 3.4) for egg clutches . Egyptian clover recorded highest number of individuals specially in spring season followed by wheat and sugar beet.

On the other hand *S.putris* and *S.elegans* recorded highest number on Egyptian clover followed by wheat and sugar beet (66.8 , 64); 46.2 , 48.4) and (44.2 ,46.2) and their egg clutches (4.6, 3.8) through spring season ,respectively obtained results show significant efficacy when treated by copper sulphate, superphosphate and low moisture of soil not only on individuals number but also on egg clutches specially through spring season followed by autumn and winter.

Present paper aimed to discover the best method to control pest snails without causing any change in the environmental component. Also it aimed to avoid the poisoning effect of pesticides on natural enemies which make the suitable balance in agricultural environment. Chemical compounds which acts as fertilizers have the same effect in limiting numbers of these land snails, improving yield crops, cost little money ,friendly to the environment , environmental pollution , human health , farm animals and live stocks in addition to wild life specially soil microorganisms. These organisms are necessary for planting our crops.

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دراسات ايكولوجية على القواقع الارضية بمنطقة جنوب محافظة بورسعيد

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معهد وقاية النباتات- الدقى – الجيزة

الهدف من الدراسة : استخدام مواد آمنة غير ضارة بالبيئة أو صحة الإنسان أو حيوانات المزرعة إضافة إلى رخص ثمنها وتوفرها باستمرار .

تمت هذه الدراسة في منطقة جنوب بورسعيد بمحافظة بورسعيد عام 2010 – 2012 تحت الظروف الحقلية على محاصيل البرسيم المصري – القمح وبنجر السكر خلال ثلاثة مواسم وهى الخريف والشتاء والربيع لمكافحة قواقع البرسيم وهى :

Monacha cantiana ، *Monacha theba cartusiana* *Succinea elegans* ، *Succinea putris*
وقد تمت الدراسة تحت الظروف الحقلية بتجربتين في خمسة أقدنة من كل محصول وأخذ خمس عينات عشوائية كمكررات من كل فدان حيث يمثل المكرر مساحة قدرها 1 متر مربع لكل محصول يتم فيه فحص وفرز وتعداد القواقع المشار إليها سابقا وكذلك عدد كتل البيض في التربة محل العينة.

وفى هذه التجربة تم دراسة تأثير الري بعد 15 ، 20 ، 25 يوم بالإضافة إلى كنترول لحساب تأثير فترات الري على تعداد تلك القواقع وكذلك كتل البيض لهذه القواقع وخاصة في موسمي الخريف والربيع .

أما التجربة المعملية والتي تمت في محطة البحوث الزراعية بالسرو – دمياط وتم فيها استخدام مبيد اللانيت 90 % والموصى به كمبيد حشري ورخوي له تأثير واضح على تعداد القواقع وكذلك تم استخدام محلول كبريتات النحاس 5 % ، والسوبر فوسفات 15 % وكذلك تأثير محتوى التربة من الرطوبة على نشاط وتعداد هذه القواقع وذلك بموضع القواقع بعد 15 يوم من الري وحساب عدد القواقع بعد مضي 15 يوم أخرى أي بعد 30 يوم من الري لمهدد القواقع في المعمل ولوحظ في هذه التجربة مدى تأثير مبيد اللانيت 90 % يليه كبريتات النحاس 5 % ، وفى النهاية تأثير سوبر الفوسفات 15 % والذي أعطى نتيجة مقارنة لتأثير الري .

أما التجربة الحقلية الثالثة تمت أيضا في مركز جنوب بورسعيد لدراسة تأثير كبريتات النحاس 5 % وسوبر فوسفات 15 % وكذلك تأثير فترات الري على كلا من تعداد القواقع وكتل البيض .
وكانت النتائج إيجابية لكلا من كبريتات النحاس وتأثيرها على قواقع السكسينيا أكثر تأثيرا عن قواقع الموناكا وكذلك تأثير السوبر فوسفات .

كما لوحظ أن تخفيض رطوبة التربة مهم جدا لما لها من تأثير واضح على حركة القواقع وتأثيرها المباشر على عدد كتل البيض لهذه القواقع .

من المهم جدا التوصية بنتائج هذا البحث حيث أنها حققت الهدف من الدراسة بالإضافة إلى توفير الماء ، عدم الإضرار بالبيئة والمحافظة على الأعداد الحيوية والكائنات الدقيقة فى التربة بالإضافة إلى رخص ثمنها وسهولة تداولها بالإضافة إلى أمانها على صحة الإنسان وحيوانات المزرعة وأيضا تحسن من جودة المحصول حيث تعد سماد يحسن من جودة ونوعية النبات .