

## Evaluation of Some Attractive Materials and Application Control Methods on the Efficacy of Certain Pesticides Against *Monacha cartusiana* Snail Under Field Conditions in Sharkia Governorate.

Ismail, Sh. A. A.<sup>1</sup>; F. M. Abou Senna<sup>2</sup> and M. Abed<sup>1</sup>

<sup>1</sup> Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza.

<sup>2</sup> Zoology and Entomology Department, Faculty of Science, Al- Azhar University, Cairo.



### ABSTRACT

The effect of attractive materials and several application control methods of poisonous baits on the efficacy of Agrinate and Gastrotox against *Monacha cartusiana* snail were studied under field conditions. Results revealed that sugarcane syrup had the upper hand in increasing reduction percentages of *M. cartusiana* followed by (mixture of sugarcane syrup with yeast) and Birell syrup (barley syrup) while the yeast alone had the lowest reduction percentage. Regarding to the evaluation of three application control methods of poisonous baits for (Gastrotox and Agrinate) it gave different results. The hand sowing of Gastrotox is the best method followed by stack under plant while application on plastic pieces has the lowest reduction percentages. Conversely, application of Agrinate on plastic pieces gave the highest reduction percentage while hand sowing was the lowest one. Finally it could be recommended that application of Agrinate (prepared bait) on plastic pieces and hand sowing of Gastrotox (ready baits) were the best methods for controlling land snail under field conditions.

### INTRODUCTION

Molluscs are the second huge phylum of the animal kingdom, forming a major part of the world fauna (Lush, 2007). So, they are considered one of the most successful phyla among the animal kingdom. Gastropods are the most successful molluscs which have invaded land (Smith and Kershaw, 1979). In Egypt, land snails have been increased and spread rapidly in most Governorates. They caused considerable damage in field of vegetables and fruit crops as well as ornamental plants where they find the optimal condition for survival and reproduction (Kassab and Daoud, 1964). In Sharkia Governorate, land snails considered one of the most injurious to crops causing severe damage in vegetables and field crops as well as orchards (Ismail, 1997, Shetaia *et al.*, 2009, Ismail *et al.*, 2011 and Lokma, 2013). Gastropods use the chemical sense as a principle modality for detection of distant objects in the environment. Chemoreception also allows for precise discrimination between substances that are apparently indistinguishable by the other modalities (Croll, 1983). Chemical control of snail populations through the application of molluscicides remained the most effective method, particularly over large areas. Conventional pesticides especially carbamates are successfully used in Egypt as well as in many other countries, as sprays or baits to control these pests Miller *et al.*, (1988).

This study aims to throw light on the role of the synergists (attractive material) in improving the efficacy of pesticide and to find the best application control methods of poisonous baits in controlling land snails under field conditions.

### MATERIALS AND METHODS

#### 1- Pesticides used.

A- Agrinate 24% SL (methomyl).

B- Gastrotox 5% EG (metaldehyde).

#### 2- Impact of attractive material on efficacy of Agrinate under field conditions.

This field trial was carried out in Egyptian clover field, highly infested with *M. cartusiana* snails at Kafr

Mohsen village, El-Ibrahimia district, Sharkia Governorate during the growing season in 2014. Poisonous baits were prepared by mixing 90 parts of wheat bran+5 parts of tested attractive materials (sugarcane syrup, yeast, Birell syrup and mixture of sugarcane syrup with yeast) + 5 parts of Agrinate and then mixed with adequate water. About 100g of poisonous baits were offered on plastic pieces 25x25cm. Each treatment was replicated 3 times. Control treatment was prepared using wheat bran baits without any chemicals. Number of a live snail was recorded before application and after 1, 3, 7, 14 and 21 post treatment. Reduction percentages were calculated according to formula giving by Henderson and Tilton (1955). The obtained data was statistically analyzed by L.S.D using Costat programme (2005).

#### 3- Evaluation of some application control methods against *M. cartusiana* snails under field conditions.

This field trial was carried out during March 2015 in a field cultivated with Egyptian clover and infested with *M. cartusiana* snails at Hehia Elbalad, Hehia district, Sharkia Governorate. The field was monitored before application to determine an area, which was homogeneously infested with *M. cartusiana*. Two types of poisonous baits were used. Gastrotox which are pellets ready to use and Agrinate poisonous bait which are prepared prior to application as follow: (5 parts of Agrinate + 90 parts of wheat bran and 5 parts of sugarcane syrup). Baits were applied at three application methods: hand sowing, under plant stack (Takbeesh) and piles on plastic pieces. The area was divided into seven plots separated by untreated plots. One of these plots for control and the other six plots for the other treatments. In hand sowing the ready pellets or prepared poisonous baits were broadcast evenly over the surface of the appropriate plots by hand. On the other hand the other two methods were repeated five times on each replicates. The number of dead and alive snails was recorded at five replicates (50x50cm) before application and 1, 3, 7, 14 and 21 after application. Reduction percentages were calculated according to the formula giving by Henderson and Tilton (1955). The obtained

data was statistically analyzed by L.S.D using Costat progame (2005).

## RESULTS AND DISCUSSION

### 1- Effect of attractive materials on the efficacy of Agrinate against *M. cartusiana* snail under field conditions.

The effect of attractive materials (sugarcane syrup, yeast, Birell syrup and mixture of sugarcane syrup with yeast) on the efficacy of Agrinate against land snail *M. cartusiana* was studied under field conditions at Kafr Mohsen village, El-Ibrahimia district, Sharkia Governorate during 2014. Data in Table (1) revealed that Agrinate alone showed highest initial effect (54.14%) against *M. cartusiana* followed by sugarcane syrup, Birell syrup, yeast and the mixture of sugarcane syrup with yeast. Their values of initial effect were 53.24, 48.27, 46.54 and 44.16%, respectively. Mixture of sugarcane with yeast have the upper hand in residual effect which the reduction percentage recorded (80.62%), followed by sugarcane, Birell syrup, Agrinate alone and yeast which gave 78.76, 75.32, 66.78 and 64.27%, respectively. Regarding to the general mean it's obvious that sugarcane syrup gave the higher effect followed by mixture of sugarcane syrup with yeast, Birell syrup and Agrinate alone which gave 68.55, 66.04, 64.5 and 61.74% while the yeast was the lowest one with (57.18%) reduction, respectively.

These results agree with those reported by plenty of authors. Moens and Fraselle, (1980) reported that fermenting barley malt is very attractive to *Derocerace reticulatum*. Frain, (1981) suggested that the attractiveness of beer lay in the sediment and that the fermentation product (a mixture of yeast cells and wort pressed from the vats after fermentation) was more attractive than the beer. Asran (1994) indicated that sugar-cane syrup proved to be the most attractive

additive substance followed by molasses, while vanilla was the lowest attractant in this respect. Mohamed (1994) reported that, sugar-cane syrup and molasses are considered the most promising additives mixed with poisonous baits in controlling snails and slugs. Abd El-Hamid (1996) reported that proline is the preferred attractant for *Biomphalaria alexandrina* and suggested that this high attraction of proline may be due to the fact that it is released from the snails into the surrounding water as a signal. Abd El-Aal and Hamed (2010) found that, wheat bran with sugar-cane syrup recorded the highest percentage in numbers of attracted *Eobania vermiculata* and *M. cartusiana*. On the other hand when used wheat bran with dry yeast showed the lowest percentage of attraction for both snail species in this respect.

In contrast of these results Mahrous *et al.*, (2002) found that neither the tested carrier materials nor attractive materials showed significant increase in reducing numbers of *M. cartusiana* when they applied with fenamiphos as poisonous baits under filed conditions. Arafah, (2006) reported that yeast powder was more suitable material for attractive *M. cartusiana* snails while vanelia was the lowest one. Ismail, (2009) revealed that Birell syrup showed high effect on the efficacy of methomyl against *M. cartusiana* than sugar cane syrup when fine wheat bran was used as a carrier materials. As a conclusion, the author herein thinks that fermentation of sugarcane syrup or mixture of sugarcane syrup and yeast produced amino acids and carboxylic acids which can be attracted more numbers of *M. cartusiana* so, contact ability (the likelihood of contact between snail and poisonous bait), acceptability (the likelihood of commencing to feed once contact is made) and palatability (effects of the formulation, including the active ingredient, on the length of a meal once started) may be increased. Therefore the amount of molluscicide enter snail will be arise.

**Table 1. Effect of attractive materials on the efficacy of Agrinate against land snail *M. cartusiana* under field conditions.**

Attractive materials	Reduction percentage as indicated days							General mean
	1 day	3 days	Initial effect	7 days	14 days	21 days	Residual effect	
Agrinate alone	33.55	74.78	54.14	75.70	64.21	60.44	66.78	61.74
Sugarcane syrup	37.88	68.60	53.24	88.06	79.80	68.42	78.76	68.55
Sugarcane syrup +yeast	34.56	53.75	44.16	86.11	84.34	71.42	80.62	66.04
yeast	29.91	63.16	46.54	76.09	63.16	53.57	64.27	57.18
Birell syrup	33.09	63.45	48.27	83.97	75.33	66.66	75.32	64.5
L.S.D at 0.01			0.026				0.026	

### 2- Effect of different application methods on the efficacy of Agrinate and Gastrotox against *Monacha cartusiana* snails.

Influence of different application of Gastrotox (ready pellet baits) and Agrinate (prepared baits) in controlling of *M. cartusiana* were evaluated under field conditions:

In this experiment Gastrotox and Agrinate were applied at three application methods hand sowing, stack and on plastic pieces. Data in Table (2) revealed that reduction percentages were significantly influenced by pesticides used and its application methods. In the case of Gastrotox pellets, the hand sowing application had

the upper hand on the reduction percentage which recorded 66.94 and 92.88% for initial and residual effect, respectively. On the other hand stack under plant and on plastic pieces application recorded the initial effect were recorded (65.04& 56.34%), respectively. Concerning residual effect, the reduction percentages reached 77.70 and 73.90% for stack and on plastic pieces applications. Conversely, hand sowing application for prepared baits (Agrinate) is the lowest one which the reduction percentages recorded 16.88 and 4.21% for initial and residual effect, respectively. Regarding on plastic pieces application it reach 55.88 and 64.59% for initial and residual effect, respectively

followed by stack application which recorded 28.23 and 51.56% for initial and residual effect, respectively. General mean of reduction percentages for three application methods on plastic pieces, stack under plants and hand sowing were (61.10, 42.23 and 9.28%) and (73.9, 77.70 and 82.50%) for Agrinate and Gastrottox, respectively.

Generally, it can be concluded that hand sowing is the best method of Gastrottox application (as ready baits) conversely application of Agrinate (as prepared baits) on plastic pieces had the upper hand in increasing the efficacy. These results agree to certain extent with those reported by many authors. Barker *et al.*, (1991) reported that molluscicides direct against terrestrial gastropods are only occasionally delivered as spray or dusts but are more usually deployed in baits. Lokma (2013) found that under field conditions the percent

reduction in numbers of *M. cartusiana* snail was markedly increased with hand sowing compare with other two methods (plant stack and put on plastic pieces).

Finnaly, Ismail *et al.*, (2014) found that methomyl poisonous baits were more effectiveness than spray technique. Moreover when poisonous baits were put as piles on plastic pieces was the best technique to reduce numbers of *M. cartusiana* snails than under plant stock (Takbeesh) and hand sowing, in Egyptian clover fields.

As a conclusion, the author herein thinks that the reduction percentage of metaldehyde will be arise when applied by hand sowing technique this may be due to increasing the opportunity of contact between snail and ready pellets of Gastrottox.

**Table 2. Effect of different application control methods on the efficacy of Agrinate and Gastrottox against *Monacha cartusiana* under field conditions.**

Compounds	Technique of application	Reduction percentage as indicated days							General mean
		1 day	3 days	Initial effect	7 days	14 days	21 days	Residual effect	
Agrinate	On plastic pieces	35.85	75.91	55.88	80.38	61	52.38	64.59	61.10
	Stack (Takbeesh)	17.21	39.24	28.23	70.36	52.15	32.18	51.56	42.23
	Hand sowing	10.29	23.46	16.88	9.94	2.70	0	4.21	9.28
L.S.D at 0.01				0.030				0.030	
Gastrottox	On plastic pieces	49.04	63.64	56.34	77.78	89.32	89.74	85.61	73.90
	Stack (Takbeesh)	61.93	68.14	65.04	80.43	88.53	89.45	86.14	77.70
	Hand sowing	59	74.87	66.94	91.23	91.57	95.83	92.88	82.50
L.S.D at 0.01				0.030				0.030	

**REFERENCES**

Abd El-Aal, E.M. and S.A. Hamed (2010). Controlling aspects against terrestrial snails *Eobania vermiculata* and *Monacha cartusiana* under laboratory conditions. *J. Agric. Res. Kafer El-Sheikh Univ.*, 36 (4): 463- 479.

Abdel- Hamid. A.Z. (1996). Amino acids as attractant to *Biomphalaria alexandrina* snails intermediate hosts for *Schistosoma mansoni*. *Egyptian J. Bilharziasis.*, 18: 13-26.

Arafa, A.A.I. (2006). Studies on terrestrial molluscs in some Delta Governorates. Ph.D. Thesis, Fac. Agric., AL-Azhar Univ., 167 pp.

Asran, Fawkyia, D.A. (1994). Studies on harmful terrestrial snails and their management on Egyptian agriculture lands. M.Sc. Thesis, Instit. Environ. Stud. & Res., Ain Shams Univ., Cairo, 125 pp.

Barker, G.M.; R.P. Pottinger.; J.M. Lloyd; P.J. Addison; A. C. Firth and A. P. Stewart (1991). A novel baits formulation for slug and snail control. *Proceedings of the New Zealand Weed and Pest Control Conference.*, 44: 195 - 200.

Costat (2005). Version 6.311, Copyright(c), CoHort Software, 798 Lighthouse Ave. PMB 320, Monterey, CA, 93940, USA.

Croll, R.P. (1983). Gastropod chemoreception. *Biol. Rev.* 58: 293-319.

Frain, M.J. (1981). Chemoreception and feeding in the grey field slug *Deroceras reticulatum* (Muller) with reference to molluscicide formulation. PhD Thesis, University of London, London. U.K. 220 pp.

Henderson, G.F. and E.W. Tillton (1955). Test with acaricides against the brown wheat mite. *J. Econ. Entomo.* 48: 157- 161.

Ismail, Sh.A.A. (1997). Ecology, biology and control of certain terrestrial snails infesting some vegetable and field crops in Sharkia Governorate. Ph.D. Thesis, Fac. Agric., Zagazig Univ., 130 pp.

Ismail, Sh.A.A. (2009). Effect of bait colour, carrier and attractive materials on the efficiency of methomyl against two land snail species under field conditions. *Al-Azhar J. Agric. Sci. Res.*, 6: 245-254.

Ismail, Sh.A.A.; S.Z.S. Shetaia; A.I. Arafa and A.F. Abd- EL- Atty (2011). Incidence and seasonal fluctuation of certain land gastropod species associated with some crops and weeds at Sharkia Governorate. *J. Plant Prot. and Path., Mansoura Univ.*, 2 (2):1103-1110.

Ismail, Sh.A.A.; S.Z.S. Shetaia; A.A.I. Arafa and M.M. Khattab (2014). Field trials on the bait attractive distances and evaluation the efficacy of methomyl using different control application methods against the gastropod pest *Monacha cartusiana* (Muller) infesting clover fields. *J. Plant Prot. and Path., Mansoura Univ.*, 5 (6): 697-703.

- Kassab, A. and H. Daoud (1964). Notes on the biology and control of land snail of economic importance in the U.A.R. Agric. Res. Rev., 42: 77-98.
- Lokma, M.H.E. (2013). Studies on some terrestrial mollusks injurious vegetables and field crops in East Delta locality (Sharkia and Ismailia). Ph.D. Thesis, Fac. Agric. Moshtohor Benha Unive., 179 pp.
- Lush, A.L. (2007). Biological and ecological of the introduced snail *Microxeromagna armillata* in south eastern Australia. Ph. D. Thesis, School of Agriculture, Food and Wine, Univ. Adelaide, Australia., 228 pp.
- Mahrous, M. E.; Mervat, H. Ibrahim and E.M. Abd El-Aal, (2002). Control of certain land snails under field conditions in Sharkia Governorate, Egypt. Zagazig J. Agric. Res., 29 (3): 1041 - 1054.
- Miller, M.; D. Swails; F. Olson and R.T. Staten (1988). White garden snail (*Theba pisana* Muller): efficacy of selected bait and sprayable molluscicides. J. Agric. Entomol., 5 (3): 189-197.
- Moens, R. and J. Frasells (1980). La lute contre les limaces en cultures d' orchide'es. Mededelingen Faculteit Landbouw Rijksuniversitet Gent 45, 613-625.
- Mohamed, M.F. (1994). Ecological, biological and toxicological studies on land snails. M.Sc. Thesis, Fac. Agric. Cairo Univ. Egypt., 126pp.
- Shetaia, S.Z.S.; Sh.A.A.Ismail.; Samah, M. Abdel-kader (2009). Survey, population dynamics and importance value of certain land snail species infesting different crops in Sharkia Governorate. Egypt. Acad. J. Biolog. Sci., 1 (1): 37-43.
- Smith, B.J. and R.C. Kershaw (1979). Field guide to the non-marine molluscs of south eastern Australia. Canberra: Australian National Univ., 283pp.

### تقييم بعض المواد الجاذبة و طرق المكافحة التطبيقية علي كفاءة بعض المبيدات ضد قواقع موناكا كارتوسيانا تحت الظروف الحقلية بمحافظة الشرقية

شحاتة أحمد علي إسماعيل<sup>1</sup>, فكري محمد أبو سنة<sup>2</sup> و محمد عابد<sup>1</sup>  
<sup>1</sup>معهد بحوث وقاية النباتات- مركز البحوث الزراعية- الدقي- جيزة  
<sup>2</sup>قسم علم الحيوان والحشرات- كلية العلوم- جامعة الأزهر- القاهرة

أجريت هذه الدراسة حقليا لإختيار أفضل المواد الجاذبة علي فاعلية مبيد الأجرينيت وكذلك تقييم أفضل طريقة لتطبيق الطعوم السامة لمبيد الأجرينيت والجاستروتوكس لمكافحة القواقع الارضية. أظهرت النتائج أن إستخدام العسل الاسود كمادة جاذبة يزيد من فاعلية مبيد الأجرينيت يلية مخلوط العسل والخميرة ثم شراب البيريل (شراب الشعير) وكانت الخميرة منفردة هي الاقل فاعلية في حالة استخدامها كمادة جاذبة. أما بخصوص افضل طريقة لاستخدام الطعوم السامة في المكافحة أظهرت النتائج أن طريقة النثر هي أفضل طريقة للتطبيق في حالة الجاستروتوكس (طعوم جاهزة) يليها التكبيش تحت النباتات وكان الوضع علي أكياس بلاستيك هي الاقل. أما في حالة الأجرينيت (طعوم تجهز في الحقل) فان وضع الطعم علي أكياس بلاستيك هي الافضل يليه التكبيش تحت النباتات في حين ان طريقة النثر كانت الاقل في نسب الخفض. وعموما فان افضل طريقة للطعوم الجاهزة هي النثر اما الطعوم سابقة التجهيز فان الوضع علي اكياس بلاستيك هي الطريق الافضل في التطبيق عند مكافحة القواقع الارضية.