

**PLANT EXTRACT BAITES AS SAFE ALTERNATIVE COMPONENTS OF THE INTEGRATED CONTROL PROGRAMME AGAINST THE LAND SNAIL *Monacha cantiana* (Montagu) AT KAFR EL-SHEIKH GOVERNORATE Okka, M.A.**

Plant Protection Res. Inst. Agric. Res. Center, Sakha Kafr El-Sheikh

**ABSTRACT**

The study was adopted to evaluate the toxic effect of five plant extracts for controlling the land snail *Monacha cantiana* (Montagu) during the Egyptian clover season of 2004, at Kafr El-Sheikh Governorate. The plant extracts were Parsley, *Petroselinum sativum*, Fennel, *Foeniculum vulgare* (L.), Liquorice *Glycyrrhize glabra*, Fleabane *Conyza aegyptiaca* and Loquat *Eriobotrya japonica*. The effective material was extracted by commercial ethanol 75%.

Results revealed that although all tested plant extract baits were highly toxic to land snail *M. cantiana* (100% mortality) during the first three days after field application, but Liquorice, Parsley and Fennel Killed 94.2, 84.3 and 79.8% respectively, of the land snail *M. cantiana* after six days of exposure.

The tested plant extracts showed the high persistence against the land snail during the first three days and also, Liquorice, Parsley and Fennel extracts gave high persistence against the same snail during the six days from field application. Toxicity and persistence were rapidly decreased within six to nine days after treatment.

**INTRODUCTION**

The land snail *Monacha cantiana* is one of the most destructive pests on vegetable and field crops especially in moist sites. However, the land snail feed on leaves, buds, stems, shoots and fruits and cause great damage to all plant parts (El-Okda, 1980 and Ghamry *et al.*, 1993). The mean damage caused by *M. cantiana* to fresh plants of the Egyptian clover was found to be about 5.65% (5.082 tons/feddan) of four consecutive cuttings (Okka, 2003). Till now, synthetic molluscicides or insecticides are used for controlling the snails (Crowell, 1967, El-Okda, 1981, Ghamry *et al.*, 1993 and Lokma & El-Harby, 1999).

Intensive studies were carried out to find safe alternative compounds such as natural toxicants (presented in many kinds of plants) that had molluscicidal effects and could be used in the integrated control programme of the snails (Farnsworth, 1966, Hegnauer, 1971, Fischer *et al.*, 1979 Seigler, 1981 and Okka, 1997).

The present work is done to evaluate the toxic effect of different plant extracts to the land snail *M. cantiana* under field conditions within a short period via the reduction field rate with placed baits below the white land traps and improvement of the persistence of plant extract. This is a suitable method of application without any effects on alive organisms and to avoid environmental hazards.

## MATERIALS AND METHODS

### 1. Plant used:

Five plants from four families were chosen for carrying the present study (Table 1).

Some pure seeds, leaves and roots of these plants were taken from local Egyptian market and the others were collected from fields. An amount of 40 gm. of seeds or leaves or roots were transferred to the solvent at the rate of 10 gm. per 100 ml organic solvent.

**Table (1): Plant used for extraction.**

Family	English name	Scientific name	Part used
Umbelliferae	Parsley	<i>Petroselinum sativum</i>	Seeds
Umbelliferae	Fennel	<i>Foeniculum vulgare</i> (L.)	Seeds
Leguminosae	Liquorice	<i>Glycyrrhiza glabra</i>	Roots
Compositae	Fleabane	<i>Conyza aegyptiaca</i>	Leaves
Rosaceae	Loquat	<i>Eriobotrya japonica</i>	Leaves

### 2. Extraction and baits preparation:

Extraction were took place for each of the five selected seeds, leaves and roots plants using commercial alcohol 75%. Extraction was run for 24 hours. The crude extracts were applied at one concentration i.e., 10% (40 gm. from plant used per 400 ml organic solvent mixed with one kg bran. Preparation of baits were done as described by Crowell (1967) and Miller *et al.* (1988) as follow:

Bait formulation constituted of 150 gm. bran mixed with 60 ml, 30 ml water containing appropriate amount of applied extract plus 30 ml. fermentative sugarcane juice which is attractive to snail, addendum granulated from dry yeast (25 gm dry yeast per one liter was added). Fermentation was run over night (Okka, 1998 & 2003).

### 3. Tested animals:

The toxicity of tested five plant extracts to *Monacha cantiana* were evaluated at Biala district of Kafr El-Sheikh Governorate during the spring of 2004.

The experiment was carried out in one feddan or 0.42 hectare, planted with the Egyptian clover and infested by *M. cantiana*. Baits were distributed in open white plastic bags (15 x 20 cm) and placed underneath the white land traps (each trap was plastic case rectangle shape (1.0 x 0.5 meters) containing one kg straw-rice to keep on the humidity of soil (Okka, 2003). Each treatment consisted of three replicates and the one left without treatment as check Control. The traps were placed along the borders adjacent to irrigation canals (86 meters) arranged with repetition and an equal distance between each trap (4.0 meters).

Traps were placed post-cutting and irrigation for ten days, from 17 to 26 April.

Mortality percentages were recorded according to Anonymous, (1965) after three, six and nine days after field application. The snail of *M. cantiana* were handily collected from all parts of the trap and soil surrounded and counted in plastic bags at examination whereas, the collected snails were burned (Okka, 1998).

The results were statistically analyzed by F-test. The persistence efficacy of the tested plant extracts against the land snail *M. cantiana* as percent mortalities were corrected by using Abbott's formula (1925).

## RESULTS AND DISCUSSION

### 1. Effectiveness of the tested extract baits on the land snail *Monacha cantiana* under field conditions:

#### a. After three days from field application:

Data in Table (2) show that all the tested plant extract baits were highly effective against the land snail *M. cantiana* as they resulted in 100% mortality of the land snail after three days from exposure.

**Table (2): Toxicity of different crude extract baits to the land snail *Monacha cantiana* under field conditions.**

Plant used for extraction	Mean no. of land snail <i>M. cantiana</i> after exposure period					
	3 days		6 days		9 days	
	Collected	% mort.	Collected	% mort.	Collected	% mort.
Parsley	227.3 a	100	146.0 ab	84.3	97.7 a	14.3
Fennel	178.3 b	100	163.0 a	79.8	61.0 b	18.6
Liquorice	169.7 bc	100	98.3 c	94.2	107.0 a	4.1
Fleabane	128.3 d	100	105.7 c	11.4	99.3 a	0.0
Loquat	179.3 b	100	98.3 c	8.5	45.3 b	0.0
Control (check)	145.3 cd	0.0	133.0 b	0.0	103.3 a	0.0
L.S.D. 5%	26.44		22.24		19.17	
L.S.D. 1%	36.58		30.8		26.55	

Concerning the mean numbers of collected snail, the results revealed that the highest mean numbers of *M. cantiana* (227.3 individuals) was observed in case of Parsley, while the least ones were observed in Fleabane treatment. Highly significant differences between them. The other tested plant extracts as well as the untreated (Control) could be arranged descendingly according to their mean collected numbers as follows: Loquat (179.3 individuals), Fennel (178.3 individuals) Liquorice (169.7 individuals) and untreated Control 145.3 individuals. It is note worthy to mention that the statistical analysis of the mean collected numbers revealed no significant differences between either the three extracts, Loquate, Fennel and Liquorice. Moreover, no significant differences were observed neither between Liquorice and Control (check) or between the check and Fleabane. Highly significant variations between parsley and the other treatments (Table 2).

**b. After six days from exposure:**

The obtained results in Table (2) revealed that, crude Liquorice bait was the most potent extract recording 94.2% mortality against the land snail *M. cantiana* population, followed by parsley extract bait (84.3% mortality) and Fennel extract bait (79.8% mortality). The other tested extracts caused mortality percentages ranging from 11.4% to 8.5% compared to zero % mortality in the untreated (Control).

Results indicated that, the mean numbers of collected land snail *M. cantiana* in case of with crude Fennel extract bait was 163 animal. With the exception of Parsley treatments highly significant differences were observed between all tested extracts and Control. On the other hand, no significant differences were found between Fleabane, Liquorice and Loquat (105.7, 98.3 and 98.3 animal).

**c. After nine days from field application:**

Data in Table (2) show that three tested plant extracts (Fennel, Parsley and Liquorice) caused slight effect against the land snail population *M. cantiana*. Their percentages mortality under field conditions were 18.6, 14.3 and 4.1% respectively. Fleabane and Loquat extracts showed no mortality against the same snail.

Data presented in Table (2) show that the mean numbers of the land snail *M. cantiana* were 107, 103.3, 99.3 and 97.7 animal in case of Liquorice, Control, Fleabane and Parsley respectively. Not significant differences was found between the three plant extract or Control baits. The lowest numbers of the land snail were (61) and (45.3 animal) in case of Fennel and Loquat, respectively. No significant differences were found between the Fennel and Loquat extract baits. Whereas, the highly significant differences were found between the three plant extracts namely Liquorice, Fleabane and Parsley or Control baits and the late two plant extract baits.

**2. Persistence of plant extracts:**

Data in Table (3) showed that feeding the land snail *Monacha cantiana* on bran treated with plant extracts resulted in complete mortality after three days of field application.

**Table (3): Persistence of plant extracts on bran baits under natural field conditions.**

Plant used	Mean mortality (%) of the land snail <i>M. cantiana</i> fed on treated bran in field after			
	Initial (three days)	Six days	Nine days	Mean residual activity
Parsley	100.0	82.7	19.0	50.9
Fennel	100.0	75.2	51.9	63.6
Liquorice	100.0	95.7	6.5	51.1
Fleabane	100.0	29.6	0.0	14.8
Loquat	100.0	32.3	0.0	16.2
Control	0.0	0.0	0.0	0.0

With respect to the persistence of the tested extracts under field conditions. Six days after field treatment, Liquorice, parsley and Fennel extracts percent mortality reached 95.7, 82.7 and 75.2%, respectively. Moreover, Fennel extract gave mortality of 51.9% nine days after application. Generally, the mean persistence of each Fennel, Liquorice and parsley extracts were moderate and caused percent death of 63.6, 51.1 and 50.9% after six to nine days from field application.

The reduction of residual activity of the tested plant extracts was observed after six to nine days from field application of bran treated. Percent mortality for the land snail *M. cantiana* reached 14.8% to 16.2% of each Fleabane and Loquat.

Farnsworth (1966) and Hegnauer (1971) stated that the molluscicidal furanocoumarins bergapten, chalepentin, isopimpinellin and xanthotoxin were generally found in most species of the Umbelliferae and in the Leguminosae. Fischer *et al.* (1979) and Seigler (1981) stated that, sesquiterpene lactones were widespread in nature and were found in plant of the Compositae and Umbelliferae.

Our results showed that all the tested plant extracts were highly effective against the land snail *M. cantiana* after six days exposure with the exception of Fleabane and Loquat caused complete mortality only during the first three days after field treatment. Toxicity and persistence were rapidly decreased with six to nine days after exposure.

Mogahed & El-Gengaihi (1998) who indicated that, the tested plant extracts (*Dodonaea*, *Curcuma* and *Citrullus*) and its isolated showed high persistence against 1<sup>st</sup> and 3<sup>rd</sup> instar larvae of *Spodoptera littoralis* only during the first one day after field application and then gradually decreased with time. Toxicity and persistence effects were completely diminished within three to five days after application.

## REFERENCES

- Abbott, W.S. (1925). A method of computing the effectiveness of an insecticide. *J. Econ. Entomol.*, 18: 265-267.
- Anonymous (1965). Molluscicidal screening and evaluation. *Bull. Wld. Hlth. Org.*, 38: 507-581.
- Crowell, H.H. (1967). Slug and snail Control with experimental poison baits. *J. Econ. Entomol.* 60: 1048-1050.
- El-Okda, M.M.K. (1980). Land snails of economic importance on vegetable crops at Alexandria and neighbouring regions. *Agric. Res. Rev.* 58(1): 79-86.
- El-Okda, M.M.K. (1981). Response of two land mollusca to certain insecticides. *Bull. ent. Soc. Egypt, Econ. Ser.* 12: 53-57.
- Farnsworth, N.R. (1966). Biological and phytochemical screening of plants. *J. Pharm. Sci.* 55: 225-276.
- Fischer, N.H.; E.J. Olivier and H.D. Fischer (1979). The biogenesis and chemistry of sesquiterpene lactones *fortschr. Chem. Org. Naturst.* 38: 47-390.

- Ghamry, E.M.; H.I. El-Deeb, and S.M. Abd El-Ail (1993). Efficacy of certain pesticides against some land snails under field conditions of Sharkia Governorate. Egypt, J. Appl. Sci., 8(6): 764-774.
- Hegnauer, R. (1971). Chemical patterns and relationships of Umbelliferae. In the Biology and Chemistry of the Umbelliferae, ed. V.H. Heywood, 267-277. London: Academic Press.
- Lokma, H.E. and F.N. Al-Harby (1999). Molluscicidal effect of some pesticides on two land snails under field conditions at Riyadh Area in Saudi Arabia. Zagazig, J. Agric. Res. 26(2): 437-444.
- Miller, E.; S. Swails; 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.
- Mogahed, M.I. & S. El-Gengaihi (1998). Evaluation of some plant extracts and its isolated components against eggs and larvae of *Spodoptera littoralis* (Boisd.) in potato and cotton fields. Bull. ent. Soc. Egypt, Econ. Ser., 25, 1-11.
- Okka, M.A. (1997). Feasibility of using plant extracts as a Control methods for land snail *Monacha cantiana* (Montagu) under laboratory conditions. J. Agric. Sci. Mansoura Univ., 22(12): 4637-4642.
- Okka, M.A. (1998). Land traps as a mechanical method for controlling land snail, *Monacha cantiana* (Montagu) under field conditions. J. Agric. Sci. Mansoura Univ., 23(9): 4011-4017.
- Okka, M.A. (2003). Land snail *Monacha cantiana* (Montagu) injurious to Egyptian clover at Kafr El-Sheikh Governorate. J. Agric. Res. Tanta Univ., 29(2): 283-290.
- Okka, M.A. (2003). Efficiency of the land trap colours used for controlling the land snail *Monacha cantiana* (Montagu) under field conditions of Kafr El-Sheikh Governorate. J. Agric. Res. Tanta Univ., 29(4): 672-679.
- Seigler, D.S. (1981). Terpenes and plant phylogeny. In Phytochemistry and Angiosperm Phylogeny, ed. D.A. Young & D.S. Seigler (ed.). Praeger, NY. 117-148.

## المستخلصات النباتية كأحد البدائل الآمنة للمكافحة المتكاملة ضد القواقع الأرضية *Monacha cantiana* (Montagu) في محافظة كفر الشيخ

محمد عبد الحميد عكه

مركز البحوث الزراعية - معهد بحوث وقاية النبات - سخا - كفر الشيخ

- أجرى هذا البحث في ربيع ٢٠٠٤م لمكافحة القواقع الأرضية موناكا كانتيانا باستخلاص المادة الفعالة من خمس نباتات تنتمي إلى أربعة عائلات نباتية وقد وجد أن:
- نسبة الموت للقواقع الأرضية كانت ١٠٠% للخمس مستخلصات المختبرة بعد ثلاثة أيام من بداية التطبيق الحقلية.
  - نسبة الموت كانت ٩٤,٢ ، ٨٤,٣ ، ٧٩,٨% لمستخلصات كل من العرقسوس ، البقدونس والشمر بعد ستة أيام من التطبيق الحقلية.
  - استمرار سمية مستخلصات كل من العرقسوس والبقدونس والشمر وكانت نسبة الموت للقواقع الأرضية موناكا كانتيانا ٩٥,٧ ، ٨٢,٧ ، ٧٥,٢% على التوالي بعد ستة أيام من بداية التعريض الحقلية.
- يوصى الباحث باستخدام مستخلصات كل من العرقسوس والبقدونس والشمر بتركيز ١٠% لمدة أسبوع لمكافحة القواقع الأرضية موناكا كانتيانا في حقول البرسيم المصري.