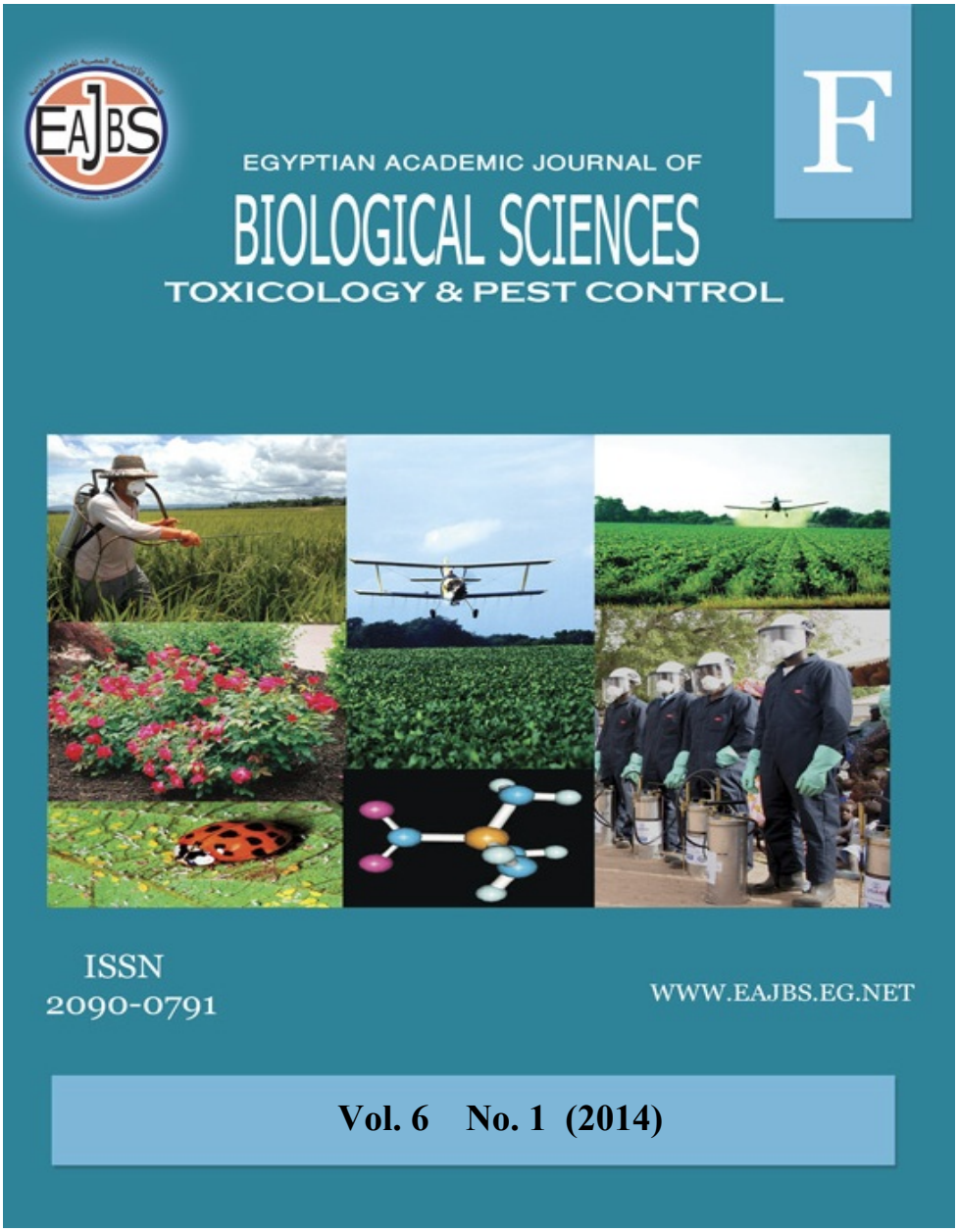

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Molluscicidal effect of some plant extracts against two land snail species, *Monacha obstructa* and *Eobania vermiculata*

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ABSTRACT

The molluscicidal effects of five ethanolic crude extracts, Cumin (*Cuminum cyminum*), Golden shower (*Cassia fistula*), Umbrella tree (*Melia azedarach*), Olive (*Olea europaea*) and pomegranate (*Punica granatum*) were evaluated against two land snail species, *Monacha obstructa* and *Eobania vermiculata,* under laboratory conditions. Three methods of bioassay were used, i.e. contact, leaf-dipping and bait techniques. The results indicated that the ethanol crude extract of Cumin was the most toxic extract for the two tested land snail species followed by Golden shower, Umbrella tree and pomegranate extracts while Olive extract had the lowest effect. The land snail, *E. vermiculata* was comparatively less susceptible to the tested plant extracts than the land snail, *M. obstructa.* Results showed that, contact technique of the tested plant extracts was the most effective method of application. The LC_{50} values of Cumin, Golden shower, Umbrella tree, Olive and Pomegranate extracts when applied as contact were 250, 325, 635, 1500 and 910 ppm for *M. obstructa* and 288, 380, 682, 1720 and 965 ppm for *E. vermiculata*, respectively.

INTRODUCTION

The terrestrial snails became an economic serious pest in Egypt. Land snails attack different kind of plants i.e cereal, vegetables, orchard trees and ornamental plants at the different growth stages and reducing their yield (El-Okda, 1980). It causes serious economic damage especially in horticulture and ornamental plants (Godan, 1983). Terrestrial snails are usually controlled chemically using traditional pesticides or molluscicides. Although the number and types of the specific molluscicides used for controlling the snails are limited, they caused different environmental problems in addition to the toxic effects to non-target organisms (Buchs *el al*., 1989). Scientists attention has been directed toward monitoring the molluscicidal activity of different plants (Hamdy *et al*., 1994, El-Hawashy *et al*., 2001, Truiti *et al*., 2005 and Mortada *et al*., 2012).

The present study was carried out to evaluate the molluscicidal activity of five ethanolic crude plant extracts, Cumin (*Cuminum cyminum*), Golden shower (*Cassia fistula*), Umbrella tree (*Melia azedarach*), Olive (*Olea europaea*) and Pome granate (*Punica granatum*) against two species of land snails *Monacha obstructa* and *Eobania vermiculata*.

MATERIALS AND METHODS

Tested plants:

The experimental plants selected for this study are listed in Table (1)

Table 1: Plants investigated for molluscicidal activity against land snails

Family	Latin Name	English name	Used part	Location
Umbelleferae	*Cuminum cyminum*	Cumin	Seeds	Local Markets
Caesalpiniaceae	*Cassia fistula*	Golden shower	Seeds	Local Markets
Meliaceae	*Melia azedarach*	Umbrella tree	Seeds	Giza
Oleaceae	*Olea europaea*	Olive	Leaves	Giza
Punicaceae	*Punica granatum*	Pome granate	Fruit rind	Giza

Extraction procedure:

The extraction of the tested samples was conducted according to Freedman *et al*. (1979) with minor modification (where tested samples were soaked in the chosen solvent instead of using soxhlet procedure). Plant material was grounded into fine powder, then 150 gm of the dried powder were extracted with about 750 mL of ethyl alcohol 95%. The produced extracts were concentrated using rotary evaporator and kept in the refrigerator until testing. The crude concentrates of extracts were diluted with distilled water. Five concentrations per each plant extract were used.

Tested snails:

Individuals of two land snail species were collected from untreated fields and ornamental plants to be subjected for laboratory tests. The glassy clover snail, *Monacha obstructa* and the brown garden snail, *Eobania vermiculata* were collected from the infested plants at Giza governorate. The snails were transferred directly in muslin bags to the laboratory and were kept in a small plastic boxes containing 8- 10 cm moist optimal soil provided with fresh green lettuce leaves for two weeks for acclimatization. Healthy adult snails with the same shell diameter were selected for each treatment and starved 24 hours before starting the experiments.

Toxicity tests:

Contact method:

Thin layer film technique was used according to Ascher and Mirian (1981). Five concentrations of the tested plant extract were prepared using distilled water. Two ml of each concentration were deposited and distributed on the bottom of a petri dish by moving the dish gently in circles. Water was evaporated under room conditions in a few minutes leaving a thin layer film of the applied concentration of the tested plant extracts. Five healthy adlult snails of the tested species were placed and exposed to the candidate concentration of the tested extract for 72 hours, then transferred to another plastic boxes (24× 10 ×12 cm), closed with muslin cloth containing optimal soil (3-5 cm) and provided with fresh lettuce leaves. A parallel control test was carried out using water only.

Leaf – dipping method:

In each concentration, fresh lettuce leaves (10 × 15 cm) were dipped for three minutes and were left for dryness under laboratory conditions (Ghamry, 1994). The treated leaves were placed inside plastic boxes (24 × 10 × 12 cm) containing optimal soil and a piece of filter paper to adsorb the moisture. Five healthy adult snails of each tested species were used for each replicate. The snails were supplied with treated leaves for 72 hours, then supplied with untreated leaves for 4 snccessive days. Untreated

control snails were fed on water treated leaves.

Poisonous baits method:

The tested extracts were evaluated as poisonous baits. The poison bait was prepared by mixing each concentration with 93% bran and 5% molasses (Ghamry *et al*., 1994). Five grams of each bait were spread on the bottom of a cylindrical glass vessel (9 cm diameter × 7 cm height) and five individuals of the adult snails of the tested species were confined in each vessel and the vessel was covered with muslin cloth and fastened with rubber band to prevent snails from escaping.

Animals were exposed to candidate concentrations of the tested compounds for 72 hours, then transferred to another plastic boxes (24 × 10 × 12 cm) containing optimal soil (3 – 5 cm) supplied with fresh lettuce leaves.

In all the three methods of toxicity as well as the control, five replicates of five individuals each, for each concentration, were used. Dead snails were counted daily up to 7 days and mortality percentages were estimated and corrected according to Abbott`s formula (Abbott, 1925). The slope, LC_{50} and LC_{90} values were calculated as described by Finney (1971).

RESULTS AND DISCUSSION

Data in Table (2) show the poison efficacy of the five tested plant extracts when used as contact against two land snail species Monacha obstructa and Eobania vermiculata. Results showed that on the bases of LC50 values, Cumin and Golden shower seeds extracts proved to be effective against the two tested land snail species. However, Cumin extract more toxic than Golden shower extract. The corresponding LC_{50} values of Cumin, Golden shower, umbrella tree, Olive and Pome granate extracts were 250, 325, 635, 1500 and 910 ppm for *M. obstructa* and 288, 380, 682, 1720, and 965 ppm for *E. vermiculata*, respectively. Also, the present results showed that *E. vermiculata* was comparatively less susceptible to the tested plant extracts than *M. obstructa.*

Table 2: Effect of some ethanolic plant extracts against two land snail species using contact technique.

Plant extracts	Tested snails	LC_{50} ppm	LC_{90} ppm	Slope
Cumin	*M. obstructa*	250	402	3.54
	E. vermiculata	288	530	3.01
Golden shower	*M. obstructa*	325	590	3.09
	E. vermiculata	380	807	1.85
Umbrella tree	*M. obstructa*	635	1330	2.02
	E. vermiculata	682	1410	1.34
Olive	*M. obstructa*	1500	3100	2.38
	E. vermiculata	1720	4095	2.15
Pome granate	*M. obstructa*	910	1790	3.94
	E. vermiculata	965	1912	3.22

As shown in Table (3) similar results were obtained when the tested plant extracts were applied using leaf-dipping technique. The corresponding LC_{50} values of Cumin, Golden shower, Umbrella tree, Olive and Pome granate extracts were 275, 385, 650, 1800 and 935 ppm for *M. obstructa* and 390, 420, 710, 2000 and 982 ppm for *E. vermiculata*, respectively. Data indicate that, the crude extract of Cumin proved to be most effective against *M. obs*tructa with LC_{50} equal 275 ppm in comparison with other tested plant extracts.

Table 3: Effect of some ethanolic plant extracts against two land snail species using leaf – dipping technique.

Plant extracts	Tested snails	LC_{50} ppm	LC_{90} ppm	Slope
Cumin	*M. obstructa*	275	610	2.20
	E.vermiculata	390	696	2.65
Golden Shower	*M. obstructa*	385	751	3.20
	E.vermiculata	420	844	2.60
Umbrella Tree	*M. obstructa*	650	1355	1.50
	E.vermiculata	710	1531	2.16
Olive	*M. obstructa*	1800	3850	2.45
	E.vermiculata	2000	5100	1.68
Pome Granate	*M. obstructa*	935	1855	2.94
	E.vermiculata	982	2110	2.05

Table (4) show that the same trend of susceptibility to the tested plant extracts among the two tested land snail species was observed when the tested plant extracts were used as baits. The LC_{50} values of Cumin, Golden shower, Umbrella tree, Olive and Pomegranate extracts were 320, 392, 782, 1989 and 990 ppm for *M. obstructa* and 397,450,830,2300 and 1152 ppm for *E. vermiculata*, respectively. The obtained results showed that both Cumin and Golden shower extracts proved to be promising plant extracts that can be effectively used as toxic baits against two tested land snails in comparison with other tested plant extracts. Finally, in our study, It is clear that cumin extract exerted the highest toxic effect followed by golden shower, umbrella tree, pome granate and finally olive extracts.

Table 4: Effect of some ethanolic plant extracts against two land snail species using bait technique.

Plant extracts	Tested snails	LC_{50} pm	LC_{90} ppm	Slope
Cumin	*M.obstructa*	320	585	3.22
	E.vermiculata	397	710	3.38
Golden shower	*M. obstructa*	392	794	3.45
	E.vermiculata	450	831	3.94
Umbrella tree	*M. obstructa*	782	1662	2.45
	E.vermiculata	830	1744	3.20
Olive	*M. obstructa*	1989	4177	2.33
	E.vermiculata	2300	5570	1.52
Pome granate	*M. obstructa*	990	2359	1.96
	E.vermiculata	1152	2831	1.85

Reviewing the abovementioned results that obtained from the previous tables, it is obvious that there are different susceptibility levels between the two tested snail species according to type of plant extracts and method of application (contact or leaf dipping or bait). These differences in the sensitivity levels may be due to the physiological state of the snail which changes from species to another. Godan (1983) stated that the phases of greater or lesser sensitivity are differ from species to another with shorter or longer life spans, but the general pattern of changing susceptibility with physiological condition remains. Therefore, Known of the snail species is important for control.

Various classes of compounds have been found responsible for molluscicidal activities of plants, such as alkyl phenols, furanocoumarins, coumarins, flavonoids, rotenoids, sesquiterpenes, diterpenes and saponins. Saponin was the greatest promise for control of the snail vectors; some plants contain as much as 30% saponin (Hostettmann, 1984). Despite the large number of plant species tested for molluscicidal activity, only about 100 natural products with recognized

molluscicidal activity have been isolated (Mott, 1983).

Molluscicidal activity of different plants was previously studied. Ghamry (1994) proved the molluscicidal activity of powder and crude extract of some cruciferous seeds on the three land snail species. El-Deeb *et al*. (1999) recorded that khella fruits ethanol extract was effective against *Monacha contiana* land snail. El-sebaii *et al.* (2000) indicated that the *Calotropis procera* plant was found to have molluscicidal activity against the two terrestrial snail species. El-Hawashy *et al*. (2001) reported that, the extracts of cauliflower, oshar and pergulania were effective against *E. vermiculata*. Ebenso (2004) found that the crude extracts of bark, root and leaf of neem produced mortality for land snails. Truiti *et al*. (2005) proved acute molluscicidal activity of the ethanolic extract of *Melochia arenosa* and *Nectandra falcifolia* on the snail, *Biomphalaria globrata*. Also, Maha and Bakr (2008) found that Hellebore plant extract suppress reproductive rate of the land snails, *E. vermiculata* and *M. obstructa*.

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ARABIC SUMMARY

التأثير الإبادي لبعض المستخلصات النباتية ضد نوعين من القواقع *Monacha obstructa* و *Eobania vermiculata*

عبد الرءوف أحمد محمد مراد
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تم دراسة التأثير الإبادي لخمسة مستخلصات إيثانولية نباتية وهي بذور الكمون وخيار شنبر والزنزلخت وأورق الزيتون وقشر الرمان كمبيدات قواقع ضد نوعين من القواقع الأرضيه وهي قوقع البرسيم الزجاجي *Monacha obstructa* وقوقع الحدائق البني *Eobania vermiculata* تحت الظروف المعملية باستخدام ثلاث طرق هي الملامسة وغمر الأوراق والطعوم. أظهرت النتائج أن المستخلص الإيثانولي لبذور الكمون كان الأكثر سميه ضد كلا النوعين من القواقع الأرضية المختبرة يلية مستخلص بذور خيار شنبر ومستخلص بذور الزنزلخت ثم مستخلص قشر الرمان بينما كان مستخلص أوراق الزيتون الأقل فاعلية ضد القواقع المختبرة. ومن جهة أخري كان قوقع الحدائق البني *E. vermiculata* أقل حساسية للمستخلصات النباتية المختبرة بالمقارنة بالنوع الأخر وهو قوقع البرسيم الزجاجي *M. obstructa* وأوضحت النتائج أن طريقه الملامسة كانت أكثر طرق المعاملة فاعلية وكانت قيم التركيز القاتل للنصف (LC_{50}) باستخدام طريقه الملامسة لمستخلص بذور الكمون وخيار شنبر والزنزلخت وأوراق الزيتون وقشر الرمان (250 و325 و635 و1500 و910 جزء في المليون) وذلك لقواقع البرسيم الزجاجي *M. obstructa* و(288 و380 و682 و1720 و965 جزء في المليون) وذلك لقوقع الحدائق البني *E. vermiculata* علي الترتيب.