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SOME ASPECTS OF BANDED CONICAL SNAIL *COCHLICELLA BARBARA* : LINNAEUS, 1758 (GASTROPODA: COCHLICELLIDAE)

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ABSTRACT : Laboratory and field experiments were conducted to investigate some biological and behavioral aspects of Banded Conical Snail *Cochlicella barbara* (Linnaeus, 1758) in Baghdad /Almadain gardens and fields at 2018 -2019. Experiments included taxonomic studies, phenotypic traits and attractive baits [Narang fruit (halves, sliced) potatoes and apple fruits slices]. The results of the diagnosis confirmed by the British Natural History Museum that the snail is *C. barbara*. The activity of this type of snail was high in the house gardens and began its activity in December and reached the highest density of the population during February and March, his presence was above plants and weeds at night and descended under plants in the soil during the day.The results of the morphological measurements of the snail indicated that the shell length was 8.95 mm and diameter 4.92, 1.43 mm at the upper opening and pointed end respectively, the diameter of the exit of the shell body is 3.02 mm and its weight reached 406.3 milligrams. The shell (cochlea) consists of 7 convex rings with two brown and light brown colors.

As for the attractive baits, the results indicated that the snails were more likely to be present on the bait at night than during the day and recorded significant differences between the baits in the extent of attraction to the snail.The Narang fruits was the most attractive, their number reached 25.1 and 82.3 during day and night respectively, compared to 7.3, 24.0, 2.0 and 4.0 days and nights respectively for potato and apple slices.The results of this research can serve in biological studies and control using combination of molluscicides with attractant baitwithin the integrated control programs of this type of snail.

Key words : Snail, conical Snail, *Cochlicella barbara*, morphological trait, attractive baits.

INTRODUCTION

The Conical snail and the Banded Conical snail feed on dead organic matter and green plant material; it also feeds on grains, legumes and canola. Its main damage is the pest that causes grain contamination at harvest, the grains may be removed immediately after they appear and can pass through the grain through the harvesting machinery and cause yield contamination. This leads to a reduction in the degree of grain classification to certain levels leading to rejection by marketers, and it was recorded as a pest on some fruit species (Baker, 1986, 2002; Gu *et al*, 2007; White-Mclean, 2011).

The Banded Conical snail *Cochlicella barbara* (Linnaeus, 1758) is one of the snails that originated in Europe and Australia and has spread to several other countries (Kerney and Cameron, 1979; Cook, 1997; Bank, 2011). First recorded in Iraq in 2017 (Al-Doori *et al*, 2018). This type is preferred relatively dry and temperate climates, particularly near the coasts of the seas and lakes, which is widespread in gardens and agricultural lands (Kerney and Cameron, 1979; Herbert, 2010).

The shell of the adult is small, conical, pointed, with a length of between 8 - 10 mm, wide width 5.1 - 5.3 mm and contains 7 - 8 white swollen spiral rings with patches of brown to light brown (Kerney and Cameron, 1979). Kuiter(1999), Herbert (2001, 2010) and Micic *et al* (2013) indicates that this type exists in all types of acidic sandy soils. This type of snail puts several hundred eggs, especially in the spring, in the form of white capsuleits diameter ranged between 2.6 - 2.9 mm containing 15-20 eggs each. Eggs hatches and then passes through three stages of development that take 2.5, 5, 8 days respectively, and reaches to the adult stage after58 days. The life cycle and reproduction of this species depends on moisture during the rainy months and is not sensitive to changes in the ecosystem (Heller, 2001; Sallam and El-Wakel, 2012). Banded Conical Snail (BCS) is an agricultural pest and

causes severe damage to many agricultural crops and economic losses to farmers as a result of yield contamination, it causes delays in harvesting times and the entrance of snails with cereals into the slot of harvesting machines. Which necessitates the addition of the extra cost for the cleaning of grain, because the contaminated seed may lead non-validity for export and rejected (Baker, 2002; White-Mclean, 2011; Kuiter, 1999). It is considered as harmful pest in Chile, Korea and Japan and is classified in Asia from agricultural pests. Godan (1983) and Morronda (2005) have shown that this species is a host of some Ascaris that infect humans and animals and cause disease.

Attractant baits and their interaction with Molluscicides and its use in a combination of baits are key factors in the management of this species of snails and as an effective method in their control (Maclannis *et al*, 1974; Thomas, 1982).

The research aims to investigate some biological and behavioral aspects of Banded Conical snail *Cochlicella barbara* (Linnaeus, 1758) in Baghdad as its phenotypic properties and its presence and testing the efficiency of some bait for future use in combination with the insecticide to control the spread of this snail and reduce the damage in the Iraqi environment.

MATERIALS AND METHODS

Sampling

Samples were collected from agricultural fields and domestic gardens in the area ofAlmadain (35 km south of Baghdad). During the period from December 2018 to March 2019, samples were kept in glass tubes containing 90% alcohol.

Diagnosis

Samples of snails were placed in test tubes containing 90% alcohol and all information related to collection, host and spreading during February 2019, samples were sent to the Department of Diagnosis and Services, for the British Natural History Museum for accurate diagnosis.

Phenotypes

Some of the specifications of the shell body were calculated in the adult phase and included: cochlear length, cochlear diameter from the wide and pointed ends, diameter of the exit hole of the cochlea, shell weight, number of cochlea rings and their color, for this purpose, 10 snails were randomly collected from home gardens in the area of Almadain during February 2019.

Attracting baits

The efficiency of three types of attracting bait in attracting the snail was studied under field conditions during February and March 2019. The fruits of Narang or bitter orange *Citrus aurantium* (Half-fruits, juicy pulp, white and yellow crust), potatoes rings and apple rings. The experiment was carried out in three locations and the baits were distributed in a sequential manner with an area of 2 m2 for each bait, three replicates were used for each type bait in each site. The number of snails trapped for each bait was calculated after 24 hours from its position and twice, one at midday and the other at midnight.

Experimental design and statistical analysis

The experimental design was Completely Randomized Design for the field experiments. Data were analyzed using Genstat software and means were compared using Duncan Multiple Range Test (DMRT) at 0.05 probability level.

RESULTS AND DISCUSSION

Samples collection

Notes on the samples indicatesthat the snails were banded conical snail, which is the terrestrial molluscs (Fig. 1).

Diagnosis

The diagnostic results of Jon Ablett, a specialist in the classification of snails, indicated that this snail is a conical snail or a banded conical snail *Cochlicella barbara* (Linnaeus, 1758), this species is a widespread in Europe and other countries. This diagnosis is identical to what Al-Doori *et al* (2018) found and its presence in the ground and that in agreement with Kerney and Cameron (1979), who refer that this snail is a terrestrial species.

Phenotype

The results indicate that the snail shell length was 8.95 mm and diameter 4.92 mm and 1.43 mm at the wide and pointed end, respectively (Table 1). The diameter of the cochlea exit (body exit) was 3.02 mm and the weight of the snail 406.3 mg. The cochlea consists of 7 convex rings with two brown and light brown colors. The results obtained confirm what Kuiter (1999) refers to that this snail has a cochlea consisting of 7 - 8 rings with two brown and light brown colors. As for the length and width of the cochlea, there are slight differences with the Al-Doori *et al* (2018) that the length of the cochlea ranged between 10.8 - 11 mm and its width at the upper opening 5.1 - 5.3 mm. This may be due to individual differences or nature of nutrition or due to differences in climatic conditions between the two years of the two studies.

Fig. 1 : Banded Conical Snail *Cochlicella barbara* cone snails spread in the fields and gardens of Almadain.

Table 1 : Body measurements of the Banded Conical snail *Cochlicella barbara.* L.

No.	Shell length (mm)	Shell diameter		Cochlea exit (mm)	Snail weight (mg)	Cochlea rings	Cochlea color rings
		Wide end (mm)	Pointed end (mm)				
1	9.60	6.14	1.94	3.28	450	7	Two alternate colors
2	8.18	5.00	1.06	3.29	452	7	Two alternate colors
3	8.51	4.84	1.33	2.43	604	7	Two alternate colors
4	9.36	4.93	1.20	2.80	301	7	Two alternate colors
5	10.02	5.58	1.31	3.33	550	7	Two alternate colors
6	8.68	4.47	1.42	3.19	352	7	Two alternate colors
7	9.03	4.82	1.55	3.28	353	7	Two alternate colors
8	7.82	4.35	1.15	3.23	350	7	Two alternate colors
9	7.52	4.16	1.46	2.23	351	7	Two alternate colors
10	7.13	4.95	1.92	2.85	300	7	Two alternate colors
Mean	8.95	4.92	1.43	3.02	406.3	7	

Fig. 2 : Banded Conical Snail *Cochlicell abarbara* on the bait of the Narang *Citrus aurantium*.

Fig. 3 : Banded Conical snail *Cochlicell abarbara* on the bait of potato cut.

Attracting baits

The results show that the fruits of Narang were the best baits in attracting the (BCS) (Table 2, Fig. 2). They attracted numbers during 24 hours was 25.1 and 82.3 days and night respectively, compared to 7.3, 24.0, 2.0 and 4.0 day and night on both potato and apple pieces (Figs. 3 and 4), respectively. The baits of the whole half fruit of Narang was better than that of the crusts only (Fig. 5) or the pulp only (Fig. 6), their number were 15.8, 71.6, 3.0 and 5.2 respectively each night and day, respectively. It has been observed that the snail feeds on the white pulp of the of Narang crust greedily, but the removal of the crust from the pulp leads to dehydration in a short time compared to whether left in full contents.

The use of the combination between snail bait and molluscicides in combination an attractive taste is

Fig. 4 : Attraction of Banded Conical snail *Cochlicell abarbara* on the bait of Apple cut.

Fig. 5 : Banded Conical snail *Cochlicell abarbara* on the bait of Narang *Citrus aurantium* crust (white part).

Fig. 6 : Banded Conical snail *Cochlicell abarbara* on the pulp of the fruits of Narang *Citrus aurantium*.

Table 2 : Numbers of Banded Conical snail attracted to different plant baits at field conditions.

Attractive baits		Average number of snails attracted to the baits within 12 hours	
		Day	Night
Narang	Half fruit	25.1a*	82.3a
	Crust only	15.8b	71.6b
	Pulp only	3.0d	5.2d
Potato pieces		7.3c	24.0c
Apple pieces		2.0d	4.0d

*Means followed by the same letters vertically did not differ significantly according to the DMRTat the probability of 5%.

considered to be an important resource for the management of snails that cause damage (Thomas, 1982; Maclannis *et al*, 1974). There is a possibility to use the white crust of the Narang fruits or its extracted in combination with one of the molluscs pesticides or with one of the toxic chemical compounds to the snails, such as copper silicate or iron phosphate to produce attractive taste and use in the management of this type of snails and this supports the findings of Micic *et al* (2019), which used copper silicate in the control of snails attacking the Agricultural crops.

The results obtained by Kumar *et al* (2011) showed

that the snail *Lymnaea acuminata* responds to the traps containing carbohydrates and amino acids containing molluscs pesticides and respond to these baits after 2 hours of use. The use of starch, histidine and limolene as an attractant bait increases the efficiency of attractionfor more than 54%. The researcher also pointed out that the molluscs pesticides, which contain materials of plant origin, give the best combinations of bait attractant and this is a new method and technique to control harmful snails. This is what supports the objectives of this research using parts of the Narang fruits of in combination with Molluscicides in the field of management and reduce the spread and damage as well as use in small quantities compared to the use of Molluscicides alone. This, in turn, reduces pesticide leakage and contamination. As both Kumar and Singh (2006) and Kumar *et al* (2009) reported that Molluscicides were more effective and attractive to snails when they used natural plant-based substances such as *Ferula asafetida* containing Ferulic acid or *Syzygium aromaticum* containing Eugenol or *Carum carvi*, which contains Limonene, when used in the form of pellet in the control of the snail *L. acuminate*.

CONCLUSION

We conclude from the results of this research the spread of Banded Conical snail *Cochlicella barbara* in recent years in the Iraqi environment and its population will increase if not taken measures to control it as it causes damage to agricultural crops, especially wheat for its ability to enter with grain through Harvesting machines causes contamination of the crop, low quality and unfit for human consumption or exportation. And that the fact that it is a host of some Ascaris that infect humans and mammals and cause disease, it is necessary to take effective measures to control it, and that the use of parts of the fruits of the Narang or active substances in their components within the attractive taste in combination with molluscs pesticides can be an effective way to manage this type of snails.

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