Archives of Agriculture Sciences Journal
Print ISSN: 2535-1680
Online ISSN: 2535-1699

ARCHIVES OF AGRICULTURE SCIENCES JOURNAL

Volume 6, Issue 1, 2023, Pages 214–225

Available online at www.agricuta.edu.eg

DOI: https://dx.doi.org/10.21608/aasj.2023.200161.1143

First record of the terrestrial snail *Cochlicella acuta* (Gastropoda: Pulmonata: Geomitridae) in Assiut governorate, Upper Egypt

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Abstract

This study reports the first occurrence of the terrestrial snail *Cochlicella acuta* in Assiut governorate, Upper Egypt during a survey carried out between March 2018 and February 2020. The conical snail, *Cochlicella acuta* is a species of terrestrial snails in the family Geomitridae. The individuals of *C. acuta* snail were found in two localities, Al-Muallimeen nursery, Assiut district and orchard fruits, Sedfa district at Assiut governorate, Upper Egypt. The specimens found were collected and transferred to the laboratory for examination to provide some data about the morphological features of these specimens and photographs to confirm the identification of this species. The snails were found on some ornamental plants, fruit trees and Egyptian clover were observed during the study period. Thus, this study contributes some information about the distribution and occurrence of this species on various plants in the studied areas of Assiut governorate, Upper Egypt was provided.

Keywords: terrestrial snail, first record, Upper Egypt, *Cochlicella acuta*, Assiut.

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1. Introduction

The conical snail, *Cochlicella acuta* (Müller, 1774), is one of the most widespread land snail species in the world and is known to cause damage to several agricultural crop species. This species belongs to Gastropoda group, which is considered the most important class of the phylum Mollusca with the most of animals causing economic damage to a wide variety of plants including field crops, vegetables, horticulture crops as well as ornamental plants by feeding on leaves, flowers and fruit crops or as vectors of fungal or viral disease to these crops. The economic damage caused by these molluscs is due to not only feeding but also to contamination with their bodies, feaces or slime leading to deterioration of the product quality and the depreciation of its marketing value (Heiba *et al*., 2018). In some countries such as in Chile, 1984, where find living snails *Cernuella virgata* in a shipment of barely from South Australia. This one rejection cost the Australian Barely Board 13 million A $ in compensation payment (Baker, 1989). *C. acuta* snails are originally native to coastal areas of the Mediterranean and Western Europe (Baker and Hawke, 1991). However, it has been spread by human activities and now known from different parts of the world, including Africa: Morocco; Europe: Albania, Belgium, Bulgaria, Croatia, Cyprus, France, Gibraltar, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Romania, Slovenia, Spain, United Kingdom, and former Yugoslavia; Oceania: Australia, Bermuda (Baker, 1986; Baker and Hawke, 1991; Bank, 2011; Cabaret, 1979; Kerney and Cameron, 1979). In Europe, this species can be found in maritime habitats, usually in dunes and coastal grassland. It can occasionally be found on calcareous ground inland (Kerney and Cameron, 1979). Also, spread as an agricultural pest in England. Italy also considers this species a pest not only because of the damage it can cause to plants, but also due to its ability to ability to act as intermediate hosts for trematodes that in infect both humans and animals (Godan, 1983). *C. acuta* was accidentally introduced into southern Australia where it is considered a widespread and important agricultural pest (Baker and Hawke, 1991). *C. acuta* and *C. barbara* have been introduced into California and are currently established, where they can become locally abundant, often in greenhouse situations (Hardy, 2004). In southern Australia, there are four introduced snail species that cause damage to grain crops and pastures: *Cernuella virgata*, *C. acuta*, *C. barbara*, and *Theba pisana*. This species, in association with the other three can become a contaminant of small grains due to large amounts of them aggregating on crops. Significant economic losses can occur to farmers due to this aggregation behavior which causes damage to the crop (contamination), damage to machinery

during harvest, clogging of the farm machinery, and delays during harvest (Baker, 2002). *C. acuta* and *C. barbara* also cause damage to canola seedlings in Australia. They "may cause direct feeding damage to canola in early winter, just as they attack pastures and other crops in southern Australia (Baker 1986; 1989; Gu *et al.*, 2007). *C. acuta* and *C. barbara* are known to be intermediate hosts of nematodes and trematodes which infect man and domestic animals (Godan, 1983 and Morrondo *et al.*, 2005). *C. acuta* is an intermediate host of both *Müllerius capillaris* (Müller) and *Cystocaulus ocreatus* Davtian, lung worms of sheep (Godan, 1983). *C. barbara* can act as an intermediate host for *Protostrongylus rufescens* (sheep lungworm) (Herbert, 2010). Introductions of nonindigenous species can result in substantial ecological, agricultural, medical, and economic problems and extirpation of native fauna (Ali *et al*., 2019; Rahel, 2002). Several studies indicated that this species was found in many Delta Governorates, northern Egypt (Akra 2001; Ali, 2017; Eshra, 2013; Gazzy *et al.*, 2019; Mohammed 2015). While regarding southern Egypt, limited studies addressed the land snails, however, the present work shows that the conical snail *Cochlicella acuta* was found for the first time in Assiut governorate, Upper Egypt. It is also our aim to get more information about occurrence of *C. acuta* on some agricultural crops in Assiut governorate, Upper Egypt.

2. Materials and methods

The land snail *Cochlicella acuta* occurred for the first time in Assiut governorate, located in Upper Egypt on the River Nile, which extends for about 120 km from the north to the south along the banks of the Nile. Land snail samples were found in two localities at Assiut governorate (Figure 1): Al-Muallimeen ornamental nursery, Assiut district located in the western of the River Nile (27°10'18.8"N 31°11'15.0"E), fruit orchard, Sedfa district located in the southern of Assiut governorate (26°58'14.6"N 31°22'11.2"E). The specimens of the land snail *C. acuta* were collected by hand in the early morning from the soil surface between seedlings, plant pots and the leaf litter for ornamental nursery and from tree trunks, branches and leaves for fruit orchard, the collected samples placed in labeled plastic bags and transferred to the laboratory of Agricultural Zoology and Nematology Department, Faculty of Agriculture, Al-Azhar University, Assiut, Egypt for further examination, measurements and identification of the species. After specimens were cleaned, species identification of the collected snails was done based on morphological features including the shape, height, breadth and color of the shell. Identification was based on the key features reported by Godan (1983) and Neubert *et al.* (2015), Ali and Robinson (2020), and Ali and Ramdane (2020), with reference to some notes on the

history of its distribution in Egypt. In the two studied areas, all the snails found on ornamental plants and the soil surface around, and on both tree and soil surface around the tree for fruit trees were observed one time every month during the period from March 2018 to February 2020.

Figure (1): Map showing Assiut governorate, Upper Egypt, and the collection localities of *Cochlicella acuta* specimens.

3. Results

During the random survey, individuals of conical snail, *Cochlicella acuta* were found, and this is not surprising as this species can be easily distributed through human activities, abundant populations of individuals of *C. acuta* were observed in Sedfa region on fruit trees in a private property orchard, Sedfa district, Assiut governorate, Egypt. On the other hand, only a few individuals were found in Assiut region, Assiut governorate, Egypt on ornamental plants in Al-Muallimeen ornamental nursery, Assiut district, Assiut Governorate (Table 1).

3.1 The snail habitats

At Assiut region (Al-Muallimeen ornamental nursery), land snails *C. acuta* were found on ornamental plant seedlings, under potted plants, the soil surface between pots and leaf litter. The ornamental plants were: kalanchoe (*Kalanchoe* sp.) and paperflower (*Bougainvillea* sp.). While the specimens of snails recorded in Sedfa region (fruit orchard) on trunk, branches, leaves of trees and on the soil surface around trees and on Egyptian clover (*Trifolium alexandrinum*) (Figure 2). The fruit trees were mandarin (*Citrus reticulata*), naval

orange (*Citrus sinensis*), fig (*Ficus carica*), pomegranate (*Punica granatum*) and guava (*Psidium guajava*). Hence, it was noticed that the plant diversity, moist soil between pots and seedlings and shade were the preferred habitats for snails.

Table (1): Occurrence of the terrestrial snail *Cochlicella acuta* on some host plants at Assiut governorate, Upper Egypt.

District	Location	Latitude	Longitude	Host plants	
				Scientific name	Family
Assiut	Al-Muallimeen ornamental nursery	27.17188	31.18750	*Bougainvillea* sp.	Nyctaginaceae
				Kalanchoe sp.	Crassulaceae
Sedfa	Private property orchard	26.97072	31.36977	*Trifolium alexandrinum*	Fabaceae
				Citrus reticulata	Rutaceae
				Citrus sinensis	Rutaceae
				Ficus carica	Moraceae
				Punica granatum	Lythraceae
				Psidium guajava	Myrtaceae

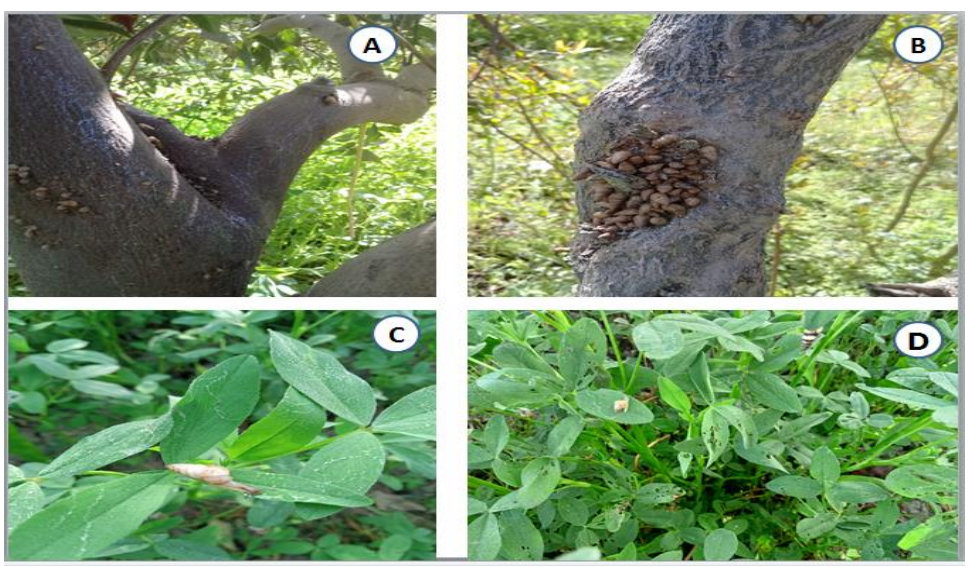

Figure (2): Individuals of land snail *Cochlicella acuta* with some the mucus secretions in sampling sits (A- D): snails on some fruit trees and Egyptian clover plant.

3.2 Taxonomic information

Phylum: Mollusca Linnaeus, 1758; Class: Gastropoda Cuvier, 1795; Order: Stylommatophora (Schmidt, 1855); Superfamily: Helicoidea (Rafinesque, 1815); Family: Geomitridae (Boettger, 1909); Subfamily: Geomitrinae (Boettger, 1909); Genus: *Cochlicella* (Férussac, 1821); Species: *Cochlicella acuta* (Muller, 1774).

3.3 Shell measurements and description

C. acuta snail specimens were collected from fruit trees and ornamental plants, the shell shape is conical, very elongated, with 8 to 10 slightly convex whorls, the shell colour ranging from whitish-creamy to pale brownish often with a brown spiral bands or brown blotches, with medium sutures. The aperture is elliptical, peristome not bending, umbilicus extremely narrow, obscured by reflected columellar lip. The shell length of specimens ranged between 10-20 mm and a diameter ranged between 4-7 mm (Kerney and Cameron, 1979) (Figure 3).

Figure (3): The external appearance of the collected specimens of the land snail *Cochlicella acuta*.

3.4 The distribution of the conical snail species C. acuta (Family: Geomitridae) in Egypt

This species is common in the Mediterranean region (Ali and Robinson, 2020; Kerney and Cameron, 1979) and it was easily introduced to many other countries through various human activities, especially the seedling trade. For Egypt, it was recorded on numerous vegetation in many governorates, it was recorded by Kassab and Daoud (1964) and El-Deeb *et al.* (1996), and Ismail (1997) mentions it from Sharkia governorate and reported that (Lokma, 2007). It is reported in Monofia and Gharbia governorates (Al-Akra 2001; Heikal, 2015; Metwally *et al*., 2002) and in Kafr ElSheikh (El-Deeb *et al*., 2003; 2004). In 2013, it was found in Abulmatamir center, El-Beheira governorate by Eshra (2013) and in Fayed district, Ismailia governorate (Rady *et al*., 2014). Mohammed (2015) confirmed the previous reports and listed this species from Qalubia, Gharbia, Munyfia, Dumyat, and Ismaelia governorates and in the North Western Coast (Abdel kader *et al*., 2016), Cairo (Mohamed and Ali, 2011), King Mariout and Borg El Arab, Alexandria (Ali, 2017). Later, the species is mentioned again on Kafr El-Sheikh (Gazzy *et al*.,

2018; 2019; Heiba *et al*., 2018). Recently, this species was recorded in Giza, Cairo and Qalyubia Governorates (Ali and Robinson, 2020), Sharkia governorate (Ali and Ramdini, 2020).

4. Discussion

This study aims to report the presence of *C. acuta* for the first time in Assiut Governorate, Upper Egypt. The occurrence of *Cochlicella* spp. can be determined by chewing or rasping damage to plants, presence of eggs, juveniles and adults, empty snail shells, mucus and slime trails, and feces like a ribbon (Herbert, 2010). These harmful species can cause great damage to grain and oilseed production and polluted crops during harvesting; this may result in reduced or even rejected consignment quality (Baker, 2002; Roth and Hertz, 1997). However, in the Governorates of Lower Egypt, this species was recorded by EL-Okda (1980 and 1984) and Hashem *et al.* (1992) at Alexandria Governorate. Baker *et al.* (1991) revealed that the land snail *C. acuta* was more dominant in pastures than in crops especially in spring and summer. Also, Hashem *et al.* (1993) reported abundance of *C. acuta* on fruit orchards at El-Beheira governorate. The results showed that the fruit orchards are exposed to snails attacking. Idress (2003) surveyed the land snails *Monacha cantiana*, *Eobania vermiculata*, *Theba pisana* (Muller), *C. acuta*, *Succinea putris* infesting field and vegetable crops, orchards and ornamental plants at El-Hamol, Balteem, Sakha and Kafr El-Sheikh districts. Mortada (2002) found that 13 species of terrestrial snails and slugs belonging to five families Helicidae, Succinedae, Achatinidea. Zonitidae and Limacidae were detected on different crops in 25 localities representing five districts of Dakahlia governorate. Eshra (2013) showed that the survey of land snails on ornamental plants at the Abulmatamir region, El-Beheira governorate during the two spring seasons 2011 and 2012. The land snails; *C. acuta*, *E. vermiculata* and *T. pisana* species were recorded on *Artemisia* sp., *Latania vershaffeltii*, *Jasminum grandiflorum*, *Rosa* spp. and *Hibiscus* spp. plants. Abdel kader *et al.* (2016) revealed that five species of herbivorous land snails were found on different host plants at the North Western coast of Egypt. These species were *M. cartusiana*, *E. vermiculata*, *T. pisana*, *C. acuta* and *Helicella vestalis*. In Kafr El-Sheikh governorate, this species was recorded on guava and navel orange by Gazzy *et al.* (2018), on Egyptian clover and cabbage by the same Author (2019). However, a number of researchers have reported the prevalence and incidence of some other land snail species in Upper Egypt (Ibrahim *et al.*, 2021; Mahmoud *et al*., 2021; Ramzy, 2009). Eshra (2004) found that, *E. vermiculata* (Müller) (Gastropoda: Helicidae), *T. pisana*, *H. vestalis* and *C. acuta* recorded the highest population during spring and summer in

June, July and August on orange, banana, guava and grape trees investigated area in Alexandria and El-Beheira governorates through 1999 and 2000. The population fluctuations of land snails varied according to crop, temperature, relative humidity and season to another (Awad, 2014; Eshra, 2013; Mostafa, 2020).

5. Conclusion

In conclusion, this study documented the first occurrence of the terrestrial snail *Cochlicella acuta* in Assiut governorate, Upper Egypt. The snails were observed in two locations: Al-Muallimeen nursery in Assiut district and orchard fruits in Sedfa district. They were found inhabiting ornamental plants, fruit trees, and Egyptian clover. The findings provide some insights about the distribution and occurrence of *C. acuta* on various plant species in the surveyed areas of Assiut Governorate, Upper Egypt.

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