

Observations on some biological aspects of *Cicadatra persica* (Cicadidae: Hemiptera) in apple fruit orchards in Erneh, Syria

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Abstract

Cicadatra persica Kirkaldy, 1909 (Hemiptera: Cicadidae) is regarded as a potential constraint to the productivity of apple fruit orchards in Erneh (33°21'N, 35°52'E), near Damascus, Syria. However, no research has been conducted on this pest. This study examined adult emergence, egg laying, and hatching periods. Adults emerged in early June, with an emergence peak in the fourth week of June 2011, and started laying eggs in mid-June. Egg development was approximately 40 days, with the first eggs hatching on 1st August 2011 and the final hatch on 17th August 2011. The simple and relatively successful method of monitoring egg development reported here may be useful for studying the nymphal ecology and life cycle of this species.

Introduction

Cicadas are destructive pests that cause damage to some apple orchards in Syria. The most obvious damage of cicadas is that caused by egg laying in small twigs. This damage causes twigs to split and die,

causing a symptom called *flagging*. As juveniles, the larvae feed on the xylem fluid of woody plant on roots, using piercing and sucking mouthparts. The life cycles of most cicadas are long, usually involving many years spent underground as juveniles, followed by a brief adult life (2-6 weeks above ground) (Boulard, 1990; Young & Bennet, 1995). Fifth instars may occupy the feeding cell at the base of the emergence burrows for up to several weeks before an unknown stimulus triggers their final exit from the soil (Beamer, 1982). After mating, females lay eggs in bark or twigs, the eggs hatch later in the season and the new nymphs burrow underground and begin feeding on roots. During their soil stages, the cicadas settle themselves anywhere from 50-600 mm below the surface (James *et al.*, 1986; Williams *et al.*, 1993).

In Syria, the occurrence of *Cicadatra persica* Kirkaldy, 1909, was recorded and studied for the first time in apple fruit orchards during field work in Erneh in June 2011 (Dardar *et al.*, 2012). *C. persica* Kirkaldy 1909, was found for the first time in Macedonia and its song was recorded and analyzed in 1998 (Gogala & Trilar, 1998). We report on biological studies conducted on *C. persica*, in apple fruit orchards in Syria.

Materials and methods

Fieldwork was carried out in an apple orchard in Erneh (33°21'N, 35°52'E), a village located in the Alsheikh Mountains in southwestern Syria. The orchard was approximately 0.3 ha, and contained 128 apple trees (cultivar Starking). Trees were 2-2.5 m tall and were in the production stage.

Adult emergence

Adult emergence was monitored three times a week by visual observation from mid-May 2011. Emergence traps were also used to determine the adult emergence period and its peak. Each emergence trap was a circular tent of muslin (diameter 2 m) that was established around the trunk of the tree to a height of approximately 0.5 m (Figure 1).

Historical damage from egg laying was unevenly distributed in the orchard; typical samples of apple trees were chosen to study adult emergence. The trees were divided into five categories based on the number of egg nests (Table 1). One tree was chosen randomly from each category and an emergence trap was established. Traps were checked and exuviae collected once a week from the beginning of June until the end of July.

Egg laying period

The number of twigs on 45 apple trees damaged by newly laid egg nests were recorded every week from the first emergence of adults until late July.

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Figure 1. Emergence trap.



Figure 2. Trap to check newly hatched larvae.

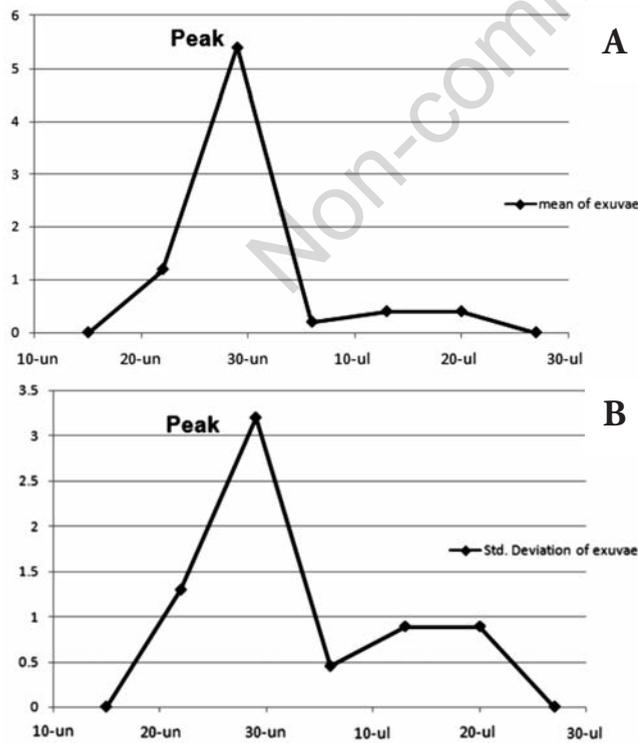


Figure 3. A) and B) Emergence period of adults of *Cicadatra persica*.

Egg development and hatching period

Traps (n=22) for newly hatched larvae were established on twigs with new egg nests. Each trap was a sleeve of muslin with a small plastic container set below the damaged twig to catch hatching larvae (Figure 2). The traps were checked twice a week for eight weeks beginning 4th-6th July

Results

Adult emergence

The first adults were observed on 7th June 2011. Adults were found in emergence traps from 14th June to 17th July, a period of five weeks. The peak of adult emergence was in the 4th week of June (23th-29th) (Figure 3).

Egg laying period

Egg laying started on 14th June 2011, one week after adult emergence began. The peak of egg laying was from 25th June to 9th July with the last egg nest being found on 13th July. The egg laying period continued for one month from 14th June to 13th July (Figure 4).

Egg development and hatching period

Egg hatch started on 1st August 2011, 40 days after oviposition, and continued for approximately three weeks, with a possible peak between 4th-7th August (Figure 5). Larvae (n=672) were captured in most traps (20 of 22). The two traps in which no larvae were recorded were established on twigs that were broken by the wind during the summer, and this stopped the flow of plant sap within these twigs, causing egg death.

Discussion

Studying the abundance of cicadas and their emergence period is important for determining the timing and the level of damage on apple trees in Erneh in order to identify the most suitable date for carrying out pest control measures.

Adults emerged during a 5-week period from mid-June to late-July. Eggs of *C. persica* were laid from mid-June until mid-July, with a 2-week peak from the end of June to the beginning of July. This period is short compared with some other cicadas, such as *Kikihia ochrina*, which lays eggs during a 5-month period (Logan & Connolly, 2005).

Eggs of *C. persica* on apple tree twigs were laid in June and July and hatched in August the same summer. In comparison, eggs of *K. ochrina* and other New Zealand species probably overwinter and hatch the following summer, giving a period of egg development last-

Table 1. Distribution of egg nests per tree in the apple orchard.

Category	No. nests/tree	Frequency
1	0	7
2	1-10	70
3	11-20	26
4	21-30	17
5	31-40	8

ing 7-11 months (Cumber 1952; Harford 1958; Logan, unpublished data). A long period of egg development has also been reported for *Cryptotympana facialis* and *Graptopsaltria nigrofusca*, in whose eggs are laid in summer and first begin to hatch 10-12 months later in the following summer (Moriyama & Numata, 2008).

Methods for estimating the density of cicadas (*Cicada* and *Magicicada* spp.) including counts of larval skins (exuviae) and emergence traps (Dybas & Davis, 1962; Wolda, 1989; Dean & Milton, 1991; Milton & Dean,

1992; White & Sedcole, 1993; Anderson, 1994) were used in this study in order to estimate the adult emergence phenomenon. These methods were time-consuming and labor-intensive, and in some cases have been recognized as poor or biased estimators of cicada densities (Patterson *et al.*, 1997). For these reasons, we suggest adult emergence and cicada numbers could be estimated according to sound levels (Patterson *et al.*, 1997) as a more precise measurement.

The length of the life cycle of cicadas depends largely on the duration of the subterranean nymphal stage which can be determined by rearing or regular checking over many years. However, there have been relatively few attempts to rear cicada nymphs, and consequently the length of lifecycle is known for less than 20 of the estimated 1200 species worldwide (Karbon 1986; Moulds & Carver 1991). Further attempts to rear *C. persica* on apple plants and under suitable conditions are necessary to determine the unknown details of its life cycle.

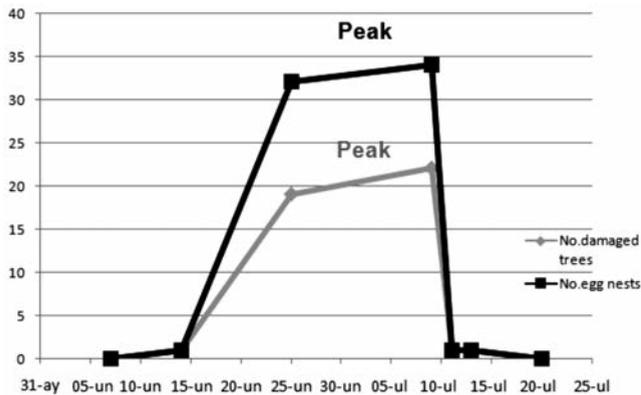


Figure 4. The period of egg laying of *Cicadatra persica*.

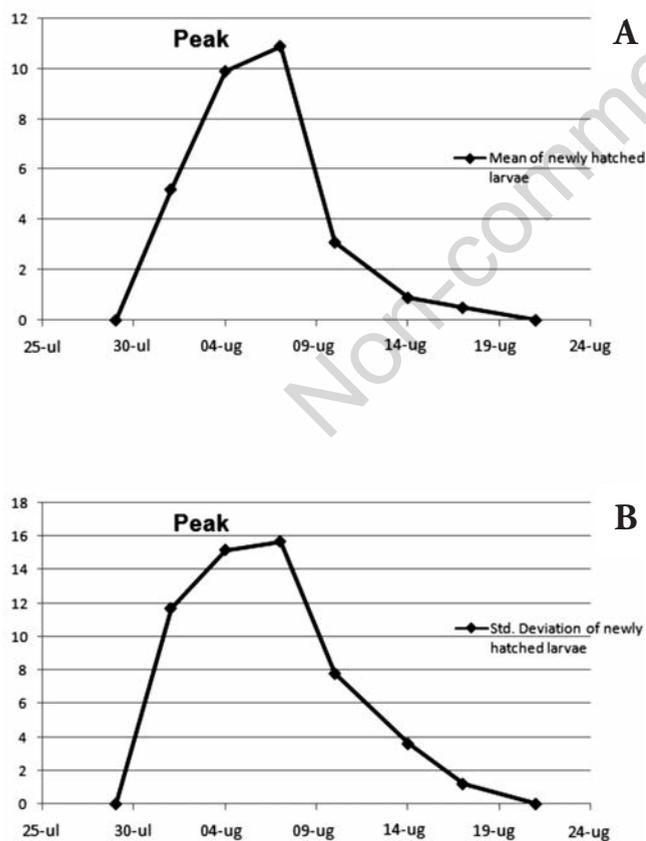


Figure 5. Number of newly hatched larvae of *Cicadatra persica*.

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