

Short communication

Biology of *Diaphorina citri* (Hem.: Liviidae) and parasitism by *Psyllaephagus stenopsyllae* (Hym.: Encyrtidae) in Baluchestan, Iran

B. Motamedinia^{1&*}, A. Bageri² and Q. Sabahi³

1. Agricultural and Natural Resources Research Center of Southern Khorasan, P.O. Box: 413, Birjand, Iran, 2. Agricultural and Natural Resources Research Center of Hormozgan, Bandarabas, Iran, 3. Department of Plant Protection, Faculty of Agricultural Science and Engineering, College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran.

*Corresponding author, E-mail: bmoetamedi@yahoo.com

چکیده

پسیل آسیایی مرکبات، *Diaphorina citri* Kuwayama، یکی از آفات مهم و ناقل بیماری گرینینگ مرکبات می باشد. در این پژوهش، ویژگی های زیستی این آفت در شرایط آزمایشگاهی و میزان پارازیتسم آن توسط زنبر *Psyllaephagus stenopsyllae* (Tachikawa) مورد بررسی قرار گرفت. طول دوره قبل از تخم گذاری و دوره تخم گذاری به ترتیب 9 ± 0.51 و 15.7 ± 0.23 روز بود. میانگین تعداد تخم گذاشته شده توسط حشره ماده $25.0 \pm 23.0/25$ عدد و میانگین طول دوره پورگی 18.7 ± 14.83 روز بود. میانگین درصد پارازیتسم توسط *P. stenopsyllae* 6 ± 7 درصد تعیین شد.

Citrus varieties such as lime, lemon, orange and mandarin are important crops in Iran, covering an estimated 291000 hectares. *Diaphorina citri* Kuwayama, commonly known as Asian citrus psyllid, causes severe damage to trees by taking large quantities of sap from foliage and producing honeydew that results in the development of sooty mould on leaves and shoots. It is also capable of transmitting the citrus greening bacterium to its host plant. Citrus greening disease or "Huanglongbing" is the most serious disease of citrus in the world affecting a number of citrus cultivars in Afghanistan, Caribbean, Guadeloupe, China, Hong Kong, India, Indonesia, Malaysia, Mauritius, Mexico, Myanmar, Nepal, Pakistan, Philippine Islands, Reunion Island, Ryukyu Islands, Saudi Arabia, Sri Lanka, Argentina, Brazil, Venezuela, Taiwan, Thailand and United States (Halbert & Nunez, 2004). This disease is caused by the bacterium *Candidatus Liberibacter asiaticus* and exhibits a variety of symptoms including yellow shoots, initial leaf mottling and chlorosis followed by stunted growth, branch dieback and eventual death of trees. According to Bove *et al.* (1999), *D. citri* has been established in southeastern cities of Kahir and Ghasregand in Sistan and Baluchestan province of Iran. Introduction of *D. citri* and greening has led to high yield losses and huge economical costs for farmers in south of Iran. In addition to Sistan and Baluchestan,

two other important citrus-producing provinces of Hormozgan and Kerman have also been affected by *D. citri* and greening disease. The current study aims to measure the developmental periods of *D. citri* and rate of parasitism by *Psyllaephagus stenopsyllae* (Tachikawa) (Hym.: Encyrtidae) because better understanding of the biology of *D. citri* is essential for its management strategies and biological control.

To maintain the culture of *D. citri*, citrus plants (*Citrus latifolia*) were selected in Sarbaz, region in Baluchestan, Iran, in 2008. First, ten fresh citrus branches (10 cm long) containing *D. citri* were cut and taken to the laboratory to be placed in containers (15 × 15 × 45 cm) with 70% water and 30% sugar for adults emergence. After 4 days, bottom of branches were cut and after two weeks, branches replaced with new ones. The culture was maintained at the temperature of $25 \pm 1^\circ\text{C}$, with a relative humidity (RH) of $70 \pm 5\%$ and a photoperiod of 14: 10 (L: D) hours. During intensive observation 300 adults were collected and transferred on ten fresh citrus branches in a container (15 × 15 × 45 cm, with a net cloth top). After 24 h. the females were removed and eggs were counted. The containers were placed in an incubator at the temperature of $25 \pm 1^\circ\text{C}$, with a RH of $70 \pm 5\%$ and a photoperiod of 14: 10 (L: D) hours for daily observation on incubation period, duration of immature stages and sex ratio. All insects were checked daily for molting, while the

exuviae were removed when the nymphs entered into the next instars. Then, 25 newly emerged pairs of adults were transferred on 25 citrus branches in the previously described containers (one pair adult in one container) to study the oviposition, fecundity and longevity. They were moved on new citrus branches at 2-day intervals and their eggs were counted until the last adult died. The samples of the first to fifth psyllid instars were collected from different trees in various locations at in Baluchestan and taken to the laboratory to assess the rate of parasitism by the encyrtid *P. stenopsyllae*. The psyllid-infested flushes were put into a container (10 × 10 × 15 cm), labeled and placed into the incubator. After 14 days, the container was transferred to a freezer to kill the insects before recording the number of *D. citri* and *P. stenopsyllae* to calculate the apparent parasitism rates.

The incubation period took 3-4 days with an average of 3.9 ± 0.47 days. The mean of total nymphal period (1st instar to 5th instar) was 14.83 ± 18.7 days.

The longevity of the male psyllids varied from 18 to 25 days with an average of 21.6 ± 0.5 days and from 18 to 32 days with an average of 26.6 ± 2.1 days for the female. It showed a higher longevity for the female psyllid. The pre-oviposition period of *D. citri* was 7 to 11 days with an average of 9 ± 0.51 days. The oviposition period was 12 to 18 days with an average of 15.7 ± 0.23 days. The number of laid eggs per female was 58 to 367 with an average of 230.25 ± 50.7 eggs.

The species *P. stenopsyllae* was observed parasitizing the *D. citri* nymphs on *C. latifolia* in Baluchestan wherever the psyllids were found. The apparent parasitism was zero (in January) to 32% (in March) with an average $7 \pm 6\%$ in 2008. In Rask, Sarbaz and Oraki regions, mean parasitism was 22 ± 3 , 25 ± 1 and $21 \pm 2\%$, respectively. In terms of the rate of parasitism, there was no significant differences in Sarbaz, Rask and Oraki regions ($P > 0.05$).

References

- Bove, J. M., Garnie, M., Ledane, G., Hasanzadeh, N., Salehi, M. & Taghizadeh, M. (1999) Report of witches broom and huanglongbing (greening) in south of Iran. *Applied Entomology and Phytopathology* 67, 96-97.
- Halbert, S. E. & Nunez, C. A. (2004) Distribution of the Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Psyllidae) in the Caribbean Basin. *Florida Entomology* 87, 401-402.

Received: 20 August 2012

Accepted: 27 November 2012