



Short communication

Colonization of introduced parasitoid, *Encarsia guadeloupae* Viggiani, on the exotic spiralling whitefly, *Aleurodicus dispersus* Russell, infesting ornamentals

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ABSTRACT

The exotic spiralling whitefly, *Aleurodicus dispersus* Russell, was observed to infest several ornamentals including rose, hibiscus, poinsettia and acalypha in and around Bangalore. Efforts were made to colonize the aphelinid parasitoid, *Encarsia guadeloupae* Viggiani, during 2002 - 2003 on the above ornamentals infested with the spiralling whitefly. A total of five predators, namely, *Axinoscyrnus puttardria* Kapur and Munshi, *Cryptolaemus montrouzieri* Muls., *Anegleis cardoni* (Weise), *Mallada astur* (Banks) and *Cybocephalus* sp. were observed on the spiralling whitefly on these ornamentals during the study but their impact on the spiralling whitefly was negligible. Inoculative releases of *E. guadeloupae* were made on rose (156 adults), hibiscus (179 adults), poinsettia (124 adults) and acalypha (247 adults). *Encarsia guadeloupae* was recovered within a month after its release with 3.43 - 32.94% parasitism. A steady decline in the population of spiralling whitefly was observed on these ornamentals. *Encarsia guadeloupae* was found to be the only parasitoid encountered throughout the study and the total parasitism steadily increased up to 96.00% on rose, 86.40% on hibiscus, 90.40% on poinsettia and 39.86% on acalypha at six months from release. Parasitism by *E. guadeloupae* was significant and negatively correlated with the population of spiralling whitefly on all the four ornamentals.

Key words: *Aleurodicus dispersus*, *Encarsia guadeloupae*, biological control, spiralling whitefly, rose, hibiscus, poinsettia, acalypha

The spiralling whitefly, *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae), native to the Caribbean Islands and Central America was first discovered in the city of Thiruvananthapuram, South India, in November 1993 (Palaniswami *et al*, 1995). The spiralling whitefly may have been introduced into India from neighbouring countries such as Maldives (Muniappan, 1993) and Sri Lanka (Ranjith *et al*, 1996) through plant material. Since then, it has been reported from other parts of Kerala, Karnataka, Andhra Pradesh, Tamil Nadu and Maharashtra (David and Regu, 1995; Prathapan, 1996; Mani and Krishnamoorthy, 1996; Sathe, 1999) and Lakshadweep islands (Ramani, 2000).

The spiralling whitefly is a polyphagous pest known to attack about 500 plant species including several ornamentals (Srinivasa, 2000). Chemical control of *A. dispersus* is almost impossible owing to its wide host range and heavy wax coating (Kajita *et al*, 1991). However, the natural enemies, chiefly the aphelinid parasitoids *Encarsia*

guadeloupae Viggiani and *Encarsia* (?) *haitiensis* Dozier, have proved useful in suppressing the spiralling whitefly in the Pacific Islands and African countries (Waterhouse and Norris, 1989; D'Almeida *et al*, 1998). The present study was conducted to colonise the parasitoid, *E. guadeloupae*, on spiralling whitefly infesting ornamentals like rose, poinsettia, hibiscus and acalypha.

Cassia leaves containing parasitised nymphs (black) were kept in glass vials (15 cm x 2.5cm). Adult parasitoids that emerged were collected and the identity of *E. guadeloupae* was ascertained in the laboratory. These were fed on 50% honey in glass vials prior to release in the field.

Field releases made on *Hibiscus rosasinensis* L. at U.A.S. farm, Hebbal, *Acalypha hispida* Burm.f and *Euphorbia* (= *Poinsettia*) *pulcherrima* Willd. at the IIHR Farm, Hessaraghatta and *Rosa indica* Lindl. at Hessaraghatta village, all located in Bangalore North. A

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total of 156 adults of *E. guadeloupae* on *R. indica* in August 2002, 179 adults on *H. rosasinensis* during May 2003, 124 adults on *P. pulcherrima* in July 1998, and 247 adults on *A. hispida* infested with spiralling whitefly in June 2003, were released.

Sampling was done for six months on the ornamental plants from the month of release. Populations of the whitefly and its natural enemies were estimated at monthly intervals. Ten plants infested with spiralling whitefly were randomly chosen for recording observations. In each plant, four shoots were selected and in each shoot, ten leaves (beginning 6th leaf from top) were collected and populations of adult whiteflies, healthy and parasitised nymphs and the predators if any were recorded on each leaf. The leaves were kept in plastic jars (16 cm x11 cm) and the emergence of natural enemies was recorded. Parasitoids emerged making an irregular hole, while, the whiteflies emerged through a ‘T’ shaped slit. Correlation analysis was carried out to determine relationship between parasitism and spiralling whitefly population.

Although more than 40 indigenous predators were found to feed on spiralling whitefly in India (Ramani *et al*, 2002), a total of five species of predators, namely, *Axinoscymnus puttardriahi* Kapur and Munishi, *Cryptolaemus montrouzieri* Muls., *Anegleis cardoni* (Weise), *Cybocephalus* sp. and *Mallada astur* Banks were recorded on the spiralling whitefly infesting rose, hibiscus, poinsettia and acalypha during the study period. Local predators, observed in negligible numbers did not have any impact on the population of spiralling whitefly as observed in Indonesia by Kajita *et al* (1991).

Results on colonization of *E.guadeloupae* on the spiralling whitefly infesting different ornamentals are presented in figures 1- 4.

Rose

The population of spiralling whitefly declined from 30.50/ leaf in August 2002 to 2.57 / leaf in February 2003. *Encarsia guadeloupae* was first recovered in September 2002 and found to be causing 21.74% parasitism, which went up to 96.00% in February 2003 (Fig 1). Correlation analysis revealed that there was significant influence of parasitism ($r = -0.943$) on the population of spiralling whitefly.

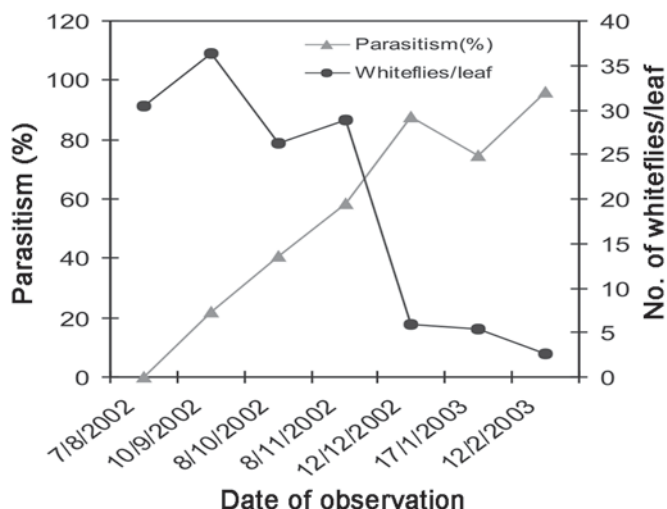


Fig 1. Parasitism by *Encarsia guadeloupae* on rose

Hibiscus

Spiralling whitefly incidence was observed in May 2003 on hibiscus at Hebbal. The population declined from 52.40 /leaf in May 2003 to 2.90 in November 2003 (Fig 2). *Encarsia guadeloupae* was first recovered in June 2003 causing 18.96 % parasitism, which later increased to 86.40% in November 2003. Correlation analysis revealed that there was significant influence of parasitism ($r = -0.979$) on the population of spiralling whitefly.

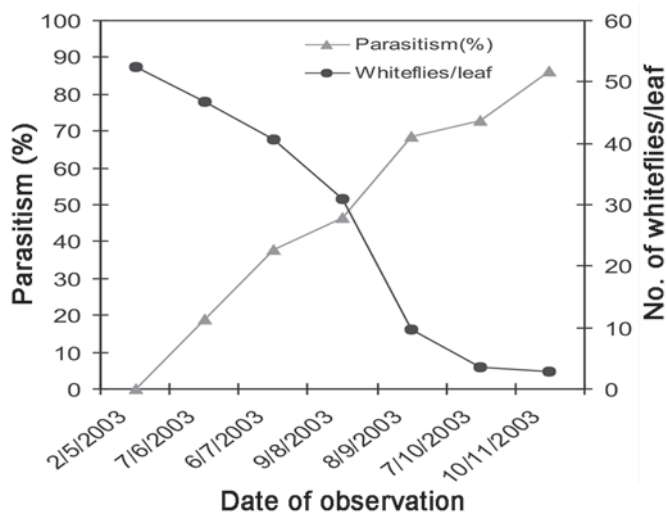


Fig 2. Parasitism by *Encarsia guadeloupae* on hibiscus

Poinsettia

The spiralling whitefly was observed in severe form in June 2003 on poinsettia at the IIHR Farm. The parasitoid was recovered in July and recorded a parasitism of 32.94 %. The parasitism went up to 90.40 % in December 2003. The

population of whitefly declined from 105.42/leaf in June 2003 to 1.52 / leaf in December 2003 (Fig 3). Correlation analysis revealed that there was significant influence of parasitism ($r = -0.954$) on the population of spiralling whitefly.

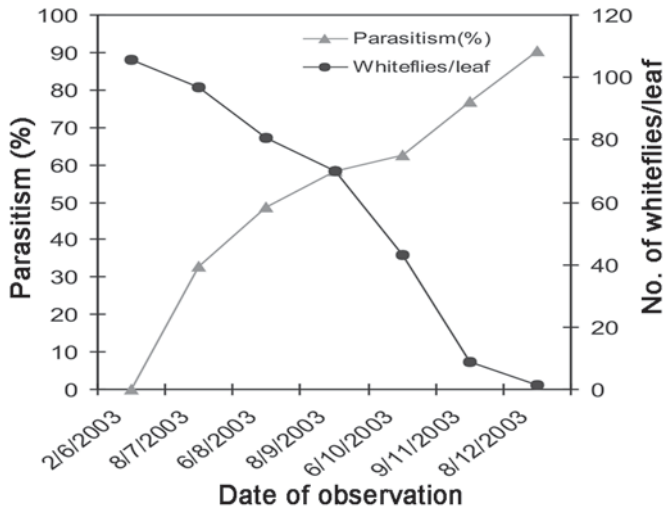


Fig 3. Parasitism by *Encarsia guadeloupae* on poinsettia

Acalypha

On acalypha, the population of whitefly declined from 23.45/leaf in June 2003 to 9.66 / leaf in December 2003 following the release of *E. guadeloupae* in June 2003. Parasitism level increased gradually from 3.43% to 39.86% (Fig 4). Correlation analysis revealed that there was significant influence of parasitism ($r = -0.948$) on the population of spiralling whitefly.

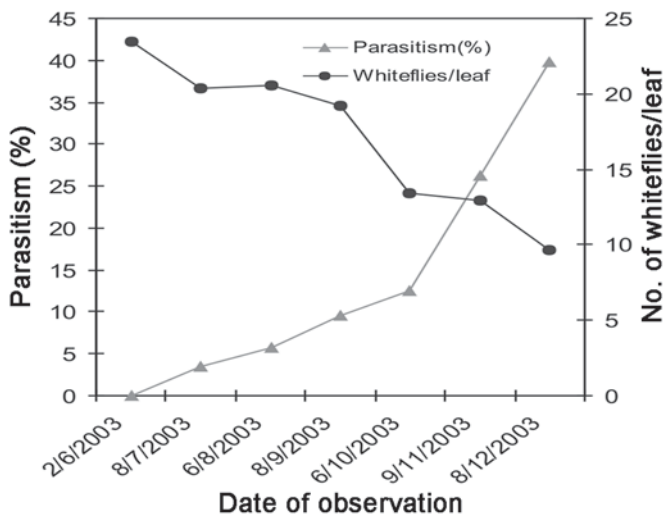


Fig 4. Parasitism by *Encarsia guadeloupae* on acalypha

Very high level of parasitism of 86.40 - 96.00% by *E. guadeloupae* was observed on the above ornamental crops, except on acalypha, in the present study. Even in acalypha, if observations had been continued for some more months, higher level of parasitism could probably have been observed. Geetha (2000) and Mani *et al* (2004) reported 80 % parasitism by *E. (?) haitiensis* (*Encarsia meritoria* sp. nr.) on spiralling whitefly infesting guava.

The activity of parasitoids was observed throughout the study period. Parasitism by *E. guadeloupae* was significant and negatively correlated with the population of whitefly ($r = -0.943$ to -0.979) in the present study. Similar significant correlations between abundance of spiralling whitefly and natural enemies, chiefly *E. (?) haitiensis* in Hawaii, was reported (Kumashiro *et al*, 1983). Similarly, Chandrasekar (1990) and D’Almeida *et al* (1998) reported that the decline in spiralling whitefly population was mainly due to the action of *E. (?) haitiensis* and *E. guadeloupae* in Sri Lanka and Benin, West Africa. According to Kumashiro *et al* (1983), a single release of *E. (?) haitiensis* in 1980 reduced the population of the spiralling whitefly by 78-98% around Honolulu in Hawaii. The population of *A dispersus* in Malaysia remained low mainly due to the presence of *E. guadeloupae* (H.Kajita, pers. commun., 1996). The efficacy of *E. guadeloupae* in controlling spiralling whitefly (as observed in the present study on ornamental crops) in Hawaii, Malaysia, India, Philippines, Togo, Ghana, Nigeria, Tenerife (Canary Islands) and Taiwan (Waterhouse and Norris, 1989; Neuenschwander, 1994; Chien *et al*, 2000; Nijhof *et al*, 2000; Mani and Krishnamoorthy, 2002) has also been reported on other crops.

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REFERENCES

Chandrasekara, D.1990. Effect of weather and natural enemies on population variation of the spiralling whitefly (SWF), *Aleurodicus dispersus* Russell (Homoptera, Aleyrodidae). Research Report submitted to the Degree of B.Sc., University of Peradeniya, Sri Lanka, 26 p.

- Chien, C. C., Chou, L.Y. and Chang, S.C. 2000. Introduction, propagation and liberation of two parasitoids for the control of spiralling whitefly, (Homoptera: Aleyrodidae), in Taiwan. *Chinese J. Ent.*, **20**: 163-178.
- David, B.V. and Regu, K. 1995. *Aleurodicus dispersus* Russell (Aleyrodidae: Homoptera), a whitefly pest new to India. *Pestology*, **19**: 5-7.
- D'Almeida Y.A., Lys, J.A, Neuenschwander, P. and Ajounu, O. 1998. Impact of two accidentally introduced *Encarsia* species (Hymenoptera: Aphelinidae) and other biotic and abiotic factors on the spiralling whitefly *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae) in Benin, West Africa. *Biocontrol Sci. Tech.*, **8**: 163-173.
- Geetha, B. 2000. Biology and management of spiralling whitefly *Aleurodicus dispersus* (Russell) (Homoptera: Aleyrodidae). Ph.D Thesis, Tamil Nadu Agricultural University, Coimbatore, India, 196 p.
- Kajita, H., Samudra, I.M. and Naito, A 1991. Discovery of the spiralling whitefly *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae) from Indonesia, with notes on its host plants and natural enemies. *Appl. Ent. Zoology*, **26**: 397-400.
- Kumashiro, B.R., Lai, P.Y., Funasaki, G.Y. and. Teramoto, K.K. 1983. Efficacy of *Nephaspis amnicola* and *Encarsia* (?) *haitiensis* in controlling *Aleurodicus dispersus* in Hawaii. *Procs. Hawaiian Ent. Soc.*, **24**:8.
- Mani, M. and Krishnamoorthy, A. 1996. Spiralling whitefly and its natural enemies on guava in Karnataka. *Insect Environ.* **2**: 12.
- Mani, M. and Krishnamoorthy, A. 2002. Classical biological control of spiralling whitefly, *Aleurodicus dispersus* Russell – An appraisal. *Insect Sci. Applic.*, **22**:263-273.
- Mani, M., Krishnamoorthy, A., Venugopalan, R. and Pattar, G.L. 2004. Biological control of exotic spiralling whitefly *Aleurodicus dispersus* Russell on guava by *Encarsia haitiensis* Dozier and *Encarsia guadeloupae* Viggiani in India. *Pest Management in Horticultural Ecosystems*, **10**: 29-39.
- Muniappan, R., 1993. Spiralling whitefly, *The Hindu* dated August 11, 1993, p.28.
- Neuenschwander, P., 1994. Spiralling whitefly *Aleurodicus dispersus*, a recent invader and new cassava pest in Africa. *African Crop Sci. J.*, **2**: 419-421
- Nijhof, B.W., Oudman, L., Torres, R and. Garrido, C 2000. The introduction of *Encarsia guadeloupae* (Hymenoptera: Aphelinidae) for control of *Aleurodicus dispersus* and *Lecanoideus floccissimus* (Homoptera: Aleyrodidae) on Tenerife. *Proceedings of the Section Experimental and Applied Entomology of the Netherlands Entomological Society*, **11**: 41-47.
- Palaniswami, M.S., Pillai, K.S., Nair, R.R. and. Mohandas, C 1995. A new cassava pest in India. *Cassava Newslett.*, **19**: 6-7.
- Prathapan, K.D.1996. Outbreak of the spiralling whitefly, *Aleurodicus dispersus* Russell (Aleyrodidae, Homoptera), in Kerala. *Insect Environ.*, **12** : 36-37.
- Ramani, S. 2000. Fortuitous introduction of an aphelinid parasitoid of the spiralling whitefly, *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae), into the Lakshadweep Islands with notes on host plants and other natural enemies. *J. Biol. Control.* **14**: 55-60.
- Ramani, S., Poorani, J. and Bhumannavar, B.S. 2002. Spiralling whitefly, *Aleurodicus dispersus* Russell in India. *Biocontrol News and Information*, **23**: 55-62.
- Ranjith, A.M., Rao, D.S. and Thomas, J.1996. New host records of the mealy whitefly, *Aleurodicus dispersus* Russell, in Kerala. *Insect Environ.*, **2**: 35.
- Sathe, T.V. 1999. Whitefly, *Aleurodicus dispersus*, a new pest of guava, *Psidium guajava* in Kolhapur, Maharashtra. *Ind. J. Ent.*, **61**: 195-196.
- Srinivasa, M.V.2000. Host plants of the spiralling whitefly, *Aleurodicus dispersus* (Homoptera: Aleyrodidae). *Pest Mgt. in Hortl. Ecosystems*, **6**:79-105.
- Waterhouse, D.F. and Norris, K.R.1989. Biological control. Pacific prospects - supplement 1, ACIAR Monograph, **12**,125 p.

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