

## *Telenomus fariai* (Hymenoptera: Scelionidae) is not a good choice for the control of domestic populations of *Triatoma infestans* (Hemiptera: Reduviidae)

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### ***Telenomus fariai* (Hymenoptera: Scelionidae) no es una buena elección para el control de poblaciones domésticas de *Triatoma infestans* (Hemiptera: Reduviidae)**

**RESUMEN.** Esta es una descripción de estudios experimentales hechos en campo para evaluar la eficacia de *Telenomus fariai* como agente de control biológico de *Triatoma infestans*, el principal vector de *Trypanosoma cruzi* (agente etiológico de la enfermedad de Chagas) en países del Cono Sur de Sud América. El objetivo de esta nota es informar la ineficacia de *T. fariai* para regular la abundancia poblacional de *T. infestans* bajo condiciones de campo en forma narrativa, ya que desafortunadamente los datos originales se perdieron hace tiempo, no publicados debido a que los resultados “negativos” no eran usualmente publicados al momento de los estudios (década de 1980). La finalidad de la nota es corregir el reporte selectivo e informar a colegas interesados acerca de los esfuerzos hechos sobre una idea que era (y probablemente aún es) muy atractiva al momento de realizar el trabajo.

**PALABRAS CLAVE.** Control biológico. Mal de Chagas. Parasitoide. Vinchuca.

**ABSTRACT.** This is a description of experimental field studies that evaluated the efficacy of *Telenomus fariai* as a biological control agent of *Triatoma infestans*, the main vector of *Trypanosoma cruzi* (the aetiological agent of Chagas disease) in the Southern Cone countries of Latin America. The objective of this note is to report the inefficacy of *T. fariai* to regulate the population abundance of *T. infestans* under field conditions in a narrative way, as the original data have long been lost and unpublished because “negative” results were not published at the time (1980s). The aim is to correct that selective reporting and inform interested colleagues about efforts made on an idea that was (and probably still is) very appealing at the time the work was made.

**KEYWORDS.** Biological control. Chagas disease. Kissing bug. Parasitoid.

Studies on oophagous parasitoids were carried out between 1977 and 1982, mainly in the north of Córdoba province, central Argentina (Brewer et al., 1978, 1979, 1980, 1981, 1984a, 1984b). When we started the studies, *Telenomus fariai* (Hymenoptera: Scelionidae) was the only known oophagous of Triatominae in the west of Córdoba. The search for oophagous microhymenopterans was carried out in wild ecotopes (bird nests, mammal burrows, and bark and fallen dead trees) and domestic and peridomestic structures present in houses of rural communities.

Besides the active search for triatomine eggs

(especially in bird nests and domestic/ peridomestic structures), a productive technique to estimate the prevalence of egg parasitoidism was the exposure of lab produced eggs of *Triatoma infestans* (Hemiptera: Reduviidae) inside small wire-mesh bags, located in the potential triatomine ecotopes. After two weeks the bags were collected, transported to a rearing chamber with a controlled temperature of 25 °C, eggs placed inside Kahn tubes and inspected daily for the emergence of *T. infestans* nymphs or parasitoids (Brewer et al., 1978). Studies showed there were seven species of oophagous parasitoids of Triatominae. Three species (*T. fariai*

(Scelionidae), *Ooencyrtus venatorious* (Encyrtidae), *Centrodora (Oolathron) mireyae* (Aphelinidae)) were gregarious (several individuals emerging from one triatomine egg) and the rest were solitary parasitoids (*Anastatus excavatus*, *A. charitos*, *A. catamarcensis*, *A. coreophagus* (Eupelmidae)). These parasitoids were found parasitizing eggs of *T. infestans*, *T. guasayana*, *T. delponteii* and *T. platensis* (Brewer et al., 1978, 1979, 1980, 1981, 1984a). Surveys in several areas and ecotopes (in the Espinal and semiarid Chaco biomes, central Argentina) showed a pattern of parasitoidism that peaked in wild ecotopes (especially bird nests, where about 37% of the triatomine eggs were parasitized) (Brewer et al., 1980), and decreased in peridomestic structures (where 12% of the eggs were parasitized) to show no parasitism in *T. infestans* eggs within houses of rural communities.

After the descriptive phase of the study, an experimental study was designed to evaluate the impact of parasitoidism on the population abundance of *T. infestans*. Among the seven species found in the previous studies, we selected *T. farii* as the only one to evaluate, because it was the most frequent species found under field conditions, it was very productive under lab rearing conditions (representing a serious threat for triatomine rearing facilities), development time was relatively short and we thought a gregarious species was better than a solitary one.

Two experiments were designed. In the first, we evaluated the ability of *T. farii* to locate and parasitize *T. infestans* eggs within adobe walls. To carry out this experiment, we used a 18 (6 x 3) m<sup>2</sup> unoccupied one bedroom rural house, with adobe walls and straw-sticks-mud roof near El Abra (Cruz del Eje Department, Córdoba province). Randomly located holes (using random number coordinates) in the inner surface of each wall were perforated with a manual drill in November, 1978. Glass tubes of two different diameters and two lengths were individually labelled (coordinates recorded) and introduced in each hole, in order to evaluate the ability of the wasp to find eggs within places with different hole size and depth. We made 100 holes in each wall. In the lab, we programmed the parasitization of *T. infestans* eggs that would release the emerging *T. farii* in an established date. On the release day, we introduced one recently laid (< 5 days) *T. infestans* healthy egg (not parasitized) within each glass tube in the wall holes, and we put additional eggs in wired mesh bags in the roof and beside a little window of the room. The window was sealed with a transparent glass whose inner surface was coated with an adhesive substance, to capture the eventual *T. farii* attracted by the outside light. The lab-produced *T. farii* parasitized *T. infestans* eggs (about 100, expecting to produce about 500-600 *T. farii* adult females) were placed in an open Petri dish in the center of the room, the wooden door was shut and the set up was left untouched for one week. After this period, all the tubes with the exposed *T. infestans*

eggs were collected, as well as the *T. infestans* eggs exposed within the wired mesh bags in the roof and the window. The transparent glass coated with the adhesive was unmounted from the window and conditioned for transport. All materials were transported to the lab, where the exposed *T. infestans* eggs were placed in a rearing chamber with a controlled temperature of 26 °C and checked daily for eventual *T. farii* emergence.

### Results of the first experiment

None of the *T. infestans* eggs placed within the glass tubes inserted in the adobe walls of the experimental house was found parasitized. A few *T. infestans* eggs that were placed within the wire mesh bags located in the inner side of the roof, were parasitized (produced *T. farii* adults). The majority of the eggs placed within the wire mesh bags located besides the room window were parasitized. The transparent glass coated with the adhesive substance had numerous *T. farii* stuck onto it (probably more than 50% of the estimated number that would emerge from the lab parasitized eggs).

After the results of the first experiment were analyzed, we concluded that the simultaneous release of a high number of *T. farii* within a relatively limited space might have elicited a density-dependent reaction that triggered the escaping behaviour of the parasitoids through the window, and/or simply that the light entering through the window was a strong attraction. For a second experiment, we designed a set up using *T. infestans* populations enclosed in chicken nests located in a rural setting near El Abra. The design contemplated three experimental groups, one that received the effect of parasitoids, one that received the effect of an organophosphate insecticide (the standard by the time) and one control. Each group was replicated three times. Chicken nests were separated by a distance that made sure no interference between insecticide and parasitoids took place. Between 20-30 laboratory-reared adult *T. infestans* were used to colonize each chicken nest by October, 1979. After three months, the parasitoids were released and the insecticide applied according to the doses routinely used by the vector control programs of Argentina. Taking into account the escaping behaviour of the first experiment, we programmed the parasitization of *T. infestans* in the lab to produce a parasitoid release that would not produce a simultaneous massive emergence. In the following October, the chicken nests were dismantled and the number of *T. infestans* counted.

### Results of the second experiment

The control population of *T. infestans* showed an average abundance similar to the population that received the *T. farii* release, and both were higher than the population that received the effect of the organophosphate insecticide.

We concluded that *T. farii* is not able to affect the abundance of *T. infestans*. Posterior studies on the

population ecology of *T. infestans* demonstrated the reason that explains why *T. fariai* was not able to regulate *T. infestans* abundance. As the main factor regulating the population abundance of *T. infestans* under field conditions is the intraspecific food competition (access to a blood meal), the reduction of the number of young nymphs (by egg parasitoidism) decreases the food competition among the nymphs of the host population, increasing the survival of the surviving nymphs (Gorla & Schofield, 1989). The net result on the number of *T. infestans* individuals reaching adulthood is the same, with or without the effect of the parasitoid presence. Domestic populations of triatomines should not exist, as this is the only situation that would avoid the vectorial transmission of *T. cruzi*. In a classical sense, a biological control agent will not eliminate its target population so that the classical biological control approach has to be discarded for the control of triatomine populations in domestic ecotopes. Biological control attempts, using microhimenoptera, *Beauveria* spp. or viruses on peridomestic populations of triatomines, with interventions affecting the pre-adult phases, should consider the same problem we faced with *T. infestans* populations. The efficacy of biological insecticides (confronting the same logistic problems to the synthetic insecticides) on the control of triatomine populations has yet to be demonstrated.

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