Investigation note

Identification of native coccinellids of San Luis Potosí, for the biological control of *Dactylopius* spp.

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Abstract

The main phytosanitary problem of the nopal vegetable in San Luis Potosí, Mexico is the wild cochineal and the chemical control is inefficient. The present study started from the hypothesis of one of the natural enemies of *Dactylopius* spp., existing in San Luis Potosí is *Chilocorus* spp. The objective was to carry out an identification, to establish the basis of a biological control program for conservation. In July 2015, a collection of coccinellids was carried out at the San Ignacio ranch in the municipality of Santa María of Río, SLP. The collection site was a plot of ten hectares, and subdivided into ten subplots of one hectare. A subplot was chosen and an area where there was a greater presence of *Dactylopius* spp., Which was eighty square meters and approximately 665 plants was sampled. The methodology of Vanegas *et al*. (2010). Which proposes a sample size of 10 plants taken at random and from each one a cladode, from which the present coccinellids were collected and of these thirty were kept in 70% ethyl alcohol and others alive in breeding chambers. Some collected specimens were taken for identification to the National Reference Center for Biological Control, in Tecoman, Colima, where their morphological and genitalia characteristics were defined, contrasting with the group's bibliography. The identified coccinellid was *Chilocorus cacti*, subfamily: Chilocorinae, Tribe: Chilocorini. This is the first complete taxonomic identification of the predator present in nopal vegetable plots in San Luis Potosí, Mexico.

Keywords: *Chilocorus cacti*, Coccinellidae, Coleoptera, nopal vegetable.

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San Luis Potosí, Mexico, is part of the area considered the center of origin of the genus *Opuntia* and its cultivated variants are the product of the prolonged relationship of domestication (Aguirre, 1983, Reyes, 2009). The wild cochineal (*Dactylopius* spp.) parasitizes *Opuntia* plants and five of the eleven *Dactylopius* species in America are found in Mexico. The most common is *Dactylopius opuntiae* (Cockerell) (Hemiptera: Dactylopiidae) (Flores *et al*., 2006).

The nopal wild cochineal is the most important pest of the nopal vegetable in San Luis Potosí, as the cultivated area increases, the production season and the bad handling of agrochemicals increase (García *et al*., 2008; Luna, 2011; Pacheco *et al*., 2011). It should be mentioned that chemical control, especially the use of organophosphorus insecticides, which is the most common tool (Palacios *et al*., 2004), is not efficient and causes damage to the environment and the health of workers. In addition, it is difficult to corroborate the safety intervals of the products because the harvest cuts can be made every 7 days (Luna, 2011).

In the study area the incidence of wild cochineal occurs from April to September (García *et al*., 2008), the time between generations varies from 35-45 days (Pacheco *et al*., 2011) and the factors that hinder the control of this plague are its waxy cover, its resistance to adverse climatic factors, high reproduction rates and short life cycle (Pacheco *et al*., 2011). The nopal damage is caused by females, both nymphs and adults, since, when extracting sap, they cause yellowing, weakening and death of the plant (Vanegas *et al*., 2010). In the case of the male once it emerges it goes towards the females to copulate; it remains alive for two to four days and then dies (Marin and Cisneros, 1977).

The inefficiency of the insecticides causes abandonment of cactus plantations, allowing the natural enemies to re-establish, making evident the predatory action of some beetles in nopaleras without chemical control measures (Luna, 2011). In the state of San Luis Potosí, several predators with similar characteristics to coccinellids have been observed attacking the wild cochineal in the municipality of Soledad of Graciano Sánchez (Jarquín *et al*., 2013).

The coccinellids are an important family of coleoptera known as ladybugs or ladybugs and are still of great importance for agro ecosystems, as they help the natural control of pests of economic importance such as aphids, whitefly, scales and in general, body insects soft (Moron and Terrón, 1988). The objective of this study was to identify the coccinellid in nopal vegetable gardens in San Luis Potosí, as a first step for the implementation of a biological control proposal for conservation in the state. The hypothesis proposed was that *Chilocorus* spp. It was one of the natural enemies of *Dactylopius* spp., In cactus and therefore an insect eligible for use within a biological control strategy for conservation.

On July 28, 2015, a collection of coccinellids was carried out at the San Ignacio ranch in the municipality of Santa María of Río, San Luis Potosí (22º 11' 22.9'' north latitude and 100º 52' 36.3'' west longitude at 1 777 meters above sea level). The collection site was a plot of ten hectares, which was subdivided into ten subplots of one hectare. A subplot was chosen and an area was sampled with a history of the presence of *Dactylopius* spp., with dimensions of 20 m long and four wide, which consisted of five rows and approximately 665 plants.

To do this, the methodology of Vanegas *et al*. (2010). Which proposes to take a sample of 10 plants at random and from each one, a cladode, from which the present coccinellids were collected. Of the collected insects, thirty specimens were taken and kept in 70% ethyl alcohol another part was introduced live in breeding chambers. Individuals in alcohol were identified in the National Reference Center for Biological Control (CNRCB), in Tecomán, Colima.

The taxonomic identification was made through illustrations and taxonomic keys based on the book of Coccinellidae (Gordon, 1985) and ten specimens were used. The sex was identified with a simple microscope, as well as the quantification of segments in the abdomen of the coccinellids, since it is documented that males present six segments and females five. In this process, we used a Car Zeiss® stereoscope microscope, Discovery V20, an Axio cam HRC camera adapted to it and a combine ZM® program to scan the microscope images (Axio Vision SE64). Finally, between 30 to 40 photos of the highest quality were selected.

The identification of the coccinellid found in San Luis Potosí, Mexico coincided fully with the taxonomic keys of Gordon (1985). The Coccinellidae, is a very diverse and well-known family within the Coleoptera order. They are commonly known as 'chinitas' or 'ladybugs' and due to their inoffensive appearance and their colorful colors are considered one of the most charismatic coleoptera groups (Zabala *et al*., 2003).

The characteristics of Coccinellidae corroborated were its clipedal laterally expanded to the eyes, antenna reduced to ten segments or less, apical segment of maxillary palpus cylindrical with truncate apex; maxilla thistle enlarged or strongly sclerotized (Gordon, 1985).

The first criterion used to assign the specimens to a subfamily was to visualize the extension of the clipedal to the eyes and antenna reduced to ten segments or less, for which it was possible to affirm that the specimens analyzed by their characteristics belong to the Chilocorinae subfamily. This is distinguished by having the clipeous dilated under the eyes, creating a kind of mask easy to distinguish.

The criterion for classifying the specimens in the tribe of this subfamily consisting of three tribes, Telsimiini, Platynaspini and Chilocorini, is that only Chilocorini is found in the western hemisphere. The postcoxal line character was used for the genre, which was clearly observed. The genus *Chilocorus* presents in the clipee a border on the front edge and is slightly trimmed. To assign species, the criterion was based on red spots and circles and its reddish chest, according to Gordon (1985).

The anterior edge of the pronotum is strikingly concave, with very long sides, the base of the elytra is quite wider than the pronotum. Ventrally, the epiplexes are wide and descend to the apex. The metasternal has depressions to house the femurs (Santos, 2007).

Chilocorus cacti is one of the most widespread broad-spectrum predators used for efficient control of the density of mites and phytophagous insects (Aurali *et al*., 2001). This coccinellid was used in campaigns of biological control of scale insects such as *Asterolecanium pustulans* (Cockerell), *Pseudaulacaspis pentagona* Targioni and *Diaphorina citri* in Puerto Rico (Cruz and Segarra,

1992). In Mexico, there are reports and technical reports that C. cacti depredates the snow flake *Unaspis citri* (Comstock) (SENASICA, 2006) and the white scale of mango *Aulascaspis tubercularis* Newstead (Carrillo *et al*., 2008). In addition, it is distributed in the southern and western parts of the United States. UU (Gordon 1985).

Taking into account the above, the coccinellid collected according to the taxonomic keys and the genitalia observed, which served to corroborate the identification and based on the characteristics of tegmen and sifo, the insect collected was *Chilocorus cacti* L. 1767 (Coleoptera: Coccinellidae).

Conclusions

Given the taxonomic characteristics of the identified organism, in the present work, it belongs to the subfamily: Chilocorinae, Tribe: Chilocorini, genus: *Chilocorus*, species: *cacti*. This is the first complete taxonomic identification of the predator present in nopal vegetable plots in San Luis Potosí, Mexico. This is the first report of *C. cacti* present in nopal vegetable plots without chemical management in San Luis Potosí, Mexico, this finding emphasizes the negative impact of the extensive use of pesticides on the different species of an agroecosystem; however, it also provides alternatives for the development of strategies for the biological control of pests in cactus cultivation, through the use and conservation of native species.

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