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Original article

Prevalence of parasitization by Diptera in *Apis mellifera* L in southern Spain

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Summary — Two hundred and two samples of bees from 35 beehives distributed among 12 apiaries were analysed. They were collected between October 1990 and October 1992 in southern Spain. The thoraxes of 25 bees taken from each sample were examined individually (5 050 in total) to look for diptera larvae (myiasis). Twenty-four fly larvae were discovered in the anterior dorsal part of the bees' thoraxes. The flies were widely distributed throughout southern Spain although honeybee infestations reached a low rate of incidence (0.48%), mainly in July.

Apimyasis / parasitism / *Senotainia* sp / *Apis mellifera* L / Spain

INTRODUCTION

The presence of parasitic dipterans in the honey bee (*Apis mellifera* L) has long been recognized. The first fly reported to cause apimyasis was *Rondaniooestrus apivorus* (Villeneuve, 1916), diagnosed on the African continent (Knutson, 1978). In Europe, the most well-known parasitic dipterans that attack the bee belong to the *Borophaga incrassata* species (Paillot et al, 1944) of which the most commonly identified is *Senotainia tricuspis* Meigen, 1841, whose biology has been studied by Simintzis (1949), Giordani (1955), and Boiko (1958).

S tricuspis is distributed throughout central and southern Europe, and has been reported in Tunisia, Northern Africa (Mathis, 1957). Some years ago it was also recorded in Portugal (Rocha and Mira Delgado, 1986), where it appears during September, in contrast to France, where the highest levels of parasitization occur during August (Simintzis and Fiasson, 1951).

In Spain, high infestation levels by Diptera between 1940-1950 are well known:

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diptera larvae have been known to exist in the bee's thorax on the island of Mallorca, where levels of parasitization of 90% were found in bee colonies during 1946 (Ramírez Gómez, 1949). It was even suggested that some samples from the region of Valencia could correspond to *Myapis angellozi* Séguy, among others, a synonym of *Senotainia tricuspis* Meigen (Valenciano, 1951). Pajuelo and Fernández Arroyo (1979) reported a percentage of infestation by diptera of 1.8% (n = unknown), probably *S tricuspis*. Preliminary data about this pathology (apimyiasis) were published recently (Orantes Bermejo and García Fernández, 1995).

Views on the damage caused by this apimyiasis differ. Some authors (Ramírez Gómez, 1949; Boiko, 1959; Rocha and Mira Delgado, 1986) consider that it provokes a high number of deaths among bees, in the absence of evidence of any other disease (Valenciano, 1951). However, others (Simintzis and Fiasson, 1951; Giordani, 1955) hold that the infected bees did not show any symptoms and continued to lead a normal life in their colonies.

In this paper, we study the prevalence of parasitization and distribution by dipteran larvae in southern Spain.

MATERIALS AND METHODS

Twelve apiaries located in the regions of Andalusia, Extremadura and Murcia, southern Spain (fig 1) were sampled between October 1990 and October 1992. Two hundred and two samples of bees were taken from thirty-five beehives and preserved at –20 °C until analysis.

Twenty-five bees from each sample, ie 5 050 bees in total, were examined individually in search of diptera larvae. The thorax of each bee was cut into transverse sections and incubated at 37 °C in 10% potassium hydroxide (KOH) for two days to make them clearer. Lastly, the cuts and the liquid where they were incubated were examined under a stereoscopic microscope equipped with an ocular micrometer. The larvae found were photographed and the posterior spiracles were dissected.

RESULTS AND DISCUSSION

Of the 5 050 bees examined, 24 larvae were found in 24 honeybees (one first instar larva and 23 second instar larvae). This represents a total incidence of 0.48% . Nevertheless, larvae were found in 9 out of the 12 study zones and in 40% (n = 35) of the hives examined (fig 1). All the larvae were attached to the muscles of the anterior part of the thorax. The highest number of positive samples appeared during July and the range of parasitization obtained from the 17 positive samples was from 4% to 12% . Fly larvae which parasitize adult honey bees seem to be widely distributed in southern Spain. Their presence is more notable in the eastern area (fig 1), especially during the month of July.

There are no taxonomic studies which compare the various larvae of the genus *Senotainia,* which makes it difficult to identify the second instar larvae. The morphology of the different taxonomic characteristics of the larvae found in this study resemble those described by Giordani (1955) for the species *S tricuspis.*

Rocha and Mira Delgado (1986) discovered this diptera in the region of Portoalegre (Portugal) near Cáceres during September. In this study our positive sample in Cáceres was discovered in May. In southern France, the maximum parasitization was found to occur in August (Simintzis and Fiasson, 1951). There could be two reasons to this: firstly, *S tricuspis* experiences one complete and another partial life cycle in the period of one year (Giordani, 1955) and, secondly, there exists a great variety of climates and ecosystems in the southern Iberian peninsula, which affect the life cycle phenology.

The levels of parasitization found in bees during the study were very low: 0.48% (n =

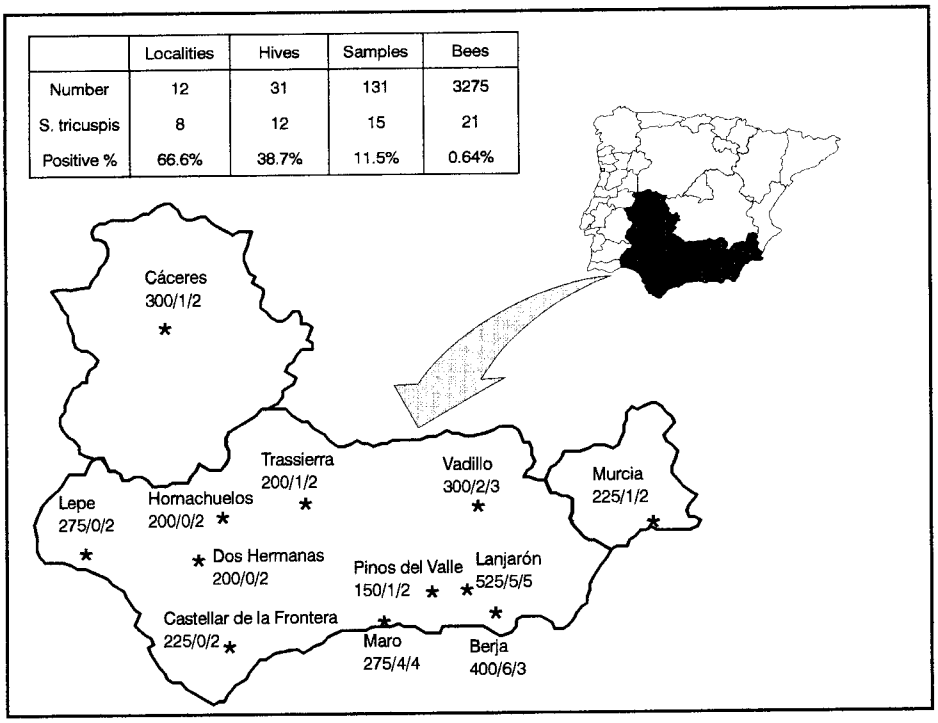

Fig 1. Distribution of the apiaries in the study of apimyiasis. The numbers on the map represent the number of bees examined / the number of infected bees / the number of hives. The table indicates the percentage of parasitization in relation to localities, hives, samples and bees.

5 050 bees) coinciding with the results from other studies consulted: in France, 0.17% (n = 38 965 bees) (Rousseau, 1953) for the species *S tricuspis.* Similarly, the number of positive samples in our study was 8.42% (n = 202), which is comparable with 9.1% (n = 508) found in Portugal (Rocha and Mira Delgado, 1986).

Over the years observant beekeepers have reported that unknown larvae have been killing their bees, just as occurred in the 1940s. There are similarities between these two periods that lead us to believe that it is not mere coincidence. The years between 1984 and 1994 were the driest of this century in Spain, followed by the period 1945-1953 (source: Instituto Nacional de Meteorología). They are, therefore, the years with the highest number of sunny days, conditions propitious to *S tricuspis* attacks and which may have caused in its population a small increase which was detected by beekeepers and by means of ordinary laboratory diagnosis.

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Résumé — Taux de parasitisme de l'abeille *Apis mellifera* L par des Diptères

dans le sud de l'Espagne. Un échantillonnage a été effectué d'octobre 1990 à octobre 1992 sur 35 colonies réparties en 12 ruchers dans le sud de l'Espagne (fig 1). Nous avons analysé individuellement 5 050 thorax d'abeilles et trouvé 24 larves de Diptères dans 9 des 12 ruchers étudiés. Dans l'ensemble, le taux moyen de parasitisme est bas (0,48 %) mais il varie entre 4 et 12 % dans les échantillons parasités. Malgré ce taux de parasitisme réduit, ces diptères parasites d'abeilles sont largement répandus dans le sud de l'Espagne et apparaissent principalement en juillet. Comme il n'existe pas de comparaison taxonomique des larves des différentes espèces du genre *Senotainia,* il est difficile de déterminer les insectes au deuxième stade larvaire. Les divers caractères morphologiques des larves étudiées ici ressemblent à ceux décrits par Giordani (1955) pour l'espèce *S tricuspis.* L'augmentation des attaques parasitaires des dernières années pourrait être causée par une plus grande insolation et par la sécheresse qui s'ensuit. Les attaques de *S tricuspis* sur l'abeille domestique sont favorisées par la sécheresse.

***Apis mellifera* / *Senotainia* sp / taux de parasitisme / Espagne**

Zusammenfassung — Ausmass der Parasitierung von *Apis mellifera* L durch Fliegen im südlichen Spanien. Im Süden von Spanien (Abb 1) wurden von Oktober 1990 bis Oktober 1992 Proben von 35 Völkern gesammelt, die auf 12 Bienenständen verteilt waren. Wir haben den Thorax von 5050 einzelnen Bienen präpariert und 24 Larven von Fliegen in 9 der 12 untersuchten Bienenstände gefunden. Die Befallsrate ist mit insgesamt 0,48% gering, bei den befallenen Proben schwankte die Rate zwischen 4% und 12%. Trotz der geringen Befallsrate sind diese in Bienen parasitierenden Zweiflügler in Südspanien weit verbreitet und treten vor allem im Juli auf. Es gibt keine taxonomischen Vergleiche von den verschiedenen Larven der Arten von *Senotainia* sp. Deshalb ist es schwierig, die Tiere im zweiten Larvenstadium zu bestimmen. Die Morphologie der verschiedenen für die Taxonomie bedeutsamen Merkmale, die in dieser Untersuchung gefunden wurden, ähnelt der wie sie von Giordani (1955) für die Art *S tricuspis* beschrieben wurde. Die Häufung des Befalls in den letzten Jahren könnte vielleicht durch eine längere Zeit der Sonneneinstrahlung und der damit verbundenen Trockenheit verursacht sein, die in den letzten Jahren in Spanien aufgetreten ist. Die Angriffe auf Bienen durch *Senotainia tricupis* werden durchTrockenheit begünstigt.

***Apis mellifera* / *Senotainia* sp / Parasitierung / Spanien**

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