NEWS AND VIEWS / NOTICIAS Y OPINIONES

A scientific note of pest-insects associated with stingless bee hive *Melipona eburnea* in the Ecuadorian Amazon Region

Una nota científica de insectos-plaga asociados con las colmenas de abejas sin aguijón *Melipona eburnea* en la región amazónica ecuatoriana

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Resumen: Bees are the primary pollinators in nature. However, climate change, excessive use of fertilizers and invasive species have caused the decline of bee colonies. Therefore, this study aimed to analyze the presence of pests in colonies of *Melipona eburnea*. For this, the colonies of *M. eburnea* were examined during the honey extraction process. We found 4 different pests associated with the physical conditions of colonies and the fragile defense of the bees against the invaders. In conclusion, this report of the presence of pests is to alert researchers and meliponicultures to prevent the decline of stingless bees.

Palabras clave: Honey production, meliponiculture, propolis, stingless bees.

Abstract: Las abejas son los principales polinizadores en la naturaleza. Sin embargo, la influencia del cambio climático, el uso excesivo de fertilizantes y especies invasoras han provocado la disminución de sus colonias. El objetivo del presente estudio fue analizar la presencia de plagas en colonias de *Melipona eburnea*. Se examinaron las colonias de *M. eburnea* durante el proceso de extracción de miel. Cuatro plagas diferentes fueron encontradas, asociadas con las condiciones físicas de las colonias y la frágil defensa de las abejas contra los invasores. En conclusión, este informe de plagas es para alertar a los investigadores y meliponicultores y evitar el declive de las abejas sin aguijón.

Key words: Abejas sin aguijón, meliponicultura, producción de miel, propóleos.

Introduction

Bees are a group of efficient pollinating insects since they visit the flowers constantly; appreciating this food habit, they have come to offer a significant ecological and economic importance[1]. In this context, the interaction between plant-pollinator ensures the survival and reproduction of plants[2]. However, interactions that depend highly on a specific type of pollinator, there will be a high vulnerability of rupture and subsequent collapse when it is absent. An example of pollinators are bees of the Meliponini tribe that are widely distributed in the Neotropics and one of Melipona genus; it has been reported 16 species in Central America and 60 in South America[3]. In Ecuador, Colombia, Venezuela, and Brazil, some species of this genus have been documented[4].

In Ecuador, the use of these bees for the production of honey is not widespread, and it has been recorded that in the provinces of Zamora, Morona Santiago and Loja are dedicated to meliponiculture with six species; Melipona eburnea (Friese, 1900); M. cf. indecisa, M. mimetica (Cockerell, 1919); M. rufiventris (Lepeletier, 1836) and two unidentified species[5]. Unfortunately, cases have been reported in which the colonies disappear, but in most of these, the reason is unknown[5].

One of the reasons for the decline in bees is viruses that are transmitted by mites[6-9]. There are few studies on parasites (virus vectors) and pests that can affect stingless bees compared to A. mellifera[10], even though the oldest bee fossil that has been found corresponds to a stingless one[2,11]. In this study, we analyzed the presence of pests and parasites in M. eburnea from meliponaries in Porotoyacu community of the Ecuadorian Amazon Region.

M. eburnea was recollected manually of 11 boxes in the Porotoyacu community (0°52'31.25" S and77°44'54.37" O, 811 masl), Napo province, Ecuador. The community is responsible for extracting honey in an artisanal way, so the hives are built by hand. These are placed in wooden boxes on top of their roofs so that the bees can take advantage of the grape plantations near their homes. We collected workers of stingless bees, pollen and propolis, which were placed in plastic jars and airtight covers Ziploc®, respectively. These were taken to the laboratory and stored in a 96% alcohol solution. The Motic® optical microscope model BA210 and a Motic® stereoscope model SMZ168 were used to analyze the samples. Keys corroborated the bee's taxonomic identification following[12,13].

After analyzing and recognizing the organisms present in the samples taken, four pests of the stingless bee colony were identified. One of the specimens collected in the field was identified as part of the insect order Psocoptera (without wings; apterous) (Figure 1, A). All the species described to date (5000) are free-living and do not have parasitic characteristics[14,15]. According to several studies, Psocoptera feeds on microorganisms, mainly fungal organisms, which are agents in the process of organic matter degradation; in other words, the presence of these insects can be considered as an indicator of some decomposition process[16]. probably due to the disproportionate dimensions of the box that contained the colony of bees and the intervention of some abiotic factors, there was a process of decomposition of organic matter by fungi and other microorganisms, causing Psocoptera to enter into the hive. This decom-

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position could spread to the bee-hive, where the stability can be compromised, generating that these insects at this point might be considered to be pests. The microenvironments present in the Amazon forests, characterized by the density of forests, high temperatures, humidity, and shaded areas, are ideal for developing microorganisms that serve as a source of food for the Psocoptera. On the other hand, the principal depredators of Psocoptera are spiders, Coleoptera and/or Hemiptera[14], we observed spiders around the box (bee-hive), so it can be interpreted that maybe Psocoptera was escaping from them.

The colony of M. eburnea was also infested with adult hoverflies (Diptera, Syrphidae) (Figure 1, B), that were found in the propolis, and according to Moquet L 2018[17], these invertebrates depend on pollen (a substance rich in proteins consumed by females for reproduction) and nectar (a substance rich in sugars consumed by females and males for obtaining energy). In this context, we can suggest that the hoverflies were stealing the floral resources of the colony, and the stingless bees were defending themselves, killing them.

Another organism found in the colony was a Lepidoptera: Noctuidae (larva) (Figure 1, C), with almost 300 species around the world being considered as pests to crop in the majority of cases[18]. However, there is no information about Lepidoptera found in the colony of stingless bees or honeybee of the Apis genus. Furthermore, Lepidoptera feed with herbaceous plants and in the colony, no remains of herbs that could serve as food were observed, so it is inferred that perhaps some Lepidoptera left eggs inside the colony due to the ample space in the hive bees.

Finally, an ant (Hymenoptera: Formicidae), an adult insect (Figure 1, D) was observed

in the hive of bees M. eburnea. The presence of these insects has been detailed in the literature,

such as Campanotus pennsylvanicus Degeer[19] and Solenopsis invicta Buren[20,21]. It has been described that these can be considered as a pest because they can exterminate whole colonies of bees. Experts and beekeepers recommend the use of extra protection in places where ants can climb and stay. Also, it is helpful to use materials such as slaked lime, ash, and oil with water. It's important to remember not to use any chemicals because they are toxic to these insects[22].

Herein we provide the first report of four possible pests of meliponaries in the Amazon Region Of Ecuador to alert meliponicultures and researchers to be vigilant to prevent the diffusion of these pests throughout Ecuador and Amazon Region.

Conclusions

Specimens of the orders Psocoptera, Diptera, Lepidoptera and Hymenoptera were founded, which according to several studies, can be considered as pests for the bee colony, mainly involved in processes of decomposition of organic matter and competition for resources. However, future work will investigate all impacts in lifestyle and /or diseases in bees due to these invasive species. Furthermore, we hope that our research will be helpful to motivate similar studies in Melipona bees that are used for the production and commercialization of honey in the Amazon region.

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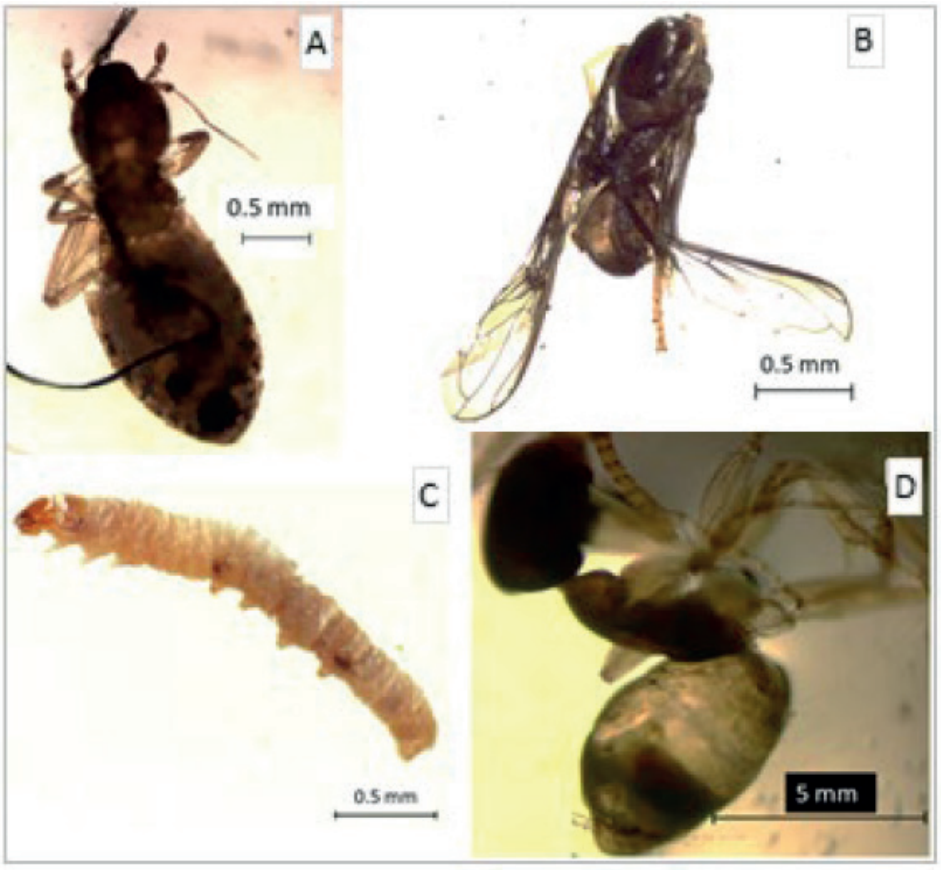

Figure 1. Pests in the colonies of Melipona eburnea. A: Psocoptera, B: Diptera, Syrphidae, C: Lepidoptera, Noctuidae (larvae), D: Hymenoptera, Formicidae, an adult.

Author Contribution Statement

All authors conceived, designed research, conducted experiments, and wrote the manuscript. All authors read and approved the manuscript.

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