OLD BROOD COMBS ARE MORE INFESTED BY THE MITE VARROA JACOBSONI THAN NEW BROOD COMBS

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Abstract

Usually, drone cells and worker brood cells with larger diameters are preferred by the mite Varroa jacobsoni. We studied the infestation rate in different types of worker cells in eight africanized honey bee colonies. New brood combs (NC) built naturally by the africanized honey bees and old brood combs (OC) with relatively smaller cells were placed in the same colony, and with egg laying by the same queen. The brood cell infestation rate was estimated by counting the number of adult female mites in 100 brood cells. The inside diameters of the infested cells (ICD) and uninfested cells (UCD) were also measured in both combs, soon after the adult honey bees emerged. The mean mite infestation was significantly higher (P = 0.002, t-test) in OC cells than in NC cells (31.2 ± 13.9% vs. 14.9 ± 6.9%, respectively). The ICD for OC was significantly greater (P < 0.001, t-test) than for UCD: 4.62 ± 0.044 mm vs. 4.54 ± 0.045 mm, respectively. The ICD mean for NC was 4.87 ± 0.062 mm while for UCD it was 4.83 ± 0.055 mm, and the difference was not quite significant (P = 0.057). The total mean of the diameters differed significantly (P < 0.001) between OC (4.58 ± 0.06 mm) and NC (4.85 ± 0.061 mm). The OC attracted more Varroa in relation to NC cells, although the cells had a smaller diameter. Though cell size is important, characteristics inherent to the larvae, to the comb or the food in the OC worker cells might have an important influence to attracting the Varroa mite.

Introduction

Historically there was a preoccupation for the size of the cells in the brood comb. On one hand, there is customary to recommend replacing worker brood combs after a certain time, for avoiding the size diminishing in cells, owing to brood accumulation, as well as of other adhering matter, to cause the diminishing of the colony efficiency and of the bees size. Nonetheless, there is a lack of actual information to support these hypotheses (DADANT & Sons, 1975). On the other hand, the size of the brood cell is also a factor influencing upon the infestation by the mite Varroa jacobsoni (MESSAGE and GONÇALVES, 1995). The development time of bees (CAMAZINE, 1986), as well as building queen cells within the colony also alter the ratio of infestation and mite reproduction (DE JONG, 1981). The reproduction success of this mite is mainly due to the number of mite females by initial adult female mite/reproduction cycle in the worker brood cells of Apis mellifera (CORREA-MARQUES, 2000; DE JONG, 2000). Generally, worker brood cells with larger diameters are preferred by this mite (MESSAGE and GONÇALVES, 1995). The object of this work was to examine the infestation indexes of the mite Varroa jacobsoni in various types (size) of combs, placed in the same colony of Africanized honey bees.

Material and methods

Two types of brood combs were used in the experiment. To each Africanized bees colony (N = 8) an Africanized size comb (PA), naturally built by the same bees, and an Africanized old comb (PV) were allotted, where the cell walls had been made thicker by time, and cells were relatively smaller. The combs of different cell size were placed in the same bee colony. The cell diameter was measured for each 80 to 100 cells of worker brood in each comb, short after bees had emerged from their cells. Combs with emerging worker bees were retired from the colonies, and examined when bees had began chewing the wax capping for getting out of their cells. The cappings were retired by means of tweezers, and each opened cell was carefully examined by means of a magnifying glass with incorporated light. There were also counted the remaining mites inside the cell, and their offspring. Mites were classified as initial female mite, young female, deutonymph female, and protonymph male. The infestation index in worker brood cells of each comb type was given by dividing the number of adult female mite by the number of examined cells, all multiplied by 100 (No. of adult mites / No. of examined cells x 100). Data were statistically analyzed by using the ‘Student’ t-test.

Results and discussion

As concerns the cell diameter measured in combs, we noticed in PV that the diameter of the infested brood cells was significantly larger (P < 0.001) than the diameter of the non-infested cells : 4.62 ± 0.044 mm vs. 4.54 ± 0.045 mm, respectively. The average of the new Africanized comb for the infested cells was 4.87 ± 0.062 mm, without showing any statistical difference (P = 0.057). The general average of the diameter was significantly different (P < 0.001) between the old comb cells (4.58 ± 0.06 mm) and the new Africanized comb cells (4.85 ± 0.061 mm). For each comb type there was noticed the larger diameter
(worker cells were preferred by the mite, but nonetheless when comparing of both comb types, we noticed the mites preferred the old comb cells, although those had smaller diameters. The average infestation in 100 cells was greater in the old comb cells than in the new Africanized comb cells (31.2 ± 13.9% vs. 14.9 ± 6.9%, respectively), and this infestation difference proved to be highly significant (see Table I, p = 0.002, t-test). The Varroa infestation was greater in the worker bees developed in the old comb, than in the bees bred in the new Africanized comb. In this result a noticeable fact was registered, that is to say the PV cells had smaller diameters, and in spite of the diminished cells the infestation was greater in this comb type.

Table I

| Infestation index by the Varroa jacobsoni mite (initial female mites by brood cells) in brood combs with Africanized size cells (naturally built by Africanized bees), and old brood combs (with smaller cells) obtained by Africanized Apis mellifera honey bee colonies |
|---|---|---|---|---|
| | Colony | Old comb | New Africanized comb |
| | Examined cells | Infested cells | *(Infestation index (%) | Examined cells | Infested cells | *(Infestation index (%) |
| 69 | 53 | 8 | 20.80 | 63 | 8 | 15.60 |
| 71 | 200 | 49 | 30.00 | 115 | 10 | 10.40 |
| 32 | 90 | 9 | 15.60 | 90 | 7 | 13.30 |
| 47 | 100 | 21 | 34.00 | 100 | 12 | 18.00 |
| 66 | 100 | 30 | 49.00 | 100 | 15 | 23.00 |
| 73 | 100 | 17 | 19.00 | 100 | 7 | 9.00 |
| 74 | 100 | 26 | 54.00 | 100 | 15 | 25.00 |
| 117 | 100 | 21 | 27.00 | 100 | 4 | 5.00 |

* = Number; **Mite number/examined cells number x 100

When comparing the general diameters between the old comb cells and the new Africanized comb, the results unexpectedly show the contrary to the reported by MESSAGE and GONÇALVES (1995), and ISSA et al. (1993), being also difficult to explain that given the old comb (many times used for brood) have attracted more mites, as compared to the new comb, in spite of having smaller cells, with a smaller diameter. ERICKSON et al. (1998) found the infestations by Acarapis woodi were significantly higher in the colonies with new combs than in those with old combs (5.2% vs. 1.2%, respectively). Equally, other studies have also shown the adult female mites that parasitized the worker brood in new combs had a greater reproductive potential than those produced in old combs (HASSAN, 2000).

In addition to our observations, reported here, a greater number of mites were encountered in the smaller diameter cells when the mite attraction to brood was proven in different diameter cells (RAMON et al., 1993), and equally they encountered more mites in the smaller worker brood cells (CALIS et al., 1993).

Conclusions

Bees compensated the smaller cell diameter by producing deeper cells for accommodating the bee development. Brood cells of the old comb have shown smaller diameter, and attracted more Varroa mites, as compared to the cells of the new Africanized comb. The cells of the old comb were generally two times more infested by the mite than the brood cells of the new comb.

LITERATURE


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