

BEE HEALTH

PP-001 [Bee Health]

EFFECTIVENESS OF OXALIC ACID IN THE CONTROL OF VARROA MITES IN AFRICANIZED HONEYBEE COLONIES IN THE TROPICAL CONDITIONS OF COSTA RICA

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Introduction: At present, synthetic acaricides are regularly used for the control of *Varroa destructor*. However, acaricide resistant mites have appeared in different countries. This problem has led to the development of natural, non-toxic products for the control of varroa mites, such as different organic acids.

Objective: In the present study, oxalic acid's effectiveness in controlling varroa mites in Africanized honeybee (AHB) colonies was evaluated in the tropical conditions of Costa Rica.



Figure 1. Dorsal view of an adult female of varroa mites in AHB colonies (Calderón, 2019).

Materials and methods: The experiment was conducted during July and August (rainy season) in an apiary of 16 Africanized colonies in Atenas, province of Alajuela, Costa Rica. The colonies were divided into four groups to apply oxalic acid in different ways. 1- Trickleing method: it was applied weekly to the top of the frames by the means of a syringe. 2- Glycerin shop towel method: impregnated shop towel was placed on the top of the frames. 3- Impregnated cardboard method: four impregnated cardboard strips were used per colony. 4- Control group: no oxalic acid was applied. The treatments were applied during four weeks in the brood chamber, and observations were made to determine possible adverse effects. Further flumethrin treatments were subsequently applied during five weeks as a shock product to eliminate surviving mites and calculate the effectiveness of oxalic acid treatment. The cumulative mite-fall after oxalic acid and shock product was assumed to be 100%. Fallen mites were collected using a bottom board trap.

Results: The effectiveness of the different methods for varroa control corresponded to 74.4% with the glycerin shop towel, 63.0% with trickling and 50.0% with cardboard strips. For the control group, a 34.1% natural fall of mites was registered. According to the results, oxalic acid showed effectiveness in the control of *V. destructor* in AHB colonies under tropical conditions. The towel method presented the greatest effectiveness, followed by trickling method, so both can be considered as an alternative in the integrated management of varroa mites by beekeepers.



Figure 2. To assess the number of fallen varroa mites a bottom board trap was used in AHB colonies. A white card coated with a thin layer of vaseline was placed inside the trap (Calderón, 2019).

Conclusion: The concentrations of oxalic acid used in the study showed effectiveness in the control of varroa mites in AHB colonies. It was also safe for use in AHB's since no queens were lost, and there was no brood or adult bees mortality in any of the colonies during the experiment.

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Effectiveness of oxalic acid in the control of varroa mites in Africanized honeybee colonies in the tropical conditions of Costa Rica

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At present, synthetic acaricides are regularly used for the control of *Varroa destructor*. However, acaricide resistant mites have appeared in different countries. This problem has led to the development of natural, non-toxic products for the control of varroa mites, such as different organic acids. In the present study, oxalic acid's effectiveness in controlling varroa mites was evaluated in the tropical conditions of Costa Rica. The experiment was conducted during July and August (rainy season) in an apiary of 16 Africanized honeybee (AHB) colonies in Atenas, province of Alajuela. The colonies were divided into four groups to apply oxalic acid in different ways: 1- trickling METHOD: it was applied weekly to the top of the frames by the means of a syringe, 2- glycerin shop towel method: impregnated shop towel was placed on the top of the frames, 3- impregnated cardboard method: four impregnated cardboard strips were used per colony, and 4- control group: no oxalic acid was applied. The treatments were applied during four weeks in the brood chamber, and observations were made to determine possible adverse effects. Further flumethrin treatments were subsequently applied during five weeks as a shock product to eliminate surviving mites and calculate the effectiveness of oxalic acid treatment. The cumulative mite-fall after oxalic acid and shock product was assumed to be 100%. Fallen mites were collected with a bottom board trap. The effectiveness of the different methods for varroa control corresponded to 74.4% with the glycerin shop towel, 63.0% with trickling and 50.0% with cardboard strips. For the control group, a 34.1% natural fall of mites was registered. According to the results, oxalic acid showed effectiveness in the control of *V. destructor* in AHB colonies under tropical conditions. The towel method presented the greatest effectiveness, followed by trickling method, so both can be considered as an alternative in the integrated management of varroa mites by beekeepers. The concentrations of oxalic acid used in the study are considered safe for use in AHB's since no queens were lost, and there was no brood or adult bees mortality in any of the colonies during the experiment.