

Effects on the Quality of Africanized Honeybee (*Apis mellifera*) Colonies from Agricultural Pollination Services

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INTRODUCTION

Pollination services are critical for both agricultural productivity and environmental sustainability. Approximately 73% of cultivated plant species worldwide depend on bee pollination to some extent. However, in Brazil, the commercial use of managed honeybee colonies for crop pollination remains underdeveloped, despite its estimated annual economic value of USD12 billion. The limited adoption is mainly due to the lack of beekeeper training and the absence of a structured migratory beekeeping system.

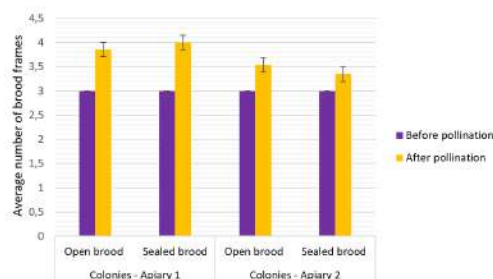
This study evaluates the quality of Africanized honeybee colonies (*Apis mellifera*) used in soybean (*Glycine Max*) pollination and assesses whether this practice strengthens colonies, potentially reducing the need for artificial supplementation.

METHODOLOGY

Thirty-three Langstroth hives with standardized brood and food frames were transported from a permanent apiary in Ribeirão Preto city, São Paulo, Brazil, to a soybean field in Anhumas city, São Paulo, where they remained for 12 days during the R2/R3 flowering stage. The hives were divided between two apiaries with different environmental conditions: one with partial shade and a nearby water source, and another exposed to full sun. Colony evaluations were conducted before and after the pollination period, analyzing brood frame numbers. Paired t-tests compared pre - and post-pollination colony conditions.

RESULTS AND CONCLUSION

All colonies showed significant brood frame growth post-pollination (open brood: $t = 6.3$, $p < 0.0001$; sealed brood: $t = 5.5$, $p < 0.001$). Colonies placed in shaded conditions exhibited greater sealed brood production (4.0 ± 0.0 frames) compared to those in full sun (3.35 ± 0.49 frames, $p < 0.01$), reinforcing the importance of shade and water availability. These results align with prior studies indicating that exposure to extreme temperatures negatively affects bee colony development. Soybean pollination strengthened Africanized honeybee colonies, potentially reducing the need for supplementary feeding during dearth periods. Providing shaded environments further enhanced colony performance.



These findings highlight the benefits of integrating beekeeping with precision pollination strategies, emphasizing the need for structured migratory beekeeping in Brazil.



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