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PP-411 [Bee Biology]

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THE PALMER METHOD FOR MASS PRODUCTION OF *Apis Mellifera* L. (HYMENOPTERA: APOIDEA) IN TROPICAL ZONE AS A CONDITION FOR REDUCING INTROGRESSION BY AFRICANIZATION

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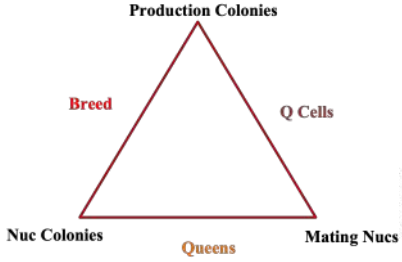
REMARKS

The large-scale production of genetically superior queen bees constitutes a central component of selective breeding programs aimed at improving *Apis mellifera* populations. In tropical regions, apiculture is hindered by the continuous introgression of Africanized genes through natural hybridization, which is associated with heightened defensive behavior and reduced colony productivity.

Controlled mating, particularly through instrumental insemination, has therefore become indispensable for genetic conservation and the stabilization of desirable traits within managed populations. The Palmer´s Method in beekeeping is a system focused on making beekeeping more sustainable and self-sufficient. Instead of relying on buying queens or packages every year, the method emphasizes internal resource management within the apiary.



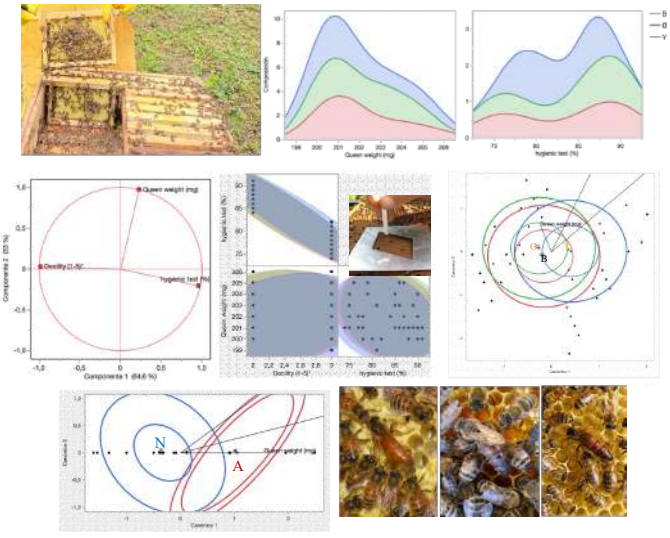
Palmer Method: "Sustainable Apiary" maintain a standing fleet of nucleus colonies (nucs) that (i) supply brood to production hives, (ii) supply high-quality queens reared locally, and (iii) are continuously replenished by splits from production colonies-creating a closed loop of Queens/Brood/Nucs.

In practice, the method reports extremely high brood output from nuc Banks: temporal data from a temperate system. illustrating the scalability of the approach for mass queen/colony production.

RESULTS

Palmer´s method, centered on nucleus colony management, offers a scalable framework for sustainable queen and colony production in tropical systems. By maintaining nuc banks that supply brood, queens, and drones while being continuously replenished, the method establishes a closed cycle of colony renewal.

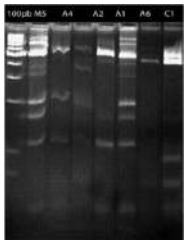
Field data indicate high brood yields and efficient queen pipelines, while complementary tools such as drone flooding and spatially managed mating yards enable partial control of open matings, reducing Africanized introgression. This integrated framework provides a practical and field-tested foundation for mass propagation and gradual genetic redirection of managed *Apis mellifera* stocks in tropical regions.



Queens: Provide fresh, locally adapted genetics that sustain vigorous, productive colonies. Brood: Maintain a steady supply of young bees that support both queens and nucleus colonies. Nucleus Colonies (Nucs): Act as a biological bank, ensuring a constant reserve of living resources.

The evaluation of honey bee populations in the region revealed haplotypes A1, A2, A4, and A6.

Following the implementation of the Palmer Method, the selection of colonies with European ancestry was confirmed by mitochondrial DNA analysis, which identified lineages M and C.



Queens are selected based on performance and reared under optimal conditions. This helps produce locally adapted queens, enhancing colony resilience and performance.

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The Palmer Method For Mass Production Of Apis Mellifera L. (Hymenoptera: Apoidea) In Tropical Zone As A Condition For Reducing Introgression By Africanization

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Bee nuclei serve as the foundation for the formation of new colonies. In beekeeping, the Palmer method has enabled the efficient and sustainable production of biological material by managing nuclei and fertilized queens, considering in turn the Page method. This approach facilitates the controlled expansion of colonies within apiaries while ensuring optimal thermoregulation conditions in nuclei (50 long x 24 wide x 20 deep, and 4 frames, in a dual core Palmer nucleus with 7 frames, feeder system and queen excluder), to rapidly accumulate brood and food reserves. These productive units are consistently available, leveraging bees' natural nesting behavior. A genetic improvement plan supports the establishment of Palmer nuclei using Apis mellifera L. lineages C or M, enabling the selective breeding of drones and the controlled fertilization of queens from these lineages. This process ensures genetic diversity, drift, enhancement, and preservation. This research examines the productive management conditions for large-scale biological material at the Guadalajara de Buga beekeeping station (969 o.v.s.l; average temperature: 24°C; annual precipitation: 1,380 mm) in contrast to those at the "Honey Land" station in San Andrés Island (85 o.v.s.l; 27°C and 822 mm annual precipitation). These conditions facilitate the production of biological material, which is distributed to beekeepers in hillside regions of Colombia and from overseas territories to mainland areas of Central America. The queens, drones, and bees associated with the system established in both tropical zones are evaluated in terms of morphometry using discriminant analysis, wing venation, size, and weight and ADNm-PCR. Despite the challenges, the work has been recognized by beekeepers and has contributed to reducing the Africanization process by introgression.