



Title: Prototype of technical boxes to increase productivity in native bee meliponaria (Scaptotrigona)

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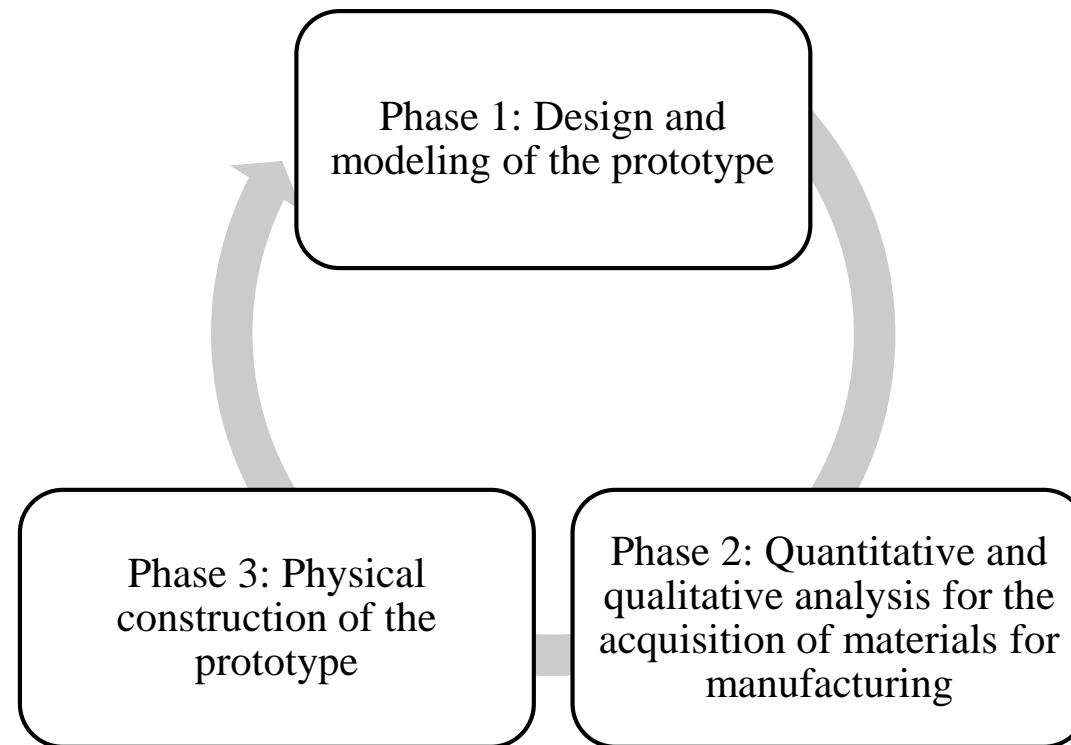
Introduction

Meliponiculture is a fruitful activity that means an income opportunity for workers in the Northern region of the State of Puebla. However, it is limited by the lack of knowledge of the appropriate techniques for its exploitation, monitoring and strengthening of the hives. Currently there is a great variety in nest structures or hives and they are usually found in natural hollows of logs and rocks, or in constructions made by meliponic farmers; These housing buildings are usually improvised and do not have the necessary requirements to protect the honey flies from environmental conditions and external organisms, thus contributing to expose the hives to negative factors that cause low levels of productivity, infestation of pests.

The honeycomb or hive must be a suitable medium for the reproduction and generation of different derived products (pollen, propolis, honey, brood foot); Analyzing this requirement, the prototype of a technified box is created, the generation of the prototype provides a utility model suitable to be applied in the meliponarians of the region at an accessible cost, ensuring the reproductive conditions of the *Tetragonisca angustula* bee and notably improving the levels of productivity.

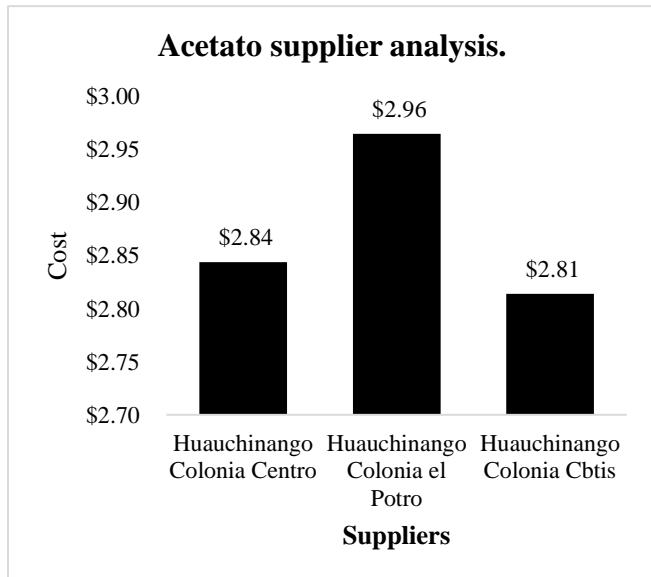
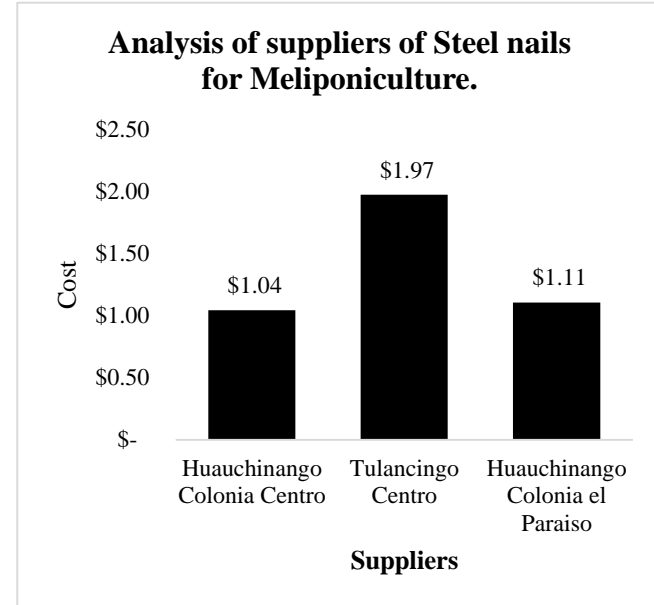
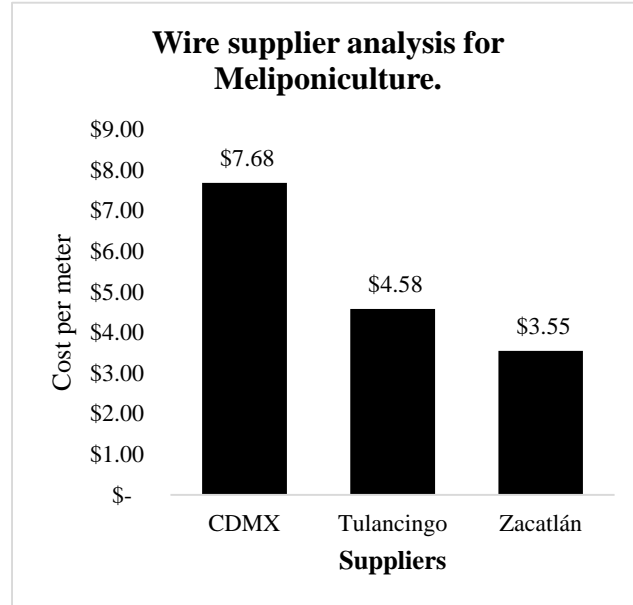
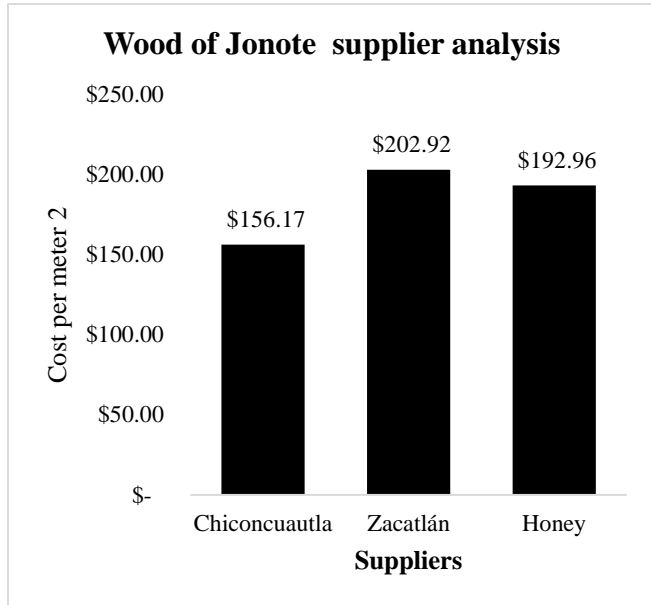
Methodology

The methodological description that allowed the design and manufacture of the presented prototype was developed from 3 phases:



Consultation Source: Own Elaboration

Phase 2: Quantitative and qualitative analysis for the acquisition of materials for manufacturing



Consultation Source: Own Elaboration

Phase 1: Design and modeling of the prototype

Part	Features	Dimensions
Base legs	They contribute the stability of the box the contemplating the control of sudden movements.	2 cm x 4 cm x 22 cm.
Base	It allows the colony of bees that inhabit the hive to develop suitable environmental conditions for reproduction.	2 cm x 22 cm x 22 cm
Nest	Contains the hive brood foot.	7.5 cm x 23 x 23 cm
Super nest	This zone allows the separation of the hive into two sections to create a new nucleus or a new hive.	6.5 cm x 23 cm x 23 cm
Melario	In this area is the honey, during the extraction process the analyzed area is slightly detached without being affected.	8 cm x 23 cm x 23 cm
Top	Ensures permeability, protecting the content of the hive, providing ideal environmental characteristics for improving the productivity of bees.	2 cm x 23 cm x 23 cm
Fastener	Allows manipulation and movements to move the hive.	2 cm x 2 cm x 19 cm.

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Phase 3: Physical construction of the prototype



1. Wood cutting and preparation.



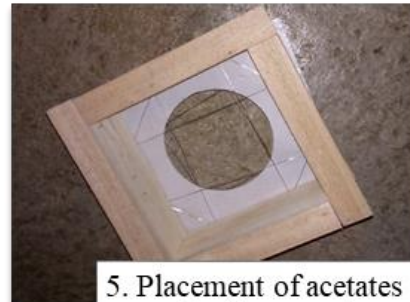
2. Base construction.



3. Leg to base assembly.



4. Nest construction.



5. Placement of acetates in the Super nest.



6. Super nest construction.



7. Melario construction.



8. Placement of wire between honey comb and Super nest.

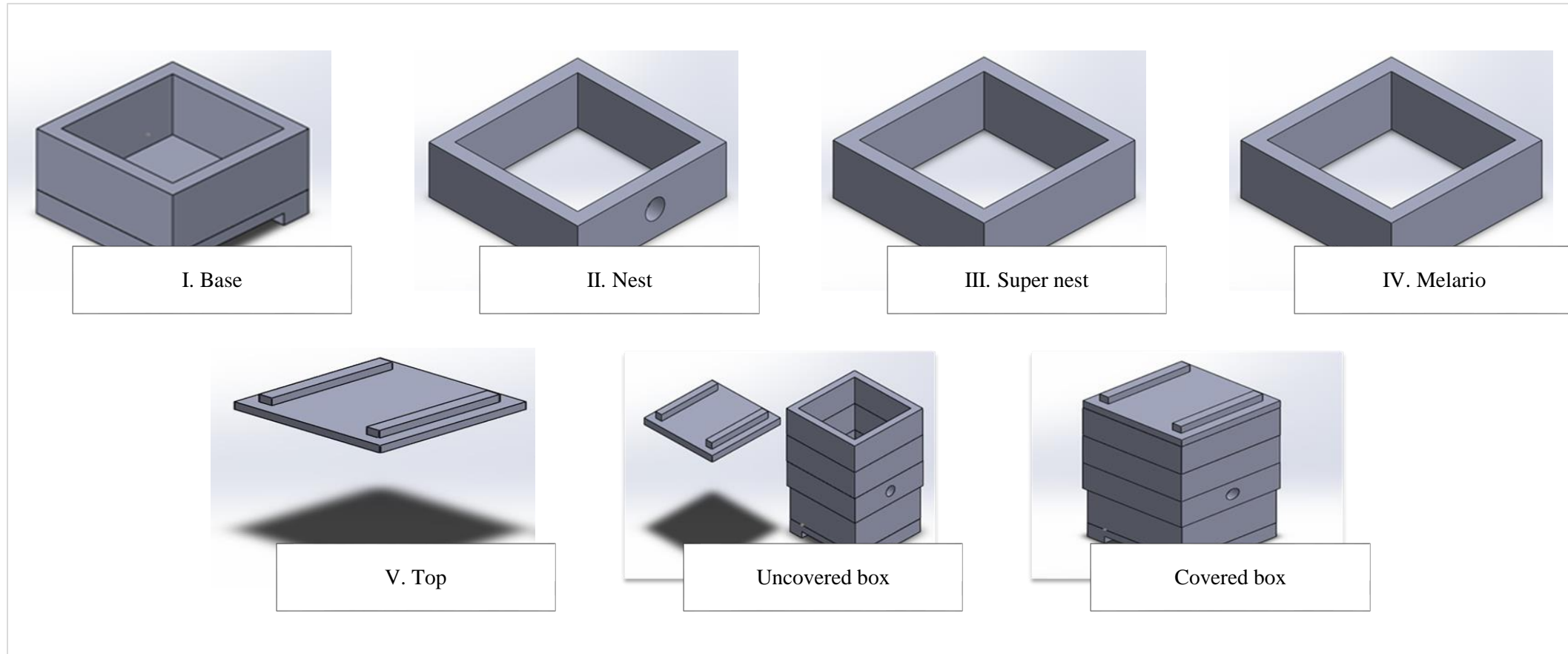


9. Box construction.

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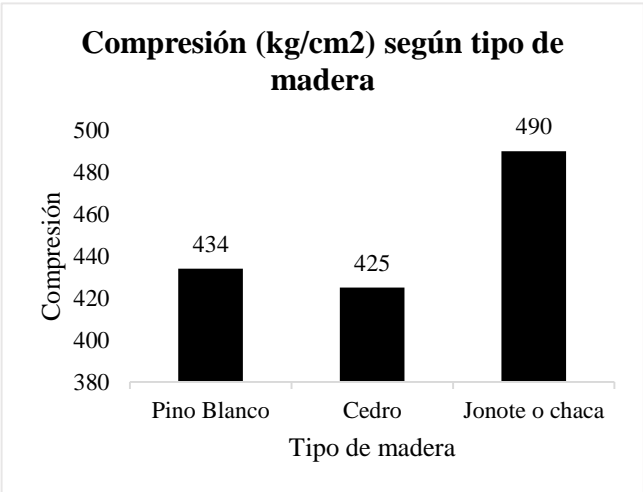
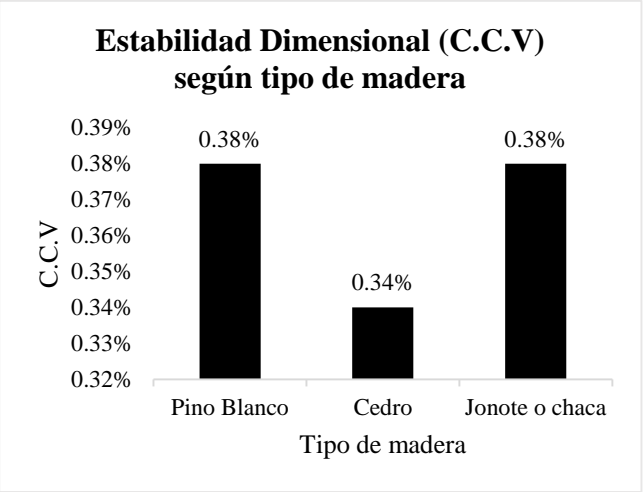
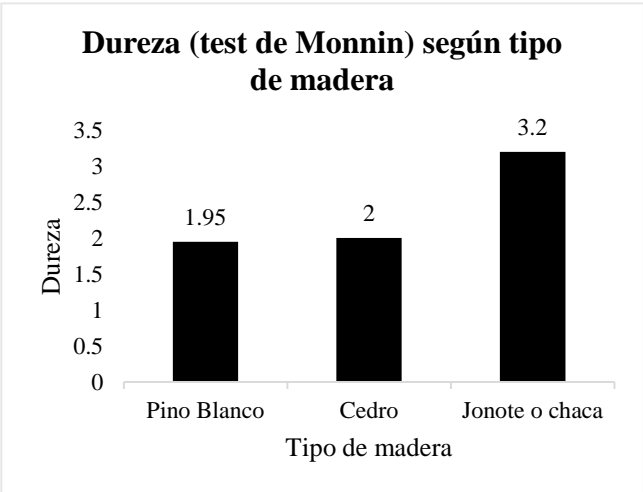
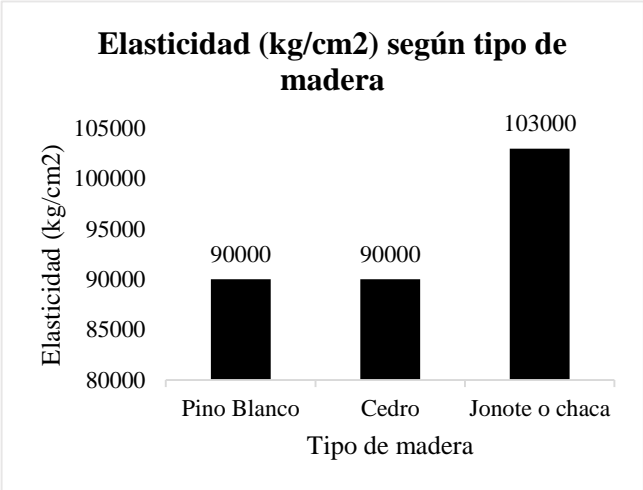
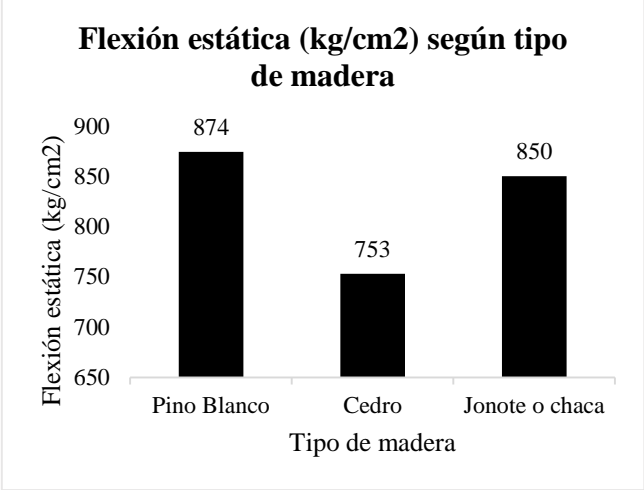
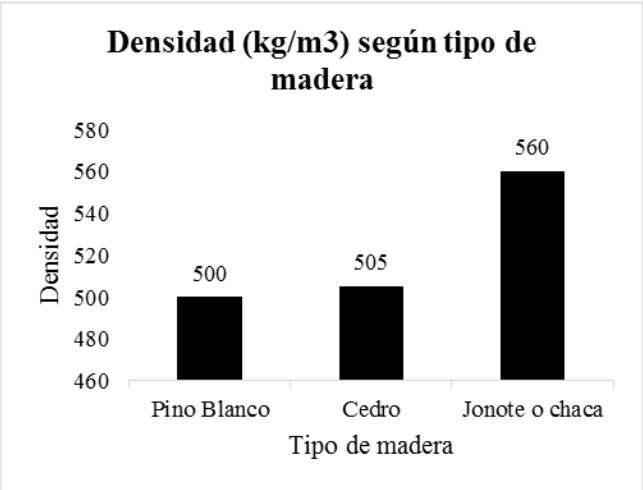
Results

The results observed in Phase 1 are shown with the scaled design in the SolidWorks Technological software of the proposed prototype, the model exposes each of the parts that make up the hive:



Consultation Source: Own Elaboration

The effects obtained for Phase 2 according to the qualitative analysis of the types of wood existing in the region and the area of influence allowed us to observe the general, physical and mechanical characteristics, concluding that for jonote wood:



Source of Consultation: Own Elaboration

Using the logistical intervention, the optimal suppliers were determined to purchase the set of required materials:

Selection of suppliers				
Materials	Supplier	Unit price	Required quantity	Subtotal
Jonote Wood	Chiconcuautla	\$ 156.1729	1	\$ 156.173
Wire for Meliponiculture	Tulancingo	\$ 3.5507	3	\$ 10.652
Steel nails for Meliponiculture	Huauchinango Colonia Centro	\$ 1.0440	5	\$ 5.220
Acetates	Huauchinango Colonia Centro	\$ 2.8141	2	\$ 5.628
TOTAL				\$ 177.673



Consultation Source: Own Elaboration

Annexes



Consultation Source: Own Elaboration

Conclusions

A quantitative and qualitative analysis was carried out by means of which a technified box model for melipon bees was designed, considering the existing theoretical references regarding the breeding of the species of bees. Through exploratory research, variables that make up optimal physical, mechanical and functional characteristics for meliponiculture in the region were analyzed, determining that the appropriate wood for the construction of the technified box.

The physical development of the technified box brought multiple benefits that are reflected in the increase in the productivity of honey and its derivatives, as well as the decrease in the levels of affectation by pests, preserving in a safe way the native bee species *Tetragonisca angustula* of the Sierra Norte del Estado de Puebla: in the same way, an efficient work system was created for the physical construction of the model that, by presenting a competitive cost, would create a new source of employment to promote the economic and sustainable development of the region.

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