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THE ADAPTABILITY OF THE INDIGENOUS BEES, *Apis cerana* TO TOP-BAR HIVES IN SARAWAK

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ABSTRACT

Beekeeping with indigenous bees, *Apis cerana,* in Sarawak is an aged-old tradition and passion among many of the rural communities. The use of the traditional log-hives using cutout tree trunks, bark and local lumber still exist. The introduction of modern beekeeping using the Malaysian modified Langstroth hives with movable-frame to the traditional beekeepers has met with limited success due to the high incidence of absconding. Therefore, there is a need to introduce more appropriate beekeeping technology such as the use of top-bar hives; commonly referred to as a transitional method of beekeeping. A 3x3x3 factorial experiment in a Complete Randomized Block Design (CRBD) was carried out to evaluate the adaptability of *Apis cerana* to top-bar hives. The research investigations conducted revealed three significant outcomes. Firstly, the comb-space for *Apis cerana* in the coconut growing areas of Kota Samarahan was 28 mm. Secondly, a measuring device using an acrylic plastic grid incorporated with the use of a digital camera and computer made sampling for data collection more efficient and effective. Thirdly, the indigenous bees of Sarawak can adapt to the use of top-bar hives. Experimentation with three levels of comb-space, 25 mm, 28 mm and 32 mm, revealed that the appropriate comb-space to be used for beehive design should be similar to the natural comb-space. Results revealed that the most appropriate comb-space was 28 mm and conclusively shown to be critical in the design of beehives. There were no burr-combs and subsequently nil stickiness among the frames or top-bars in hives with comb-space of 28 mm. The present adoption of the standard comb-space of 25 mm in Malaysian modified Langstroth hives could have been one of the reasons for the high frequency of indigenous bees to abscond. The findings also showed that adopting the correct comb-space could reduce the infestation by wax moth. This subsequently can reduce the incidence of absconding and hence enhance the productivity of local honey production. The research conducted explicitly indicates that *Apis cerana* was able to adapt to the use of top-bar hives. There were no significant differences in the growth of the combs and the broods among the three types of hive designs tested. There was also no incidence of wax moth infestation and no absconding in the Malaysian modified Langstroth beehives with top-bar. The Malaysian modified Langstroth hive with top-bar of width 28 mm is therefore recommended as the most appropriate beehive design for beekeepers in rural Sarawak.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Traditional beekeeping with the indigenous bees, *Apis cerana* (*A. cerana*) still exists and remains very much a passion among several rural communities in Sarawak, Malaysia. This gives a wonderful opportunity to explore and exploit traditional beekeeping practices by introducing some modern methods and technique. This would enhance the productivity of the hives, thereby generating some cash income to the rural communities.

Despite the existence and abundance of wild (feral) bee colonies found in both the lowlands and the highlands of Sarawak, beekeeping activity is unfortunately not being explored and exploited aggressively as a potential income or food generating activity. Identifying some of the major constraints, among which is the appropriateness of hive designs that can suit differing competency levels of beekeepers or potential beekeepers, will enable the active pursuits in beekeeping, thus enhancing the productivity and efficiency of the enterprise in Sarawak.

1.2 Problem Statement

The introduction of the modern method of beekeeping using the Langstroth beehive design by the Department of Agriculture, Sarawak over the last ten years has not been widely successful. Only a small percentage of beekeepers who were given government assistance have succeeded. This could be due to certain inherent shortcomings in the design of the beehives or the lack of the necessary knowledge and skill in the modern approach in beekeeping. Other causes of failure were the excessive predation by wasps, bee-eaters and failure of supersedure.

1.3 Objectives

The objectives of the research investigations were as follows:

1. to evaluate the adaptability of *A. cerana* to top-bar hives,
2. to determine the appropriate comb-space for *A. cerana* in Asajaya and
3. to develop an efficient and reliable device to measure the growth and development of bee colonies.

CHAPTER 2

LITERATURE REVIEW

2.1 The Asiatic Honeybee, *Apis cerana*

2.1.1 Biology of the Honeybee

Bees live in a tightly knit social structure whereby every individual member of each caste and sex plays specific role for the survival of the colony (Akratanakul, 1987). A bee colony would comprise of a single queen, several thousand workers and at times several hundred males (the drone). The three categories are referred to as castes. The queen is the only member that lay eggs and is responsible for the continuity and survival of the colony. The other function of the queen is that she produces the substance known as pheromones which is very vital for the cohesive stability of the colony's social behaviour and order. The queen is the largest in term of size and may live for two to three years (Crane, 1990).

The drones are the male members whose main and only function is to mate the queen. Having no food collection and stinging apparatus, their sole role is mating. Produced from unfertilized eggs, the queen lays drone eggs in larger brood cells. They are produced mainly during the reproductive (swarming) phase of the colony's seasonal cycle and they have very short life-span. Only a small percentage would manage to mate with the queen and they died soon after mating while the rest would live for several weeks or months (Crane, 1990).

The workers are "sterile"/unmated female bees developed from fertilized eggs. They perform all the chores except reproduction. As soon as they emerge from the sealed brood they function as the "nurse bee" cleaning the hives and feeding the young larvae. At this stage they produce the fat and protein-rich "royal jelly". This "royal jelly" is fed to young larvae for up to a few days after hatching; after which the larvae of the drones and workers bees are fed with honey and pollen. Only the larvae destined to be a queen is continuously fed with "royal jelly". At three weeks old, these worker bees become the "field bees" whose tasks include guarding the colony, collection of food and water until they die (Akratanakul,1987). They are the smallest in term of body size.