UNIVERSITI PUTRA MALAYSIA

MORPHOLOGY AND COLONY DEVELOPMENT OF STINGLESS BEES *Lophotrigona canifrons (Hymenoptera: Apidae)*

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MORPHOLOGY AND COLONY DEVELOPMENT OF STINGLESS BEES *Lophotrigona canifrons* (*Hymenoptera*: *Apidae*),

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A project report submitted to Faculty of Agriculture, University Putra Malaysia, in fulfillment of requirement of PRT4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture Science

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CERTIFICATION

This project report entitled **Morphology and Colony Development of Stingless Bees *Lophotrigona Canifrons* (*Hymenoptera*: *Apidae*)** was prepared by Muhammad Firdaus Bin Md Salleh to the Faculty of Agriculture in fulfillment of the requirement of PRT4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science.

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CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ABSTRACT

Lophotrigona canifrons was found that they have a potential to be commercialized in the future in order to fulfill the consumption of honey. This is because of *L. canifrons* can develop a big honey pot, they can supply a greater amount of honey compared to other commercialize stingless bees nowadays. Through this study, *L. canifrons* were being observe to study the morphology and to compare the temperature and relative humidity outside and inside the topping box. Other than that, the development of colony of *L. canifrons* were being observed. In this study, the data shows that there is no significant difference between the temperature inside the topping box and outside the topping box (df = 12 ; P-Value = 0.423 ; T-Value = -0.20) and relative humidity inside the topping is significantly higher than outside the topping box (df = 12 ; P-Value = 0.004 ; T-Value = 3.20). This shows that there is correlation between relative humidity towards the development of the colony of *L. canifrons* and the structure of involucrum becomes more complicated over the time passes.

ABSTRAK

Lophotrigona canifrons telah didapati bahawa mereka mempunyai potensi untuk dikormesiakan pada masa akan datang bagi memenuhi pengambilan madu. Ini adalah kerana L. Canifrons boleh menghasilkan kantung madu yang besar serta membekalkan sejumlah madu yang banyak berbanding dengan lebah madu yang dikormesialkan pada masa kini. Melalui kajian ini, L. Canifrons telah dipilih untuk dikaji tentang morfologi dan untuk membandingkan suhu dan kelembapan di luar dan di dalam kotak topping*. Selain daripada itu, pembentukan koloni L. Canifrons juga dikaji. Dalam kajian ini, data menunjukkan bahawa tiada perbezaan yang signifikan di antara suhu di dalam kotak* topping *dan di luar kotak* topping *(df = 12; Nilai P = 0.423; Nilai T = -0.20) dan kelembapan di dalam kotak* topping *jauh lebih tinggi daripada di luar kotak* topping *(df = 12; Nilai P = 0.004; Nilai T = 3.20). ini menunjukkan bahawa terdapat korelasi di antara kelembapan ke arah pembangunan koloni L. canifrons dan struktur* involucrum*nya menjadi lebih rumit daripada semasa ke semasa.*

CHAPTER 1

INTRODUCTION

1.1 Malaysia Stingless Bees Production

Stingless bees industries also were known as Meliponiculture industry. In Malaysia, there are about 30 species of stingless bee and most of them were found in the forest. Compared to production of honey bees, stingless bee would issuing three products that are honey balls, propolis and pollen. When looking at the market of stingless bee products, the price could reach RM 120 for a bottle of 350 mililiters, while honey is usually sold in equal quantities at RM 30. According to some stingless beekeeper, usually price of stingless bee honey is more expensive than regular honey bees that the price could reach RM 250 to RM 350 per kilogram.

Other than honey production, stingless beekeeper also produce a propolis in a liquid state at a price about RM25 per 10 mililiters. Propolis is a composed of resin taken by stingless bees from the tree that containing rubber. They bring back to the colony to be processed until it form a propolis. Stingless bee also produce a pollen called bee bread. Studies have shown its market price is about RM 38 per bottle which volume is about 300 gram per bottle. It is a food of stingless bee and it is a mixture of pollen with honey processed using its saliva and then go through the process of digestion and fermentation (Anim, 2013).

1.2 Malaysia Stingless Bees Industries

Nowadays, many people in Malaysia have an interest in maintaining bees for honey, but the interest was retarded because of fear of stung by honeybees. So, the stingless bees give a new dimension to the honey industry in Malaysia (Mian, 2012). Stingless bee beekeeping usually for pollination purpose since this stingless bees were known as efficient pollinator compared to other bees.

Usually farmer in Malaysia commercialize three products from stingless bees which are honey, bee bread (pollen) and propolis. Propolis is an admixture of plant resins, beeswax, and hive debris (Erickson, 2015). Although in a small scale of production for a colony, but when farmers kept in a large quantities, the production can be increased. Wild colonies nesting of stingless bees were extracted in the tree trunks. Each species of stingless bees has their own specific nest requirements according to their sizes, population and quality of habitat (Fonseca, 2012). Their colony entrance also shows the specific difference of species.

1.3 Significant of Study

Table 1.3.1 shows 36 species of stingless bees in Peninsular Malaysia according to Debra Smith, 2012. From 36 of this species, there are 15 species were collected in MARDI and only two species were being commercialize around Malaysia. The two species commonly be commercialized were *Geniotrigona thoracica* and *Heterotrigona itama* (Anem, 2013). For now, *Lophotrigona canifrons* were not being commercialize

because of its aggressive behavior (Yaacob, 2015). Since *L. canifrons* develop a big honey pot, they will produce greater amount of honey compared to other commercialize stingless bees nowadays. This species has a huge potential to be commercialize in future in order to fulfill our consumption of honey. Because of that, it is important to study the basic knowledge of this species and the role of abiotic factor in development of its colony.

Table 1.3.1 Meliponine species in Peninsula Malaysia (Debra Smith 2012)

Species	Distribution
1. *Geniotrigona lacteifasciata* (Cameron, 1902)	Malaysia - Peninsula; Borneo
2. *Geniotrigona thoracica* (Smith, 1857)	Malaysia - Peninsula
3. *Heterotrigona bakeri* (Cockerell, 1919)	Malaysia - Penang
4. *Heterotrigona erythrogastra* (Cameron, 1902)	Borneo; Malaysia - Peninsula
5. *Heterotrigona itama* (Cockerell, 1918)	Malaysia - Peninsula
6. *Homotrigona aliceae* (Cockerell, 1929)	Malaysia - Peninsula
7. *Homotrigona fimbriata* (Smith, 1857)	Malaysia - Peninsula; Borneo
8. *Homotrigona lutea* (Bingham, 1897)	Malaysia - Peninsula
9. *Lepidotrigona flavibasis* (Cockerell, 1929)	Peninsula Malaysia;
10. *Lepidotrigona nitidiventris* (Smith, 1857)	Malaysia - Peninsula; Borneo
11. *Lepidotrigona terminata* (Smith, 1878)	Malaysia - Peninsula; Borneo
12. *Lepidotrigona ventralis* (Smith, 1857)	Borneo; Malaysia;
13. *Lisotrigona cacciae* (Nurse, 1907)	Borneo; Malaysia;

14. *Lophotrigona canifrons* (Smith, 1857)	Borneo; Malaysia - Peninsula
15. *Patriotrigona pendleburyi* (Schwarz, 1939)	Borneo; Malaysia - Peninsula
16. *Patriotrigona klossi* (Schwarz)	Malaysia Peninsula; Borneo
17. *Sundatrigona moorei* (Schwarz, 1937)	Borneo; Malaysia - Peninsula
18. *Tetragonilla atripes* (Smith, 1857)	Borneo; Malaysia - Peninsula
19. *Tetragonilla collina* (Smith, 1857)	Malaysia - Peninsula
20. *Tetragonilla fuscibasis* (Cockerell, 1920)	Borneo; Malaysia - Peninsula
21. *Tetrigona apicalis* (Smith, 1857)	Borneo; Malaysia - Peninsula
22. *Tetrigona binghami* (Schwarz, 1937)	Borneo; Peninsula (unofficial)
23. *Tetrigona peninsularis* (Cockerell, 1927)	Malaysia - Peninsula
24. *Tetrigona vidua* (Lepeletier de Saint Fargeau, 1836)	Malaysia Peninsula
25. *Tetragonula fuscobalteata* (Cameron, 1908)	Borneo; Malaysia - Peninsula
26. *Tetragonula geissleri* (Cockerell, 1918)	Borneo; Malaysia - Peninsula
27. *Tetragonula laeviceps* (Smith, 1857)	Southeast Asia
28. *Tetragonula melina* (Gribodo, 1893)	Borneo; Malaysia
29. *Tetragonula minangkabau* (Sakagami & Inoue, 1985)	Malaysia - Peninsula
30. *Tetragonula minor* (Sakagami, 1978)	Malaysia - Peninsula
31. *Tetragonula pagdeni* (Schwarz, 1939)	Malaysia;
32. *Tetragonula pagdeniformis* (Sakagami, 1978)	Thailand; Malaysia- peninsula
33. *Tetragonula penangensis* (Cockerell, 1919)	Malaysia - Penang
34. *Tetragonula reepeni* (Friese, 1918)	Borneo; Malaysia - Peninsula
35. *Tetragonula testaceitarsis* (Cameron, 1901)	Malaysia - Peninsula
36. *Tetragonula zucchii* (Sakagami, 1978)	Malaysia - Peninsula

1.4 Objectives of Study

1. To describe the morphology of *Lophotrigona canifrons*.
2. To compare the temperature and relative humidity outside and inside the topping box.
3. To observe the development of *Lophotrigona canifrons* colony.

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