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Comparative Study of Galo-Galo Bee Honey Production with Topping Size and Number of Colonies in West Payakumbuh

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Abstract

The purpose of this research is to examine how the size of the topping and the quantity of colonies affect the amount of honey produced by galo-galo bees in West Payakumbuh, West Sumatra. Three topping sizes (small: 20 cm × 20 cm, medium: 30 cm x 30 cm, and large: 40 cm x 40 cm) and different colony counts (1, 2, and 3 colonies per hive) were investigated using an experimental technique over a 12-week period. To ascertain the correlations between variables, information on honey production, environmental factors (temperature, humidity, and blooming patterns), and beekeeper observations were gathered and subjected to multiple correlation analysis. The findings demonstrated a weak relationship between honey output and both colony size and topping size, with medium-sized toppings and two colonies per hive producing the maximum productivity. In particular, flowering patterns and temperature were environmental influences. This study offers helpful suggestions for improving colony management and hive architecture in order to increase Galo-galo honey output in West Payakumbuh. The results advance scientific knowledge of beekeeping practices and provide insightful information to help local beekeepers increase their output and financial results.

Keywords: galo-galo bees, honey production, topping size, number of colonies

Introduction

It has long been known that honey is a natural substance with many health advantages and a high nutritional content. The Payakumbuh Barat District of West Sumatra is home to the Galo-galo bee, one of the bee species that produces honey in Indonesia. Through customary beekeeping methods, local communities have long used Galo-galo bees as a source of revenue. But Galo-galo bees' ability to produce honey is frequently erratic and affected by a number of things, including beekeeping practices such using topping in artificial hives. The topmost portion of the hive where bees construct their honeycombs is referred to as the "topping." Although it has not been thoroughly investigated in Payakumbuh Barat, it is believed that the size of the topping has a major impact on honey productivity.

Despite the long history of Galo-galo beekeeping, there is still a dearth of research on the best practices, especially with relation to topping size (Abduh et al, 2023; Nyunza, 2018). The ecological and behavioral characteristics of Galo-galo bees have been the main focus of previous research, with little attention paid to technical aspects like topping size (Khan & Khan, 2018). The lack of scientific data on the influence of topping size on honey production presents a research gap that has to be addressed to increase the efficiency and productivity of Galo-galo beekeeping in Payakumbuh Barat.

This study offers innovation by conducting a comparative examination of Galo-galo honey output based on differences in topping size. The results of this research are expected to provide technical recommendations on the most effective topping size to enhance honey production, serving as a reference for beekeepers in Payakumbuh Barat. Additionally, this project will link field data with statistical analysis to provide a more comprehensive picture.

Methodology

This study is designed to analyze the relationship between the size of artificial hive toppings and honey production from Galo-galo bees (*Apis dorsata*) in Payakumbuh Barat using multiple correlation analysis. The research methodology includes several stages: preparation, implementation, data collection, and data analysis.

The research location was chosen based on the presence of active Galo-galo bee colonies and the willingness of local beekeepers to participate. Three different topping sizes were prepared: small (20 cm x 20 cm), medium (30 cm x 30 cm), and large (40 cm x 40 cm). Galo-galo bee colonies were introduced into the artificial hives, with each hive assigned a specific topping size (Michener, 2013; Priyambodo et al, 2023). The hives were monitored weekly for 12 weeks to observe colony activity, honeycomb construction, and honey production.

The amount of honey produced in each hive was measured every two weeks. Local beekeepers provided insights into colony behavior and hive maintenance practices. Data were analyzed using multiple correlation analysis to identify the relationships between topping size and honey production (De Vladar & Barton, 2011; Hair et al, 2019). This analysis aimed to determine the extent to which these variables influence each other.

Results and Discussion

Dominant Galo-galo Bee Species Cultivated by the Community in Payakumbuh Barat

The Galo-galo bees, also referred to as stingless bees, are being raised more and more for their pollination and honey production. According to the data presented, the community in Payakumbuh Barat has demonstrated a predilection for particular species of The Galo-galo bees. Based on primary data, there are three dominant species of Galo-galo bees that are grown in Payakumbuh Barat.

Table 1. Types of Stingless Bee

No	Types of Stingless Bees	Number of Respondents Keeping (people)	Percentages (%)
1	Heterotrigona itama	15	50.00
2	Geniotrigona thoracica	10	33.33
3	Lophotrigona canifrons	5	16.67

Fifteen out of thirty responders (50%) cultivate Heterotrigona itama, making it the most prevalent of the three. Because of its resilience to different conditions and comparatively high honey production, Heterotrigona itama is widely favored. Because of its kind disposition, beekeepers find it easier to handle this species (Abd Jalil et al, 2017).

The second most cultivated species Geniotrigona thoracica with 10 out of 30 respondents (33.33%) involved in its cultivation. Geniotrigona thoracica is valued for its medicinal honey, which is believed to have higher antioxidant properties compared to other species. This species is also known for its resilience in different climatic conditions (Duangphakdee et al., 2024).

Only five of the thirty responders (16.67%) were connected with Lophotrigona canifrons, making it the least cultivated species. Lophotrigona canifrons is known for its distinctive honey qualities and promise in niche markets, despite its lesser level of popularity. However, its restricted cultivation may be attributed to its lower honey output and more complicated maintenance requirements (May-Itzá et al, 2022).

A increasing interest in environmentally friendly beekeeping methods is shown in Payakumbuh Barat's cultivation of these Trigona bee species. The community's preference for Geniotrigona thoracica and Heterotrigona itama emphasizes how crucial honey production and therapeutic uses are to their beekeeping endeavors. The cultivation of these species, especially Lophotrigona canifrons, could be improved with more study and assistance from regional agricultural organizations in order to diversify the beekeeping sector and boost local economies.

The Correlation between Topping Size and Number of Colonies with Production per Harvest and Production per Colony

Insights into the variables impacting Galo-galo bee honey production in Payakumbuh Barat are provided by the correlation analysis between topping size and colony count and production per harvest and production per colony. These factors might not be the main forces behind honey production in this area, according to the results, which show minimal connections. The outcomes of the analysis that has been done are described as follows.

Table 2. The Result of Correlation of Topping Size, Number of Colonies, and Honey Production

Aspects	Production per Harvest	Information	Production per Colony	Information
Topping Size	0.05	Very weak correlation	-0.21	Weak negative correlation
Number of Colonies	-0.09	Very weak negative correlation	-0.20	Weak negative correlation

There is a very weak positive correlation between topping size and productivity per harvest, as indicated by the correlation coefficient of 0.05. According to the poor correlation, honey yield is not significantly influenced by topping size alone. Production per harvest may be more significantly impacted by other variables, including as the health of the bee colony, the availability of floral supplies, and environmental circumstances. According to research, Galo-galo bees can adapt to a wide variety of hive configurations, and their output is more reliant on outside variables like the environment and the availability of feed (Roubik, 2018). In order to increase honey production, beekeepers in Payakumbuh Barat shouldn't only concentrate on making toppings bigger. Rather, they ought to think about enhancing the availability of fodder, preserving the health of the colony, and guaranteeing ideal environmental circumstances.

Production per colony and topping size have a weakly negative association, as indicated by the correlation coefficient of -0.21. This suggests that the amount of honey produced per colony may be marginally decreased by higher topping sizes. Inefficient use of space in larger hives may be the cause of the negative association. A larger hive construction may need more energy from bees to maintain and defend, which could lower their productivity in producing honey. Furthermore, bigger topping sizes may cause resources to be distributed unevenly within the hive, which would reduce overall production (Heard, 2016). The size and layout of beehives should be carefully considered by beekeepers. Larger topping sizes may appear advantageous, however they may unintentionally result in less honey being produced per colony. It is essential to design hives in a way that maximizes both space and resource use.

There is a very weak negative link between the number of colonies and production each harvest, as indicated by the correlation value of -0.09. This implies that the amount of honey produced per harvest is not considerably increased by expanding the number of colonies. Colonies' rivalry for resources could be the cause of the weak negative association. There may be less foraging space available as the number of colonies rises, which would mean that each colony has less access to nectar and pollen. The results of Jaffé et al. (2016), who pointed out that resource rivalry plays a crucial role in stingless bee productivity, particularly in regions with little floral diversity, are consistent with this. In order to prevent resource depletion and decreased output, beekeepers should refrain from overcrowding their apiaries with colonies. Rather, they ought to concentrate on keeping a balanced number of colonies in line with the forage resources that are accessible.

The number of colonies and productivity per colony have a weakly negative connection, as indicated by the correlation coefficient of -0.20. This suggests that the productivity per colony somewhat declines as the number of colonies rises. The diffusion of resources like nectar and pollen among more colonies may be the cause of the negative association. Each colony may have less access to resources when several are set up in a small space, which lowers productivity per colony. High colony density has been shown to have a negative effect on individual colony performance in prior stingless bee studies (Klein et al., 2018). Colony density should be carefully controlled by beekeepers to guarantee that every colony has access to enough supplies. The detrimental consequences of high colony density could be lessened by employing techniques like alternating foraging patches or adding more flowering plants.

Conclusion

According to the analysis's weak correlations, honey output in Galo-galo beekeeping in Payakumbuh Barat is not significantly influenced by the size of the colonies or the size of the topping. Other elements that may have a greater impact on honey output include the environment, the availability of fodder, and the traits of the bee species. To provide a more thorough understanding of Galo-galo bee productivity and to create plans for maximizing honey production in this area, future studies should investigate these parameters.

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