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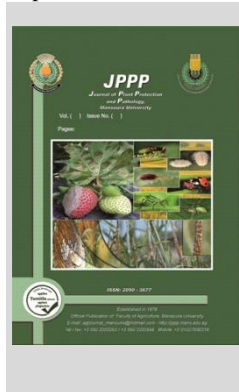
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Compression Between Modified and Common Honey Bee Hive on Honey Bee Activity

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ABSTRACT

Beehives are a practical way to keep a bee colony. It protects them from environmental factors and predators. The beekeeping industry has seen very few changes and improvements to the widely used langstroth or common hive. The aim of the present study is to compare the bee activity of modified and combined honey bees in the apiary of the Faculty of Agriculture, Mansoura University during the 2020 harvest season. The areas of stored pollen, worker brood, and sealed honey area compared to the modified hive. The results revealed that the mean average incubation of female workers was in the third week of May. There is a significant positive correlation between the type of honey bee hive and its activities. A modified hive is much more effective for honey bee activities than langstroth or common hive. Increased worker brood in colonies means increased pollen storage area, which results in healthy, vigorous colonies. This research confirms that an altered hive is the most important indicator of increased activity of honey bee colonies. The modified cell has removed the defects of the foaming cell and increased the efficiency of the common hive.

Keywords: Langstroth hive, Modified hive, workers brood, stored pollen and sealed honey bee.

INTRODUCTION

Honey bee is the most economically important of bee colony product. Hives are made to precise measurements so all the parts within the outer shell fit properly and give a suitable space for the bees to suit the local weather conditions and climate. (Papanikolaou *et al.* 2016)

Certain standard hive modifications have enhanced the performance of honey bees in cold conditions. Some examples of these cold-based adaptations are fan-heated, heated beehives (Erdoğan and Bauer, 2009), beehives containing a temperature control device during the winter season (Omran, 2011), beehives with an automated system and a complex control structure to improve the separation process. Winter for honey bees (Zacepins and *et al.* 2012).

This can be the primary examination to distinguish langstroth foam hive compared with common langstroth in Egypt. Since there is no endorsed reference materials on the impact of polystyrene substance on honey bee products items, it is preferable for analysts to examine it (Taha 2014). The most common material for making beehives is wood. Polystyrene foam (FP) is one of the newer alternatives used for hives. This material is superior to wood in its properties and is preferred for further beekeeping (Prendergast 2019).

Because of the optimal microclimate in the hive, bees prefer foam hives over wood hives. It has good thermal insulation capabilities, which keep the hive warm or cool from the outside. (Starks and Gilley 1999). Compared to common hives, polyurethane hives seem to offer superior stability in humidity between days and nights. The beekeeping industry has seen very few changes and

improvements on the widely used common hive. (Wang *et al.*, 2021). The amount of brood in the colony expresses the overall health of the hive and it may be used for calculating the honey yield in the season. Numerous researchers discovered a The relationship between pollen storage, the production of brood, and honey yield. (Fathy, 1998 a, Jevtić *et al.*, 2009; Taha and Al-Khtani, 2013). The growth of the colonies was found to be affected by several factors such as: bee flora (Abdella, 1996; Taha, 2007), colony strength (Georgijev *et al.*, 2003; Jevtić *et al.*, 2009), feed supply (Mladenovic *et al.*, 1999; Castagnino *et al.*, 2004; Mattila and Otis, 2006; DeGrandi-Hoffman *et al.*, 2008; Ghazy, 2009) and time of the year Al-Humyarie *et al.*, 1999). Studies showed that FP is not harmful to organisms when used under normal conditions for this, the purpose of this study was to look into the variation of colony activities in common and modified hive under Dakahlia Governorate conditions.

MATERIALS AND METHODS

This study was performed in the apiary belonged to the faculty of agriculture at Mansoura university, Dakahlia Governorate during harvesting honey in 2020. Honeybee hives colonies (each one consist of seven combs) of the Carniola hybrid. Honeybees were equal in strength (brood, bees, and stored pollen and honey) and headed by the young sister's open for newly mated queens. Colonies were in two groups (modified and commonly beehives. Each type of beehive was represented by five colonies per race (a total honey bee colonies was ten).

The Modified hives were the same characterize of common hives. The Modified hive was mixed with wood and foam. The modified hive follows as:

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Type hive / Structure	Modified hive	Common hive
Outer cover	It has a white sheet-covered roof with two holes in the edge of Two opposite sides. The cover is insulated with a high density foam layer between two layers of the counter, like a sandwich. The cover is equipped with two openings or holls to ventilate the cell from hot air and carbon dioxide from the cell. The cell is equipped with handles to close the cell cover.	The outer covering is a wooden or polystyrene covering that fits over the top of the hive. At higher latitudes, the cap tapers downwards around the inner cap and an inch or so downward over the superclimate.
Breeding box hive (Hive body)	this box is insulated with a foam layer between two layers of the counter, like a sandwich. (350*520*150 mm) and the box is equipped with iron handles to carry the cell.	Hive bodies was rectangular boxes with standardized inside dimensions to take standardized frames but polystyrene foam boxes have much larger outside dimensions than boxes made out of wood (35*48*160 mm)
The bottom board	It must have three sides measuring 20 x 44 mm each, with a back piece measuring 20 *20mm. The mesh is sandwiched between the frames, which are fastened together with screws and glue. The mesh must be made of nonferrous metal or galvanized metal and have a mesh size small enough to prevent bees and wasps from passing through.	The bottom board is almost always exterior-grade plywood, to resist water damage. It keeps dampness and some pests out of the lower brood chamber.

The worker-sealed brood area, stored pollen, and honey sealed were measured at weekly intervals using an empty standard frame divided into square inches (Al-Tikrity *et al.*, 1971).

Statistical calculations

Using the computer program of in all experiments. All data were statistically analyzed by One Way ANO-

VAs according to Duncan's Multiple Range Test CoHort Software (2004).

Data (numbers in each replicate) for each treatment were transformed by using: $\ln(x + 1)$ prior to analysis to normalize the residuals. Correlation and regration and paired t-test between each parameter in two hives were analyzed Sigmaplot 15 (2023).



Fig. 1. Modified hive and different contents.

RESULTS AND DISCUSSION

Results

1. Workers brood area.

The present data obtained in table (1) showed that the average mounts of workers sealed brood, stored pollen and sealed honey bee area and their percentage in modified beehive as comparison with common beehive.

During the harvesting season, the average mounts of the worker sealed broad in the modified hive surpasses the common ones.

It can be noticed that, the third week of May, which was followed by the fourth week of May, saw the highest mean worker sealed brood areas in modified hives and presented by 73.17 (sq. inches/month/week) (17.18%) and 66.48 (15.49%), respectively. Meanwhile, the mean worker sealed brood areas were the highest in common hives, it was recorded in the fourth week in May which, followed by the third week of May and presented by 67.47 (sq. inches/month/week) (19.2%(and 45.2 (12.84%) , respectively.

Moreover, the lowest one was found in modified hives and common hives were observed in the second week of April in modified and common of beehives were represented by 30.45 (7.09%) and 16.93 (4.8%) respectively.

The results shown in Table 1 showed that the best date for rearing worker broods was in the third and fourth week of May, on the contrary, the least brood production was in the second week.

Also, modified beehives gave significantly more averages of sealed working brood areas of 429.12 (in²/cell) than common beehives of 351.39 (in²/cell) with significant differences found in Table 2.

2. Stored pollen area:

The impact of various hive types on the flight behavior and pollen storage of honey bee colonies in modified and common beehives, followed by a calculation of the quantity of stored pollen areas throughout the investigation. The data in (table 1) made it clear that May saw the highest number of pollen storage areas in modified and common hives.

The high average mean of stored pollen area was recorded 29.87 and 23.6 inch²/colony for the modified and common hives, respectively. The highly average mean of stored pollen was in the second week of May in modified and common hives.

As shown in table (1) the second week of April was the lowest date of stored pollen areas performing 3.83 (inch²/colony) in modified hive and 0.97 (inch²/colony) in common hive, respectively.

It is obtained that modified hives was higher than common hives of stored pollen areas with total average 110.07 and 102.6, sq², respectively. While the data analysis on common hive was highly significant correlation coefficient r values among sealed honey bee and workers brood, as it recorded r= 0.415 and the value of linear regression between works brood and stored pollen, sealed honey bee areas were 0.173 & 0.312 respectively in Fig 2.

3. Sealed honey bee area:

Table (1) showed that the storage production of honeybees in modified and common hives was monitored

by measuring sealed honey bee areas throughout the trial period. It is showed that the highest average of sealed honey bee areas was in May in modified and common hive. The highly average mean of sealed was the last week on of May in modified 78.23 and common hives and 83 (inch²/colony), respectively.

As shown in table (1) the last week of May was the highest significant date of sealed honey bee areas for m hive types represented,

On contrary the second week of April was the lowest dates of sealed honey bee areas.

It gave 0% on common but the lowest average of sealed honey bee areas was the third week of April in modified 0.0 (inch²/colony), respectively. It was cleared that modified hives was superior to common hives of sealed honey bee areas with total average 215.60 (37.05%) and 155.18 (53.13%) sq², respectively.

The data analysis on modified hive was highly significant correlation coefficient r values among sealed honey bee and workers brood, as it recorded r= 0.409 respectively and the value of linear regression between works brood and stored pollen, sealed honey bee areas were 0.173 & 0.312 respectively in Fig 2.

While the data analysis on common hive was highly significant correlation coefficient r values among sealed honey bee and workers brood, as it recorded r= 0.415 and the value of linear regression between works brood and stored pollen, sealed honey bee areas were 0.173 & 0.312 respectively in Fig 3.

The t-test analysis revealed that there was only significant difference between the modified and common used beehives in brood production by honey bees with the highest number of sealed honey was in the modified beehive. Although the sealed honey area and stored pollen area by honey bees was higher in the modified beehive than the common used ones, each parameter did not differ between both types of beehives (Table 2).

Table 1. Average mounts of worker-sealed brood area, stored pollen, and honey sealed in modified and common hive during of harvesting honey in 2020.

Type hive	Date	Brood	percentage	Pollen	percentage	Sealed honey	percentage		
Modified hive	April	1	34.45 cd	8.03%	6.10 ef	5.54%	3.70 de	1.72%	
		2	30.45 d	7.09%	3.83 f	0.027%	2.84 de	1.32%	
		3	40 c	9.32%	9.75 de	8.49%	0.07 e	0.00%	
		4	58.7 b	13.68%	8.94 e	6.70%	5.03 d	2.33%	
	May	1	59.6 b	13.88%	15.35	13.95%	3.31 de	1.53%	
		2	66.27	15.45%	29.87	27.14%	23.7 c	11%	
		3	73.17 a	17.18%	19.57	17.87%	51.18 b	23.74%	
		4	66.48 ab	15.49%	14.29	12.98%	79.87 a	37.05%	
	Total		429.12 sq	100%	110.07 sq2	100%	215.60 sq2	100	
	Common hive (Langstroth)	April	1	38.9 bc	11.07%	9.17 c	8.93%	1.97 d	1.27%
			2	16.93 d	4.8%	0.97 d	0.9%	0 d	0%
			3	35.17 c	10%	8.77 c	8.55%	4.90 cd	3.16%
4			48.48 b	13.79%	13 bc	12.67%	3.03 d	1.95%	
May		1	45.77 b	13%	16.45 b	16.03%	1.13 d	0.73%	
		2	44.47 bc	12.66%	23.4 a	22.81%	10.10 c	6.51%	
		3	45.2 bc	12.84%	13.77 bc	13.77%	51.10 b	32.91%	
		4	67.47 a	19.2	8.07 c	7.86%	83 a	53.47%	
Total		351.39 sq	100%	102.6 sq	100%	155.23 sq	100		

Table 2. Summary of the t-test analysis between some honey bee activity in both the modified and common beehives.

Parameters	Type of beehive		t- test	
	Modified	Common	t	P
Brood	53.64±5.08	42.80±4.41	2.799	0.027
Pollen	2.52±0.19	2.36±0.24	1.177	0.278
Sealed honey	2.22±0.46	1.98±.48	0.930	0.383

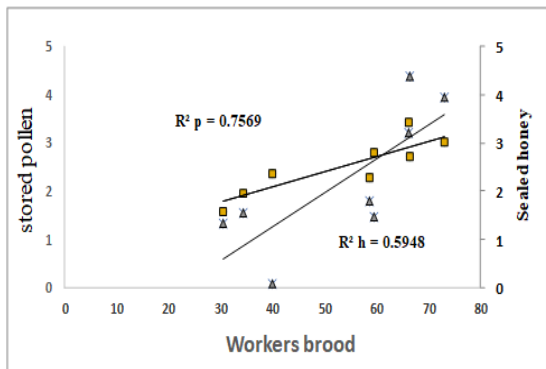


Fig. 2. The relationships between workers brood, stored pollen and sealed honey bee in modified hive.

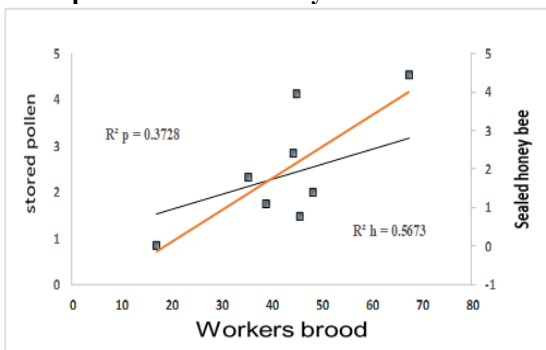


Fig. 3. The relationships between workers brood, stored pollen and sealed honey bee in common hive.

Discussion

Wood is the most widely used material for beehives. One of the most recent beehive alternatives is foam polystyrene (FP). This material exceeds wood in terms of properties and is recommended for future bee breeding. (Prendergast 2019). The high area of sealed worker bees may have developed in May because of the greater number of worker bees collecting more pollen grains from the alfalfa. The presence of a large number of nurse bees encourages the egg laying of the queen. These results are maintained by Rana and Goyal (1994); Shawer et al., (2003) where they report that the largest sealed brood area was recorded in May. These differences may be caused by the variation in colony strength consistent with the type of hive affecting the specific temperature of the hive which may influence the activity of the queen in laying eggs and the colony for rearing brood. In this regard, Abdullah (1996) mentioned that the productivity of honey bee colonies throughout the year is affected by various factors: especially the age of the queen and the ability to lay eggs, the population of the colony, the availability of empty combs, the weather temperature, and the pollen and nectar supplied. William and Milagra (2014) Migratory beekeeping using foam hives is recommended as it gives the opportunity to carry more hives, but they need to be extra careful while tying the hives to move them. The common hive had

significantly weight more than the foam hive, while the foam hive produced significant working brood areas compared to the common hive. Dodologlu *et al.* (2004), Colonies in common hives performed better than polystyrene hives in terms of overwintering colony survival, winter population loss, brood area, the number of bee frames and a low ferocity. Colony weight gains during nectar flow 781 were significantly larger in hives getting supplemental feeding regardless of feeding mode in polystyrene hives. Furthermore, Wineman *et al.* (2003) The number of adult bees increased by 37.5% in polyethylene-covered hives over the winter, compared to only 11.8% in uncovered colonies. Polyethylene-covered colonies produced 20.8 kilogramme honey/colony during the spring, but uncovered colonies produced only 10.2 kg honey/colony (P = 0.0004). Because the temperature in the populated hives coated with polyethylene was greater than in the uncovered ones, the brood area grew quicker, and the number of colonies has increased in the spring. Alburaki, and Corona, (2021). There are few investigations to identify modified hives compared to common (langstroth) in Egypt. This results were agreement with Al-Sheikh (2007) who stated that the highest amount of feed received during the spring season occurred in May. The most sealed honey bee areas were found in experimental colonies in May, which coincided with the peak flowering of Egyptian alfalfa (*Trifolium alexandrinum*). as this phenomenon has been reported before Taha (2007). Beehive types affected growth or spring quantity of adult bees and brood areas but did not effect on colony survival rate. Also, results were consistent with Taha (2014) the activity wasn't affected significantly between the modified and common hives, according to the analysis of variance.

Production honey actually depends on several factors, for example, the colony's workers, bee race, age, colony's weather factors (the health of the colony), and the abundance of flowering plants. Foam hives are preferred whereas transporting bees because they are very light, but beekeepers need to be aware of damage through tying and transport. The foam hives were easily damaged by mice. Therefore, it needs to be extra careful during storage. Therefore, the modified cell was reconciled to the defects of the foam cell and the joint cell efficiency was increased.

CONCLUSION

This research confirms that the modified hive is the most important indicator for increasing and maintaining the activities of honey bee colonies, especially if used in winter. The modified hive was removed the disadvantages of foam hive and Increase the efficiency of common hive.

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مقارنة بيين الخلايا الخشبية والخلايا المعدلة علي أنشطة النحل المختلفة

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المخلص

تعتبر خلايا النحل هي الطريقة العملية للحفاظ على مستعمرة النحل وحمايتهم من العوامل البيئية والحيوانات المفترسة. حيث شهدت صناعة تربية النحل تغييرات وتحسينات قليلة جدا على خلية لانجستروث الشائعة المستخدمة على نطاق واسع. وكان الهدف من هذه الدراسة هو مقارنة نشاط نحل العسل (مساحة حبوب اللقاح المخزنة، مساحة الحضنة المختومة للشغالات، ومساحة العسل المختومة) في الخلايا المعدلة والشائعة في المنحل بكلية الزراعة بجامعة المنصورة خلال موسم الحصاد لعام ٢٠٢٠. وكشفت النتائج أن أعلى متوسط لمساحة الحضنة للشغالات كان في الأسبوع الثالث من مايو. وهناك ارتباط إيجابي كبير بين نوع خلية نحل العسل والأنشطة خلال التجربة. وكانت الخلية المعدلة أكثر فعالية في أنشطة نحل العسل خاصة في مساحة الحضنة مقارنة مع لانجستروث أو الخلية الشائعة. تعني زيادة حضنة الشغالات للمستعمرات زيادة كثافة النحل مما ينتج عنه طوائف صحية وقوية. تعمل الخلايا المعدلة علي ازالة عيوب الخلايا القوم وتزيد من كفاءة الخلايا الخشبية الشائعة.