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EFFECT OF HIVE TYPE ON STRENGTH AND ACTIVITY RATE OF HONEYBEE COLONIES (*Apis mellifera* L.) IN EGYPT.

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ABSTRACT

The study was conducted to determine the effect of hive type (wood and foam) on brood rearing, pollen grains and honey production activity during 2011 year with recording averages temperature and relative humidity. Total of eight honeybee colonies, approximately equal in strength with young mated queen was used in this study. Results indicated that honeybee colonies kept in foam hives presented the highest average worker sealed brood areas (407.4 square inch/colony) followed by honeybee colonies kept in wooden hives (286.8 square inch/colony). No significant difference between wooden and foam hives in drone sealed brood with an averages 13.42 and 9.17 (square inch/colony), respectively. It can be concluded that honey bees stored 678.55 and 630.44 g of pollen grains during May for foam and wooden hives with percentages 40.1 and 41.1%, respectively. In relation to foam hives, June was the second of pollen storage followed by July represented by 547.36 and 465.31g with percentages 32.4 and 27.5%, respectively. In contrast, for wooden hives July was the second month of pollen storage followed by June giving 489.994 and 414.141g (31.9 and 27.0%), respectively. The mean areas of clover honey recorded 207.9 and 307.5 (square inch/colony) for the colonies housed in wooden and foam hives, respectively. Statistical analysis showed that there were insignificant differences between wooden and foam hives for drone brood areas, queen cells number, stored pollen areas, honey production areas. On the other hand, there were significant differences between wooden and foam hives for worker brood areas and colony weight. In addition, wooden hives were more suitable for rearing of honeybee than other hive types.

Keywords: Honeybee (*Apis mellifera* L.), hive types, wood, foam, biological characters, pollen grains, climatic factors.

INTRODUCTION

Beekeeping industry worldwide is affected by the ecological factors. These factors have great effects not only on the behavior and activities of honey bee colonies, but also on plant growth and development. The microclimate of honeybee colonies is still in need to more and more studies to assess the effect of the ever changing environmental factors on their microclimate, and to investigate whatever the subsequent effects of these changes on biological, morphometrical, physiological, behavioral and productivity aspects of the worker bee individual and colony (Komisar, 1991 and Southwick, 1991). Data on the changes over time in the main biological components of honey bee colonies, i.e. adult and brood populations and food stores, are used by researchers to monitor hive health and to study behavior and population dynamics. Weighing hives daily or weekly is done by beekeepers and bee researchers (Szabo and Lefkovitch, 1991; Harbo, 1993; Savary, 2006) to help determine the best time to harvest honey or estimate food reserves for periods with no nectar flow. Weighing is fast, requires little training and is not disruptive to the colony so it can be done at any time of year. Weighing hives regularly, often, and with relatively high precision can provide useful information on colony dynamics. Buchmann and Thoenes (1990) first proposed using high-precision electronic balances, an idea also explored by Meikle *et al*. (2006). Hives are a convenient way of containing a colony of bees and protecting them from the elements and predators, thereby enabling the bees to thrive and maximize honey production without encouraging swarming or in any way being detrimental to the bees. One of the main purposes (aim) of the behavioral and microclimatic studies for honeybee colonies inside and outside the hive is to determine the most suitable habitat for honeybees to survive and reproduce to maintain its kind.

For this standpoint, the present work was designed to investigate the influence of housing honeybee colonies in different hive types (wood and foam). To infancies the best habit for bees for ventilation, productive and coast.

MATERIALS AND METHODS

1. Tested honeybee colonies:

The present study was carried out from the first of May to the end of July, 2011 year for three months in the apiary of Faculty of Agriculture, Mansoura University, Dakahlia governorate, Egypt. Four foam langstroth hives and four wooden langstroth hives were used. Eight colonies of 1st hybrid Carniolan were chosen, each colony was headed by a queen nearly of the same age and the colonies were identical in strength, brood areas and food stocks. The research was carried out to evaluate the suitability of the two types of hives for inhabiting honeybee colonies and their effect on colony productivity under Egypt environmental conditions. Firstly, hives were weight without bees or feeders and then colonies (hive+ bees+ feeder) were weight every twelve days from the first of May till the end of July, 2011. A total of eight honeybee (*Apis mellifera* L.) colonies of 8 combs covered with bees were established during May, 2011. The established colonies were headed by mated young local Carniolan sister queens. The test colonies were divided randomly into two groups of four colonies each. Same caring and applications were used for all colonies through the experiment.

2. Measuring of temperature and relative humidity:

The measurements of temperature and relative humidity inside and outside the hives were taken every twelve days intervals at the hour 12 am. in all tested hives all over the experimental period extended from the first of May till the end of July, 2011. Air temperature outside the hives was read by a thermometer placed in the shade in the apiary.

3. Estimating worker and drone sealed brood areas and stored pollen areas:

To estimate the rate of worker, drone brood activity and stored pollen areas for each hive types, a typical langstroth frame (19 inch in length and seven inch in width) was divided into 133 square inches by means of wire. This frame was laid against any comb in which it was desired to count the number of sealed brood. The counts were made at intervals of 12 and 13 days; this method of counting was according to (Al-Tikrity *et al*., 1971). Taha (2006) mentioned that the weight of stored pollen grains for one cell and for one square inch/grams is 0.1459 gms and 3.64 gms, respectively**.**

4. Estimating honey production:

Clover flow started at the beginning of May and lasted to the first week of June, when the honey yield was estimated for each experimental colony individually in June 6, 2011. On June 6, 2011, the surplus honey combs were taken from their respective colonies and marked with paint; the bees covering them were shaken off. All combs were marked with its own hive number during the harvest. Thereafter, honey yield was estimated for each colony separately in (kg/colony) by calculating the difference between the weight of honey combs before and after honey extraction (Erdogan *et al*., 2009).

5. Estimating colonies weight:

The colonies were each placed on top of stainless steel electronic balances every twelve days during estimating the biological data. The balances had a maximum capacity of 100 kg, a precision of ±30 g as described by (Meikle *et al*., 2006).

6. Statistical analysis:

Obtained data were statistically analyzed; the correlation coefficient values between the studies of productivity and behavioral parameters as well as temperature and relative humidity were recorded using SAS program (1999). ANOVA test was used for the analysis of colony characteristics. Duncan s multiple range test was used to compare the means between the groups.

RESULTS AND DISSCUSSION

1. Worker sealed brood:

Brood rearing of worker was studied for the two hive types under the local conditions of Dakahlia Governorate, Egypt. Data illustrated in table (1) showed that date 29/05/2011 was significantly superior in worker brood areas in each foam and wooden hives with averages 624.5 and 385.8 $inch^2$/colony, respectively. There is no significant differences between the date 17/05/2011 and the date 29/05/2011 in produced worker sealed brood. Meanwhile, the date 29/05/2011 was significantly superior on all the other dates in produced worker sealed brood.

Meanwhile, date 10/06/2011 was significantly inferior of all the tested dates giving the least average of worker sealed brood for foam and wooden hives (251.3 and 160.0 inch^2/colony), respectively. From table (1) it can be concluded that the best date of worker brood rearing activity was from 17/5/2011 to 29/5/2011. On the other hand, the worst date of worker brood rearing activity was at 10/06/2011 after extracting the clover honey. Foam hives gave significantly more averages of worker sealed brood areas than wooden hives represented by 407.4 and 286.8 (inch^2/colony), respectively.

Table (1). Average of worker sealed brood area/colony during season, 2011

Date at 12 days	Worker sealed brood/ inch^2		
	Wooden hive	**Foam hive**	**Mean**
05/05/2011	281.0 f ±20.563	349.3d ±22.392	315.1BC
17/05/2011	379.8b ±59.689	608.0a ±51.101	493.9A
29/05/2011	385.8b ±108.533	624.5a ±49.539	505.1A
10/06/2011	160.0h ±39.843	251.3g ±42.199	205.6D
22/06/2011	292.0f ±44.892	319.8e ±42.003	305.9C
04/07/2011	255.3g ±46.333	368.8bc ±40.434	312.0BC
16/07/2011	288.3f ±40.822	357.5cd ±34.065	322.9B
28/07/2011	252.0g ±51.230	380.3b ±47.823	316.1BC
Mean	286.8±25.49B	407.4±47.72A	

2. Drone sealed brood:

Table (2). Average of drone sealed brood area/colony during season, 2011

Date at 13 days	Drone sealed brood areas/inch^2		
	Wooden hive	**Foam hive**	**Mean**
01/05/2011	2.50c ±2.50	2.75c ±2.750	2.63B
14/05/2011	20.25a ±10.315	13.00b ±10.368	16.63A
27/05/2011	17.50a ±9.802	11.75b ±4.589	14.63A
09/06/2011	0.00c ±0.000	0.00c ±0.000	0.00C
22/06/2011	0.00c ±0.000	0.00c ±0.000	0.00C
05/07/2011	0.00c ±0.000	0.00c ±0.000	0.00C
18/07/2011	0.00c ±0.000	0.00c ±0.000	0.00C
31/07/2011	0.00c ±0.000	0.00c ±0.000	0.00C
Mean	13.41±5.52A	9.17±3.23A	

Measuring sealed drone brood was conducted every thirteen days intervals. It is cleared obvious from table (2) that the same trend was observed for the dates 14/05/2011 and 27/05/2011 gave significantly more averages of drone sealed brood than the other dates, respectively. On contrary, there were no significant differences between all the other tested dates from 09/06/2011 to 31/07/2011. There was no sealed drone brood at all in both types of hives during the same before period. The average of drone sealed brood in wooden and foam colonies were 13.42 and 9.17 (inch^2/colony), respectively.

3. Amounts of stored pollen grains area:

Effect of different hive types on flight activity and pollen storage of honeybee colonies housed in the wooden and foam hives was followed by counting the number of stored pollen areas during the experimental period. It is cleared that the highest counting number of stored pollen areas of the test colonies was on May, to be coincided with the peak blooming of Egyptian clover (*Trifolium Alexandrinium*), this phenomenon was also reported by (Abd-Allah, 1999 and Taha, 2006).

The recorded numbers on that date were 173.2 and 186.4 $inch^2$/colony for the wooden and foam hives, respectively. Analysis of data revealed highly significant correlation coefficient r values among stored pollen and worker brood, drone brood, honey areas as it recorded r= 0.325, 0.122, 0.361, respectively. The measurements of stored pollen areas in combs were used to estimate the activity of pollen storage of honeybees housed in wooden and foam colonies. As shown in table (3) the date 29/05/2011 was significantly the highest date of stored pollen areas for the two hive types represented 218.0 and 201.0 ($inch^2$/colony), respectively. On contrary the last week of June (22/06/2011) and July (28/07/2011) was significantly the lowest dates of stored pollen areas giving 81.25 and 107.5 ($inch^2$/colony), respectively. It is cleared that foam hives was superior to wooden hives of stored pollen areas with an average 155.4 and 143.8 ($inch^2$/colony) with no significant difference, respectively.

Table (4) showed the average weight in grams and percentages of stored pollen during the experimental period for wooden and foam hives. It can be concluded that honey bees stored 678.55 and 630.448 g of pollen during May for foam and wooden hives with percentages 40.1 and 41.1%, respectively. For foam hives June month was the second of pollen storage followed by July represented by 547.36 and 465.31g with percentages 32.4 and 27.5%, respectively. In contrast, for wooden hives July was the second month of pollen storage followed by June giving 489.944 and 414.141g (31.9 and 27.0%), respectively.

Table (3). Average of stored pollen area /colony during season, 2011

Date at 12 days	Stored pollen areas/$inch^2$		
	Wooden hive	**Foam hive**	**Mean**
05/05/2011	161.3b ± 28.935	147.5b ±14.121	154.4C
17/05/2011	140.3b ±39.884	210.8a ±37.330	175.5B
29/05/2011	218.0a ±47.455	201.0a ±9.678	209.5A
10/06/2011	146.3b ±42.787	159.3b ±22.889	152.8C
22/06/2011	81.25d ±26.402	141.5b ±20.871	111.4D
04/07/2011	156.3b ±33.626	158.5b ±21.789	157.4C
16/07/2011	107.5c ±19.419	117.5c ±41.458	112.5D
28/07/2011	140.0b ±37.249	107.5c ±15.877	123.8D
Mean	143.8±14.16A	155.4±12.78A	

Table (4). Monthly average of stored pollen (inch^2) and pollen weight (gm/colony) in wooden and foam hives during season, 2011.

Month	Av. Monthly (sq. in.)		Av. Weight (gm)		%	
	Wooden	Foam	Wooden	Foam	Wooden	Foam
May	173.200	186.433	630.448	678.55	41.1	40.1
June	113.775	150.400	414.141	547.36	27.0	32.4
July	134.600	127.833	489.944	465.31	31.9	27.5
Total/season	421.575	464.666	1534.533	1691.22	100	100

4. Clover honey production:

Table (5). Average of accumulated honey production areas (inch^2/colony) during season 2011, year.

Date at 12 days	Honey areas/ inch^2		
	Wooden hive	Foam hive	Mean
05/05/2011	269.0f ±80.873	610.5c ±251.049	439.8B
17/05/2011	397.8e ±43.895	423.8d ±105.003	410.8C
29/05/2011	780.8b ±89.744	909.8a ±75.134	845.3A
10/06/2011	14.50k ±8.627	40.00j ±14.720	27.25F
22/06/2011	12.25k ±7.814	30.00jk ±13.385	21.13F
04/07/2011	63.75i ±12.479	101.3h ±38.688	82.50E
16/07/2011	61.25i ±4.27	163.8g ±49.048	112.5D
28/07/2011	63.75i ±20.451	181.3g ±94.679	122.5D
Mean	207.9±95.12A	307.5±111.46A	

Honey production was detected by calculating the difference between masses of honey combs before and after extraction process. The mean mass of clover honey yield recorded 207.9 and 307.5 (inch^2/colony) (7.0525 and 7.776 kg/colony) for the colonies housed in wooden and foam hives, respectively. Analysis of variance detected no significant differences in this parameter between wooden and foam hive. Honey production in fact is multi dependant for instance, colony population workers, race, age and build up sanitary status of colony (colony health) weather factors, abundance of flowering plants, competition between workers on the flowering area, duration of flow and its abundance, occurrence of bees natural enemies are limiting factors. In addition, the consumption of the harvested honey inside the hives depends upon the number of nurse workers and bee brood, moreover, play a decisive role in this respect on the ambient (outside) temperature since honeybees are cold blooded animals, yet they do thermoregulation in the hives to hold constant brood nest temperature at 32-34 °C. Thermoregulation in the colonies means higher consumption of honey (carbohydrate food) to produce energy needed to keep on the colony temperature. Therefore, the more suitable colony isolation the lower the honey consumption. The above mentioned phenomena may help in understanding and interpreting the highest honey yield of isolating colonies. Kleinschmidt (1993) housed 56 honey bee (*Apis mellifera*) colonies in hives of 8 different designs In Queensland, Australia, varying in colour, ventilation, and type of hive body stated that hive design had no effect on honey production.

3.5. Metrological factors activity:

Table (6). Mean temperature and relative humidity inside and outside the experimental colonies during season, 2011.

Date	Air Climate F.		Temperature & RH inside			
			Wooden hive		**Foam hive**	
	T. C°	**RH %**	**T. C°**	**RH %**	**T. C°**	**RH %**
05/05/2011	38.0	33.0	36.6	30.8	36.2	32.5
17/05/2011	40.5	20.0	37.7	32.0	37.9	33.2
29/05/2011	32.5	42.0	39.1	34.7	39.5	36.5
10/06/2011	33.5	47.0	37.7	36.2	36.3	44.2
22/06/2011	41.6	31.0	42.7	31.7	42.3	33.7
04/07/2011	39.2	43.0	36.0	60.5	35.8	62.5
16/07/2011	36.1	47.0	37.2	43.7	37.6	46.2
28/07/2011	32.9	62.0	38.3	48.7	38.1	48.7

From table (6) it is cleared that both of the two hive types decrease the RH percentage inside the hives than outside the hives all over the tested period. In addition, wooden hives were more suitable for controlling the RH percentage than the foam hives. It's obvious that temperature within the hive increased in daytime and decreased in nighttime, which was constantly higher than outside. These results are in agreement with Simpson (1961) and Spink *et al*. (2008) they found that the increase of active hive temperature caused by the presence of honeybee, supporting the former studies about the colonial thermoregulation of honeybees. The humidity within the hive was higher than that of the ambient and fluctuated little even when the ambient humidity changed considerably. The results are supported by Sudarsan *et al*. (2012) indicated that both heat and mass transfer resulting from honeybee metabolism play a vital role in determining the structure of the flow inside the beehive and mass transfer cannot be neglected. Also at low ambient temperature, the nonuniform temperature profile on comb surfaces that result from brood incubation enhances flow through the honeybee cluster which removes much of the carbon-dioxide produced by the cluster resulting in lower carbon-dioxide concentration next to the brood. Moreover, increasing ambient air temperature causes ventilation flow rate to drop resulting in weaker flow inside the beehive. Finally honeybee colony has a different microclimate from those of ambient, which partly caused by the honeybee activity.

6. Honeybee colony weight:

Data showed in table (7) stated that the colony weigh in both of wooden and foam are increasing sharply from the beginning of May getting the tip at the end of May after that the colony weigh is decreasing sharply during June. Slightly increasing was observed during July but at less level than May. The results are in agreement with (Meikle *et al*., 2008) they mentioned that, weekly changes in running average weights were correlated with food store changes but not adult or brood weights. Rapid or unexpected changes in weight parameters could indicate treatment effects in field experiments. These analyses can be made more precise by incorporating other techniques. For example, by electronically counting the number of foragers, weight change due to foragers and that due to water inflow and outflow can be estimated. Combined with other approaches, weight data such as those presented here can provide a more complete picture of hive dynamics (Meikle *et al*., 2008).

Table (7). Average of colony weight (Kg./colony) according to hive type during season, 2011.

Date at 12 days	Colony weight/kg.		
	Wooden hive	Foam hive	Mean
05/05/2011	19.14bc ± 2.354	16.59c ± 0.308	17.87B
17/05/2011	21.06b ±2.839	17.55c ±0.532	19.30B
29/05/2011	25.09a ±1.170	18.86bc ±0.771	21.97A
10/06/2011	17.45c ±0.083	12.35d ±0.425	14.90C
22/06/2011	16.61c ±0.508	10.85bc ±0.614	13.73C
04/07/2011	17.14c ±0.614	11.06d ±0.564	14.10C
16/07/2011	17.54c ±0.570	11.08d ±0.485	14.31C
28/07/2011	16.57c ±0.373	10.68d ±0.525	13.62C
Mean	18.82±1.04A	13.63±1.21B	

Table (8) Analysis of variance for different tested parameters within wooden and foam hives during season, 2011.

Parameters	Wooden hive	Foam hive	L.S.D.$_{5\%}$
Worker brood	286.8±25.49b	407.41±47.72a	116.04
Drone brood	13.42±5.52a	9.17±3.23a	17.74
Stored pollen grains	143.84±14.16a	155.44±12.78a	40.92
Honey production	207.9±95.12a	307.5±111.46a	314.28
Colony weight	18.82±1.04a	13.63±1.21b	3.43
Temperature	38.16±0.73a	37.96±0.75a	2.52
Relative humidity	39.79±3.71a	42.19±3.67a	11.19

Data illustrated in table (8) showed that there were insignificant differences between wooden and foam hives for drone brood areas, stored pollen areas, honey production areas and both temperature and relative humidity inside hives. On the other hand, there were significant differences between wooden and foam hives for worker brood areas and colony weight. These results are logically as there are more than 5 kg. over weight for wooden hive than the foam one. It's recommended for the migratory beekeeping to use foam hives because it gives the opportunity of carrying more hives. But it needs more careful during tying the hives for transporting. Wooden hive was significantly more weight than foam hive; meanwhile foam hive was produced significant worker brood areas than langstroth hive. These results are not in agreement with Dodologlu *et al*., 2004 they stated that colonies housed in wooden hives achieved superior performance over polystyrene hives as measured by overwintering colony survival, winter population loss, brood area, number of frames of bees and low defensiveness. In polystyrene hives, colony weight gain during the nectar flow was significantly higher in colonies receiving supplementary feeding regardless of feeding method.

In addition, Wineman *et al*., 2003 found that adult bee population in polyethylene PE-covered hives increased by 37.5% during the winter, compared with only 11.8% in non-covered hives. During the spring, PE-covered colonies produced ± 20.8 kg honey/colony, while non-covered colonies produced only ± 10.2 kg honey/colony (P=0.0004). As the temperature that prevailed in PE-covered populated hives was higher than non-covered ones, and resulted in a faster increase of the brood area size, colony population build-up and more spring honey per colony.

There are multiple factors playing a role in honey bee colony declines, including parasites and diseases, genetics, poor nutrition, pesticide exposure and environment. There is an important link between the health of agriculture and the health of our honeybees for our country's long term agricultural productivity. But there is still much work to be done to protect the honey bee population. The causes of differences among the studies could be genotypes, experiment areas, years and management conditions. Hive types have affected the development or spring amount of adult bees and the brood areas but did not affect the survival rate of the colonies. These results demonstrate that if it's possible all frames should be settled vertically in hives for better wintering ability and more colony population in spring (Yeninar *et al.,* 2010).

This is the first investigation for determine langstroth foam hives comparing with langstroth wooden ones in Egypt. The results are in agreement with El Sheikh (2007) who stated that the peak of incoming loaded and unloaded foragers during spring season was in May. Due to the lack of certified reference materials about the effect of polystyrene content on the products of honeybees, it prefers to be discussed by researchers.

Interestingly, Beliles *et al.* (1985) stated that reproductive developmental toxicity of styrene monomer showed no toxic effects. Actually, the uterotrophic assay and reproductive developmental toxicity using styrene oligomers extracted from PS (Polystyrene) containers resin showed there were no effects on estrogenic activity (Bachmann *et al*., 1998; Fail *et al*., 1998) or reproductive functions and development (Nagao et al., 2000). These findings are supported by Ohno *et al*., 2001 and Date *et al*., 2002 they confirmed that this material PS (Polystyrene) don't show any estrogenic activity in the MCF-7 cell proliferation assay and the luciferase reporter gene assay.

As can be seen above, there are few reports on the endocrine disrupting effects of styrene. It needs more investigation to verify the effects of this material on bees, products and human health.

RECOMMENDATIONS

1- Beekeepers can use plastic sheet or cement clean bags for covering colonies and putting water in feeders when the humidity is low, to raise the relative humidity inside the colonies. This is ideal in sites or countries with low humidity (East Owainat region in Egypt and Arab Gulf countries).
2- Using foam hives is preferable during transferring bees as its very light, but beekeepers need to keep awareness of damages during tying and transferring.
3- The canvas sack is better than the other covers in places with high relative humidity.
4- Foam hives was easy to damage by rats. So, it needs more careful during storing.
5- The coast of foam hives is 75 Egyptian pounds and working for 5 years, on the other hand, the wooden hive coastal is 75 Egyptian pounds and can used for 20 years or more.
6- The material (Polystyrene) can be recommended for use in non-migratory beekeeping.

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تأثيــر نــوع الخليــة على قــوة ومعدل نشــاط طــوائف نحــل العســل فى مصـــــر

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قسم بحــوث النحـــل- معهد بحوث وقاية النباتات- مركز البحوث الزراعية- مصــر

أجريت هذه الدراسة بهدف تحديد تأثير نموذج الخلية (الخشب و الفوم) على نشاط الحضنة، حبوب اللقاح وإنتاج العسل لطوائف نحل العسل خلال عام 2011 مع تسجيل متوسطات درجات الحرارة و الرطوبة النسبية. تم إستخدام 8 طوائف نحل متساوية القوة تقريبا ومزودة بملكات حديثة التلقيح. أوضحت النتائج أن طوائف نحل العسل في الخلايا الفوم أعطت أعلى متوسط لمساحة حضنة الشغالات المقفلة (407.4 بوصة مربعة/طائفة)، يليها طوائف نحل العسل في الخلايا الخشبية (286.8 بوصة مربعة/طائفة). لم تكن هناك فروق معنوية بين الخلايا الخشبية والخلايا الفوم في مساحة حضنة الذكور مع المتوسطات 13.42 و 9.17 (بوصة مربعة/طائفة)، على التوالي. يمكن الاستنتاج أن طوائف نحل العسل خزنت 678.55 و 630.448 جرام من حبوب اللقاح خلال شهر مايو للخلايا الفوم والخلايا الخشبية بنسبة مئوية 40.1 و 41.1٪، على التوالي. بالنسبة للخلايا الفوم، كان شهر يونيو فى الترتيب الثانى من حيث تخزين حبوب اللقاح ويليه شهر يوليو بمتوسط 547.36 و465.31جم بنسبة مئوية 32.4 و 27.5٪، على التوالي. على النقيض، كان شهر يوليو بالنسبة للخلايا الخشبية فى الترتيب الثاني من تخزين حبوب اللقاح يليه شهر يونيو معطيا 489.994 و414.141 جرام (31.9 و 27 %) على التوالي. سجل متوسط مساحة عسل البرسيم 207.9 و 307.5 (بوصة مربعة/طائفة) للطوائف الموجودة في الخلايا الخشبية و الفوم، على التوالي. أظهر التحليل الإحصائى عدم وجود إختلافات معنوية بين الخلايا الخشبية والخلايا الفوم لكل من حضنة الذكور، مساحة حبوب اللقاح المخزنة، مساحة العسل. من ناحية أخرى، كانت هناك فروق معنوية بين الخلايا الخشبية وخلايا الفوم لمساحة حضنة الشغالات المقفلة ووزن الطوائف. بالإضافة إلى ذلك، كانت الخلايا الخشبية أكثر ملاءمة لتربية نحل العسل من نماذج الخلايا الأخرى.