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INFLUENCE OF USING POLLEN TRAPS ON AMOUNTS OF BROOD AND STORED POLLEN IN HONEY BEE COLONIES (*Apis mellifera* L).

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ABSTRACT

The present work aimed to study the relation ship between brood rearing and stored pollen in trapped colonies (colonies with pollen traps) and non trapped colonies (colonies without pollen traps). The highest average of worker brood in trapped and non trapped colonies were observed in summer, while the lowest average was in autumn. Areas of worker brood differed significantly and were high in summer and spring season according density of bees in trapped and non trapped colonies. Highest amount of stored pollen was observed during Spring and Summer season, represented (670 sq .in (36%) and (826 sq .in (45%) in trapped colonies , while that was (768 sq .in (27%) and (1135 sq .in (40%) in non trapped colonies , respectively . Highest rate of stored pollen and brood rearing recorded in spring and summer seasons. The Lowest amounts of stored pollen and brood was observed in autumn and winter. Non trapped colonies reached to 428 sq .in (15%) and 519 sq .in (18%), respectively, while trapped colonies were 149 sq .in (8%) and 203 sq .in (11%) of stored pollen with brood 457 sq .in (12.36%) and 188 sq .in (5.08%), respectively. Non trapped colonies collect more pollen and rear more brood than trapped colonies. The amounts of stored pollen and the rearing sealed brood can arranged in a descending order from summer, spring, autumn and winter.

INTRODUCTION

Pollen grains are considered to be the main source of protein, fat, vitamin and minerals for honey bee colonies. It play an important role in the life of colony especially brood rearing. (Ibrahim and Selim, 1974 ; and Shawer 1987) found the correlation between worker brood rearing and the amount of collected pollen are fairly well established for worker brood rearing . Hussien (1981) observed a highly significant positive correlation between amount of pollen collected and brood rearing. Colonies with pollen traps produced less honey and reared less brood than control colonies. Rosenthal *et al .,(1981)*, found that both pollen stores and brood rearing over 4 years increased steadily in March, April and May. This indicated that there was a direct relation between the amount of brood reared and the increase in pollen stores. Wille *et al.,* (1985), reported that, the weight of pollen collected by a colony (calculated from amounts collected in pollen traps) varied from 10 to 26 kg/year. There were considerable differences in the pollen collected by different colonies. There was only weak correlation between the amount of pollen collected, the number of brood cells reared, and life expectancy. Worker brood area was highly correlated with pollen stores area (EL – Sarrag (1993). He added that worker brood areas were lowest in October and highest in March and April. The monthly pollen stored rate was 26.7% higher in northern region than in southern region , and brood areas were also larger in northern region. Highly positive correlation between collected pollen and

the daily drone and worker brood rearing rates in both trapped and un trapped colonies (EL – Sherif *et a*l ., (1994) . (Fathy (1997) , observed the correlation between brood activity and stored pollen in winter. The major peak of brood rearing activity and higher rate of stored pollen were in May , while the lowest production of brood and gathered pollen occurred during February. El-Basiony; *et al* (2002). Observed four peaks for: broad rearing area, number of brood cells, pollen grain area, number of pollen grain cells, and number of comb covered with adult worker bees and the number of sealed honey per colony. These peaks were recorded on 6 March, 14 April, 10 May and 18 June. The aim of the present work is to throw light on the effect of pollen trap on amounts of brood rearing and stored pollen in honey bee colonies.

MATERIALS AND METHODS

The experiments were carried out at apiary of Faculty of Agriculture, EL-Mansoura, university for one year , began in September 2005 and ended in August 2006.

For studying pollen gathering activity and its relation to brood rearing, amounts of stored pollen and identification of pollen types in experimental region a whole year, ten colonies of honey bee (*Apis mellifra* L.) F_1 Carniolan hybrid were chosen, each headed by a mated queen of similar age. These colonies were divided in two groups, five colonies with pollen traps (trapped colonies) and five colonies without pollen traps (Non trapped colonies). The experiments were carried out in both groups .

1. Construction of pollen trap:

The pollen trap is a wooden box**,** it has a slope roof and two vertical metal strips each 32 cm. in width and 10,5 cm. in length. Each strip has hole of about 0.3 cm. in diameter. A slide wooden box (collection tray) 34 cm. in width, 27 cm. in length fixed under the fine wire screen to collect pellets which fall from the worker legs when try to pass threw the trap to hive.

2. Estimation of brood rearing:

To estimating the rate of worker brood activity during a whole year, 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 count were made at intervals of 12 days, this method of counting was according to Al-Tikrity *et al.* (1971).The number of sealed worker brood cells was calculated by multiplying the number of squares by 25, which proved to be the number of worker cells per square inch.

3. Estimation of stored pollen :

The same previous method of brood counting was used at 12 days intervals, to count the number of square inches of pollen grains stored by the field worker.

RESULTS AND DISCUSSION

1 : Brood rearing activity :

The average production of worker brood colony were estimated in colonies with pollen trapped (trapped colonies) and in colonies without traps (non trapped colonies).

Data illustrated in Table 1 recording the monthly and total counts of sealed worker brood square inches for the trapped and non trapped colonies. The results also shown graphically in (Figure 1 and 2)

In general, the data showed that brood rearing level in both colony groups fluctuated slightly from one month to another within the season, but differed greatly between season .

The results in Table 1 and Figure 1 revealed that the major peak of sealed worker brood occurred during June in trapped and non trapped colonies 1025 and 1292 sq .in , respectively .

Table (1): Monthly and seasonally average of workers sealed brood (sq. in/colony) in trapped and non trapped colonies during 2005-2006.

Months	Trapped colonies	Non-trapped colonies
Sep005	244	450
Oct	114	193
Nov	99	92
Autumn	457(12.36%)	735 (11.93%)
Dec	126	295
Jan2006	38	246
Feb	24	382
Winter	188 (5.08%)	923 (14.98%)
Mar	72	308
Apr	442	567
May	787	930
Spring	1301(35.2%)	1805(29.3%)
Jun	1025	1292
Jul	301	540
Aug006	425	866
Summer	1751 (47.36%)	2698 (43.79%)
TOTAL	3697	6161

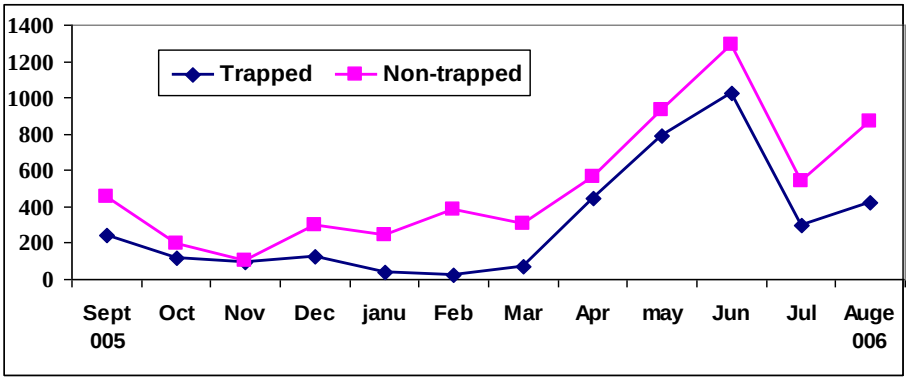

Figure (1): Monthly average of sealed worker brood (sq .in) in trapped and non trapped colonies during 2005/2006 at Mansoura distict.

Data presented in Table 1 showed that brood rearing in non – trapped colonies was more active than in trapped colonies throughout different seasons.

In summer, the colonies reared largest sealed brood area 2698 sq . in / non trapped colony and 1751 sq . in / trapped colony.

The worker brood was the least in autumn 457 sq . in / trapped colonies and 735 sq .in / non – trapped colony.

It could be mentioned that the highest average of worker brood in trapped and non trapped colonies were observed in summer , while the lowest average were in autumn .

Analysis of variance in Table (2) showed that there is significant difference between amounts of worker brood during spring and summer seasons in trapped and non trapped colonies, while it was not in autumn and winter season in trapped and non trapped colonies .

Areas of worker brood differed significantly and were high in summer and spring season according density of bees in trapped and non trapped colonies .

Theses fluctuation in brood activities during months of experiment may be attributed to colonies condition with or without pollen trapped , queen activity , population size and amounts of stored pollen.

It could be concluded that non trapped colonies were more active in brood rearing than trapped colonies .

Table (2): Analysis of variance of workers sealed brood (sq. in) in trapped and non trapped colonies in different season during 2005/2006 at Mansoura distict.

Season	Trapped colonies	Non trapped colonies
Autumn	C 65.3	C 105.3
Winter	C 23.7	C 115.3
Spring	B 185.9	B 257.8
Summer	A 218.9	A 337.4
F. Test	***	***

Means with the same letter are not significantly different.

2 : Amounts of stored pollen :

Data in Table (3) and Figure (2) showed average monthly and seasonally count of stored pollen per colony in trapped and non trapped colonies.A decrease in stored pollen was observed during October(20 sq. in) in trapped colony while it was(58 sq . in) in November for non – trapped colony.

The highest rate of gathering pollen was observed during June in trapped and non trapped colonies , recorded (582 sq .in) trapped) and (720 sq .in) non trapped colony) , Also in May , large amounts of stored pollen were recorded (505 and 401 sq .in) in trapped and non trapped colony , respectively.

The highest rate of stored pollen was observed during spring and summer seasons, represented (670 sq .in and (827 sq .in)in trapped colonies, while it was (768 sq .in) and (1135 sq .in) in non trapped colonies , respectively .

These percentage were due to the suitability of ecological condition for plant flowering and the highest population of foraging bees that could gather

pollen from the blooming plants in these periods such as clover, citrus , some ornamental plants and some vegetables .The differences of collected pollen during autumn season was estimated (8%) and (15%) in trapped and non trapped colony , respectively ; most of these pollen grains were collected in September and this agree with the finding of *EL-Dakhakhni* (1980) . The lowest amount of the lack in pollen sources and decreased of temperature degree, which greatly affect foraging activity of bees.

Table (3): Monthly and seasonally average of stored pollen (sq. in/colony) in trapped and non trapped colonies during 2005/2006 at Mansoura distict .

Months	Trapped colonies	Non-trapped colonies
Sep005	97	264
Oct	20	106
Nov	32	58
Autumn	149 (8 %)	428 (15 %)
Dec	92	187
Jaun006	58	110
Feb	53	222
Winter	203 (11 %)	519 (18 %)
Mar	50	129
Apr	115	238
May	505	401
Spring	670 (36 %)	768 (27 %)
Jun	582	720
Jul	130	91
Aug006	115	324
Summer	827 (45 %)	1135 (40 %)
TOTAL	1849	2850

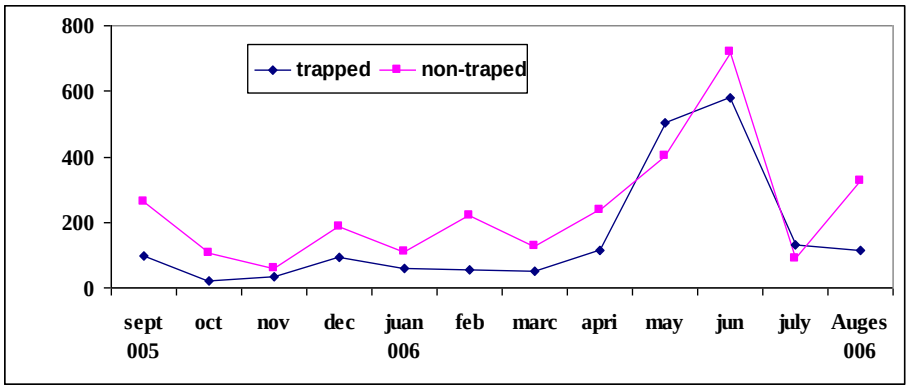

Figure (2): Monthly average of stored pollen (sq .in) in trapped and non trapped colonies under different temperature and relative humidity.

Analysis of variance as in Table (4) showed that there is significant differences between amounts of stored pollen during spring and summer seasons in trapped and non trapped colonies . while , it was in significant differences between trapped and non trapped colonies in autumn and winter .

Areas of stored pollen differed significantly and were high in summer and spring according to population size.

The fluctuation in stored pollen activities during months of experiment year may be attributed to present or absent of pollen traps, availability of pollen sources, colony strength and hereditary behaviour suitability of environmental condition .

It could be concluded that non trapped colonies were more active in collected pollen than trapped colonies.

Table (4): Analysis of variance of stored pollen (sq. in) in trapped and non trapped colonies in different season during 2005/2006 at Mansoura distict.

Season	Trapped colonies	Non trapped colonies
Autumn	C 21.3	C 60.9
Winter	C 25.5	C 64.9
Spring	B 95.6	B 109.7
Summer	A 103.3	A 154.7
F. test	***	***

3:Relation between brood activity and stored pollen.

The estimation the amounts of worker brood from was started September 2005 to August 2006 (sq .in = 25 worker cells).

Data in Table (5) and figures (3, 4) show an obvious relationship between brood rearing activity and the amounts of stored pollen in trapped and non trapped colonies.

Large amounts of stored pollen and brood were found in May and June. Amounts of stored pollen in non trapped colonies reached to 401 sq .in and 720 sq .in with brood 930sq .in and 1292 sq .in , respectively .

While for trapped colonies they were 505 sq .in and 582 sq .in of stored pollen with broods 787 sq. in and 1025, respectively ,this occurred through activity months during spring and summer season.

Less amounts of stored pollen and brood were noticed in November and December.

Table (5): Monthly average amounts of sealed worker brood and stored pollen (sq .in) in trapped colonies and non trapped colonies during whole year.

Months	Trapped colonies		Non trapped colonies	
	Brood (sq. in)	Stored pollen(sq.in)	Brood (sq. in)	Stored pollen(sq.in)
Sept05	244	97	450	264
Oct	114	20	193	106
Nov	99	32	92	58
Dec	126	126	295	187
Jaun06	38	38	246	110
Feb	24	24	382	222
Mar	72	50	308	129
April	442	115	567	238
May	787	505	930	401
June	1025	582	1292	720
July	301	130	540	91
August	425	115	866	324
total	3697	1849	6161	2850

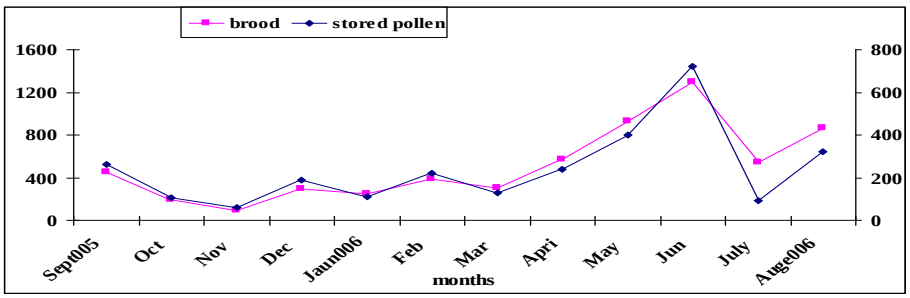

Figure (3) Relation between sealed worker brood and amounts of stored pollen in trapped colonies under different temperature (c°) and relative humidity (R.H) in a whole year.

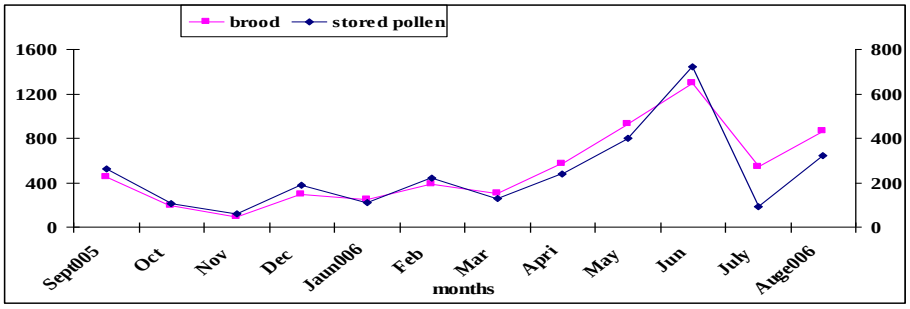

Figure (4) Relation between sealed worker brood and amounts of stored pollen in non trapped colonies under different temperature (c°) and relative humidity(R.H) in a whole year .

In non trapped colonies amounts of stored pollen reached to 58 sq .in and 187 sq. in with brood 92 sq. in and 295 sq . in, respectively ; while for trapped colonies they were 32 sq. in and 92 of stored pollen with broods 99 sq . in and 126 sq. in, respectively. this occurred through dearth months during Autumn and winter season .

Highest rate of stored pollen and brood rearing were recorded in spring and summer season. In non trapped colonies they reached to 768 sq .in and 1135 sq .in of stored pollen with brood 1805 sq .in and 2698 sq .in , respectively ; while for trapped colonies 670 sq .in and 827 sq .in of stored pollen with brood 1301 sq .in and 1751 sq .in were recorded , respectively in Table (6).

Lowest rate of stored pollen and brood were observed in autumn and winter. In non trapped colonies reached to 428 sq .in and 519 sq .in, respectively, while, for trapped colonies they were 149 sq .in and 203 sq .in of stored pollen with brood 457 sq. in and 188 sq .in, respectively.

The obtained results were agreements with (EL-Dakhakhni , 1986 and Abd El Fattah, 1983).

It can be stated that high level of stored pollen and the high activity of producing brood occurred in spring and summer.

This may be attributed to the facts that in spring ,honey bees start the activity with a worm temperature and beginning of blooming flowers . Honey

bees increase their population due to increase sources of pollen .

In summer , prevailing high temperature help the bees for collecting pollen and flowers abundance , while it is difficult to gather it in cold weather, therefore , the amounts of stored pollen were more in summer than in spring Table (3).

In winter, amounts of stored pollen in trapped and non trapped colonies were less than spring and summer, but more than autumn .

Also sealed brood production of non trapped colonies was 6161 sq in whole year with amount of stored pollen 2850 sq .in .

The same trend was observed in trapped colonies 3697 sq .in of brood and 1849 sq .in of stored pollen.

It can be concluded that non trapped colonies collect more pollen and rear more brood than trapped colonies . The amounts of pollen and the rear of sealed brood can arranged in a descending order from summer , spring , autumn and the winter .

Brood rearing cycles of the workers of honey bee colony in all colonies regardless colony with or without pollen trap seemed to be greatly correlated to the average daily temperature and relative humidity prevailing in apiary region .The common feature of brood rearing activity indicated low brood product during the winter as the average daily temperature was low and focal sources were rare , then the situation changed and the bee activity increased quite suddenly and gradual increase in activity of brood rearing occurred till reaching its highest peak in summer this was associated with the rise in average daily temperature and available sources of nectar and pollen .

After this activity ,rearing of brood started to decline with the decrease in temperature and less available nectar and pollen sources

However fluctuation in brood rearing was observed within one year, the fluctuation might be due to many complicated factors weather external or internal.

These results indicated that non trapped and trapped colonies were differed significantly in producing worker through out the year.

Table (6):Seasonal amounts of sealed work brood and stored pollen (sq. in) in trapped and non trapped colonies during a whole year.

Season	Trapped colonies				Non trapped colonies			
	Brood	%	Stored pollen	%	Brood	%	Stored pollen	%
Autumn	457	12.36	149	8	735	11.93	428	15
winter	188	5.08	203	11	923	14.98	519	18
Spring	1301	35.2	670	36	1805	29.3	768	27
Summer	1751	47.36	827	45	2698	43.79	1135	40
Total	3697		1849		6161		2850	

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تاثير استخدام مصائد حبوب اللقاح على كميات الحضنة وحبوب اللقاح المخزونة في طوائف نحل العسل.

أحمد محمود ابوالنجا ، حسن محمد فتحي، هالة كامل الصيرفي و دينا مندوه.

قسم الحشرات الاقتصادية –كلية الزراعة -جامعة المنصورة

يهدف البحث الى دراسة العلاقة بين كميات الحضنة وحبوب اللقاح المخزونة في الطوائف ذات مصائد حبوب اللقاح والطوائف بدون مصائد حبوب اللقاح **واظهرت النتائج ما يلي :**

1 ان أعلى كمية من الحضنة كانت في شهر يونيو في كلا من الطوائف ذات المصائد وبدون مصائدحيث بلغت 1025,1292بوصة مربعة لكل خلية على التوالي و أعلى متوسط لكميات الحضنة فى الطوائف ذات المصائد وبدون مصائد لوحظت في موسم الصيف بينما اقل متوسط كان في موسم الخريف

2 وجدت أن مساحات الحضنة تختلف معنويا وتزيد في موسم الصيف والربيع تبعا لكثافة النحل في كل من الطوائف ذات المصائد وبدون مصائد .

3 لوحظت أعلى معدلات لحبوب اللقاح المخزونة خلال موسم الربيع والصيف حيث بلغت 670، 826جرام /طائفة في الطائف ذات المصائد ,بينما بلغت 768، 1135جرام /طائفة فى الطوائف بدون مصائد علي التوالي

4 أعلى معدلات من مساحة الحضنة ،وحبوب اللقاح المخزونة لوحظت خلال موسم الربيع والصيف بينما أقل المعدلات كانت لموسمي الخريف والشتاء .