J. Agric. Sci. Mansoura Univ., 31 (3): 1605 - 1615, 2006

STUDIES ON CERTAIN ACTIVITIES OF EGYPTIAN HONEYBEES (*lamarckii cockerel)* IN SIWA OASIS

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ABSTRACT

Study results indicated that Egyptian honeybee activities fluctuated under Siwa weather conditions. Two peaks of worker and drone brood were recorded. The first and minor one occurred at April. Monthly mean areas measured were (205.13 & 198.12 inch^2/ col.) and (11.78 & 25.17 inch^2/ colony), while the major peak was in June. Sealed brood areas were (240.15 & 213.15 inch^2/ col.) and (80.35 & 75.12 inch^2/ col.) in the two years of the study respectively. A significant positive correlation was found between rearing workers, drones and temperature degrees. The lowest brood rearing was noticed during Aug., Sept., and Oct. In spite of markedly decrease in temperature degree in Nov., brood rearing activities increased due to the available pollen gathered from Eucalyptus. Pollen gathering activity has also two peaks, the first was recorded at Apr., while the second was at June. Mean of stored pollen areas in those peaks were (38.12 & 50.87 inch^2/ col.) and (86.66 & 93.15 inch^2/ col.) in the two years respectively. A positive correlation have found between pollen gathering and brood rearing activities, but relative humidity had a close negative effect. Maximum number of constructed queen cells were (33.16 & 43.16), in June during the two years. The maximum measured areas of stored honey were (211.53 & 230.70 inch^2/ col.) in the end of June during the investigated years respectively. Accordingly Siwa Oasis seems to be more profitable for rearing and propagating *Apis mellifera lamarckii.*

INTRODUCTION

Egyptian honey bees, *Apis mellifera lamarckii*, is likely the oldest race of honey bee cultivated by human in Egypt for a long time (Walter *et al.* 2001). It was reared in a few areas around of Assuit Governorate, about 400 km. of Cairo and still managed in mud pipe hives since the ancient times .

Since the standard honey bee race, *Apis mellifera carnica* and *Apis mellifera ligustica* which successively introduced to Egypt for improving honey bee production, Mazeed (1964),found that *lamarckii* colonies has been districted and largely replaced in commercial beekeeping operation. So the rest native colonies are concentrated mainly at Manfalut district, Assuit Governorate, till now .

On the other hand, many economic characters especially in controlling bee diseases, has been achieved for this Egyptian subspecies, Haggag and Zaky (2000). In addition, *lamarckii* bees genetically is considered as a genetic resource in improving honey bees breeding programmes

Recently, towards the goal of both utilizing and preserving the genetic diversity in the Egyptian honey bees a selective breeding programme involving this subspecies was established by the Beekeeping Research Department in Egypt, Kamel (1991).

Accordingly Siwa Oasis which is located in the western desert of Egypt (850 km from Cairo) was chosen as an isolated area for preserving the

Egyptian race where the colonies established in modern movable wooden hives that specially designed for this purpose. On the other hand, the rotation at Siwa Oasis involves crops and plants which are considered rich sources of nectar and pollen, Haggag (2002) beside its suitable environmental conditions for rearing and propagating honey bee colonies.

The aim of this study is to investigate some environmental factors affecting the relation of honey bee *Apis mellifera lamarckii* activities in this new isolated district.

MATERIALS AND METHODS

Preparing the experimental colonies :

Egyptian honey bee colonies were studied, after being transferred in modern movable frame hives which were designed for this purpose Fig (2&3). Bees were transferred from traditional mud pipe hives to this wooden hives by removing capped brood combs carefully from the front end of these mud hives and tied into special frame of the wooden hives. These brood combs plus additional pollen and honey combs were fixed in the inner front of the wooden hives. Adult worker bees were quickly transferred from pipe hives to the wooden hive using a special tool following a special technique and were quickly provided to the wooden hives. By this way the *lamarckii* bees were established successfully at Siwa Oasis.

Fifteen honey bee colonies of about equal strength headed by open mated pure queens were selected in three apiaries located in three different sites of the Oasis (10-15 Km. away from each other) during (2003/2004 & 2004/2005). The bees in this investigated colonies were allowed to free flight for collecting available nectar and pollen from cultivated crops as well as natural plants existed in this area .

Measurement of *Apis mellifera lamarckii* activities were investigated to evaluate the effect of Siwa environmental conditions on :

a, Worker and drone sealed brood areas.
b, Pollen stored areas.
c, number of constructed queen cells.
d, Honey stored areas.

The sealed of worker and drone brood areas were measured at 2 week intervals using a special frame divided into square inches. The sealed brood area of workers was corrected by multiplying the measured brood areas by 14/12.

Temperature and relative humidity were recorded by meteorological department at Siwa Oasis . The recorded data were statistically analyzed using F- test.

RESULTS AND DISCUSSION

(I) Brood rearing activity:

(a)Sealed worker brood :

Results obtained in Table (1) which illustrated in Fig. (4) indicated that, there were two peaks of worker brood rearing activity.

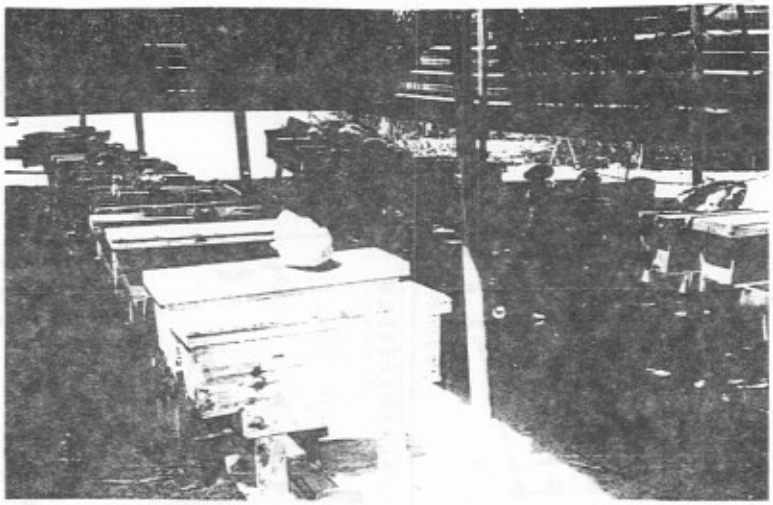

Fig. (1) One of the experimented apiaries in Siwa Oasis

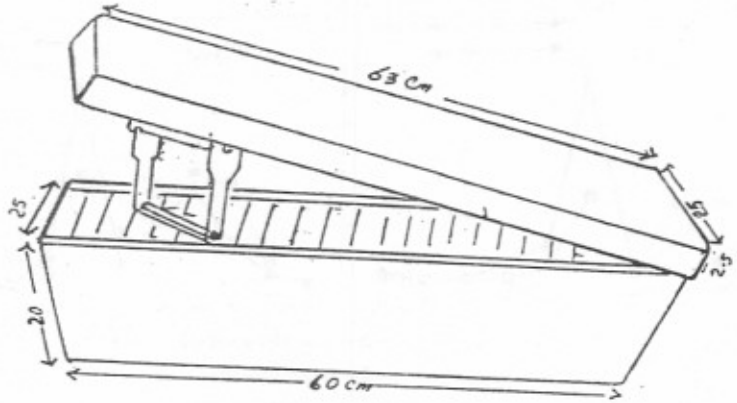

Fig. (2) The new wooden modified hive with the cover lid opened

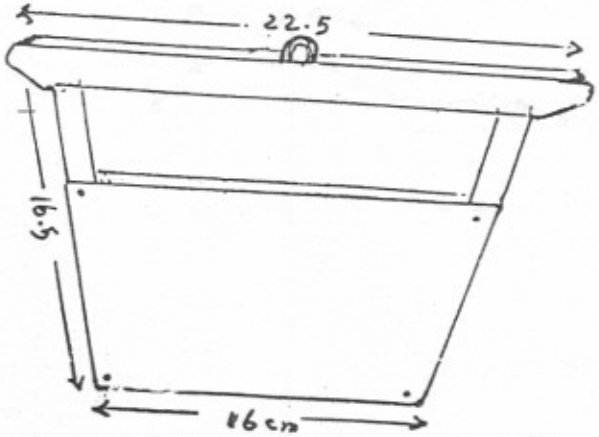

Fig. (3) The feeder of the new modified hive

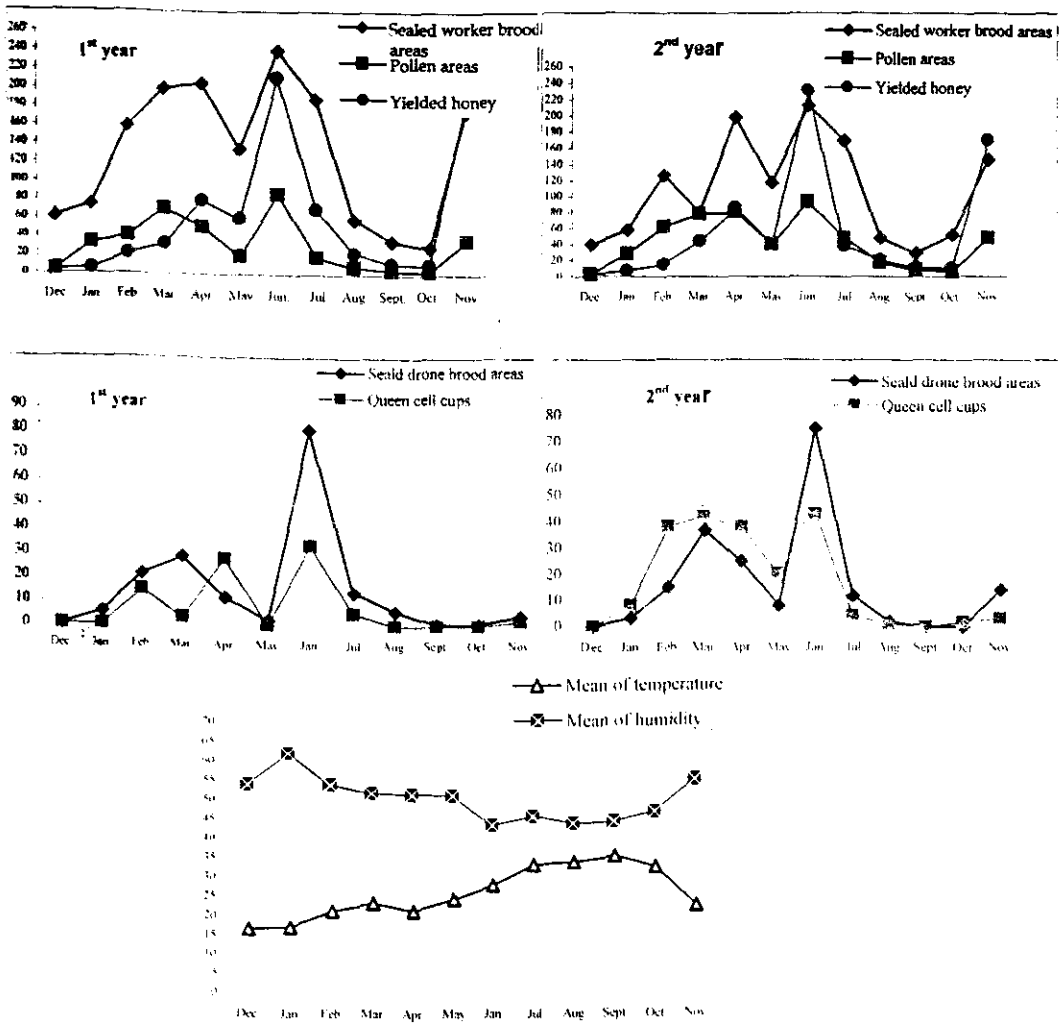

FIG.(4): Monthly Mean Areas Of Different Activities Of Egyption Honey Bee Race And Mean Of Some Weather Factors During The Twwo Successive Years Of Study In Siwa Oasis.

Table (1): Monthly mean areas of different activities of Egyptian honey bee race and mean of some weather factors during (2003/ 2004 & 2004/2005).

Months / Activities	Dec.	Jan.	Feb.	Mar.	Apr,	May	Jun.	Jul	Aug.	Sept.	Oct.	Nov.
Sealed worker brood areas												
1st year	61.22	74.17	158.65	199.71	205.13	135.19	240.15	189.05	59.91	36.33	29.12	176.15
2nd year	40.11	58.18	127.20	80.14	198.12	117.40	213.15	170.12	48.14	29.18	52.14	146.37
Sealed drone brood areas												
1st year	0.101	5.39	21.24	2856	11.78	2.11	80.35	14.11	6.125	0.88	0.934	4.18
2nd year	0.0	3.17	15.18	37.14	25.17	8.11	75.12	11.70	1.932	0.02	0.0	14.12
Queen cell cups	0.0	0.0	14.45	3.12	27.81	0.0	33.16	5.12	0.0	0.0	0.0	1.85
1st year												
2nd year	0.0	8.11	38.17	42.13	38.12	20.52	43.16	4.11	0.620	0.0	1.8	3.12
Pollen areas												
1st year	3.87	32.67	40.31	70.13	50.67	19.17	86.66	18.41	8.14	4.10	3.13	36.17
2nd year	3.17	28.15	62.11	78.13	80.11	40.11	93.15	48.11	17.25	8.11	6.12	48.17
Yielded areas honey												
1st year	3.70	5.17	21.15	32.15	79.12	60.14	211.53	70.14	23.05	11.21	10.12	185.23
2nd year	2.85	7.12	15.33	44.18	85.13	40.11	230.70	38.17	20.11	11.42	10.15	170.12
Mean of temperature	16.75	17.25	21.5	23.5	21.5	24.5	28.0	33.25	33.75	35.25	32.5	22.5
Mean of humidity	54 %	62 %	54 %	52 %	51.5 %	51.25 %	43.5 %	45.75%	43.75 %	44.25 %	46.75 %	55.0 %

F. value

1st year= 0.955

2nd year= 1.066

The 1st peak was recorded at the end of April in the two years of the study as a result of available pollen grains gathered from numerous of Date palm trees *Phoneix dactylifera* L. (about 2.0 million and half trees), broad beans, *Vicia faba* L., Citrus sp. Trees, and a lot of wild plants. This abundance of pollen from these sources during Feb. and Mar., play a great role for building *lamarckii* colonies to be more active during Alfalfa blooming period, at Jun. Monthly means of worker brood areas during this period were 205.13 & 198.25 inch^2/ colony in the 1st and 2nd years, respectivily. The second and major peak was recorded at the end of Jun. due to the available pollen collected from Alfalfa crop *Medicago saitiva* L., (which considered the main cultivated crop in this isolated area) and some ornamental plants, as well as vegetable plants. A positive correlation were detected between some weather factors (maximum and minimum air temperature and maximum and minimum RH.%) and sealed worker brood areas during the two successive years of investigation. This results confirm those of El- Dakhakhny (1980) who stated that there was a positive correlation between pollen gathering and brood rearing activity. Maximum monthly mean of sealed worker brood areas in this period were 240.15 & 213.15 inch^2/ col. in the two years (2003/2004/ & 2004/2005), respectively.

Table (2): Mean temperature degree and relative humidity recorded during the two years of the study (2003/2004& 2004/ 2005)

Months	Temperature degree			Relative humidity		
	Max.	Min.	Mean	Max. %	Min. %	Mean %
Jan. 1st year	28.0	7.0	17.5	81.0	45.0	63.0
2nd year	25.0	9.0	17.0	79.0	43.0	61.0
Feb. 1st year	33.0	11.0	22.5	72.0	36.0	54.0
2nd year	31.0	10.0	20.5	70.0	38.0	54.0
Mar. 1st year	33.0	16.0	24.5	72.0	32.0	52.0
2nd year	30.0	15.0	22.5	75.0	30.0	52.5
Apr. 1st year	26.0	15.0	20.5	69.0	34.0	51.5
2nd year	27.0	18.0	22.5	70.0	33.0	51.5
May.1st year	32.0	20.0	26.0	75.0	28.0	51.5
2nd year	28.0	19.0	23.0	72.0	30.0	51.0
Jun. 1st year	34.0	20.0	27.0	65.0	22.0	43.5
2nd year	38.0	21.0	29.0	67.0	20.0	43.5
Jul. 1st year	42.0	24.0	33.0	70.0	20.0	45.0
2nd year	44.0	23.0	33.5	72.0	21.0	46.5
Aug.1st year	44.0	25.0	33.0	69.0	20.0	44.5
2nd year	44.0	26.0	34.5	65.0	21.0	43.0
Sept.1st year	43.0	27.0	35.5	68.0	20.0	44.0
2nd year	42.0	28.0	35.0	67.0	22.0	44.5
Oct.1st year	38.0	26.0	32.0	71.0	19.0	45.0
2nd year	41.0	25.0	33.0	73.0	24.0	48.5
Nov.1st year	28.0	18.0	23.0	75.0	35.0	55.0
2nd year	29.0	15.0	22.0	76.0	34.0	55.0
Dec.1st year	25.0	7.0	16.0	83.0	33.0	48.0
2nd year	26.0	9.0	17.5	85.0	35.0	60.0

On the other hand, decreasing in brood rearing activity was recorded during the summer and early autumn months (Aug., Sept. and Oct.) which considered as a dearth season in pollen sources as well as maximum temperature (42.0 & 43 °C) in the first and the second year of the study. The mean of worker sealed brood areas were 59.91, 36.33, 29.18, and 48.14, 29.18 and 52.14 inch^2/ col.) in this period of the two years (2003/2004/ & 2004/2005), respectively.

Concerning *Apis mellifera lamarckii* activity under Assuit Conditions, which considered the main area of rearing this Egyptian honey bees, Fathalla (2004) mentioned that the mean areas of *lamarckii* sealed brood was (104,6 inch^2/ col.) during July. Adly (2000) stated that brood rearing activity of honey bees fluctuated between races and hybrids, increasing in spring and least brood areas was noticed in September (Autumn season). Birgit *et al.* (1999) mentioned that during bad weather, a decline in the pollen stores might alter the brood feeding by nurse bees and this can result in underfeed larvae, which may be sealed at a lighter weight. Fathallah (2004) also stated that a significant correlation was detected between some weather factors and area of sealed brood in the case of Egyptian race. Brandeburgo (1990), also stated that temperature and humidity increase colony activity since they were positively correlated with number of foragers, number of guard bees, brood and colony temperature. . Accordingly Siwa Oasis showed more pronounced of *lamarckii* brood rearing activity.

(b) Drone brood rearing :

Results obtained in this study indicated that the maximum mean of drone brood rearing areas were (80.35 & 75.12 inch^2/ col.), during June of the two years of study, while the lowest areas were (0.10 & 0.88 inch^2/ col.), during Sept. & Dec. in the first year and at Sept., Oct. & Dec.during the second year. Drone brood rearing can hardly be observed during dearth seasons. Reactivation of rearing drones was noticed during the month of November due to the available pollen from eucalyptus. Drone brood was noticed to start slowly by the beginning of Feb., and increased gradually till it reached it's climax during June Table (1) and Fig (4). The present data revealed that there were significant and positive correlation between worker brood, drone brood areas and the amount of stored pollen grains. So it could be concluded that the presence or absence of drones in honey bee colonies may be an indicator of food sufficiency in those colonies. These results are in agreement with those obtained by (Shoreit *et al.* 2002). They found that maximum drone rearing was observed in Assuit during March. Also, results obtained in this study go in line with that obtained by Fathallah (2004) who reported that maximum percentage of monthly drones sealed brood for Egyptian honey bees reared in Assuit which considered the main area for rearing *lamarckii* bees was noticed in March.

(c) Queen cell cups construction :

Data presented in Table (1) and illustrated in Fig (4) indicated that there were two peaks of constructed queen cells. The major peak was in the middle of June, while the minor one was at the end of March during the two successive years.

Maximum percentage of monthly unsealed queen cells numbers were recorded in April and June (27.81 ، 33.16) in 2003 and (38.12 ، 43.16) in 2004. The lowest number was recorded during winter season (Des. & Jan.) in the two years of the study. Results obtained also revealed a few queen rearing during the 1st of November in the two years of the study, due to the available of pollen grains from Eucalyptus plants. The average of constructed queen cells number were (1.85 ، 3.12) in 2003 and 2004 years, respectively. It was noticed that this activity of building queen cells were affected with other factor such as colony strength, the queen state and pollen stored areas, and weather conditions. Therefore building queen cells may be considered an indicator for queen rearing activity of honey bees. On the other hand, non constructed queen cells were observed during months from Aug. to Oct. and from Dec. to Jan. in the first year 2003 and from Sept. to Dec. in the second year 2004. Statistical analysis showed a highly positive correlation between brood rearing activity and the number of constructed queen cells. This mean that there was a close relationship between each of the two variable. This result confirm those obtained by Robinson *et al.* (1994), who stated that queen rearing activity may be due to the genotype and environment interactions. Shoreit *et al.* (2002) mention that maximum numbers of queen cells cups were noticed in Assuit region during Feb.- April period. Fathalla, (2004) stated that the total number of unsealed queen cells was 138.0 / colony. in case of Egyptian bees under Assuit province. Accordingly beekeepers must take care of their colonies in Siwa Oasis during March and June to protect them from the fatal effect of swarming.

(2) Pollen gathering activity:

The present results indicated that the collected pollen during the two years of study were fluctuated according to the blooming periods of different plants. Fig. (4) showed a remarkably higher quantity of stored pollen from March till June during the two successive years. This may be related to the abundance of pollen grain Sources. Haggag (2002) mentioned that the agricultural rotation at Siwa Oasis involves crops and plants which are considered rich sources of food for *Apis mellifera lamarckii*, and the existence of pollen sources is the main factor affecting the pollen yield collected by colonies . He added that there are about thirty five different plants of nectar and pollen sources at Siwa Oasis . Also Hussein *et al.* (1982) stated that an abundance of Alfalfa florets encourage *lamarekii* bees to collect considerable amount of pollen grains. Maximum mean pollen areas measured was 50.67 & 80.11 and 86.66 & 93.15 inch^2 / col., during April and Jun. in the two successive years of the study (2003/2004/ & 2004/2005). Highly significant correlation was noticed between some weather factors and the amount of stored pollen. There was a positive correlation between temperature and stored pollen grains. These results was in agreement with Adly (2000) who stated that a significant and positive correlation was found between pollen storing activity and both minimum and maximum temperature .In contrast, results obtained in Table (1) revealed that there was a close negative effect of the relative humidity and pollen gathering activity by honey bees.

The present results go in line with Fathalla, (2004) who mentioned that there was a significant correlation between weather factors and stored pollen areas for Egyptian honey bees under Assuite circumstances. Ibrahim, and Selim (1987) stated that fluctuation in temperature had a slight effect on pollen gathering activity but relative humidity had a negative effect on pollen grains collecting by honey bee colonies.

(3) Nectar gathering activity:

Data presented in Table (1) and illustrated in Fig. (4) indicated that there were significant differences between the mean areas of stored honey gathered by *lamarckii* bees under Siwa weather conditions. It was also, observed that the main honey yielded at Siwa Oasis was obtained during June month from Alfalfa flowers.The highest stored honey areas were (211.53 and 230.70 inch^2 / col.) during June of the 1st and 2nd years, respectively. The lowest measured areas of stored honey was (3.70 and 2.85 inch^2 / col.) during Dec. of the 1st and the 2nd years, respectively. Significant correlation was detected between some weather factors and stored honey. This result confirmed those obtained by Shimanuki *et al.* (1994) who mentioned that honey production is the accumulation of multi factors including, climate, soil, moisture, diseases, etc.

Regardless, honey crop plants it was noticed that Alfalfa crop is the main honey crop, while aromatic, medicinal and wild plants play a secondary role as nectar sources resulting in improving the quality of Siwa honey.

From presented results it could be concluded that the annual activities of *lamarckii* bees can be divided into four stages as follows:

1. The building up stage which included the months of Feb., March and the first half of April.
2. The foodstorage inclusive Alfalfa flowering which started from the end of May till July.
3. The dearth season which included August till October month during which brood rearing was ceases.
4. The winter period exists through Dec. and Jan. where no activities were observed due to the scarce of food sources and unsuitable weather conditions.

The outcome of this study clearly indicated that rearing *Apis mellifera lamarckii* in newly movable wooden hive instead of mud pipe hive was the best process to help beekeepers to inspect their colonies during active seasons, prevent swarming, encourage bees to build fresh wax combs, transfer bees from place to another, easy to treat bee diseases, to be able to extract honey out of the frames or marketing honey in bulk comb honey for high prices to increase the income of the Beekeepers. Also it could help beekeepers to move their colonies for pollinating purposes.

Eventually, Siwa Oasis seems to be more profitable isolated area for rearing and propagating the Egyptian honeybees *Apis mellifera lamarckii cockerell* due to its agricultural rotation and the suitable climatic conditions.

Acknowledgment

The authors offer their deep thanks to Prof. Dr. Ahmed EL-Badawy, Research Leader of Beekeeping Dept., Ministry of Agriculture and Former, (FAO expert), for his valuable advice, encouragement, and unlimited help during this work.

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دراسات على بعض أنشطة النحل المصري في واحة سيوة

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تم دراسة نشاط النحل المصري في تربية حضنة الشغالات والذكور وبناء بيوت الملكات وجمع حبوب اللقاح وانتاج العسل لاول مرة تحت الظروف البيئية لواحة سيوة وذلك خلال الفترة من عام ٢٠٠٣ حتى ٢٠٠٥ م ويمكن تلخيص النتائج المتحصل عليها كالاتي:-

١- يوجد موسمين لتكاثر النحل المصري تحت الظروف البيئية للواحة وهما شهري ابريل ويونيو من كل عام لتوافر حبوب اللقاح من النخيل(حوالي ٢ مليون نخلة تقريبا) وكذا البرسيم الحجازي تواليا.

٢- بلغ متوسط مساحة الحضنة للشغالات والذكور التي تم قياسها (٢٠٥,١٣ & ١٩٨,١٢ ، ١١,٧٨ & ٢٥,١٧ بوصة مربعة/ طائفة) لكل من الشغالات والذكور خلال شهري ابريل ويونيو من كل عام تواليا. كما نلاحظ وجود ارتباط موجب بين نشاط تربية الحضنة ودرجة الحرارة. بينما كان اقل متوسط لتربية حضنة الشغالات والذكور خلال اغسطس وسبتمبر واكتوبر لندرة حبوب اللقاح.

٣- متوسط مساحة حبوب اللقاح المخزنة التي سجلت[(٣٨,١٢ & ٥٠,٨٧) ، (٨٦,٦٦ & ٩٣,١٥) بوصة مربعة/ طائفة] خلال ابريل ويونيو من عامي التجربة. وتوجد علاقة موجبة بين كمية حبوب اللقاح المخزنة ونشاط النحل في تربية الحضنة.

٤- متوسط اعداد بيوت الملكات المبنية(٣٣,١٦ & ٤٣,١٦) خلال شهر يونيو من كل عام.

٥- بلغ متوسط مساحة العسل المخزن (٢١١,٥٣ ، ٢٣٠,٧٠ بوصة مربعة / طائفة) خلال شهر يونيو وهي فترة تزهير البرسيم الحجازي الذي يعتبر المحصول الرئيسي في الواحة.

٦- استخدام الخلية الخشبية الخاصة بالنحل المصري ساهم في زيادة نشاط النحل في تربية الحضنة وجمع حبوب اللقاح وتسهيل عمليات الفحص ومقاومة التطريد وزيادة إنتاجية العسل.