

## SIWA OASIS AS A NEW ISOLATED REGION FOR PRESERVING AND PROPAGATING THE EGYPTIAN HONEYBEE RACE, *Apis mellifera lamarckii* COCKERELL

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### ABSTRACT

Different activities of *Apis mellifera lamarckii* were studied under Siwa Oasis climatic conditions. Results obtained indicated main peak of worker brood activity this main peak was recorded at the onset of May (140 inch<sup>2</sup>/colony) in 1<sup>st</sup>-year .while in the 2<sup>nd</sup>. year the main peak was recorded at the onset of April (135.9 inch<sup>2</sup>/colony). The brood drone has main peak (15.66 and 21.1 inch<sup>2</sup>/colony) in March over the two years of study. The mean pollen stored areas measured was 18.3 inch<sup>2</sup>/colony in Jun of 1<sup>st</sup>. year and 12.3 inch<sup>2</sup>/colony in November of the 2<sup>nd</sup>-ones . Maximum numbers of queen cells were recorded during February. and March (34.5 & 38.5 cells/col., respectively) in the 1<sup>st</sup>. year and they were (29 & 27.85 cells/col, respectively) in 2<sup>nd</sup>-ones. The maximum area measured of stored honey was (119.8 inch<sup>2</sup>/colony) during June in the 1<sup>st</sup>. year and in the 2<sup>nd</sup>-ones it was (129 inch<sup>2</sup>/colony) during July. a significant positive correlations was found between stored pollen and the rate of rearing worker brood during the two years of study, (0.188 & 0.553). A positive correlation between air temperature and the amount of stored pollen were, also, found during the two years, (0.414 & 0.013). The obtained results revealed that the Siwa Oasis was profitable for rearing and propagating *Apis mellifera lamarckii*.

### INTRODUCTION

The Egyptian honeybee *Apis mellifera var. lamarckii* Cockerell (Smith, 1961) formerly known as *Apis mellifera var. fasciata* latr. is the recognized, descendant of the pharaonic bee kept by the Ancient Egyptians about 4000 years B.C. It is the oldest honeybee known to be kept and reared by mankind.

Since the standard honey bee race, *Apis mellifera carnica* and *Apis mellifera ligustica* which successively introduced to Egypt for improving honeybee 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 that concerned in controlling bee diseases, has been achieved for this Egyptian subspecies, Haggag and Amany (2000). in addition, *lamarckii* bees is genetically considered as a genetic resource in improving honeybee breeding programmes. Recently, towards the goal of both utilizing and preserving the genetic diversity in the Egyptian honeybee a selective breeding programme involving this subspecies was concerned as described by 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, beside its suitable environmental conditions for rearing and propagating honey bee colonies Haggag (2002).

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

## **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, Haggag (2006). 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 arranged in the anterior area 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.

Twenty honeybee colonies of about equal strength headed by open mated pure queens were located in Siwa Oasis station research during the two successive years (2005 & 2006). The bees in these 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 brood areas (inch<sup>2</sup>).
- b, Pollen stored areas (inch<sup>2</sup>).
- c, number of constructed queen cells.
- d, Honey stored areas (inch<sup>2</sup>).

The worker and drone brood areas were measured at 19 days intervals, El-banby (1954) days using a special frame divided into square inches. Temperature and relative humidity were recorded by meteorological department at Siwa Oasis. The recorded data were statistically analyzed using the correlation coefficients.

## **RESULTS AND DISCUSSION**

### **1) Worker Brood rearing activity:**

Results obtained in Table (1) which illustrated in Fig. (1) appeared that the worker brood rearing activity was continued on year-around during the two successive years of study.

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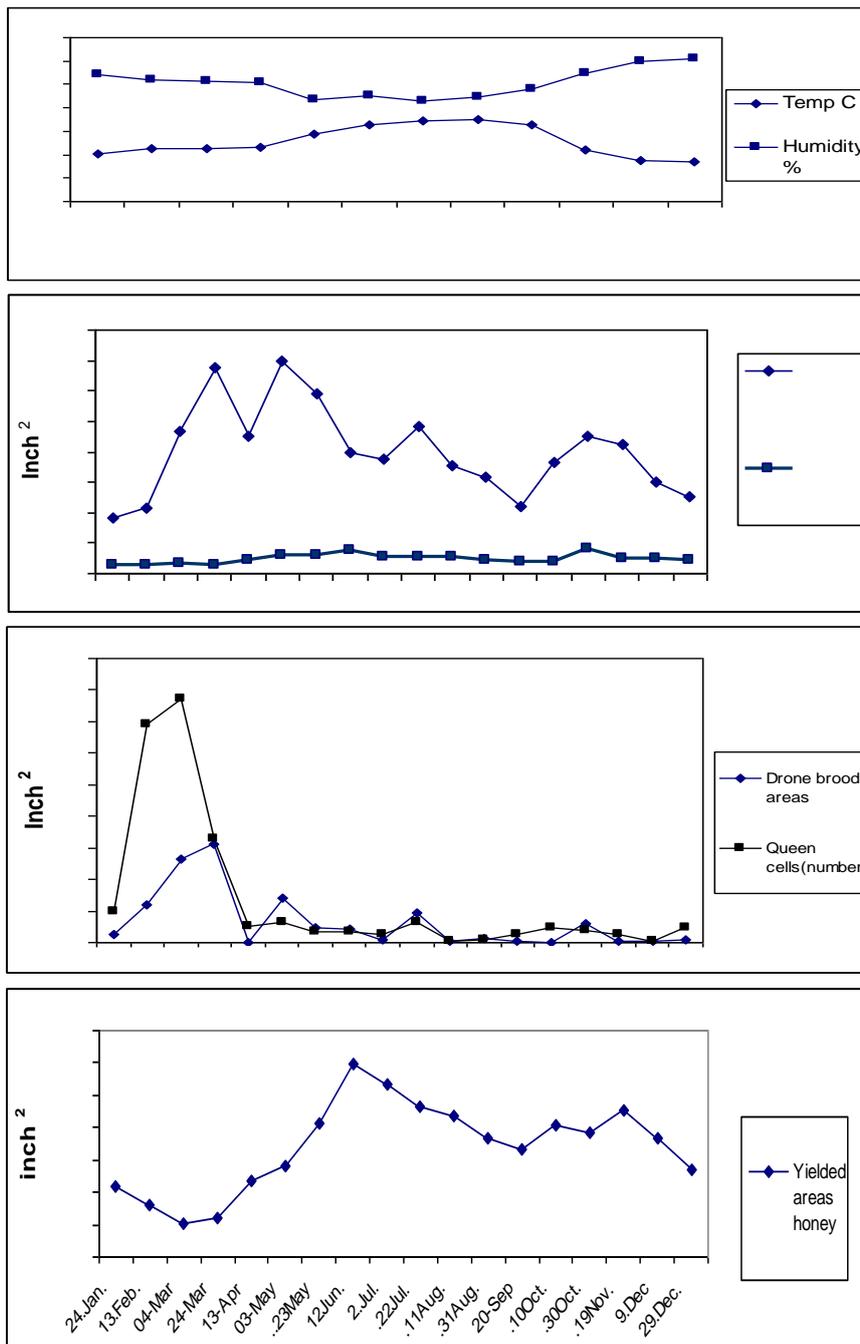


Fig (1): Different activities of Egyptian honey bee race and mean of some weather factors during the 2005 in Siwa Oasis

This activity has a major peak of rearing in the onset of May, (140 inch<sup>2</sup>/col.) of the first year, 2005. After that the worker brood rearing curve was gradually decline until recorded the least brood quantity at September, 20, (44.3 inch<sup>2</sup>/col.). However, this activity return to increase from the beginning of October where recorded the second and minor peak, (40.3 inch<sup>2</sup>/col.) at the end of the same month .In the second year, the first and major worker brood rearing peak was occurred at the beginning of April, (135.9 inch<sup>2</sup>/col.) while the minor peak was recorded during late of October, (98.8 inch<sup>2</sup>/col.). The results confirmed by Fathallah (2004) who mentioned that the mean areas of *lamarckii* sealed brood was (104, 6 inch<sup>2</sup>/ col.) during July.

On the other hand, the amounts of the stored pollen were gradually increased with the progression of active season until reached its maximum quantity at June, 12, (18.3 inch<sup>2</sup>/col.) in the 1<sup>st</sup>. year.

Another peak of storing pollen was appeared at the end of October (16.2 inch<sup>2</sup>/col.) for the first year. During the 2<sup>nd</sup>. Year, less amounts of pollen were stored in the colonies where the major storing peak was done at the middle of November, (12.3 inch<sup>2</sup>/col.) while the minor peak was at March, 19, (10.16 inch<sup>2</sup>/col.).

Therefore, the available amounts of pollen gathered from numerous pollen sources such as Date palm trees *phoenix dactylifera L.*, brood bean *Vicia Faba L.*, citrus *Citrus sinensis*, *Citrus ractulataL.*, *Citrus auratium L.*, and a lot of wild plants during spring of the studied years encouraged honeybee colonies for quickly developing. 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.

Positive correlation was found between stored pollen and the rate of rearing worker brood during the two years as shown in Table (3).There also was a positive correlations between air temperature and the amount of stored pollen for the two successive years, (+ 0.414 & + 0.013, respectively).This findings agreed with those obtained by Adly (2000) who 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.

## **(2) Drone brood rearing**

The activity of honeybee Egyptian race in rearing drone brood was strongly noticed during March of the two years, Table (1 & 2). The main peak of drone brood in the 1<sup>st</sup>. year was recorded in March, 24, (15.66 inch<sup>2</sup>/col.) while it was (21.1 inch<sup>2</sup>/col.) in March, 19, of the 2<sup>nd</sup>.ones. None drone brood was found during April of the 1<sup>st</sup>. year or July and September of the 2<sup>nd</sup>.ones.

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The rearing of drone brood was positively affected by the rate of worker brood rearing in the two studied years, ( $r = + 0.389$  &  $+ 0.531$ ), which, in turn, influenced by the available amounts of pollen required for rearing process. The obtained results were corresponded with those reported for this honeybee race in Assuit Governorate by Shoreit *et al.*, (2002) and Fathallah, (2004). They approved that the maximum rate of monthly sealed drone brood was noticed in March.

### **(3) Queen cells construction**

Data presented in Tables (1 & 2) indicated that the peak of queen cells construction, (which represented swarming season) during the study years was occurred at the end of February and the onset of March.

The numbers of queen cells were 34.5 cells/col. and 38.5 cells/col. in February, 13, and March, 4, of 2005 year. Those numbers in 2006 year were 29.0 cells/col. in February, 27 and 27.8 cells/col. at March, 19, as shown in Fig. (1 & 2). Highly significant positive correlation were found between the reared area of drone brood and the number of queen cells constructed in the two studied years, ( $+ 0.936$  &  $+ 0.719$ , respectively), as appeared in table (3). This result confirmed 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) who mentioned that maximum numbers of queen cell cups were noticed in Assuit region during February, April period. Fathallah, (2004) stated that the total number of unsealed queen cells was 138.0 /colony, in case of Egyptian bees in Assuit province. Accordingly, beekeepers must take care of their colonies in Siwa Oasis during March to protect them from the fatal effect of swarming.

### **(4) Nectar gathering activity**

Data observed in Tables (1 & 2) indicated that the highest amount of stored honey by the Egyptian honeybee race were in June, 12, (119.8 inch<sup>2</sup> /col.). In the 1<sup>st</sup>.year and in July, 17, (129 inch<sup>2</sup> /col.).In the 2<sup>nd</sup>. Ones, Fig. (1 & 2).

On the other hand, there were various honey sources throughout different months of the year. However, the main honey yield at Siwa Oasis was obtained during June and July where the climax of alfalfa flowering was occurred.

Positive correlation was detected between air temperature and the amount of stored honey. This correlation was highly significant in the 2<sup>nd</sup>. year. Where the mean air temperature and relative humidity was more suitable for nectar secretion from plants. It is also revealed that, there was significant negative correlation between the reared area of drone brood and the amount of stored honey during the two years of study, ( $-0.620$  &  $-0.695$ , respectively). This means that the honeybee foraging workers utilizing with the constructed drone combs or cells in storing the incoming nectar instead of building new combs. So, the rate of drone brood rearing declined.

Otherwith, the tendency of colonies to swarming through constructed new queen cells was negatively influenced by the season of nectar gathering. This influence was significant ( $- 0.648$ ) and highly significant ( $- 0.783$ ) in the 1<sup>st</sup>. and 2<sup>nd</sup>. Years, respectively.

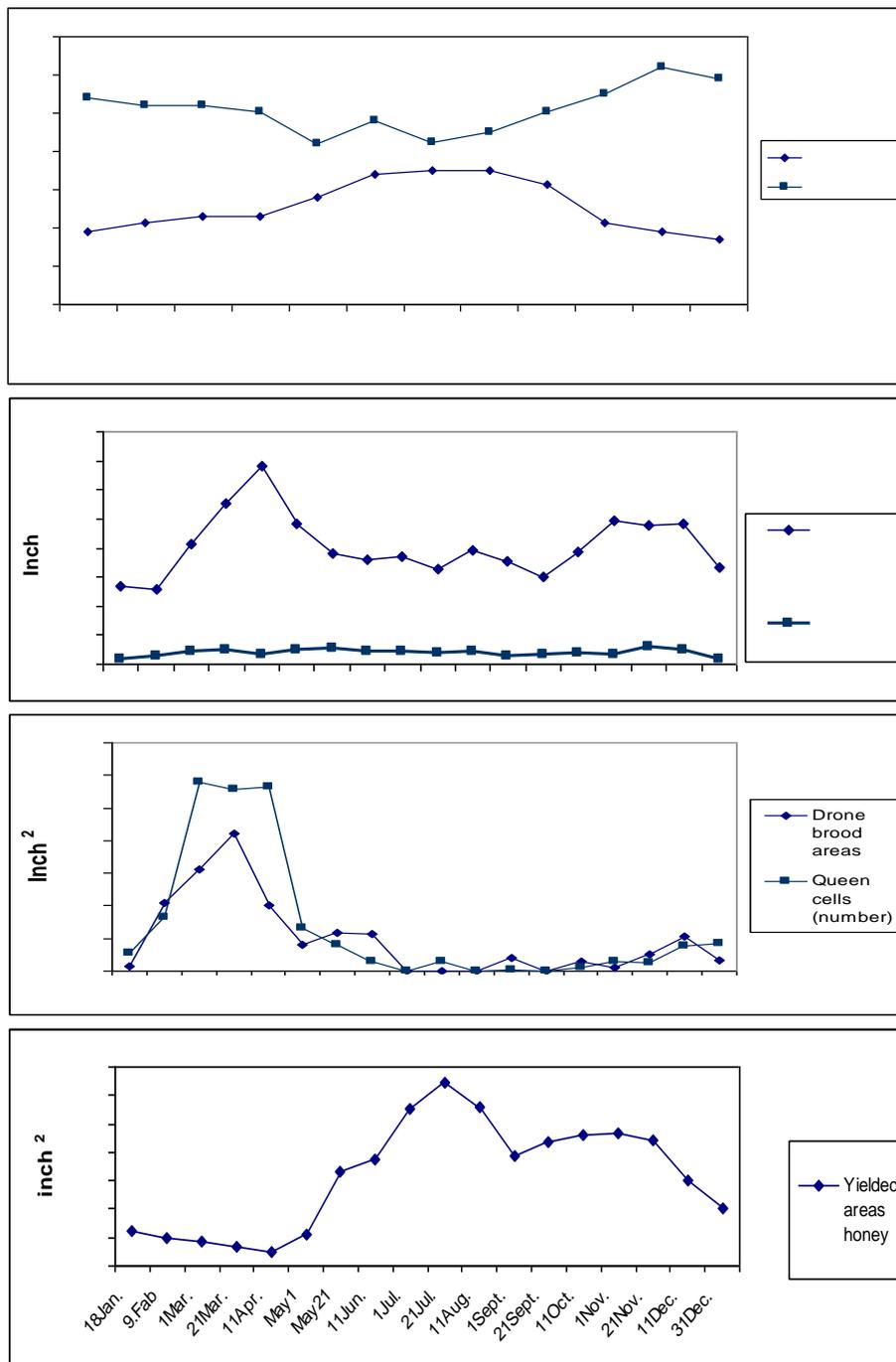


Fig (٢): Different activities of Egyptian honey bee race and mean of some weather factors during 2006 in Siwa Oasis

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.

In conclusion, the outcome of this study clearly indicated that Siwa Oasis was more suitable for rearing and propagating *Apis mellifera lamarckii* because this isolated area has a profatple circumstances to rear *lamarckii* bees, and abundance of nectar plants.

**Table (3): Correlation coefficients between different activities of the Egyptian honeybee colonies under Siwa Oasis conditions during two successive years (2005/2006).**

	Worker brood	Drone brood	Pollen areas	Honey areas	Queen cell.
<b>Temperature</b>					
۲۰۰۵	-۰,۰۵۰	-۰,۲۹۳	۰,۴۱۴	۰,۵۴۷	-۰,۳۴۷
۲۰۰۶	-۰,۲۲۸	-۰,۴۹۲	۰,۰۱۳	۰,۷۸۸**	-۰,۵۲۹
<b>R. Humidity</b>					
۲۰۰۵	-۰,۱۳۹	۰,۱۵۶	۰,۵۰۱	۰,۵۵۷	۰,۲۴۴
۲۰۰۶	۰,۱۳۴	۰,۱۹۰	۰,۲۲۶	۰,۵۶۷	۰,۳۱۴
<b>Worker brood</b>					
۲۰۰۵		۰,۳۸۹	۰,۱۸۸	-۰,۰۸۳	۰,۱۱۰
۲۰۰۶		۰,۵۳۱	۰,۵۰۳	-۰,۳۵۰	۰,۴۴۳
<b>Drone brood</b>					
۲۰۰۵			-۰,۴۰۵	-۰,۶۲.*	۰,۹۳۶**
۲۰۰۶			۰,۳۳۳	-۰,۶۹۵*	۰,۷۱۹**
<b>Pollen areas</b>					
۲۰۰۵				۰,۸۵۳**	-۰,۴۸۰
۲۰۰۶				۰,۱۸۰	۰,۰۴۴
<b>Honey areas</b>					
۲۰۰۵					-۰,۶۴۸*
۲۰۰۶					-۰,۷۸۳**

\* Significant at 5%

\*\* Significant at 1%

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### واحة سيوة كمنطقة منعزلة جديدة لتربية والحفاظ على سلالة نحل العسل المصرى

#### ***Apis mellifera lamarckii* cockerell**

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تم دراسة الأنشطة المختلفة للنحل المصرى المربى فى منطقة واحة سيوة خلال عامى ٢٠٠٥ & ٢٠٠٦. وقد أظهرت النتائج أن هناك فترة يرتفع بها نشاط حضنة الشغالات وكان الارتفاع الأكبر لحضنة الشغالات فى بداية شهر مايو ( ١٤٠ بوصة / طائفة) أثناء السنة الأولى و(١٣٥,٩ بوصة / طائفة) للسنة الثانية على التوالي وأوضحت النتائج أن هناك ارتباط معنوى موجب بين تربية حضنة الشغالات وبين مخزون حبوب اللقاح خلال سنتى الدراسة. وكان متوسط الحد الأقصى لحضنة الذكور ( ١٥,٦٦ و ٢١,١ بوصة / طائفة ) أثناء مارس للسنتين على التوالي. كما وجد أن هناك ارتباط ايجابى بين نشاط تربية حضنة الذكور و معدل تربية حضنة الشغالات. وكان متوسط مساحة حبوب اللقاح فى قمته فى يونيو من السنة الأولى (١٨,٣ بوصة / طائفة). وكان (١٢,٣ بوصة / طائفة) للسنة الثانية. وكان هناك ارتباط موجب بين درجة حرارة الهواء و مخزون حبوب اللقاح فى عامى الدراسة . أما البيوت الملكية فكان العدد الأقصى أثناء فبراير ومارس (٣٤,٥ و ٣٨,٥ بيت ملكى \ للطائفة ) و( ٢٩ و ٢٧,٨٥ بيت ملكى \ للطائفة) فى السنة الأولى و الثانية على الترتيب , وكانت مساحة العسل المخزون (١١٩,٨ بوصة / طائفة) أثناء يونيو فى السنة الأولى و (١٢٩ بوصة / طائفة) فى يوليو من السنة الثانية. ومن هذه الدراسة يمكن استخلاص أن واحة سيوة تعتبرمنطقة منعزلة مناسبة لتربية نحل العسل المصرى للمحافظة على نقاء التركيب الوراثى لهذه السلالة.

**Table (1): Honeybee colonies activities of the Egyptian race under the environmental conditions of Siwa Oasis during 2005 .**

Months Activities	Jan.	Feb.	Mar.		Apr.	May.		Jun.	Jul.		Aug.		Sept.	Oct.		Nov.	Dec.	
	24	13	4	24	13	۳	۲۳	12	2	22	11	31	20	10	30	۱۹	9	29
<b>worker brood areas</b>	36.8	۴۲,۵	۹۳,۳	۱۳۵,۸	90	۱۴۰	۱۱۷,۶	79	۷۵,۵	۹۶,۸	۷۱,۳۳	۶۳,۱۶	44.3	۷۳	۹۰,۳	85	۵۹,۸	۵۰,۰
<b>mean</b>	36.8	۴۲,۵	۱۱۴,۵۵		90	128.8		79	۸۵,۱۵		67.24		44.3	81.65		85	54.9	
<b>Drone brood areas</b>	1.3	۶	۱۳,۱۶	15.66	0.0	۷	۲,۳	2.2	۰,۵	۴,۶	۰,۲	۰,۷	0.2	۰,۰	۳,۰	0.2	۰,۳	۰,۵
<b>Mean</b>	1.3	۶	۱۴,۴۱		0.0	4.65		2.2	2.55		0.45		0.2	1.5		0.2	0.4	
<b>Queen cell</b>	4.8	۳۴,۵	۳۸,۵	16.5	2.5	۳,۳	۱,۷	1.7	۱,۳	۳,۳	۰,۲	۰,۵	1.2	۲,۳	۲,۰	1.2	۰,۳	۲,۳
<b>Mean</b>	4.8	۳۴,۵	۲۷,۵		2.5	2.5		1.7	2.3		0.35		1.2	2.15		1.2	1.3	
<b>Pollen areas</b>	5.2	۵,۳	۶,۵	5.16	8.8	۱۱,۵	۱۴,۸	18.3	۱۱	۱۱,۲	۱۱,۲	۸,۸	7.8	۷,۸	۱۶,۲	9.7	۹,۳	۸,۷
<b>Mean</b>	5.2	۵,۳	۵,۸۳		8.8	13.15		18.3	11.1		10.0		7.8	12		9.7	9.0	
<b>Yielded areas honey</b>	43.66	۳۱,۶	۲۰,۶	23.83	46.7	۵۶	۸۲,۸	119.8	۱۰۷,۲	۹۲,۷	۸۷	۷۳,۳	66.5	۸۱,۵	۷۶,۸	91	۷۳,۲	۵۳,۶۶
<b>mean</b>	43.66	۳۱,۶	۲۲,۲۱		46.7	69.4		۱19.8	99.95		80.15		66.5	79.15		91	63.43	
<b>Mean of temperature C°</b>	17.0	20.5	22.5		22.5	23.0		29.0	33.0		34.0		35.0	33.0		22.0	17.5	
<b>Mean of humidity %</b>	61.0	54.0	52.5		51.5	51.0		43.5	45.0		43.0		44.5	48.5		55.0	60.0	

Months Activities	Jan. ١٨	Feb.		Mar.	Apr.		May.	Jun.		Jul.	Aug.		Sept.	Oct.		Nov.	Dec.	
	١٨	٧	٢٧	١٩	٨	٢٨	١٨	٧	٢٧	١٧	٦	٢٦	١٥	٥	٢٥	١٤	٤	٢٤
<b>worker brood areas</b>	٥٣,٨	٥١,٣	٨٢,٦	١١٠,٨	١٣٥,٩	٩٦,٩	٧٦,٣	٧١,٥	٧٤,١	٦٥	٧٨,١	٧١	٥٩,٦	٧٧,٥	٩٨,٨	٩٥,٥	٩٦,٥	٦٧
<b>mean</b>	٥٣,٨	٦٦,٩		١١٠,٨	١١٦,٢		٧٦,٣	٧٢,٨		٦٥	٧٤,٥		٥٩,٦	٨٨,١٥		٩٥,٥	٨١,٧٥	
<b>Drone brood areas</b>	2.8	١٠,٥	١٥,٦	٢١,١	١٠	٤	٥,٨	٥,٦	.	.	.	٢	.	١,٥	٠,٦	٢,٥	٥,٣	١,٦
<b>mean</b>	1.3	١٣,٠٥		٢١,١	٧		٥,٨	٢,٨		.	١		.	١,٠٥		٢,٥	٣,٤٥	
<b>Queen cell</b>	٢,٨	٨,١٦	٢٩	٢٧,٨	٢٨,٣	٦,٦	٤	١,٥	.	١,٥	.	٠,١٦	.	٠,٥	١,٥	١,٣	٣,٨	٤,١٦
<b>mean</b>	2.8	١٨,٦		٢٧,٨	١٧,٥		٤	٠,٧٥		١,٥	٠,٠٨		.	١,٠		١,٣	٣,١	
<b>Pollen areas</b>	٣,١	٥,٨	٨,١٦	١٠,١٦	٦	١٠	١٠	٩	٨,٨	٨	٩	٥,٨	٦,١	٧,١	٦	١٢,٣	٩,٣	٢,٨
<b>mean</b>	٣,١	٦,١		١٠,١٦	٨		١٠	٨,٩		٨	٧,٤		٦,١	٦,٦		١٢,٣	٦,٠٥	
<b>Yielded areas honey</b>	٢٤,٨	١٩,٦	١٧,٥	١٣,٥	١٠	٢٢	٦٦	٧٥	١١٠	١٢٩	١١٢	٧٧	٨٧	٩٢	٩٣	٨٨	٦٠	٤١
<b>Mean</b>	٢٤,٨	١٨,٦		١٣,٥	١٦		٦٦	٩٢,٥		١٢٩	٩٤,٥		٨٧	٩٢,٥		٨٨	٥٠,٥	
<b>Mean of temperature C°</b>	17.0	١٩,٠		٢١,٠	٢٣,٠		23.0	2٨.0		3٤.0	3٥.0		35.0	٣١,٥		٢١,٥	١٩,٠	
<b>Mean of humidity %</b>	٥٩,٠	54.0		52,٠	٥٢,٠		٥٠,٥	٤٢,٠		٤٨,٠	٤٢,٥		٤٥,٠	٥٠,٥		55.0	6٢.0	

Table (2): Honeybee colonies activities of the Egyptian race under the environmental conditions of Siwa Oasis during 2006 .