

Effect of different seasons on some honey bee activities under Nasr City conditions - (Cairo) Egypt

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Abstract

This study was carried out at the apiary of the Plant Protection Department- Faculty of Agriculture - Al-Azhar University- Cairo during year (2013&2014). Colonies of carniolan F₁ hybrid were used. The results showed that the largest monthly mean of the sealed worker brood area (in.²/colony) recorded (370.0, 369.2 and 292.2) in spring for the colonies without traps (control), with fixed trap three days and without three days (3&3) consequently and colony with fixed traps, along the whole time of the investigation period, respectively. While the smallest monthly means of the sealed worker brood area (in.²/colony) recorded (146.4, 140.9 and 121.3) in autumn for control and another two treatments, resp. Spring season is the best season for the monthly means of the stored pollen area (in.²/colony) (137.3, 111.8 and 88.8) for control, and another two treatments resp. Whereas, the smallest monthly mean of the stored pollen area (in.²/colony) recorded (28.2, 22.2, and 12.6) in autumn for control and another two treatments resp. The spring season is the best, where the monthly means of the stored honey area (in.²/colony) were (600.0, 480.2 and 338.3) for control, and another two treatments, respectively. The smallest monthly means of the stored honey area (in.²/colony) recorded (70.4, 65.0 and 44.6) in autumn for control and another two treatments resp. the other two seasons are ranked in between in the three activities. All data obtained were statistically analyzed and discussed.

Key words: honey bee activities, different seasons.

Introduction

Pollen and nectar are the natural major protein and carbohydrates sources of the honeybee colonies, they are very important and necessary for the development, worker brood area producing, strength, and healthy of the honeybee colony. A good relationship between nectar flow seasons and all honey bee activities and their products under suitable environmental conditions according to the role which say no pollen no bees. Colony development, reproduction, population size and food reserves are the major criteria to measure the success of honey bee colony surviving in different regions (Paxton and Echagarreta, 1997). They are affected by many environmental factors, (Harbo, 1986 and Chinh *et al* 2005). Pollen is the sole protein food of honey bee colony harvested by bee foragers in their natural environment. The presence of pollen in the nest is a prerequisite for normal colony development and first of all, for regular growth and development of the brood. Brood rearing is a major factor in apiary production and affected by colony feeding on nature pollen and nectar (Roman, 2006). In Egypt, many researchers studied honeybee activities {(Khatab (1976), Abd Al-Fattah (1983), El-Wasseef (2002), Shawer *et. al.* (2003), Abd Al- Hady (2007), El-Feel, (2008), Zaref, 2008), and Shaheen, (2012)}, under the condition of the different regions, but few investigations were carried out in Nasr city region. So, the aim of this study is monitoring some activities of

honey bee colonies in rearing worker brood, gathering pollen, and producing honey under different seasons.

Materials and Methods

This study was carried out at apiary of Plant Protection Department, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt, during 2013- 2014.

1- Experiments design:

Twelve honey bee colonies (Carniolan F₁ hybrid) of the same strength, each colony consisted of four brood combs, two honey and pollen combs and headed by new mated queen sisters were prepared and divided as follow.

- Each of four colonies provided by pollen traps, fixed at the hive entrance (permanent fixed traps) throughout the investigation period (treatment).
- Each of another four colonies provided by pollen trap fixed at the hive entrance three days and removed three days consequently, (fixed traps 3&3) throughout the investigation period (treatment).
- Four colonies without fixed pollen traps (control).

The bees in these tested colonies were allowed to free flight for collecting available nectar and pollen from cultivated sources as well as natural plants existed in this region.

2- Activities of honey bee colonies:

Activity measurements of the F₁ hybrid Carniolan colonies were investigated to evaluate the effect of

different treatments under different seasons on the following parameters:

- a. Worker brood areas (inch²).
- b. Pollen stored areas (inch²).
- c. Honey stored areas (inch²).

These activities were measured at (13) day intervals, by using a langstroth frame divided into square inches.

Data were subjected to analysis of variance (ANOVA) using "COSTA" computer statistical program. Mean values were compared using Duncan's multiple range test (Duncan, 1955).

Results and Discussions

Monthly means of honeybee sealed worker brood areas (in.²/colony) established at Nasr city during seasons of (2013&2014) were measured. Data presented in Table (1) and figure (1), showed that the largest monthly means of the sealed worker brood area (in.²/colony) recorded (370.0, 369.2 and 292.2) in spring for control and another two treatments resp. while the smallest monthly means of the sealed worker brood area recorded (146.4, 140.9 and 121.3) in autumn for control and another two treatments, resp. The monthly means of the sealed worker brood area recorded (177.8, 215.4 and 223.0) in winter ranked the second order followed by the monthly means (150.4, 195.8 and 204.5) in summer for control and another two treatments resp. From above mentioned data, it could be cleared that increasing of the monthly means of the sealed worker brood areas (in.²/colony) during spring and winter seasons is due to absence of oriental hornet and presence of Eucalyptus flow where attacking of oriental hornet during autumn leads to decreasing of the monthly mean of the sealed worker brood area.

There were significant differences among the monthly means of sealed worker brood areas in different seasons for permanent fixed traps. While there were no significant differences between the means of winter and summer seasons for control, and fixed traps 3&3. On the other hand, there were significant difference between these means for the control and fixed traps 3&3 in all while there was significant difference between above mentioned and means of permanent fixed traps colonies in all seasons. As respect to effect of putting trap on the colony, the data in the same table show that the smallest monthly means of the sealed worker brood area

(in.²/colony) recorded (general mean 185.4) in the colony with fixed trap throughout the investigated period (permanent) while, the largest one recorded in control (236.0). The general monthly mean of the sealed worker brood area for fixed traps 3&3 was (230.3 in.²). Statistical analysis gave no difference between general monthly mean of the sealed worker brood area for control and fixed traps 3&3. While there was a significant difference between the mean of the permanent fixed traps treatment and each of control and fixed traps 3&3. Serag El-Dein, (1991 & 2004) reported that in Kafr El-Sheikh region, for Carniolan race colonies, the highest average of sealed worker brood area was found during May and July, while the lowest area was found during November. Taha, (2005) found that, for Carniolan race colonies, the largest mean worker sealed brood area (289.7 & 290.04 in²/12days/colony) was observed at clover blossoming period in two observation years, respectively. Abd Al-Hady, (2007) reported that, for Carniolan race colonies, the highest rate of worker brood rearing was during spring, (37.28%), followed by summer, (25.92%), winter, (21.24%) and autumn, (15.56%).

Table 1. Monthly means of honeybee sealed worker brood areas (in.²)/colony established at Nasr city during season of (2013&2014).

Season	Month	Permanent fixed traps				Mean	Fixed traps 3&3				Mean	Control				Mean
		R1	R2	R3	R4		R1	R2	R3	R4		R1	R2	R3	R4	
Autumn	Sep.	100	90	105	90	96.25	113	110	115	117	113.8	115	110	117.5	110	113.1
	Oct.	127	120	133	127	126.8	132.5	147.5	145	145	142.5	165	147	135	147.5	148.6
	Nov.	134	145	150	135	141.0	160	170	166	170	166.5	180	170	170	190	177.5
	Mean	120.3	118.3	129.3	117.3	121.3Db	135.2	142.5	142.0	144.0	140.9Ca	153.3	142.3	140.8	149.2	146.4Ca
Winter	Dec.	160	166	182	160	167.0	190	200	195	200	196.3	200	210	205	210	206.3
	Jan.	170	170	175	170	171.3	200	210	200	210	205.0	205	210	210	220	211.3
	Feb.	200	205	190	185	195.0	250	260	230	240	245.0	255	266	240	245	251.5
	Mean	176.7	180.3	182.3	171.7	177.8Bb	213.3	223.3	208.3	216.7	215.4Ba	220.0	228.7	218.3	225.0	223.0Ba
Spring	Mar.	270	288	260	255	268.3	370	380	310	300	340.0	330	340	315	300	321.3
	Apr.	300	310	303	280	298.3	380	390	350	340	365.0	380	380	355	350	366.3
	May	315	320	310	295	310.0	410	422	388	390	402.5	455	435	400	400	422.5
	Mean	295.0	306.0	291.0	276.7	292.2Ab	386.7	397.3	349.3	343.3	369.2Aa	388.3	385.0	356.7	350.0	370.0Aa
Summer	Jun.	230	222	225	205	220.5	280	260	240	250	257.5	290	265	255	266	269.0
	Jul.	160	150	135	125	142.5	210	200	175	220	201.3	220	200	188	225	208.3
	Aug.	80	95	90	88	88.3	130	120	125	140	128.8	137	125	133	150	136.3
	Mean	156.7	155.7	150.0	139.3	150.4Cb	206.7	193.3	180.0	203.3	195.8Ba	215.7	196.7	192.0	213.7	204.5Ba
General mean		187.2	190.1	188.2	176.3	185.4B	235.5	239.1	219.9	226.8	230.3A	244.3	238.2	227.0	234.5	236.0A

Means in the same row or column with the same small or capital letters do not differ significantly according to Duncan's multiple range test at 5% probability

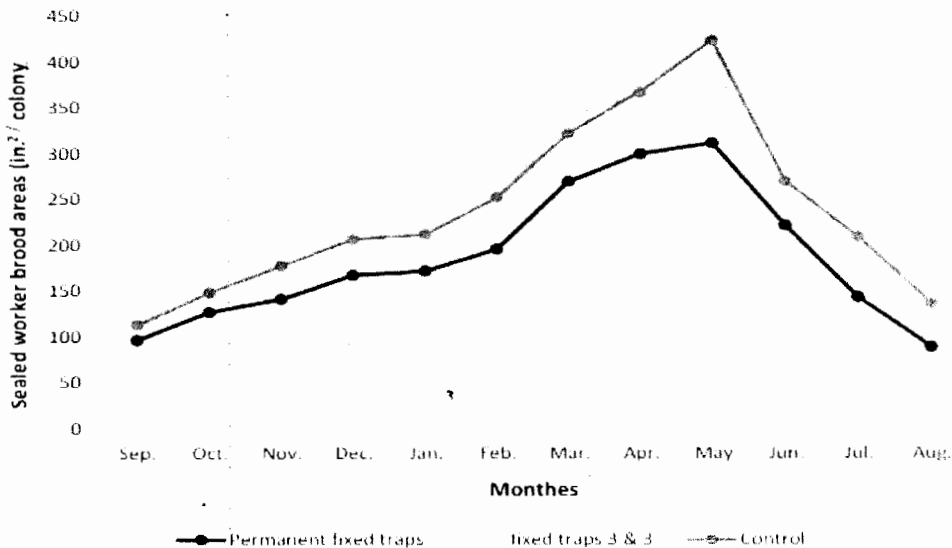


Fig.1. Mean of sealed worker brood areas (in.²) per honey bee colony established at Nasr city during seasons of (2013&2014).

3.2. Storing pollen area.

Monthly means of stored pollen areas (in.²) by honeybee colonies established at Nasr city during seasons of (2013&2014).

Data presented in Table (2) and Figure (2). show that the activity started in Sep. where the recorded pollen area per colony was (17.3, 15.3 and 4.0) for control, fixed traps 3&3 and the colony with permanent fixed trap through September, resp. the monthly activity increased gradually to record peak of activity during May (152.5, 124.3 and 101.8) for control, fixed traps 3&3 and the colony with permanent fixed traps. The activity decreased gradually to give less stored pollen area (in.²) /colony in August (11.3, 6.3 and 0.0) for control, fixed traps 3&3 and the colony with permanent fixed traps, resp. As regard to the effect of the season on the monthly means of the stored pollen area (in.²) /colony, it could be cleared that spring season is the best season for the monthly means of the stored pollen area (in.²) /colony (137.3, 111.8 and 88.8) for control, colony with fixed trap (3&3) consequently fixed traps along the whole time of the investigation. The smallest monthly means of the stored pollen area (in.²) /colony recorded (28.2, 22.2, and 12.6) in autumn for control and another two treatments resp. The monthly means of the stored pollen area (in.²) /colony recorded in winter (80.7, 66.3 and 45.8) ranked the second order followed by the monthly means recorded (65.0, 48.2 and 29.1) in summer for control and another two treatments resp. Statistically there were significant differences among the monthly means in the different seasons either for control and

treatments.

From above mentioned data it could be concluded that, increasing of the monthly means of the stored pollen area (in.²) /colony during spring and winter seasons is due to the same reasons mentioned above in sealed brood means. As respect to the effect of putting trap on the colony, the data in the same table show that the smallest monthly means of the stored pollen area (in.²) /colony recorded (general mean 44.1) in the colony with permanent trap throughout the investigated period while the largest one (general mean 77.8) recorded in control. The obtained results are in agreement with those of Hussein, (1982) for Carniolan race colonies, who mentioned that a significant effect on pollen gathering activity was detected after feeding of colonies during the dearth season (December), while non-significant correlation was noticed during active season (March and April). Shaver et al. (2003) in Kafr El-Sheikh revealed that the highest number of incoming workers carrying pollen/colony/minute and the largest stored pollen area throughout the blooming seasons of citrus, clover and cotton was observed in colonies moved to food sources-rich areas. The highest number of incoming workers carrying pollen/colony/minute and the largest stored pollen area were found in May (the blooming season of clover), followed by July and August (cotton season). Zeedan, (2002) revealed that under the environmental conditions of Giza region, gathering and storing pollen began slightly during January recorded 2178.5 pollen cells/colony, representing 5.7% and increased during February 6.5% and reached its maximum rate of

gathering pollen during August 12.8% then these amounts were declined gradually to its minimum value stored pollen during December, 5.0% of the total stored pollen. He reported that the highest rate of stored pollen

recorded in the summer season (4582.2 cells/col. represented 36.0%). The lowest rate recorded in winter (2113.3 cells/col. represented 16.6%).

Table 2. Monthly means of stored pollen areas (in.²) /honeybee coloney established at Nasr city during seasons of (2013&2014).

Season	Month	Permanent fixed traps Mean				Fixed traps 3&3				Mean	Control				Mean	
		R1	R2	R3	R4	R1	R2	R3	R4		R1	R2	R3	R4		
Autumn	Sep.	5	4	2	5	4.0	10	18	13	20	15.3	20	18	16	15	17.3
	Oct.	10	10	7	12	9.8	20	18	14	20	18.0	25	27	30	27	27.3
	Nov.	25	24	20	27	24.0	30	31	32	40	33.3	30	37	48	45	40.0
Mean		13.3	12.7	9.7	14.7	12.6Dc	20.0	22.3	19.7	26.7	22.2Db	25.0	27.3	31.3	29.0	28.2Da
Winter	Dec.	35	36	37	35	35.8	55	57	57	48	54.3	60	65	60	65	62.5
	Jan.	44	45	47	42	44.5	66	60	67	66	64.8	80	82	83	80	81.3
	Feb.	52	55	60	62	57.3	85	72	84	79	80.0	100	100	94	99	98.3
Mean		43.7	45.3	48.0	46.3	45.8Bc	68.7	63.0	69.3	64.3	66.3Bb	80.0	82.3	79.0	81.3	80.7Ba
Spring	Mar.	70	75	75	72	73.0	100	95	102	97	98.5	115	120	125	115	118.8
	Apr.	85	95	97	90	91.8	110	105	117	119	112.8	140	140	145	138	140.8
	May	95	105	107	100	101.8	130	120	127	120	124.3	150	155	155	150	152.5
Mean		83.3	91.7	93.0	87.3	88.8Ac	113.3	106.7	115.3	112.0	111.8Ab	135.0	138.3	141.7	134.3	137.3Aa
Summer	Jun.	60	65	57	73	63.8	100	88	95	80	90.8	120	115	120	110	116.3
	Jul.	25	16	27	26	23.5	50	45	55	40	47.5	65	60	75	70	67.5
	Aug.	0	0	0	0	0.0	10	5	10	0	6.3	15	10	10	10	11.3
Mean		28.3	27.0	28.0	33.0	29.1Cc	53.3	46.0	53.3	40.0	48.2Cb	66.7	61.7	68.3	63.3	65.0Ca
General mean		42.2	44.2	44.7	45.3	44.1C	63.8	59.5	64.4	60.8	62.1B	76.7	77.4	80.1	77.0	77.8A

Means in the same row or column with the same small or capital letters do not differ significantly according to Duncan's multiple range test at 5% probability.

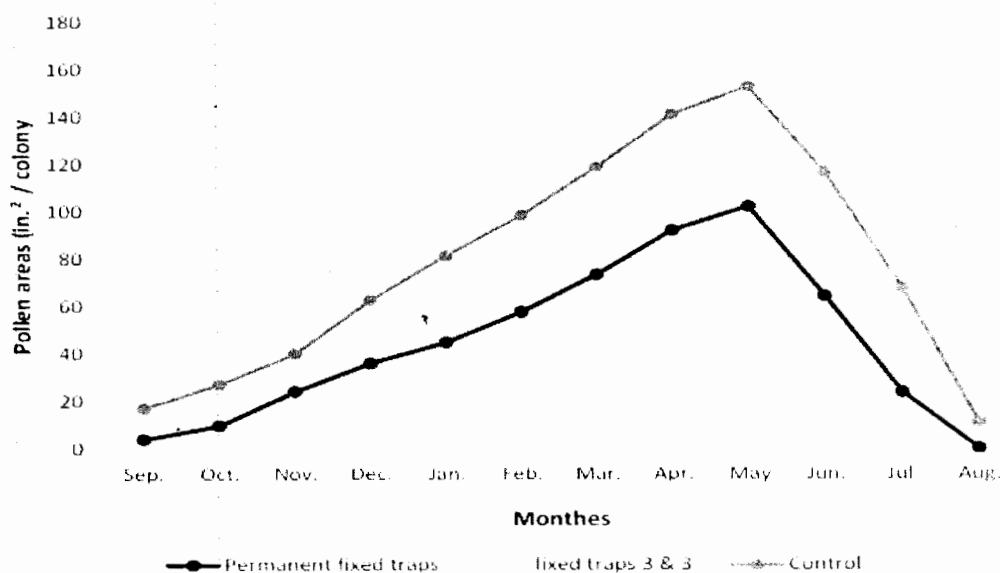


Fig : (2). Monthly means of stored pollen areas (in.²)/ honeybee colony established at Nasr city during seasons of (2013&2014).

3.3 Storing honey area.

Monthly means of honey bee stored honey area (in.²)/colony established at Nasr city during season of (2013&2014).

Data presented in Table (3) and Figure (3), show that the recorded area per colony was (38.6, 32.5 and 20.0) for control, fixed traps 3&3 and the colony with permanent fixed trap through September, resp. The monthly activity increased gradually to record peak of activity during Jun. (837.5, 747.5 and 432.5) for control, fixed traps 3&3 and the colony with permanent fixed trap, resp. The activity decreased gradually to give less stored honey area (in.²)/colony in August (51.25, 45.0 and 25.0) for control, fixed traps 3&3 and the colony with permanent fixed trap, resp. nearly to that gained in Sep. It could be noticed that the reduction of the stored honey area (in.²)/colony is due to attacking of oriental hornet. As regard to the effect of the season on the monthly means of the stored honey area (in.²)/colony, it is clear that spring season is the best season on the monthly means of the stored honey area (in.²)/colony (600.0, 480.2 and 338.3) for control, colony with fixed trap (3&3) and colony with permanent fixed trap, respectively. The smallest monthly means of the stored honey area recorded (70.4, 65.0 and 44.6) in autumn for control and another two treatments resp. The monthly means of the stored honey area recorded in summer

(319.6, 286.7 and 165.4) for control and another two treatments resp. Which ranked the second order followed by the monthly means recorded (167.1, 147.9 and 106.7) in winter for control and another two treatments resp. Statistically there were significant differences among the monthly means in the different seasons either in control or treatments. From above mentioned data, increasing of the monthly means of the stored honey area (in.²)/colony during spring and summer seasons is due to the same reasons mentioned before that. As respect to the effect of putting trap on the colony, the data in the same table show that the smallest monthly mean of the stored honey area (in.²)/colony recorded (general mean 163.8) in the colony with permanent trap throughout the investigated period while the largest one recorded in control (general mean 289.3) while fixed traps 3&3days gained (244.9). **Abou El-Enain, (2002)** summarized that under Alexandria local conditions, the average honey yield per colony was 3.0, 6.2 and 8.5 kg. /colony for the Egyptian, Carniolan and the hybrid, respectively. Most of honey harvested during clover season was in June and during cotton season in September. **Helal et al. (2003)** stated that, the highest amount of honey throughout the three different blooming seasons of citrus, clover and cotton was obtained from colonies moved to food sources-rich area. The largest yield of honey was collected during May

(clover season), followed by April (citrus blooming period). **Abdel-Rahman, (1998 & 2004)**, stated that in Assiut region the largest average honey yield, for

Carniolan race colonies, was obtained from cotton plants (July), followed by clover season (May).

Table 3. Monthly means of honey bee stored honey area (in.²) /colony established at Nasr city during seasons of (2013&2014).

Season	Month	Permanent fixed traps				Mean	Fixed traps 3&3				Mean	Control				Mean
		R1	R2	R3	R4		R1	R2	R3	R4		R1	R2	R3	R4	
Autumn	Sep.	20	20	20	20	20	30	40	32.5	27.5	32.5	37.5	40	37	40	38.6
	Oct.	30	50	35	80	48.8	50	100	60	80	72.5	70	75	60	85	72.5
	Nov.	50	60	55	95	65.0	80	105	75	100	90.0	100	100	90	110	100.0
Mean		33.3	43.3	36.7	65.0	44.6Db	53.3	81.7	55.8	69.2	65.0Da	69.2	71.7	62.3	78.3	70.4Da
Winter	Dec.	80	100	75	80	83.8	100	120	110	130	115.0	135	140	130	140	136.3
	Jan.	100	115	100	105	105.0	145	155	135	145	145.0	160	175	175	155	166.3
	Feb.	125	133	127	140	131.3	170	190	180	195	183.8	190	220	210	175	198.8
Mean		101.7	116	100.7	108.3	106.7Cc	138.3	155.0	141.7	156.7	147.9Ct	161.7	178.3	171.7	156.7	167.1Ca
Spring	Mar.	290	280	285	260	278.8	322	340	355	350	341.8	440	485	475	430	457.5
	Apr.	365	405	360	385	378.8	585	580	590	500	563.8	600	655	660	610	631.3
	May	355	360	335	380	357.5	550	565	560	465	535.0	680	740	720	705	711.3
Mean		336.7	348.3	326.7	341.7	338.3Ac	485.7	495.0	501.7	438.3	480.2At	573.3	626.7	618.3	581.7	600.0Aa
Summer	Jun.	400	420	465	445	432.5	755	765	780	690	747.5	875	800	890	785	837.5
	Jul.	30	30	55	40	38.8	75	70	85	40	67.5	90	70	60	60	70.0
	Aug.	20	20	30	30	25.0	50	50	50	30	45.0	50	55	50	50	51.25
Mean		150.0	156.7	183.3	171.7	165.4Bc	293.3	295.0	305.0	253.3	286.7Bt	338.3	308.3	333.3	298.3	319.6Ba
General mean		155.4	166.1	161.8	171.7	163.8C	242.7	256.7	251.0	229.4	244.9B	285.6	296.3	296.4	278.8	289.3A

Means in the same row or column with the same small or capital letters do not differ significantly according to Duncan's multiple range test at 5% probability.

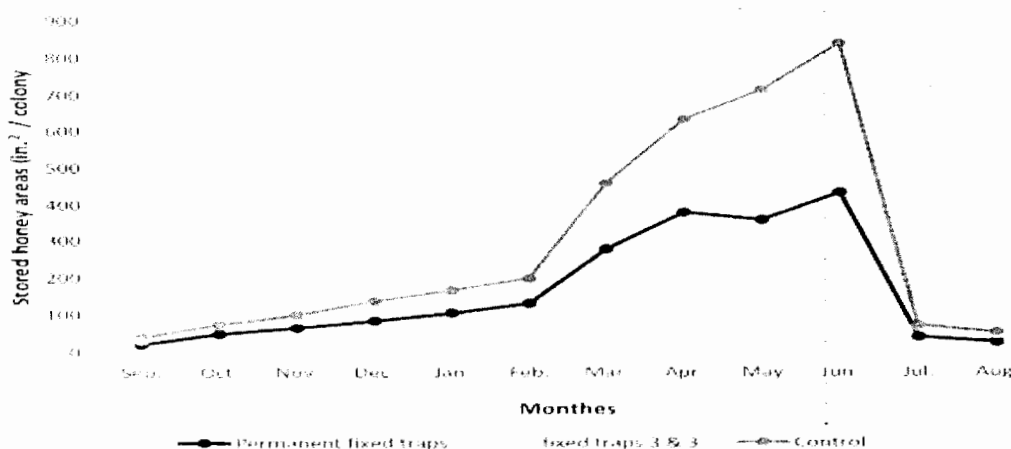


Fig 3. Monthly means of honey bee stored honey area (in.²) /colony established at Nasr city during season of (2013&2014).

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قسم وقاية النبات - كلية الزراعة جامعة الأزهر - القاهرة

أجريت هذه الدراسة في منحل كلية الزراعة - جامعة الأزهر بمدينة نصر القاهرة خلال عام كامل (2013/2014م) واستخدمت فيه طوائف نحل كرينيولي هجين أول وقسمت الطوائف الى مجموعات, مجموعته ثبت على أبوابها مصادن حبوب لقاح طول مدة التجربة ومجموعة ثبت على أبوابها المصادن ثلاثة أيام ورفعت ثلاثة أيام والمجموعة الثالثة تركت بلا مصادن (للمقارنة). وهدفت الدراسة الى قياس بعض الأنشطة مثل مساحة عيون الحضنة المقللة ومساحة عيون حبوب اللقاح ومساحة عيون العسل بالبوصة المربعة تحت ظروف الفصول المختلفة وقد أظهرت النتائج أن أفضل الفصول هو فصل الربيع حيث سجل (370.0، 369.0، 292.2) بوصة مربعة للحضنة المقللة، (137.3، 111.8، 88.8) بوصة مربعة لمساحة عيون حبوب اللقاح، (600.0، 480.2، 338.3) بوصة مربعة لعيون العسل وذلك لطوائف المقارنة والطوائف ذات مصادن الثلاثة أيام والطوائف دائمة المصادن على التوالي. أما أقلها فكان في فصل الخريف حيث سجل (146.4، 140.9، 121.3) بوصة مربعة للحضنة المقللة، (28.2، 22.2، 12.6) بوصة مربعة لعيون حبوب اللقاح، (70.4، 44.6، 65.0) بوصة مربعة لعيون العسل وذلك لطوائف المقارنة والطوائف ذات مصادن الثلاثة أيام والطوائف دائمة المصادن على التوالي. أما فصل الشتاء والصيف فكانت قيمهما بين الربيع والخريف في كل هذه الأنشطة وقد أثبت التحليل الإحصائي للنتائج وجود فروق معنوية بين الفصول المختلفة وبين المعاملات.