

BROOD REARING OF THE HONEYBEE COLONY INDIVIDUALS AND THEIR ACTIVITIES IN ASSIUT REGION

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Abstract

Maximum monthly average of workers sealed brood area (in sq. inch.) was observed during September, July and February, while minimum area of workers brood was noticed during December and November. Maximum drone brood was found during January-March period, while least drone brood was noticed during October, May and November. Total sealed brood of workers and drones was highest during February, March, and September. Maximum monthly-unsealed workers brood was found during February, September and August, with a less peak during June. Maximum of total sealed and unsealed brood was noticed during February, September and August. Maximum average monthly number of unsealed queen cells was found during March, February and July and the minimum number, during October, June, November and December. Maximum total of queen cells and queen cups was found during February-April period or swarming period. Minimum construction of queen cells and cups was observed during November and December. No constructed queen cells were observed during June, October and November, while queen cups can be observed every month. Maximum population of adult bees was found during the period from July till September. Maximum monthly surplus sealed honey area (in sq. inch.) was found during July-October period and the minimum stored honey was observed during May and April. Maximum stored pollen or bee bread was observed inside colonies during August-October period, while minimum stored pollen was noticed during December, November and May. Maximum mean number of foragers or pollen-collectors/min./ colony/month/season was found during July-September.

INTRODUCTION

Honeybee colonies were kept in small fixed comb hives and the only method of securing increase in colony numbers was by natural swarming. Beekeeping was a simple matter, consisting of little more than the capture and hiving of swarms as they issued. Once movable comb hives had come into general use the position was changed. They facilitated the enlargement of the stocks size and the honey they stored. A great bee

population in the hive at the opening of the honey flow is needed in order to obtain a good honey yield. The beekeeper needs to do all he can to discourage swarming, whereas before there was a need for swarming.

This work was carried out during 1995-1998 seasons in Assiut region in order to study the following points:

- a. Activities of honeybee colonies, before, during and after-swarming periods: sealed and unsealed workers brood, sealed drones brood, constructed or sealed and unsealed queen cells, queen cups, food stores (honey and pollen or bee bread), colony population, foraging, pollen-gathering, workers honey-sac contents and honey production.
- b. Relationship between the weather factors and previously mentioned activities of colonies, in addition to their relations together.

MATERIALS AND METHODS

All these measurements or estimates of brood rearing were conducted every twelve days. Monthly average of all studied activities was calculated. For estimating the areas of sealed worker and drone cells, separately in each of the four colonies under investigation, a standard frame divided to square inches was used. In all colonies, sealed brood areas (in sq. inch.) were measured during 1995-1998. Areas of sealed workers and drones brood (W.+D.) were pooled and percent drone sealed area (D%) is calculated. Brood areas were transferred to number of cells occupied with brood. Magnification was conducted by 26/sq. inch. for workers sealed brood areas and by 16/sq. inch. for drones sealed brood areas (in sq. inch.). Number of combs covered with bees from both sides were counted, during 1995-1998 in all colonies under investigation. Bees population or adult population was estimated in the rate of 2000 adult bees which can cover a comb from both sides. Total numbers of outgoing workers or foragers and incoming pollen-collectors, from tested colonies, during 1997-1998, were counted separately. Five readings, each of them during one minute, using counter and stopwatch, were made at each count, and in each of the four colonies under investigation. The average number of foragers and pollen-collectors/day/colony/minute, was calculated. Counting of foragers and pollen-collectors was conducted during Dec.-Mar., at 1 p.m., during Apr.-Aug., at 11 a.m. and during Sep.-Nov., at 9 a.m. (Hussein *et al.*, 1992). Food stores areas, surplus sealed honey and stored pollen or bee bread, in sq. inch.,

were measured, in four examined colonies, using a standard frame divided to square inches during 1995-1998. Average area of food stores/colony was calculated. During the honey-flows of 1997-1998, five ingoing foragers were captured from each of tested four colonies. Honey-sac weight (mg.) and percentage of total soluble solids (T.S.S. %), which reflects the sugar concentration, were measured, using a hand-refractometer. This measurement was replicated five times during the honey-flows in Assiut region. Unsealed workers brood area (in sq. inch.) were measured every nine days using a standard frame, divided into square inches, in four colonies under investigation and mean areas of unsealed workers brood/colony was calculated, during 1995-1998. Percentage of unsealed workers brood (in sq. inch./colony) from total sealed brood (W.+D.)/colony, was estimated. Constructed or sealed and unsealed queen cells and queen cups were counted every six days throughout the work, during 1995-1998. Total and mean number of queen cells and queen cups were pooled and calculated every twelve days, in order to co-ordinate these readings with those of brood rearing, adult population, food storing ability, foraging and pollen-gathering. The areas of surplus sealed honey (in sq. inch) at the end of each honey-flow was measured using a standard frame and transferred to weight (in kgs.), using the following formula of El-Dakhakhni *et al.*, 1986:

$$\text{Honey yield (in kgs.)} = \frac{\text{Area of sealed honey (in sq. inch)} \times 10.64}{1000}$$

The honey production (in kgs.) from clover honey-flow in June, 1997; from cotton honey-flow in July and August, 1997; from water hyacinth honey-flow, July, 1998; and from cotton and water hyacinth honey-flows in August, 1998; was estimated/colony/year and also, an average/colony for the two years of work 1997 and 1998, was calculated.

RESULTS AND DISCUSSION

This work was conducted from November, 1995 till March, 1996 in two localities, Dayrout and Elwan, Assiut Governorate.

Maximum monthly average of workers or drones sealed brood and their total, in both localities, was recorded in February, with a general mean of 322.105, 86.145 and 412.75 sq. inch/colony/month/locality, Table 1. Maximum monthly general mean of

percent drone for both localities was found also in February (20.969%). Highly significant correlation, $r = 0.82144$, was detected between $(W.+D.)$ and $(D\%)$, in Dayrout and Elwan, during 1995, 1996 season. The following regression equation was obtained: $Y = 0.8254 + 0.05318X$, where $Y = (D\%)$ and $X = (W.+D.)$. Maximum monthly mean of unsealed workers brood area, in both localities, was found during February with a general mean of 330.905 sq. inch./colony/month/locality. Percent workers unsealed to sealed brood/colony/month was higher (+) during November, December and February months and lower (-) during January and March months, in both localities with a general mean of -97.748%. In both localities, the maximum monthly rearing of workers or drones was observed during February with a general mean of 8374.80 workers cells and 1378.28 drones cells. Average number of colony or adult population during 1995-1996 season is presented in Table 3. General maximum monthly mean of both localities was observed during February (12633 adult). Food stores (surplus honey, stored pollen) areas in sq. inch./colony are presented in Table 2. In Dayrout, maximum areas of honey or pollen/month/colony, 87.2 and 100.27 sq. inch., respectively, were found during January, 1996. In Elwan, maximum honey areas/ month/colony, 225.57 sq. inch. was noticed during December, while maximum pollen areas, 154.00 sq. inch. was observed during February. Generally, during the period from November till March, maximum surplus honey, 154.4 sq. inch., was found during January and maximum stored pollen, 120.65 sq. inch., was observed during February. Construction of queen cells and queen cups during 1995-1996 season are presented in Table 2. In Dayrout, maximum monthly mean number of queen cells (7.7) was found during February, while in Elwan the same was observed during March (11.5 queen cells), with a general monthly mean of 8.550 queen cells/colony/month/locality, during March. For queen cups, maximum monthly mean number, in both localities, was observed during February, with a general mean of 23.070. In addition, the maximum general monthly mean number of total of queen cells and cups or wax construction ability, in both localities (30.915 queen cells and cups), was observed during February. Thus, it is possible to say that, in Assiut region, during the period from November, 1995 till March, 1996, the maximum of: sealed or unsealed workers brood, sealed drones brood, total workers and drones brood, percentage of drones, stored pollen, construction of queen cells and cups was recorded during February month. Significant correlation was detected between minimum temperature and both of workers and/or drones sealed brood, unsealed workers brood, colony

population and stored pollen. Significant correlation was found between day-time temperature and workers unsealed brood. Highly significant and negative relation was noticed between wind speed and both of workers and/or brood rearing ability, while correlation coefficients with colony population and number of queen cups were significant only. Highly significant and positive relationship was found between colony population and both of sealed workers brood, sealed drones brood and their total, unsealed workers brood, stored pollen and unsealed queen cells, while the correlation was significant only with each of surplus honey and total number of queen cells. Highly significant and positive correlation was detected between stored pollen and workers and drones brood rearing activity.

This work was conducted from January, 1997 till the end of December, 1997, in El-Badari, Assiut Governorate. Data of different activities of honeybee colonies during 1997 are presented in Tables 3-5. Two peaks of rearing workers brood were observed during August and March, Table 3. Maximum percentage of monthly workers brood rearing, 11.886% was noticed in August. The same was noticed for drones brood, however higher peak of brood workers was in August and lower peak in March. The reverse is true for drones. It is of interest to note that, total sealed brood of workers and drones was about the same during March, 297.96 sq. inch./colony/month or 11.91% from annual activity and during August, 292.46 sq. inch./colony/month or 11.68% from annual activity. Maximum percentage of monthly drones brood rearing, 37.2% was observed in March. Percentage of drones brood (D%) was calculated, the maximum D% was noticed on March. Highly significant correlation, $r = 0.41866^{**}$, was detected between (W.+D.) and (D%), in Assiut region during 1997 season. The following regression equation was obtained: $Y = -0.8313136 + 0.02630X$, where $Y = (D\%)$ and $X = (W.+D.)$.

Free (1977) reported that the number of drones being reared and the drones to workers ratio reaches a peak in May and June and few eggs are laid in drone cells after July. Maximum rearing of drones in Northern Oman was observed during April-May months (Hussein, 1997). In our work, in Assiut region, the peak of drones production was in March.

Monthly mean per colony of brood cells occupied by workers and/or drones are presented in Table 3. Maximum monthly average of workers brood cells/colony was

7328.75 cells in August, and minimum number was 1325.46 cells in December. The corresponding figures for drones were 780.64 cells in March and 7.25 cells in October. Maximum monthly average of total numbers of workers and drones brood cells/colony was 7497.55 cells in August and minimum number was 1360.82 cells in December. Mean areas, in sq. inch./colony, of workers unsealed brood, percentage of unsealed to sealed brood, their monthly mean per colony and their percentage, in Assiut region during 1997 are presented in Table 4. Percentage of workers unsealed to sealed brood was less in January, March, April and June-September months. The reverse situation was noticed during February, May and October-December months, Table 4. Average number of colony or adult population, its monthly means per colony and their percentages are presented in Table 4.

Two peaks of adult population were recorded during August and February months, with a percentage monthly activity of 10.082% and 9.408%, respectively.

Surplus sealed honey area (H) and stored pollen area (P), in sq. inch./colony/month, as food stores, in Assiut region, during 1997 are presented in Table 4.

Largest monthly average of (H) or (P) was 499.715 sq. inch./ colony or 16.211% of annual storing activity, in July, and 172.35 sq. inch./colony or 14.236% of annual storing activity in August, respectively.

Foraging and pollen-collection activities express as mean number of adult workers/colony/minute, their monthly means per colony and their percentages, during 1997, are presented in Table 5.

Maximum monthly foraging, 20.40 worker/ colony/min./month or 22.53% of annual activity and maximum monthly pollen-gathering, 6.30 worker/colony/min. /month or 21.38% of annual activity were recorded during August. Construction of queen cells and queen cups, monthly means per colony and their percentages in different months of 1997 season in Assiut region are presented in Table 5.

Maximum monthly numbers of constructed, unsealed queen cells, their total, queen cups and their total with queen cells were observed during March and followed by February, 1997. Queen cups were always found inside honeybee colonies, while, dur-

ing this work, no queen cells were observed during April-May months.

Hussein (1997) reported that, in Northern Oman, beginning of local or Omani bees, *Apis mellifera yemenitica*, in construction of queen cells was noticed during January and February.

It is of interest to note that, during March, about the same maximum percentage of monthly activity (37%) was observed for both of drone and queen rearing. Thus, mating of queens considered to be successful during March. February month comes next, with respect to rearing of drones (males) and queens (females) for preparation of mating and swarming later.

Significant correlation was detected between both of maximum, minimum and day-time temperature, from one side and, sealed workers or drones brood, unsealed workers brood, stored pollen, foragers and pollen-collectors, from the another side. Significant correlation was found between both of maximum or minimum temperature, from one side, and each of constructed queen cells and queen cups. Significant relationship was noticed between each of minimum and day-time temperature, from one side and colony or adult population, from the another side. Highly significant and negative correlation was detected between each of maximum or minimum percentage of relative humidity (R.H.%), from one side and percentage of total soluble solids (T.S.S. %) which reflects sugar content in honey-sac of workers, from the another side. Significant correlation was found between maximum (R.H.%) and each of sealed and unsealed workers brood and between minimum (R.H.%) and unsealed workers brood. Highly significant correlation was noticed between colony population and each of sealed or unsealed adult brood, total workers and drones sealed brood, stored pollen, foragers and pollen-collectors. Significant correlation was detected between colony population and each of constructed queen cells, queen cups, weight of honey-sac and % T.S.S. in its content. The maximum number of highly significant and significant correlation coefficients was observed between colony population and the studied colony's activities. Highly significant correlation was found between surplus sealed honey and % T.S.S. in honey-sac content, while the correlation between stored honey and number of queen cups was significant. Highly significant correlation was detected between stored pollen and each of sealed or unsealed workers brood, total workers and drones sealed brood,

colony population, foragers and pollen-collectors. Highly significant correlation was found between mean number of foragers, from one side, and each of sealed workers or drones brood, their total, unsealed workers brood, colony population, stored pollen, pollen-collectors, and % T.S.S. in contents of worker's honey-sac. Highly significant correlation was observed between mean number of pollen-collectors and all previously mentioned parameters. Highly significant and negative correlation was noticed between mean weight of worker's honey-sac (mg.) and both of sealed workers brood area and its total with sealed drones brood area. Significant and negative correlation was detected between honey-sac weight and colony population. Highly significant and negative correlation was existed between % T.S.S. in honey-sac contents and each of stored honey, queen cups, foragers and pollen-collectors. Significant and negative correlation was noticed between % T.S.S. and colony population.

This work was conducted during 1998 in El-Badari, Assiut. Data of different previously studied activities during 1997, in addition to data of workers honey-sacs weight (mg.), their % T.S.S. in their contents and honey yield (kg./colony) are presented in Tables 6-9. General averages of honeybees monthly activities per colony in Assiut region during 1995-1998 seasons are presented in Table 10. Maximum monthly means of rearing workers brood (sq. inch./colony/ month) were, 300.313, 290.083 and 288.125 or 7808.13, 7542 and 7491.25 workers cell during September, July and March, respectively. The same was observed in case of total of workers and drones brood. Maximum monthly means of rearing drones were noticed during March, February and August. Maximum monthly percentage of drones were observed during March (11.679%) and February (11.109%), followed by August (5.701%). Maximum monthly/colony rearing of workers and drones was found during March, 327.25 sq. inch. or 8117.25 brood cell, September, 308.46 sq. inch. or 7938.459 brood cell and July, 296.079 sq. inch. or 7637.667 brood cells.

In Kafr El-Sheikh region, El-Dakakhni (1980) reported that the major peaks of brood rearing were occurred during May and August. The lowest rearing activity occurred during November. In Assiut region, Hussein (1985) reported that the maximum brood was reared during March, June and August-September. The lowest rearing was noticed during November.

Mean monthly areas, in sq. inch./colony of unsealed workers brood, percentage of unsealed to sealed brood and their percentage in Assiut region during 1998, are presented in Table 7. Maximum monthly mean of unsealed workers brood was observed during February and September months, as in 1997 season. Percentage of workers unsealed to sealed brood was less in March, April, June-October months. The reverse situation was noticed during January, February and May. Average monthly numbers of colony or adult population per colony and their percentages are presented in Table 7. Maximum colony population was observed during August-September months.

Surplus monthly sealed honey area (H) and stored pollen area (P), in sq. inch./colony, as food stores and percentages in Assiut region during 1998 are presented in Table 7. Largest monthly average of (H) or (P) was 579.531 sq. inch., in August and 189.729 sq. inch. in September, respectively.

Mean monthly number of foragers or pollen-collectors per colony per minute and percentages, during 1998, are presented in Table 8. Maximum monthly foraging, 21.80 worker/colony/min./month and maximum monthly pollen-gathering, 8.525 worker/colony/min./month, were recorded during August. The same was observed during 1997.

In Zagazig region, the maximum pollen-collection was in summer (Darhous, 1990). In Assiut region, Hussein (1981) found that pollen-collection was highest in March and September and the lowest activity was noticed during June, November and December. A positive and significant correlation was detected between pollen-collection and brood rearing.

A peak of pollen-gathering activity of honeybee workers, in Northern Oman, was observed during May. Maximum flight activity was observed before 8 a.m. and less activity was noticed after 12.00 noon, when air temperature was drastically increased. Minimum pollen-gathering was observed during September (Hussein, 1997).

Mean weight (mg.) of workers honey-sac contents and % T.S.S. in their contents during June-August months, or active season, mean honey yield (kg.) per colony during the same months of 1997 and 1998 seasons and their general mean are presented in Table 9. During 1997 active season, mean weight of worker honey-sac (mg.) and %

T.S.S. was gradually decreased during the active season from June to August, with a general mean of 24.858 mg./worker and 44.60% T.S.S., respectively. During 1998 active season, a slight difference in mean weight of worker honey-sac was noticed between June and July readings and increased weight was detected during August with a mean of 27.642 mg./worker. A general mean of honey-sac weight during 1997 and 1998 active seasons was 26.25 mg./worker/season.

The maximum nectar-gathering capacity was 70 mg., but the average was about 40 mg. (Park, 1922). Values of honey-sac capacity are possible to use as a measure of honey production (Beig *et al.*, 1972). The Egyptian honeybee nectar gatherer carried 22.23 mg. nectar from clover, 17.43 mg. from cotton, and 11.66 mg from citrus flowers. The mean weights of nectar carried by nectar-pollen gatherers were 22.56, 6.74 and 4 mgs., respectively (Hassanein and El-Banby, 1956).

The same decrease of % T.S.S. in workers honey-sac, which observed during 1997 was noticed during 1998 with a mean of 52.973% T.S.S. The general mean of % T.S.S. during the two seasons of work was 48.787% T.S.S./season. Mean honey production (kg./colony) during the three dates of extraction, June, 25; July, 25 and August, 16, 1997, were 1.844, 7.828 and 9.682 kgs., respectively, with a general mean of 6.455 kg./colony. Mean honey production (kg./colony) during the two dates of extraction, July, 17 and August, 15, 1998, were 2.802 and 8.672 kgs., respectively, with a general mean of 5.747 kg./colony. General mean of honey yield (kgs.) per colony during 1997 and 1998 seasons was 6.096 kg./colony/season. Monthly construction of queen cells and queen cups (mean number/colony) and their percentage during 1998 season are presented in Table 8. Maximum monthly mean of constructed or sealed queen cells per colony, 4.625, was noticed during April, while the maximum monthly mean per colony of: unsealed queen cells, 4.625; total of constructed and unsealed queen cells, 7.50; queen cups, 42.375; total of queen cells and cups, 49.875, were observed during March, 1998. The same peak of queen cells and queen cups construction, was noticed during 1995-1996 and 1997, in Assiut region. Significant correlation was detected between both of maximum, minimum and day time temp. from one side and both of colony population, honey and pollen stores, number of pollen collectors and % T.S.S. in honey-sac content, from the another side. Significant correlation was found between: both of min. temp. and day time temp. and sealed workers brood; both of

max. and min. temp. and sealed drones brood; both of max. temp. and day time temp. and number of foragers. Significant correlation was detected between max. R.H.%, from one side and both of sealed drones brood, colony population, number of pollen collectors and % T.S.S. in honey-sac contents, from the another side. Significant and negative correlation was observed between min. R.H.% and number of queen cups. Significant relationship was found between wind speed and both of: colony population, food stores, number of queen cups, foragers, pollen collectors and % T.S.S. in honey sac contents. Significant correlation was observed between colony population and workers sealed and unsealed brood, total brood (W.+D.) and food stores. Significant correlation was found between food stores and both of sealed and unsealed workers brood, total brood (W.+D.), colony population, foragers, pollen collectors and % T.S.S. in honey-sac. Significant correlation was observed between each of pollen collectors and foragers from one side and drones sealed brood, stored pollen, % T.S.S. in honey sac. Significant correlation was detected between % T.S.S. and both of honey stores and number of foragers.

Data of general monthly average per colony of all studied activities of honeybee colonies in Assiut region during 1995, 1996, 1997 and 1998 seasons are presented in Table 10. Maximum monthly average of workers sealed brood area (in sq. inch.) was observed during September, July and February. Maximum drones brood was found during January-March period, while least drone brood was noticed during October, May, and November. Total sealed brood of workers and drones was highest during February, March, and September. Maximum monthly unsealed workers brood was found during February, September and August, with a less peak during June. Maximum of total, sealed and unsealed brood, was noticed during February, September and August. Minimum average number of unsealed queen cells was found during March, February and July and the minimum number, during October, June, November and December. Maximum constructed queen cells, total of unsealed and constructed queen cells, queen cups and total of queen cells and queen cups, were found during February-April period, which considered to be swarming period. Maximum population of adult bees was found during the period from July till September. Maximum surplus sealed honey area (in sq. inch./colony/month/ season) was found during July-October period. Maximum stored pollen or bee bread was observed inside colonies during August-October period. Maxi-

mum mean number of foragers or pollen-collectors/ minute/colony/month/season, was noticed during July-September period. Generally, in Assiut region, minimum foragers were observed during January, maximum sealed workers and drone brood, maximum unsealed workers brood, and maximum of their total together were noticed during February, maximum of: sealed drone brood, unsealed queen cells, constructed queen cells and their total together, queen cups and their total with queen cells were noticed during March. Minimum stored honey areas were observed during May. Maximum of: adult population, stored pollen, foragers and pollen-collectors were found during August, while during September, maximum sealed workers brood and maximum stored honey, were observed. Minimum of: sealed drones brood, unsealed queen cells and total of queen cells, were found during October. Minimum brood rearing, in general, was found during November, while, during December, minimum of: sealed workers brood, sealed workers and drones brood, total of queen cells and queen cups, adult population, stored pollen and pollen-collection. It is of interest to note that, general increment of workers brood rearing during February, was followed by maximum increment of drone rearing and construction of queen cells and/or cup, during March. Maximum adult population during August, was associated with maximum of: foragers, pollen-collectors and stored pollen or foraging and storing ability.

Table 1. Monthly mean areas (in sq. inch./colony) of workers (W.) and drones (D.) sealed brood, workers unsealed brood, monthly number of brood cells occupied by (W.) or (D.), in Assiut region during 1995-1996 season.

District Date	Sealed brood (W.) (General mean)	Sealed brood (D.) (General mean)	Monthly mean of (W+D) (General mean)	% D. (General mean)	Unsealed brood (W.) (General mean)	% W. unsealed to sealed brood/month (General mean)	Brood cells (W) (General mean)	Brood cells (D) (General mean)	Total brood cells (W+D) (General mean)
<u>A- Dayrout:</u>									
December, 1995	137.1	8.3	145.5	5.346	172.21	+125.611	356.6	132.8	3697.4
January, 1996	264.2	40.13	316.33	12.597	246.08	-93.143	6869.2	642.13	7511.33
February	318.8	82.7	410.5	20.344	327.51	+102.731	8288.8	1323.2	9612
March	218.53	39.93	258.47	15.36	171.63	-78.538	5681.86	638.93	6407.91
<u>B- Elwan:</u>									
November, 1995	89.85	3.22	93.07	3.623	113.639	+126.476	2336.23	51.44	2387.67
	(-)	(-)	(-)	(-)	(-)		(-)	(-)	(-)
December	125.43	14.74	140.17	8.452	157.553	+125.61	3261.18	235.79	3496.97
	(131.265)	(11.52)	(142.835)	(6.899)	(164.882)		(3412.89)	(184.3)	(3597.18)
January, 1996	243.35	47.6	290.95	16.135	139.293	-57.24	6327.27	761.55	7088.82
	(253.775)	(43.865)	(303.64)	(14.366)	(192.687)		(6598.24)	(701.84)	(7300.08)
February	325.41	89.59	415	21.594	334.3	+102.732	8460.79	1433.36	9894.15
	(322.105)	(86.145)	(412.75)	(20.969)	(330.905)		(8374.8)	(1378.28)	(9753.08)
March	262.84	74.58	337.67	22.375	206.422	-78.535	7833.71	1197.28	8030.99
	(240.685)	(57.255)	(298.07)	(18.868)	(189.026)	(-97.748)	(6257.79)	(918.11)	(7219.45)

Table 2. Monthly mean (per colony) of colony population, food stores, surplus honey (H.), stored pollen (P.), in sq. inch./colony and monthly construction of queen cells and cups, in Assiut region during 1995-1996 season.

District Date	Colony population (General mean)	Mean honey area (H.) (General mean)	Mean pollen area (P.) (General mean)	Constructed queen cells (General mean)	Unselected queen cells (General mean)	Total monthly mean (General mean)	Queen cups (General mean)	Total of queen cells and cups
A- Dayrout:								
December, 1995	7800	62.7	33.5	-	-	-	-	-
January, 1996	9866.67	87.2	100.27	-	-	-	-	-
February	11100	77.3	87.3	-	7.7	7.7	33.3	41
March	10600	76.87	52.93	0.93	4.67	5.6	12.4	18
B- Elwan:								
November, 1995	10071	148.57	32.93	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
December	10380.67	225.57	68.28	-	-	-	0.5	0.047
	(9090.34)	(144.14)	(50.89)	(-)	(-)	(-)	(0.25)	(0.235)
January, 1996	11825	221.6	138.01	-	-	-	2.83	2.83
	(10845.84)	(154.40)	(199.14)	(-)	(-)	(-)	(1.415)	(1.40)
February	14166	178.59	154	0.17	7.83	7.995	12.84	20.83
	(12633)	(127.95)	(120.65)	(0.085)	(7.770)	(7.848)	(23.070)	(30.915)
March	11083	154.42	131	3.75	7.75	11.5	10.42	21.915
	(10841.5)	(115.65)	(91.97)	(2.340)	(6.210)	(8.550)	(11.41)	(19.958)

Table 3. Monthly mean (in sq. inch./colony) of workers (W.) and drones (D.) sealed brood, monthly number of brood cells occupied by (W.) or (D.), in Assiut region during 1997

Date	Sealed brood (W.)	Sealed brood (D.)	Total (W. + D.)	Monthly Mean of % D	Brood cells (W.)	Brood cells (D.)	Total (W. + D.)
January	198.08	17.46	215.54	7.97	5150.17	279.31	5429.47
February	242.63	24.19	266.81	9.08	3392.25	386.96	6695.21
Mach	249.17	48.79	297.96	15.91	6478.33	780.64	7258.97
April	184.176	10.25	194.42	4.58	4788.33	164.00	4952.33
May	188.97	1.16	190.12	0.59	4912.38	18.48	4930.86
June	249.40	3.01	252.41	1.19	6484.30	48.16	6532.46
July	251.30	2.99	254.29	1.18	6533.72	47.76	6581.48
August	281.88	10.55	292.46	3.49	6328.75	168.80	7497.55
September	265.38	10.11	275.49	3.58	6899.75	161.76	7061.51
October	140.38	0.45	140.83	0.35	3649.75	7.25	3657.00
November	69.13	-	69.13	-	1797.26	-	1797.26
December	50.98	2.21	53.19	4.54	1325.46	35.36	1360.82

Table 4. Monthly mean (in sq. inch./colony) of workers unsealed brood, percent unsealed to sealed brood colony population, food stores, surplus honey (H.), stored pollen (P.) in Assiut region during 1997

Date	Unsealed brood (W.)	% W. unsealed to sealed brood/month	Colony population	Mean honey area (H.)	Mean pollen area (P.)
January	184.5	-93.14	13750	239.75	103.75
February	249.25	+102.73	16000	166.125	91.25
Mach	195.69	-78.54	14833.33	93.916	95
April	176.17	-95.66	14583.33	43.083	60.75
May	224.6	+118.86	14156.5	21.685	66.345
June	215.11	-86.25	13458.33	167.703	122.063
July	198.79	-79.11	16219	499.715	102.155
August	233.08	-82.69	17146	288.896	172.35
September	241.08	-90.84	16656.5	374.125	149.75
October	150.12	+106.94	13062.67	470.623	111.206
November	87.42	+126.17	10594	391.37	80.655
December	64.04	+125.61	9604	325.646	55.353

Table 5. Monthly foraging, pollen-collection activity (mean number of workers/colony/minute) and monthly construction of queen cells and cups in Assiut region during 1997

Date	Foragers	Pollen collectors	Constructed queen cells	Unsealed queen cells	Total of queen cells	Queen cups	Total queen cells and cups
January	1.43	0.88	1	1.043	2.043	9.336	11.379
February	3.01	1.13	3.315	2.125	5.44	31.63	37.07
Mach	4.17	1.66	3.336	4.5	7.837	49.003	56.84
April	6.92	2.52	-	-	-	20.333	20.333
May	5.08	1.45	-	-	-	8.36	8.36
June	9.83	3.23	-	0.02	0.02	7.003	7.023
July	14.48	4.75	2.41	2.69	5.1	10.195	15.295
August	20.4	6.3	0.16	0.066	0.227	11.286	11.513
September	12.03	3.75	0.015	0.125	0.14	8.39	8.53
October	4.35	1.22	-	0.023	0.023	5.553	5.576
November	4.3	1.28	-	0.095	0.095	3.755	3.85
December	4.57	1.3	0.063	0.073	0.137	2.813	2.95

Table 6. Monthly mean (in sq. inch./colony) of workers (W.) and drones (D.) sealed brood, monthly number of brood cells occupied by (W.) or (D.), in Assiut region during 1998.

Date	Sealed brood (W.)	Sealed brood (D.)	Total (W. + D.)	Mean of % D	Brood cells (W.)	Brood cells (D.)	Total (W. + D.)
January	102.67	6.25	108.917	4.693	2669.333	100	2769.333
February	238.25	29.875	268.125	11.109	6194.5	478	6672.5
Mach	288.125	39.125	327.25	11.679	6491.25	626	8117.25
April	142	5.583	147.583	2.927	3692	89.333	3781.33
May	131.292	0.875	132.167	0.791	3413.583	14	3427.583
June	246.157	1.657	247.813	0.666	6400.063	26.5	6426.563
July	290.083	5.996	296.079	2.033	7542	95.667	7637.667
August	246.75	14.969	261.719	5.701	6415.5	239.5	6655
September	300.313	8.146	308.459	2.664	7808.125	130.33	7938.458
October	247.188	0.305	247.492	0.112	6426.875	4.875	6431.75
November	156.209	0	156.209	0	5061.417	0	4061.417

Table 7. Monthly mean area (in sq. inch./colony) of workers unsealed brood, percent unsealed to sealed brood colony population, food stores, surplus honey (H.), stored pollen (P.) in Assiut region during 1998.

Date	Unsealed brood (W.)	% W. unsealed to sealed brood/month	Colony population	Mean honey area (H.)	Mean pollen area (P.)
January	177.063	+114.022	7833.33	89.333	28.833
February	289.083	+121.336	9250.00	60.875	83.000
Mach	182.75	-63.427	11875.00	60.625	125.875
April	84.333	-59.389	11916.67	29.417	109.000
May	133.922	+102.003	13635.33	22.625	61.729
June	238.375	-96.839	15562.50	142.907	90.313
July	243.376	-83.899	17604.67	305.104	121.042
August	235.625	-95.491	19594.00	579.531	160.938
September	276.146	-91.953	19333.67	507.188	169.729
October	196.172	-79.361	17781.50	401.844	126.188
November	100.271	-64.190	16708.33	215.625	61.547

Table 8. Monthly foraging, pollen-collection activity (mean number of workers/colony/minute), on structure of queen cells and cups in Assiut region during 1998.

Date	Foragers	Pollen collectors	Constructed queen cells	Unsealed queen cells	Total of queen cells	Queen cups	Total queen cells and cups
January	4.433	2.683	-	-	-	3.083	3.083
February	4.875	2.000	-	0.313	0.313	16.063	16.375
Mach	6.350	3.125	2.875	4.625	7.500	42.375	49.875
April	7.417	4.650	4.625	0.858	5.483	27.417	32.967
May	8.150	6.317	0.656	0.646	1.302	19.552	20.855
June	11.550	4.625	-	0.016	0.016	14.423	14.439
July	14.883	7.150	-	0.157	0.157	15.948	16.105
August	21.800	8.525	0.750	1.391	2.141	16.275	18.416
September	16.633	6.517	0.427	0.406	0.834	12.813	13.646
October	8.100	2.025	-	-	-	8.876	8.876
November	5.330	1.670	-	-	-	6.584	6.584

Table 9. Honey-sac content of foragers and honey yield (kg./colony) during active season (June-August) in Assiut region during 1997 and 1998 seasons.

Date	Mean weight (mg.)	Mean % T.S.S.	Date	Mean weight (mg.)	Mean % T.S.S.	Mean weight (mg.) general mean	Mean % T.S.S. general mean
June, 6, 1997	26.7	58.45	June, 19, 1998	27.62	55.26	27.16	56.855
July, 7	24.125	37.75	July, 6	27.035	52.715	25.58	45.233
August, 16	23.75	37.6	August, 7	28.27	50.945	26.01	44.273
Total	74.575	133.8	Total	82.925	158.92	78.75	146.361
General mean	24.858	44.6	General mean	27.642	52.973	26.25	48.787
Date	Mean honey yield (kg)/colony		Date	Mean honey yield (kg)/colony		General mean of 1997 and 1998 seasons	
June, 25, 1997	1.844		-	-		0.922	
July, 25	7.838		July, 17, 1998	2.802		5.32	
August, 16	9.682		August, 15	8.672		9.177	
Total						General mean of 1997 and 1998 = 5.140	
General mean	6.455			5.737		kg./colony	

Table 10. General average of honeybees monthly activities per colony in Assiut region during 1995-1998 seasons.

Months	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Activities												
1. W. Sealed brood. (area, in sq. inch.)	184.84	267.66	259.33	163.08	160.13	247.78	270.69	264.31	282.85	193.78	105.06	91.12
2. D. sealed brood. (area, in sq. inch.)	22.52	46.74	48.39	7.92	1.015	2.33	4.49	12.76	9.13	0.38	1.07	6.87
3. Total sealed brood. (W.+D.), area in sq. inch.)	207.37	314.4	307.72	171	161.14	250.11	275.18	277.07	291.97	194.16	106.13	97.99
4. W. unsealed brood. (area in sq. inch.)	164.75	289.75	189.15	130.25	179.26	226.74	221.08	234.35	258.61	173.15	100.44	114.46
5. Total sealed and unsealed brood. (area, in sq. inch.)	372.12	604.15	496.87	301.25	340.4	476.85	496.26	511.42	550.58	369.31	206.57	212.45
6. Unsealed queen cells. (Number)	0.348	3.401	5.11	0.429	0.323	0.018	1.42	0.73	0.27	0.012	0.032	0.037
7. Constructed queen cells (Number)	0.33	1.133	2.85	2.31	0.33	-	1.21	0.46	0.22	-	-	0.032
8. Total queen cells (Number)	0.68	4.53	7.96	2.74	0.65	0.018	2.63	1.18	0.49	0.012	0.032	0.068
9. Queens cups. (Number)	4.61	23.59	34.26	23.88	13.96	10.71	13.07	13.78	10.6	7.21	3.45	1.42
10. Total queen cells and cups. (Number)	5.29	28.12	42.22	26.62	14.61	10.73	15.7	14.96	11.09	7.23	3.48	1.49
11. Adult population. (Number)	10809.72	12627.67	12516.61	13250	13895.92	14510.42	16911.84	18370	17995.09	15422.08	12457.78	9347.17
12. Food reserves, honey. (area, in sq. inch.)	161.16	118.32	90.06	36.25	22.16	155.31	402.41	434.21	440.657	436.23	251.86	234.89
13. Food reserves, pollen. (area, in sq. inch.)	83.91	98.3	104.28	84.88	64.04	106.19	111.6	166.64	159.74	118.7	58.38	53.12
14. Foragers (Number)	2.93	3.94	5.26	7.17	6.61	10.69	14.68	21.1	14.33	6.23	4.82	4.57
15. Pollen-collectors (Number)	1.783	1.56	2.39	3.59	3.88	3.93	5.95	7.41	5.13	1.62	1.47	1.3

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تربية الحضنة بواسطة أفراد طائفة النحل وأنشطتهم فى منطقة أسيوط

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لوحظ أعلى متوسط نشاط شهري لتربية حضنة الشغالات المغلقة (بالبوصة المربعة) تنازلياً خلال اشهر سبتمبر، يوليو وفبراير بينما كانت أقل مساحة لحضنة الشغالات المغلقة فى شهري نوفمبر وديسمبر. لوحظت اقصى حضنة مغلقة للذكور خلال أشهر يناير، فبراير، مارس. أعلى مجموع لحضنة الشغالات والذكور المغلقة تم تسجيله فى فبراير، مارس وسبتمبر. تم تسجيل أكبر نشاط شهري لحضنة الشغالات المفتوحة فى فبراير، سبتمبر وأغسطس، ولوحظت قمة اقل فى شهر يونيو . بالنسبة لمجموع حضنة الشغالات المفتوحة والمغلقة ، كانت أكبر ما يمكن فى فبراير وسبتمبر وأغسطس. لوحظ أكبر متوسط شهري لأعداد بيوت الملكات المفتوحة فى مارس وفبراير ويوليو، وأقل أعداد فى أكتوبر ويونيو ونوفمبر وديسمبر. تم تسجيل أكبر متوسط شهري لأعداد بيوت الملكات المغلقة ومجموع البيوت الملكية المغلقة والمفتوحة والكنوس الملكية ومجموع البيوت والكنوس الملكية، تم تسجيلها فى الفترة من فبراير الى ابريل، أو موسم التطريد.

لوحظ أعلى تعداد لأفراد طائفة النحل فى الفترة من يوليو الى سبتمبر.

أكبر مساحة للعسل المختوم (البوصة المربعة) داخل طوائف النحل كان فى الفترة من يوليو الى أكتوبر. بالنسبة لمخزون حبوب اللقاح أو خبز النحل كانت أكبر كمية منه موجودة فى الفترة من أشهر أغسطس إلى أكتوبر . أكبر متوسط شهري لأعداد النحل السارح أو الخارج من الطائفة لجمع الغذاء والنحل الجامع لحبوب اللقاح والراجع للطائفة كانت فى أشهر يوليو - سبتمبر.

عموماً، فى منطقة أسيوط، فى شهر يناير: لوحظ أقل عدد من النحل السارح وفى شهر فبراير: أكبر تربية لمجموع حضنة الشغالات المغلقة والذكور وحضنة الشغالات المفتوحة ومجموعها مع حضنة الشغالات المغلقة. وفى مارس: أكبر حضنة ذكور مغلقة وبيوت ملكات مفتوحة وبيوت ملكات مغلقة ومجموعها الكلى والكنوس الملكية ومجموعها مع البيوت الملكية. وفى مايو: لوحظت أقل مساحة من العسل المختوم وفى أغسطس لوحظ أكبر تعداد للنحل ومخزون حبوب لقاح ونحل سارح ونحل جامع لحبوب اللقاح، فى شهر سبتمبر: أكبر مساحة حضنة شغالات مغلقة ومخزون عسل. وفى أكتوبر: لوحظ أقل حضنة ذكور مغلقة وبيوت ملكات مفتوحة ومجموع بيوت الملكات المفتوحة والمغلقة. وفى شهر نوفمبر لوحظت عموماً أقل تربية حضنة وفى شهر ديسمبر: لوحظ أقل عدد من حضنة شغالات مغلقة ومجموع حضنة الشغالات والذكور المغلقة ومجموع بيوت الملكات والكنوس الملكية وتعداد النحل وخبز النحل، والنحل الجامع لحبوب اللقاح.

كما لوحظ أن الزيادة العامة في تربية حضنة الشغالات في شهر فبراير، تلاها أقصى زيادة في تربية حضنة الذكور وبناء بيوت الملكات أو الكئوس الملكية، وذلك في شهر مارس. إرتبطت أقصى زيادة لتعداد النحل بالطائفة في شهر أغسطس مع أقصى أعداد النحل السارح والجامع لحبوب اللقاح أو ما يعنى القدرة على جمع الغذاء وتخزينه.