

SWARMING BEHAVIOUR OF HONEYBEE COLONIES (*APIS MELLIFERA* L.) IN ASSIUT REGION, UPPER EGYPT AND ROLE OF DIFFERENT CASTS IN THE COLONY

M.H. HUSSEIN¹, M.N. SHOREIT², M.O.M. OMAR¹
AND M.F. ABDEL-RAHMAN²

1 Plant Protection Department, Faculty of Agriculture, Assiut University, Assiut, Egypt.

2 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.

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Abstract

Maximum number of honeybee swarms during the two years of work was issued during February-March at 11-12 a.m. Another peak of swarming was observed at 2-3 p.m., during 1997 and at 12-1 p.m. during 1998. Generally, about 90% of honeybee swarms were issued at the day time from 11 a.m. to 3 p.m. Highly significant and positive correlation was detected between construction of both of queen cells and queen cups, from one side, and swarming behaviour from the another side. Maximum swarm, expressed as number of combs which covered with bees from both sides, size, expressed as number of combs which covered with bees from both sides, was observed during March, at 11-12 a.m., followed by February, June and September. During 1997, about 99% of counted swarmed queens, were found during February and March, while during 1998, about 94% of swarmed queens were counted during February and March, with a general average of 95.86%. From these queens, about 94% were virgin. Generally, maximum number of swarmed queens was observed at 11-12 a.m., then queens number decreased at 12-2 p.m. then increased at 2-3 p.m. and afterwards decreased at 3-5 p.m. A positive and highly significant correlation was detected between swarm size and number of swarmed queens during 1997 and 1998. Maximum total number of drones, or 66.91% of total drones numbers and mean number of drones/swarm were found during March, followed by February. Significant correlation was detected between number of swarmed queens and swarmed drones. In general, maximum number of drones was noticed, as in case of queens, at 11-12 a.m. Another peak was observed at 2-3 p.m. Mean fresh weight of swarming workers was 77.592 mg.; water content, 51.917 mg./worker or 66.843% from fresh weight; dry weight, 25.579 mg./worker or 329.698 mg./gm. fresh weight and protein content, mg./gm. fresh weight was 179.779 mg./gm. Dry matter content and protein content in swarming workers bodies were increased. Besides, weight of honey-sacs (mg.) of swarmed workers and % T.S.S. in their contents were more than those of swarmless workers.

INTRODUCTION

This work was carried out during 1997-1998 seasons in Assiut region in order to study the swarming behaviour and characters of honeybee swarms: dates, timing, queens, drones, and workers, with special reference to their honey-sac contents, fresh and dry weights and protein content in swarmed workers bodies.

A very large proportion of the bees of a swarm are of ages four to twenty days, or young bees, in which the glands secreting brood-food and those secreting wax are in a state of maximum activity. These are the swarm bees and called "the jobles bees". If we can manage our bees that the nurses, wax secreters, and nectar inverters, are kept fully employed we shall have no swarm. The swarm control methods include: increasing the capacity of the brood box, substituting wax foundation for old combs, removing brood to supers, increasing the supers capacity, adding brood, sealed or unsealed to the stock, abstracting a nucleus and filling up with foundation, separating flying bees from those which have not yet flown, substituting a young queen for an old one and relying upon the incidence of a nectar flow (Snelgrove, 1995).

MATERIALS AND METHODS

This work was conducted in Elwan, El-Waledeia, El-Badari and Assiut districts, during 1997 and 1998. Total number of naturally captured honeybee swarms, dates, day-time; size or density of captured swarms expressed as number of combs covered with bees from both sides, number of drones and queens/swarm, weight of swarmed workers honey-sacs (in mg) and percentages of total soluble solids (T.S.S%) were counted or measured. Fresh, dry weight (mg.), water content (mg., dry weight (%), water content (%), protein content (% from dry weight), and protein content (mg./gm. fresh weight) in swarmed workers bodies, were estimated and calculated. Protein content was determined using Keldahel method of analysis.

Five volatile oils and two scents were used with paraffin oil (1:2, v/v), during February-March 1997 and 1998; in Assiut region. Citral, geraniol, citral + geraniol (1:1), citral + geraniol + nerol (1:1:1, orange scent, lemon scent, anise oil and lemon grass oil were tested as lures for honeybee swarms.

Volatile oils and scents were mixed with paraffin oil inside plastic tubes. Punching of plastic tubes covers was conducted, in order to release the odor of tested volatile oils and scents. Swarm lures were hanged at 2m. height, in order to attract honeybee swarms.

RESULTS AND DISCUSSION

Monthly number of naturally captured honeybee swarms and their monthly percentages in Assiut region, during 1997 and 1998 are presented in Table 1. During 1997 season, maximum numbers of swarms were observed during February, followed by March. Forty three swarms or 97.73% of all swarms, during 1997, were counted during February and March. The same was observed during 1998, thirty nine swarms or 88.63% of all swarms, were counted during February and March. Maximum monthly number of swarms during 1997 and 1998 was forty nine or 55.68% of all swarms during March, while during February, thirty three swarms or 37.50% of all swarms, were counted. Percentage of swarms number during June, September and October was, 3.41%, 2.27% and 1.14%, respectively. No swarms were observed during April, May, July, August, November, and December, in Assiut region.

Morland (1930) found that excessive heat and lack of ventilation in hives are also conditions leading to swarming. Such situation is observed in Assiut region, high air temperature and lack of ventilation because of keeping of most honeybee colonies crowded inside one breeding boxes, without using of boxes for ventilation. These conditions are leading to swarming.

Table 1. Monthly numbers of honeybee swarms and their monthly percentages in Assiut region, during 1997 and 1998 seasons.

Months	1997		1998		1997 and 1998	
	Number	%	Number	%	Number	%
January	0	0	0	0	0	0
February	28	63.64	5	11.36	33	37.50
March	15	34.09	34	77.27	49	55.68
April-May	0	0	0	0	0	0
June	0	0	3	6.82	3	3.41
July-August	0	0	0	0	0	0
September	1	2.27	1	2.27	2	2.27
October	0	0	1	2.27	1	1.14
November-December	0	0	0	0	0	0
Total	44	100	44	100	88	100

Data of relation between numbers of honeybee swarms and day-time in Assiut region during 1997 and 1998 are presented in Table 2. Maximum number of honeybee swarms, 15 swarms, and 18 swarms were observed at 11-12 a.m. during 1997 and 1998 seasons, respectively. This represent 34.09% and 40.91% of all swarms which counted during 1997 and 1998 seasons, respectively, with a mean of 37.5% during the two seasons of work. Another peak of swarming was observed at 2-3 p.m., during 1997 and at 12-1 p.m., during 1998. Generally, about 90% of honeybee swarms were issued at the day-time from 11 a.m. to 3 p.m. in Assiut region, Table 2. Correlation coefficients and regression equations between each of total monthly number of queen cells, monthly numbers of queen cups and their monthly total together (X), from one side and monthly number of captured and hived swarms (Y) in Assiut region during 1997 and 1998 were calculated. Highly significant correlation was detected between construction of both of queen cells and queen cups and swarming behaviour of colonies in Assiut. Non-significant correlation was found between brood rearing and swarming in Assiut region.

Table 2. Relation between numbers of honeybee swarms and day-time in Assiut region, during 1997 and 1998 seasons.

Day-time \ Season	1997 season		1998 season		1997 and 1998		Mean
	Number	%	Number	%	Number	%	
11-12 a.m.	15	34.09	18	40.91	33	37.5	16.5
12-1 p.m.	5	11.36	13	29.55	18	20.45	9
1-2 p.m.	2	4.55	10	22.73	12	13.64	6
2-3 p.m.	13	29.55	3	6.82	16	18.18	8
3-4 p.m.	6	13.64	-	-	6	6.82	3
4-5 p.m.	3	6.82	-	-	3	3.41	1.5
Total	44	100	44	100	88	100	44

Restricting the space available for adult bees of a colony led to swarming. When large colonies were put in small hives, most swarmed without starting to rear queens (Simpson and Riedel, 1963). In Jordan, Robinson (1981) reported that, most of the colonies in Langstroth hives remain in one box throughout the year. Swarming is thus encouraged. Such situation or the same case is observed in Assiut region during the recent work.

Data of honeybee swarms monthly density or size, expressed as number of combs which covered by bees from both sides, after hiving of swarms, are presented in Table 3 and relation between day time and honeybee swarms size during 1997 and 1998 seasons and their percentages is presented in Table 4. During 1997, maximum swarms issue was 28 swarms during February, with total size of 75.5 covered combs with bees or 63.71% of annual activity and a mean of 2.696 combs/swarms. This peak was followed by March figures which comprises 35.02% of annual activity. Maximum density or swarm size was noticed at 2-3 p.m. followed by 11-12 a.m. This comprises 30.58% and 27.85% of annual activity, respectively. During 1998, maximum number of swarms was 34 during March, with total size of 101.25 covered combs with bees or 79.41% of annual activity and an average of 2.978 combs/swarm. This peak was followed by February figures which comprises 12.25% of annual activity. Maximum swarm size was observed at 11-12 a.m. followed by 12-1 p.m. This compares 41.37% and 28.43% of annual activity, respectively. Generally, in Assiut during 1997 and 1998, the maximum number of swarms, 49 swarms, maximum total swarm size, 142.75 combs covered with bees or 58.03% of annual activity and an average of 2.913 covered combs with bees/swarm, were observed during March, followed by February, June and September. Maximum number of swarms, 33 swarms and maximum swarms size, 85.75 combs covered with bees, or 34% of annual activity were observed at 11-12 a.m.

Monthly numbers of virgin, mated queens and their total from collected and captured honeybee swarms, in Assiut region, during each of 1997 and 1998, and their total, are presented in Table 5. Maximum number of queens during 1997, were observed during February, 49 queens, or 55.44% of total annual number of swarmed queens, from them fourty two were virgin and seven mated queens. Fourty virgin swarmed queens were counted during March, 1997, or 44.44% of total annual number of swarmed queens. Maximum number of queens during 1998 were noticed during March, 65 queens or 82.28% of total annual number of swarmed queens, from them sixty three were virgin and two mated queens. Eight queens were counted during February, or 10.12% of total annual number of swarmed queens. Mean numbers of queens/swarm was higher during March, 1997, and 1998, and total of two seasons, as compared with February means. They were 2.667, 1.912 and 2.143 queens/swarm, during March, while February figures were 1.50, 1.912 and 2.143 queens/swarm, respectively. During 1997, 98.88% of counted queens were observed during February-March period, while during 1998, 92.4% of swarmed queens were counted during this period, with a general mean of 95.86% during 1997 and 1998 seasons. Few queens were ob-

Table 3. Honeybee swarms size or density (number of combs covered with bees) during 1997 and 1998, in Assiut region.

Season Months	1997 season		1998 season		1997 and 1998	
	Total (n) (Mean)	%	Total (n) (Mean)	%	Total (n) (Mean)	%
January	-	-	-	-	-	-
February	75.50(28) (2.696)	63.1	16 (5) (3.2)	12.55	91.5 (33) (2.773)	37.2
March	41.5 (15) (2.767)	35.02	101.25 (34) (2.978)	79.41	142.75 (49) (2.913)	58.03
April-May	-	-	-	-	-	-
June	-	-	6.5 (3) (2.167)	5.1	6.5 (3) (2.167)	2.64
July-August	-	-	-	-	-	-
September	1.5 (1) (1.5)	1.27	1.75 (1) (1.75)	1.37	3.25 (2) (1.625)	1.32
October	-	-	2.0 (1) 2.0	1.57	2.0 (1) (2.0)	0.81
Nov-Dec.	-	-	-	-	-	-
Total	118.5	100	127.5	100	246	100

Table 4. Relation between day-time and honeybee swarms size during 1997 and 1998, in Assiut region.

Season Day Time	1997 season		1998 season		1997 and 1998	
	Total (n) (Mean)	%	Total (Mean)	%	Total (n) (Mean)	%
11-12 a.m.	33 (15) (2.2)	27.85	52.75 (18) (2.931)	41.37	85.75 (33) (2.598)	34.86
12-1 p.m.	14.75 (5) (2.95)	12.45	36.25(13) (2.788)	28.43	51 (18) (2.833)	20.73
1-2 p.m.	9.5 (3) (3.167)	8.02	31.75 (10) (3.175)	24.91	41.25 (13) (3.173)	16.77
2-3 p.m.	36.25 (12) (3.012)	30.58	(6.75)(3) (2.25)	5.29	43(15) (2.867)	17.48
3-4 p.m.	19.5 (6) (3.25)	16.46	- (-)	-	19.5 (6) (3.25)	7.93
4-5 p.m.	5.5 (3) (1.833)	4.64	- (-)	-	5.5 (3) (1.833)	2.23
Total	118.5	100	127.5	100	246	100

served during October, 1997 and June, September, and October, 1998 in Assiut region. Relation between numbers of swarmed honeybee queens and day time in Assiut region during 1997 and 1998 seasons is presented in Table 6. Maximum number of swarmed queens during 1997, was counted at 2-3 p.m., twenty nine queens or 32.22% of total swarmed queens, followed by 11-12 p.m., twenty five queens, from them twenty virgin and five mated queens, or 27.8% of all swarmed queens. Percentage of virgin queens was 92.22% of all swarmed queens during 1997 in Assiut region. During 1998, maximum number of swarmed queens was observed in swarms which collected at 11-12 a.m., twenty nine queens or 36.71% of total queens, followed by 12-1 p.m., twenty three queens, from them twenty two virgin and only one mated queen, or 29.12% of all swarmed queens. Percentage of virgin queens was 96.20% of all swarmed queens during 1998. General mean percentages of virgin queens during the two seasons of work, was 94.08% of all swarmed queens. Generally, in Assiut region, during 1997 and 1998 seasons, maximum number of swarmed queens was observed at 11-12 a.m., fifty four queens or 31.95% of all queens. Number of queens was gradually decreased at 12-2 p.m., then the number increased at 2-3 p.m. and afterwards decreased at 3-5 p.m. In El-Waledia, Assiut region, during 1997 season, a positive and significant correlation ($r = 0.47044^*$) was detected between swarm size (X) and number of swarmed queens (Y). The same was observed in El-Badari, Assiut region, during 1998 ($r = 0.50985^*$). During 1997 and 1998 seasons, correlation was positive and highly significant ($r = 0.32194^{**}$).

Monthly number of drones from honeybee swarms, which captured and hived in Assiut region during 1997 and 1998 are presented in Table 7. As observed with total numbers and mean numbers of queens, Table 5, maximum total numbers of drones in 1997 season, was during February, and in 1998 season was during March. Generally, maximum total number of drones, or 66.91% of total drones number, was found during March, followed by February, September and October. Their percentage of abundance was 29.28%, 2.66% and 1.15%, respectively. As observed with swarmed queens, mean numbers of drones swarm was high during March, 1997 and 1998 and total of two seasons, as compared with February means. They were 81.40, 92.59 and 89.16 drones/swarm, respectively during March, while February figures were : 59.75, 74.80 and 57.94 drones/swarm, respectively. No significant correlation was found between swarm size (x) and drones number (Y). However, positive and significant correlation ($r = 0.47713^*$) was detected between queens numbers in honeybee swarms (X), which captured and hived in El-Badari, Assiut region, during 1998, and numbers of drones (Y) in these swarms. In El-Badari and Elwan, Assiut region, during 1997 and 1998 seasons,

significant correlation ($r = 0.38807^*$) was observed between number of swarmed queens (X), and swarmed drones (Y). Relation between numbers of drones in swarms and day time in Assiut region, during 1997 and 1998 seasons, is presented in Table 8. Maximum number of drones during 1997, 1101 drones or 37.36% of all swarmed drones was observed at 2-3 p.m., in Assiut region. During 1998, maximum number of drones was noticed at 11-12 a.m., 1503 drones or 41.95% of all swarmed drones. During 1997 and 1998 seasons, maximum number of drones was also noticed at 11-12 a.m., 2274 drones or 34.82% of all drones during the two years of work. The same was observed with swarmed queens, Table, 6. Generally, largest numbers of drones or queens in swarms captured at 11-12 a.m., then drones or queens numbers decreased gradually at 12-2 p.m. Another peak of drones or queens numbers was noticed at 2-3 p.m., then gradual decrease in numbers of drones or queens at 3-5 p.m., in Assiut region, Tables 6 and 8.

The predisposing influences on swarming are: season, district, strain of bee, shade and ventilation, age of queen, comb space for honey and queen, drones, "manipulations", size of colony, weather and state of the "flow" (Richards, 1975).

Monthly weights of honey-sac contents (mg.) of swarmed workers and percentages of total soluble solids (% T.S.S.), which reflects the carbohydrate content or sugars of nectar in Assiut region during 1997 and 1998 seasons, are presented in Table 9. Mean weight of workers honey-sac was 38.46 mg. during March, 37.34 mg. during February and 36.34 mg/worker during September, 1997. During 1998, maximum weight (mg.), was 37.05 mg. during March, while minimum weight of honey-sac, was 26.42 mg during October. Generally, during 1997 and 1998 seasons in Assiut region, maximum mean weight of workers honey-stomach or honey-sac, was 37.44 mg. during March, followed by, 36.71 mg. during February, 36.01 mg. during September and 26.42 mg. during October. Concerning % T.S.S. in workers honey-sac contents, they were slightly less during March as compared with February figures. It is of interest to note that higher honey-sac weight (mg.) was associated with lower % T.S.S. and the reverse was true, Table 9. It is of interest to note that general mean of honey-sac weight, 26.25 mg./worker during active season, was about the same as minimum honey-sac weight, 26.42 mg./swarmed worker, from honeybee swarm collected in inactive period, during October in Assiut region.

Taranov (1955) stated that engorgement is necessary for swarming workers to be perceptive of their queen. Combs (1972) reported that all workers in a swarm were not equally engorgement. Worker engorgement occurred gradually during the ten days

prior to swarming. Its measurement may therefore serve as method of swarm prediction.

Fresh and dry weight (mg.) in swarmed workers bodies, water and protein contents (mg.) and their percentages in Elwan (A) and El-Weledia (B) districts during 1997 and in Elwan (A) and El-Badari (B) districts, Assiut region, during 1998 and their general mean, are presented in Table 10. About the same mean fresh weight of adult worker was observed in Elwan (A) district during 1997 and 1998, 77.475 mg., and in El-Weledia and El-Badari districts (B), during 1997 and 1998, 77.708 mg., with a general mean of 77.592 mg./swarmed worker. About the same figure, 78.83 was obtained by Hussein *et al.* (1980) in normal swarmless adult workers, in Assiut region. Water content (mg./worker) was 50.117 mg. in district A, and 53.717 mg. for districts (B), with a general mean of 51.917 mg./worker. It comprises, 64.644%, 69.042%, with a general mean of 66.843% from total swarmed workers bodies, respectively. General water content % of swarmed adult workers bodies, 66.843%, is less than that obtained in normal swarmless adult workers, in Assiut region, 79.98% water content (Hussein *et al.*, 1980). Dry weight (mg./worker) was 27.358 mg in district A, and 23.80 mg in districts (B), with a general mean of 25.579 mg./worker. This comprises 35.358%, 30.958% with a general mean of 33.158% dry matter from total swarmed workers bodies. This general mean of swarmed workers is more than that obtained in normal swarmless adult workers, in Assiut region, 20.02% dry matter (Hussein *et al.*, 1980). Dry weight (mg./gm.) fresh weight was higher in Elwan, 353.120 mg./gm. during 1997 and 1998 than those of El-Weledia and El-Badari, during 1997 and 1998, respectively, 306.275 mg./gm., with a general mean of 329.698 mg./gm. The previously mentioned figure is two times more than that recorded by Hussein and Abdel-Aal (1979) in normal swarmless adult workers in Assiut region. Percentage of protein content from dry weight was 49.082 in district (A) and 52.532% in districts (B), with a general mean of 50.807% in both years of work. Protein content (mg./gm. fresh weight) was 174.469 mg./gm. in district (A) and 185.089 mg./gm. in districts (B), with a general mean of 179.779 mg./gm. fresh weight of swarming adult workers, or 1.4 times more than that recorded by Hussein *et al.* (1980) for Carniolan swarmless adult workers and 1.223 times more than that estimated by Hussein and Abdel-Aal (1979) in Egyptian bees. From the represented data, it is obvious that dry matter content and protein content in swarming workers bodies were increased. Besides, weight of honeysacs of swarmed workers and percentage of (T.S.S.) in their contents were more than those of swarmless workers. These food reserves are essential during swarming.

Table 5. Monthly numbers of virgin and mated queens from honeybee swarms in Assiut region during 1997 and 1998 seasons.

Season Months	Number of queens											
	1997				1998				1997 and 1998			
	Virgin	Mated	Total (n) (Mean)	%	Virgin	Mated	Total (n) (Mean)	%	Virgin	Mated	Total (n) (Mean)	%
January	-	-	(-)	-	-	-	(-)	-	-	-	(-)	-
February	42	7	49 (28) (1.5)	54.44	7	1	8 (5) (1.6)	10.12	49	8	57 (33) (1.727)	33.73
March	40	-	40 (15) (2.667)	44.44	63	2	65 (34) (1.912)	82.28	103	2	105 (49) (2.143)	62.13
April-May	-	-	(-)	-	-	-	(-)	-	-	-	(-)	-
June	-	-	(-)	-	4	-	4 (3) (1.333)	5.06	4	-	4 (3) (1.333)	2.37
July-August	-	-	(-)	-	-	-	(-)	-	-	-	(-)	-
September	1	-	1 (1)	1.11	1	-	1 (1)	1.27	2	-	2 (2)	1.18
October	-	-	(-)	-	1	-	1 (1)	1.27	1	-	1 (1)	0.59
Nov.-Dec.	-	-	(-)	-	-	-	(-)	-	-	-	(-)	-
Total			90	100			79	100			169	100

Table 6. Relation between numbers of honeybee queens in swarms and day-time in Assiut region during 1997 and 1998 seasons.

Time	11-12 a.m.		12-1 p.m.		1-2 p.m.		2-3 p.m.		3-4 p.m.		4-5 p.m.		Total
	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	
Number of Queens													
1997													
Virgin	20		12		3		28		15		5		83
Mated	5		-	2.4(5)	-		1		1		-		7
Total	25	1.667(15)	12		3	1(3)	29	2.417(12)	16	2.667(6)	5	1.667(3)	90
%	27.78		13.33		3.33		32.22		17.78		5.56		100
1998													
Virgin	28		22		21		5		-		-		76
Mated	1		1		-		1		-		-		3
Total	29	1.61(18)	23	1.769(13)	21	2.1(10)	6	2(3)	-		-		79
%	39.71		29.12		26.58		7.59		-		-		100
1997 and 1998													
Virgin	48		34		24		33		15		5		159
Mated	6		1		-		2		1		-		10
Total	54	1.64(33)	35	1.94(18)	24	1.85(13)	35	2.33(15)	16	2.667(6)	5	1.667(3)	169
%	31.95		20.71		14.2		20.71		9.47		2.96		100

Table 7. Monthly numbers of drones from honeybee swarms in Assiut region during 1997 and 1998 seasons.

Season Months	Number of drones					
	1997 season		1998 season		1997 and 1998	
	Number	%	Number	%	Number	%
January	-	-	-	-	-	-
February	1673 (28) (59.75)	56.77	239 (5) (47.8)	6.67	1912 (33) (57.94)	29.28
March	1221 (15) (81.4)	41.43	3148 (34) (92.588)	87.86	4369 (49) (89.16)	66.91
April-May	-	-	-	-	-	-
June	-	-	75 (3) (25)	2.09	75 (3) (25)	1.15
Jul-August	-	-	-	-	-	-
September	53 (1) (53)	1.8	121 (1) (121)	3.38	174 (2) (871)	2.66
Oct.-Dec.	-	-	-	-	-	-
Total	2947	100	3583	100	6530	100

Table 8. Relation between numbers of drones in swarms and day-time in Assiut region during 1997 and 1998 seasons.

Time	11-12 a.m.		12-1 p.m.		1-2 p.m.		2-3 p.m.		3-4 p.m.		4-5 p.m.		Total
	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	Total	Mean (n)	
Number of drones													
1997													
Number	771	51.4 (15)	232	46.4 (5)	149	49.6 (3)	1101	91.75 (12)	396	66 (6)	298	99.33(3)	2947
%	26.16		7.87		5.06		37.36		13.44		10.11		100
1998													
Number	1503	83.5 (18)	923	71 (13)	886	88.6 (10)	271	90.33 (3)	-	-	-	-	3583
%	41.95		25.76		24.73		7.56		-	-	-	-	100
1997 and 1998													
Number	2274		1155		1035		1372		396				6530
%	34.82		17.69		15.85		21.01		6.06				100

Table 9. Monthly weights of honey-sac contents (mg.) of swarmed workers, and percentage of total soluble solids (% T.S.S.) in their contents in Assiut region during 1997 and 1998 seasons.

Months	Jan.	Feb.	Mar.	Apr.-Aug	Sep.	Oct.	Nov.-Dec.	Total
1997 season								
Weight (mg.) of honey sac								
Total (n)	-	597.46 (16)	230.74 (6)	-	36.34 (1)	-	-	864.54
Mean	-	37.34	38.46	-	36.34	-	-	100
%	-	69.12	26.68	-	4.20	-	-	
1998 season								
Total (n)	-	100 (3)	592.86(16)	-	35.68 (1)	26.42 (1)	-	754.96
Mean	-	33.33	37.05	-	35.68	26.42	-	100
%	-	13.25	78.53	-	4.73	3.50	-	
1997 and 1998								
Total (n)	-	697.46 (19)	823.6 (22)	-	72.02 (2)	26.42 (1)	-	1619.5
Mean	-	36.71	37.44	-	36.01	26.42	-	100
%	-	43.07	50.86	-	4.45	1.63	-	
1997 season % T.S.S.								
Total (n)	-	1025.38(16)	371.44 (6)	-	62.56 (1)	-	-	1459.38
Mean	-	64.09	61.91	-	62.56	-	-	100
%	-	70.26	25.45	-	4.29	-	-	
1998 season								
Total (n)	-	200 (3)	1050.56(16)	-	62.04 (1)	66.94 (1)	-	1379.54
Mean	-	66.67	65.66	-	62.04	66.94	-	100
%	-	14.50	76.15	-	4.50	4.85	-	
1997 and 1998								
Total (n)	-	1225.38(19)	1422 (22)	-	124.6 (2)	66.94 (1)	-	2838.92
Mean	-	64.49	64.64	-	62.3	66.94	-	100
%	-	43.16	50.09	-	4.39	2.36	-	

Table 10. Fresh and dry weight, water and protein contents (mg.) and their percentages in Elwan (A) and El-Weledia (B) during 1997, and in Elwan (A) and El-Badari (B), Assiut region during 1998, and their general mean, in adult workers bodies.

Criteria	1997		1998		General mean/ worker of 1997 & 1998 (mean of two localities)
	Total (n)	Mean/ worker	Total (n)	Mean/ worker	
Fresh weight (mg.) A	4310 (60)	71.833	4987 (60)	83.117	77.475
B	4936 (60)	82.316	4386 (60)	73.10	77.708
					(77.592)
Water content (mg.) A	2793 (60)	46.550	3221 (60)	53.683	50.117
B	3448 (60)	57.466	2998 (60)	49.967	53.717
					(51.917)
Water content (%) A	388.07 (6)	64.680	387.64 (6)	64.607	64.644
B	419.02 (6)	69.836	409.49 (6)	68.248	69.042
					(66.843)
Dry weight (mg.) A	1517 (60)	25.283	1766 (60)	29.433	27.358
B	1468 (60)	24.466	1388 (60)	23.133	23.800
					(25.579)
Dry weight (%) A	211.93 (6)	35.32	212.37 (6)	35.395	35.358
B	180.98 (6)	30.163	190.51 (6)	31.752	30.958
					(33.158)
Dry weight (mg./g. A fresh weight		351.969		354.115	353.120
B		297.220		316.457	306.275
					(329.698)
Protein content (%), A from dry weight,	299.437 (6)	49.906	289.546 (6)	48.258	49.082
B	330.143 (6)	55.024	300.241 (6)	50.040	52.532
					(50.807)
Protein content (mg/g.) A fresh weight		190.088		158.850	174.469
B		182.897		187.280	185.089
					(179.779)

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سلوك التطريد في طوائف نحل العسل (أبيس ميليفرا) في منطقة أسيوط، مصر العليا ودور مختلف افراد الطائفة

مصطفى حسن حسين^١، محمد نبيل شريت^٢، محمد عمر محمد^١،

محمد فتح الله عبد الرحمن^٢

^١ قسم وقاية النبات - كلية الزراعة، جامعة أسيوط، أسيوط، مصر.
^٢ قسم النحل، معهد بحوث وقاية النبات، مركز البحوث الزراعية، الدقى، الجيزة، مصر.

تم خروج أكبر عدد من طرود النحل خلال عامي الدراسة في شهري فبراير ومارس ما بين الساعة ١١ - ١٢ ظهرا. لوحظت قمة أقل للتطريد في الساعة ٢ - ٣ بعد الظهر في عام ١٩٩٧ وفى الساعة ١٢ - ١ بعد الظهر في عام ١٩٩٨. عموما خرجت حوالي ٩٠٪ من طرود النحل في الفترة من ١١ صباحا الي ٣ بعد الظهر. لوحظ ارتباط مؤكد جدا وموجب بين بناء كلا من البيوت الملكية والكتوس الملكية، من ناحية وحدوث التطريد من ناحية أخرى. لوحظ أقصى حجم للطرود، معبرا عنه بعدد الأقراس التي يغطيها النحل من الجانبين، خلال شهر مارس من ١١ - ١٢ ظهرا يليه شهر فبراير، يونيو وسبتمبر.

لوحظت حوالي ٩٩٪ من ملكات النحل المصاحبة للطرود، في عام ١٩٩٧ م فى شهرى فبراير ومارس، بينما في عام ١٩٩٨م فإن حوالي ٩٤٪ من الملكات القائمة بعملية التطريد لوحظت أيضا في شهرى فبراير ومارس وذلك بمتوسط عام ٨٦،٩٥٪، أربعة وتسعون بالمائة من هذه الملكات كانت عذارى. عموما، كان أقصى عدد من الملكات القائمة بالتطريد لوحظت في الساعة ١١ - ١٢ ظهرا، ثم قل عدد الملكات تدريجيا من ١٢ - ٢ بعد الظهر ثم زاد مرة أخرى فى الفترة من ٢ - ٣ بعد الظهر، وتناقص مرة أخرى من ٣ - ٥ بعد الظهر. الارتباط موجب ومعنوى جدا بين حجم الطرد وعدد الملكات القائمة بالتطريد، خلال عامى ١٩٩٧، ١٩٩٨م.

أكبر عدد للذكور أو ٦٦٪ من العدد السنوي الكلي، وأعلى متوسط لعدد الذكور/طرود، لوحظ في شهر مارس، يليه فبراير. لوحظ ارتباط معنوي وموجب ما بين عدد الملكات القائمة بالتطريد (عامل مستقل) وعدد الذكور القائمة بالتطريد (عامل تابع). عموما، فإن أقصى عدد للذكور تمت ملاحظته، كما فى حالة الملكات، فى الساعة ١١ - ١٢ ظهرا، كما لوحظت قمة أقل فى الساعة ٢ - ٣ بعد الظهر.

متوسط الوزن الطازج للشغالات القائمة بالتطريد كان ٥٩٢، ٧٧ مجم / شغالة، محتوى الماء، ١٧،٩١٧ ٥١،٨٤٢ مجم/شغالة أو ٦٦،٨٤٢٪ من الوزن الطازج، الوزن الجاف ٢٥،٥٧٩ مجم / شغالة أو ٢٢٩،٦٩٨ مجم/جم وزن طازج، محتوى البروتين ١٧٩،٧٧٩ مجم/جم وزن طازج. الوزن الجاف ومحتوى البروتين كان مرتفع فى الشغالات القائمة بالتطريد. بالاضافة لذلك، فإن وزن معدة العسل (مجم) ونسبة المواد الصلبة الذائبة الكلية المثوية فى محتويات معدة العسل للشغالات القائمة بالتطريد كانت أعلى من الشغالات غير القائمة بالتطريد.