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Weight of Honeybee Colonies in Relation with Honey Production under Minia Governorate conditions

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Abstract

This research was an attempt to find an easy method for beekeeper to predict honey production in the season. Honeybee colonies and empty hives were weighted during the flowering period of anise and Egyptian clover, which considered as main honey crops in Minia region, Egypt Governorate during 2019 and 2020 seasons. Results showed as increase in colony weights during anise flowering period with 12 days interval from 10.500 to 14.014kg in 2019 and from 10.300 to 13.790 kg in 2020. Honey production reached 2.861 kg and 2.944 kg in 2019 and 2020 per colony, respectively. The same results were recorded in the flowering periods of Egyptian clover but the increases of colonies weight were higher in the two seasons. The Egypt clover honey reached 5.199 kg /colony at the end of the flowering seasons of 2019 and 2020 where colony weight increased from 11.375 to 15.048kg in 2019 and from 11.217 to 14.648 kg in 2020 per colony.

INTRODUCTION

Since 4000 BC humans have kept bees for production honey [5]. Bees work a notice agricultural role in producing honey and the pollination of flowering crops [1]. Honey bee is the most economically important of bee colony product. It is natural sweet substance produced by honey bees, collect from the nectars of flowers [3]. [14] revealed that changes colony weight, were correlated with food store, hive weight changes from the beginning to the end nectar flow up to the honey supers are full, finally, changes in colony strength effect on hive weight [14]. Measuring hive weight helps to determine the best time to honey harvesting and determine the periods of nectar flow [12]. Also, information on colony dynamics [4]. [15] found that hive weight data used to indicate amount of food consumption. [9] revealed that the relationship between honeybee colony weight and honey stored was not dependent on honey stored amount but the number of days from the beginning of the honey harvest effect of hive weight changes.

MATERIALS AND METHODS

This study was carried out in the Faculty of Agriculture apiary in Minia region, Egypt. Eight hybrid Carnioilan honeybees (Apis mellifera carnica) colonies tested through two seasons of 2019 and 2020.

Experimental colonies: Five honeybee colonies with 6 wax combs covered with bees and having about equal strength and about equal stored honey and pollen were selected.

Control hives (Empty wooden hives): Three wooden Langstroth hives set in the same region of tested colonies. Each hive included six wooden Langstroth frames, inner burlap cover, empty wax combs and left hives in the same weather conditions of tested colonies.

Determing weights of colonies and hives: Each colony or empty hive placed on top of electronic balance made from stainless steel. The maximum capacity of balance was 100 kg, a precision of ± 30 g described by [2] & [10]. Hives were weighted with bees, brood, wax [6] & [13] and then colonies in the beginning of the crop flowered then the weight was done with 12 days intervals.

Estimating stored honey (H): Honey was determined according to equation of [9] which modified by mathematical system [16] to be modified to Egypt conditions as follows ;

$$H=1458.45+0.498822D+66.2821C+9.00293CD$$

C: The difference between honeybee colony weight and empty hives.

D: Days from beginning of the honey harvest.

H: Related of honey stored

Statistical analysis: The obtained data were subjected to one way analysis of variance and the difference among means was compared according to least significant difference [7].

RESULTS AND DISCUSSION

The obtained data in Table (1) and Fig. (1) indicated that production of Anise honey in the two seasons of 2019 and 2020 were related to colony weight as followes, when colony weight started with10.500 and 10.300 kg honey, production recorded 1.489 and 1.486 kg for two seasons of 2019 and 2020, respectively. Also, data in both seasons were showed significant differences between colony weights. Amount of anise honey was increase gradually till the end of the season in the beginning of April in both studied seasons 2019 and 2020, as 2 and 5 April which recorded 14.014 and 13.790 kg with significant differences for seasons of 2019 and 2020, respectively. On the other hand the weight of empty hives

increased slowly from 10.100 to 10.550 kg in 2019 and from 10.000 to 10.200 kg in 2020.

Data in Table (2) and Fig. (2) showed that using modified McLellan, equation between colony weight and honey production fluctuation in clover flowering period in seasons 2019 and 2020. Gradual increase of mean weight in colony and the hives from 11.375 to 15.048 kg at the end of the flowering period in 29 July with significant differences. While the weight of empty hives increased from 10.000 kg to one 10.500 kg. Also, the values of Honey production using the applied equation showed a high increase from 1.691 to 5.199 kg/colony. The same results was noted in 2020 season honey production increase from 1.662 to 5.199 kg. It was cleared that honey production increased with the increase of flowering period of the crop. In season 2019 data gradual increase in honey amount (H) which 1.691 kg at 19 May to be 5.199 kg at 29 July at the end of the season, linked to colony weight which change from 11.375 to 15.048 kg at 19 May and 29 July, respectively. Colonies weight showed significant differences between colonies weight over the days of honey flow. Whereas, there are significant differences were appeared between colonies weight at 17, 29 July and months of May and June.

In the other hand data in Table (3) and Fig. (3) at the second season of clover, results showed no significant differences between colonies weight at 22 July and 3 August, but results revealed that significant differences between colonies weight beginning of June month and its end. Furthermore, colonies weight was increased from 1.662 kg at 21 May to 5.199 kg at 3 August. In general, all results were in agreement with [8] & [11] & [14] found that positive significant correlation between weight of honeybee colonies and honey production up to19.00 kg / colony at the end of season.

Using modified Mclellan equation in the data of honey production in Minia region, will help beekeepers and research workers to predict honey production of the area.

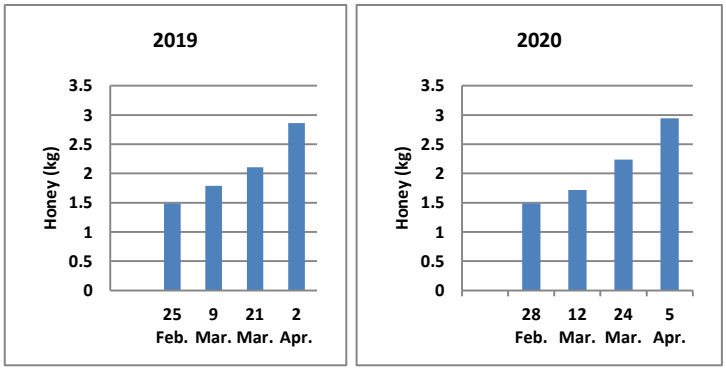

Figure (1): Application of modified McLellan, equation for honey production under Egypt environmental conditions during anise flowering periods in seasons of 2019 and 2020

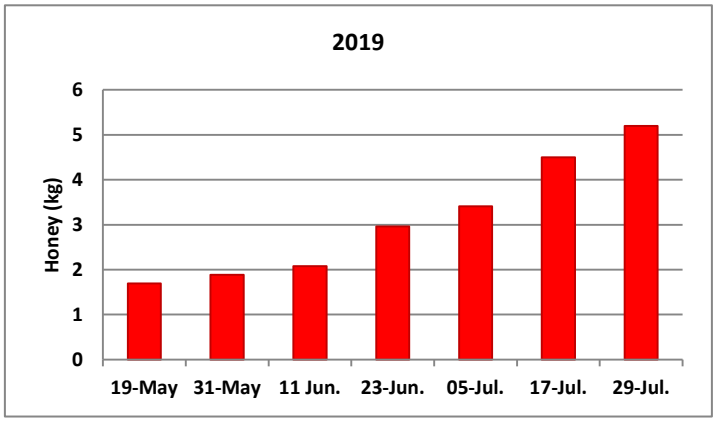

Figure (2): Application of modified McLellan, equation for honey production under Egypt environmental conditions during clover flowering periods in season 2019.

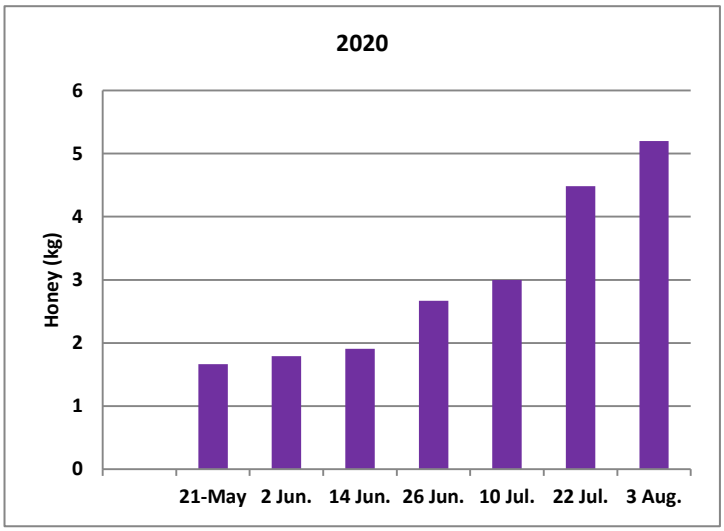

Figure (3): Application of modified McLellan, equation for honey production under Egypt environmental conditions during clover flowering periods in seasons of 2020.

Table (1): Application of modified McLellan, equation for honey production under Egypt environmental conditions during anise flowering periods in two seasons of 2019 and 2020.

	Date	Mean CW (Kg)	Mean HV weight	C	D	H	LSD 5%
2019	25 Feb.	10.500 b	10.100	0.400	1	1.489	
	9 Mar.	11.802 b	10.050	1.752	13	1.786	1.523
	21 Mar.	12.180 b	10.000	2.180	25	2.106	
	2 Apr.	14.014 a	10.550	3.464	37	2.861	
2020	28 Feb.	10.300c	9.990	0.310	2	1.486	
	12 Mar.	11.320 c	10.000	1.320	14	1.719	1.018
	24 Mar.	12.742 b	10.200	2.542	26	2.235	
	5 Apr.	13.790 a	10.200	3.590	38	2.944	

CW= Weight / colony (kg,) full. HV= Weight / hive (kg,) empty.
C= CW-HV D=Days from beginning of flowering
H= Honey stored (kg).

Table (2): Application of modified McLellan, equation for honey production under Egypt environmental conditions during clover flowering periods in seasons of 2019

Date	Mean CW (Kg)	Mean HV weight	C	D	H (kg)
19 May	11.375 d	10.000	1.375	11	1.691
31 May	11.425 d	9.900	1.525	23	1.887
11 Jun.	11.617 d	10.030	1.587	35	2.081
23-Jun.	13.039 c	10.020	3.019	47	2.959
05-Jul.	13.221 bc	10.000	3.221	59	3.412
17-Jul.	14.257 ab	10.000	4.257	71	4.497
29-Jul.	15.048 a	10.500	4.548	83	5.199
LSD 5%			1.122		

CW= Weight / colony (kg,) full. HV= Weight / hive (kg,) empty.
C= CW-HV D=Days from beginning of flowering
H= Honey stored (kg)

Table (3): Application of modified McLellan, equation for honey production under Egypt environmental conditions during clover flowering periods in seasons of 2020 .

Date	Mean CW (Kg)	Mean HV weight	C	D	H
21 May	11.217 c	10.020	1.197	11	1.662
2 Jun.	11.225 c	10.050	1.175	23	1.791
14 Jun.	11.227 c	10.100	1.127	35	1.906
26 Jun.	12.421 b	10.000	2.421	47	2.667
10 Jul.	12.638 b	10.120	2.526	59	2.997
22 Jul.	14.217 a	9.975	4.242	71	4.486
3 Aug.	14.648 a	10.100	4.548	83	5.199
LSD 5%		1.013			

CW= Weight / colony (kg,) full. HV= Weight / hive (kg,) empty.
C= CW-HV D=Days from beginning of flowering
H= Honey stored (kg).

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