

COMPARATIVE STUDY BETWEEN CARNIOLAN, ITALIAN RACES AND FIRST ITALIAN HYBRID ACCORDING TO PROPOLIS GATHERING ACTIVITY

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ABSTRACT

In the present investigation, comparative study was carried out between Carniolan, Italian races and F1 Italian hybrid in collecting propolis. Propolis was gathered by: using wooden traps, between frames, from feeders.

Wooden traps provided with holes, 1.5 cm in length and 3 mm in width, were put on the top bars of the frames. Results explained that Carniolan race was obviously outstanding in gathering activity of propolis by the three different methods during the whole year. Therefore, the total colony production was (46 gm/colony/year) in Carniolan race from the feeders. In contrast, 1st Italian hybrid was the lowest, producing (33 gm/colony/ year). And, Italian race produced (34 gm/colony/year) from the feeders. Regarding traps, Italian race was superior, producing (22.3 gm/colony/year). While, 1st Italian hybrid was the lowest, producing (13 gm/colony/year). Regarding between frames, both of Italian and 1st Italian hybrid produced nearly the same amounts with an average 8.2, 8.3 gm /colony/year, respectively. While, Carniolan race produced 10.9 gm/colony/year.

INTRODUCTION

Propolis is a mysterious substance produced by mysterious creatures. Honey bees produce propolis by collecting resins from various plant sources and combine that with bees wax, pollen and their own amazing enzymes, (Bratter *et al.*, 1999). Many authors mentioned that races of honey bees differ greatly in their habit of propolis gathering. The present work was, therefore, undertaken to study the activity of Italian, Carniolan races and 1st Italian hybrid in collecting propolis from traps, feeders and between frames under Mansoura floral and environmental conditions, at El- Baydaa village, during 2004-2005. So, a lot of methods of collecting propolis have been described by many authors, but there is no standard method for collecting propolis until now, maybe anyone be able to invent one.

Recently, the most known races, having superior characteristics, are the Carniolan, *A. mellifera carnica* Pollm., Italian, *A. mellifera ligustica* Spin. and Caucasian, *A. mellifera caucasica* Gorb (Adam, 1983). The last 50 decades have a strong concerning of the secondary bee products. The most important product which has the largest respect is propolis, Ghisalberti (1979). Many authors describe a lot of propolis collecting methods. Marletto, 1983 and 1984 and Kosonocka, 1990 mentioned that the most primitive and burdensome methods is scraping small pieces of bee glue from all hive contents. But, Muszynska *et al.*, 1983 used a propolis board made of two

queen excluders with severed 3mm long bars fixed between them. Meanwhile, Pechhacker and Huttinger, 1986 and Ghazala, 1998 used plastic or wooden top bars, circle or a net to harvest propolis with the same holes. Also, many authors studied the relationship between the bee races and propolis gathering activity, El Shaarawy, 1989 and Mohanny, 2005. Some others studied the factors affecting collecting propolis such temperature, bee race, local floral and phenology and strength of the colony, Bankova and Marcucci (2000); El-Morsy (2003) and Salomao *et al.* (2004).

In this investigation of the different races (Carniolan, *A. mellifera carnica*, Italian, *A. mellifera ligustica*, and 1st Italian hybrid), the propolis gathering activity was conducted.

MATERIALS AND METHODS

The experiments in this study were carried out at El-Baydaa village, El-Senbellaween, Dakahlia Governorate, for one year, beginning in September 2004 and ending in August 2005. A total of nine honeybee colonies (*Apis mellifera* L.) housed in local Langstroth hives with relatively same strength, three pure Carniolan colonies (*A. mellifera carnica*), three pure Italian colonies (*A. mellifera ligustica*) and three 1st Italian hybrid colonies.

Estimation of Propolis collection:

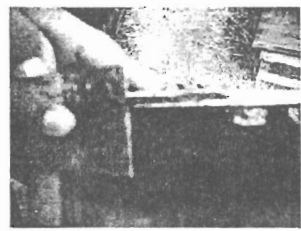
Propolis samples were obtained from three colonies for each Italian, Carniolan race and 1st Italian hybrid. The samples were collected over a year 2004/2005 from wooden nets (48cm. in length, 36cm. in width, 2mm. in thickness) and having openings (holes) with 1.5cm in length and 3mm in width, (Fig. 1). The used traps were placed on top bars of the hive frames. These traps were replaced monthly where they taken, frozen to promote propolis removal, weight and new ones were used. Samples from feeders and between frames were collected and weighted, (Fig. 1).



From traps



From feeders



Between frames

Fig.(1). Different methods of collecting propolis

RESULTS

1. Propolis gathering activity from traps:

The results summarized in tables (1 and 2) and fig (2) showed the average amount of propolis collected from traps by Italian, Carniolan races and 1st Italian hybrid at one month intervals during 2004-2005. Regarding the

Italian race in different months of the year, the collected quantities fluctuated from 4.0 gm. In both July and August- which were the greatest quantities, each month was represented by 17.9 %, to 0.0 gm. In January in the three races (the lowest quantity) in relation to the decrease of mean temperature.

Table (1) and Fig (2) showed that Italian race gathered the highest amount of propolis from traps, giving an average 22.3 gm/colony/year; while Carniolan race gave 15 gm/colony/year. Meanwhile, 1st Italian hybrid was the lowest race in collecting during the whole year, giving 13 gm/colony/year. In general, summer was the highest season of propolis collection from traps in the three races. The averages were 11.0, 8.0 and 7.0 gm /colony, representing 49.3 %, 53.4 % and 53.8 % for Italian, Carniolan and 1st Italian hybrid, respectively. table (1) and fig (2) printed out that winter was the lowest season of propolis collection from traps. The average was 0.3, 0.3 and 0.2 gm/ colony, representing 1.4 %, 2.0 % and 1.5 % for Italian, Carniolan and 1st Italian hybrid, respectively.

Table (1): Monthly and seasonal average amounts of propolis (gm/colony) collected from the traps during 2004/2005.

Months	Propolis amounts (gm/colony)		
	Italian	Carniolan	F1 Italian
Sep. 2004	3	2	2
Oct.	1	1	1
Nov.	1	0.2	0.4
Autumn	5	3.2	3.4
Dec.	0.1	0	0
Jan. 2005	0	0	0
Feb.	0.2	0.3	0.2
Winter	0.3	0.3	0.2
Mar.	1	0.5	0.4
Apr.	2	1	1
May	3	2	1
Spring	6	3.5	2.4
Jun.	3	2	2
Jul.	4	3	3
Aug.	4	3	2
Summer	11	8	7
Average/year	22.3	15	13

Table (2): Correlation coefficient values (r) between changes of the monthly average amount of propolis collected from traps in three races and the changes of both temperature and relative humidity during 2004/2005.

Race	Temperature C°	R. H. %
Italian	0.96**	0.27 ^{ns}
Carniolan	0.96**	0.43 ^{ns}
F1 Italian	0.94**	0.34 ^{ns}

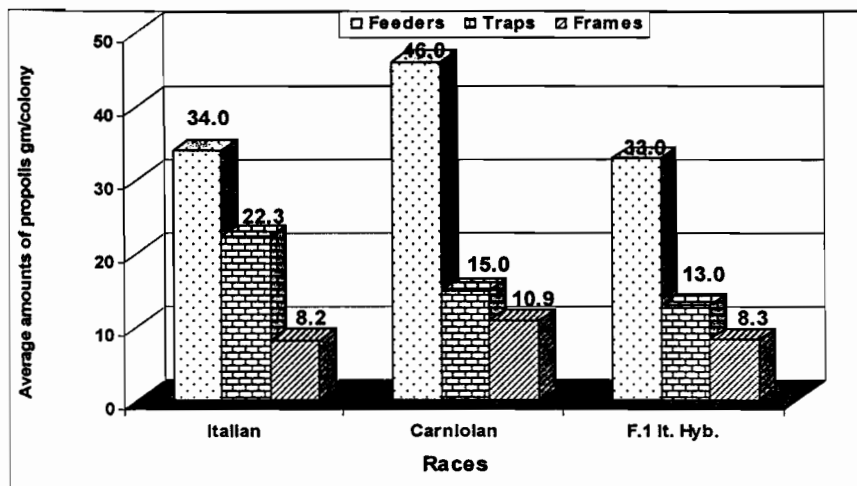


Fig. (2): The average amounts of propolis (gm/colony) collected from the feeders, traps and between frames from different bee races during 2004/2005.

Statistical analysis (table, 2) indicated that there were highly significant correlations between the changes of the monthly average amount of propolis collected from traps of each race and the changes of mean temperature during 2004/2005. But, there was insignificant correlation between average amount of propolis from traps in the three and the mean relative humidity during the whole year. From the above data, it could be concluded that the three races gathering activity of propolis by traps started greatly in autumn months especially September, and then decreased slightly during October and November to reach the minimum activity and quantity during winter months especially in January. After that the races reached the highest activity during summer season (June, July and August). Statistical analysis (Table, 3) showed that there is insignificant difference between autumn and spring season in the three races. Summer season was significantly superior of all seasons during the whole year for the three races. While, winter season was the inferior in the three races during the whole year.

Table (3): Analysis of variance of average amounts of propolis (gm/colony) in different seasons collected from the traps.

Season	Italian	Carniolan	F1 Italian
Autumn	5.0 a	3.2 a	3.4 a
Winter	0.3 b	0.3 b	0.2 b
Spring	6.0 a	3.5 a	2.4 a
Summer	11.0 c	8.0 c	7.0 c
Total	22.3	15.0	13.0
L.S.D. 5%	2.03	2.25	1.55
F. Test	52.12***	19.94***	29.87***

There are insignificant differences between the means with the same letters.

2. Propolis gathering activity from feeders:

The results in tables (4 and 5) showed the amounts of propolis collected from the feeders for Italian, Carniolan and 1st Italian hybrid during 2004-2005. The amounts of propolis collected from the feeders during 2004/2005 were 46, 34 and 33 gm/ colony for Carniolan, Italian and 1st Italian hybrid. There were insignificant differences between Italian and 1st Italian hybrid in the amounts of propolis collected from the feeders. But, there were significant differences between Carniolan race and both (Italian and 1st Italian hybrid) in the amounts of propolis collected from the feeders. Regarding the Italian race in different months of the year, it is clear obvious that the highest amounts of propolis were produced in September, October, March, July and August with an average 4.0 gm/ colony for each month. In contrast, April was the lowest month giving nothing (0.0 gm/colony). For Carniolan race, propolis was highly gathered in July and August with an average 7.0 and 8.0 gm/colony, respectively. On the other hand, propolis was highly gathered in 1st Italian hybrid in October, July and August with an average 4.0, 4.0 and 5.0 gm/colony, respectively. On the other hand, there were significant correlations between amount of propolis collected from the feeders in Carniolan race and 1st Italian hybrid and relative humidity. But there were highly significant correlations between amounts of propolis from the feeders during months in Italian race and relative humidity. According to the seasonal activity, summer was the highest season of collected propolis from the feeders with an average 20, 12 and 11 gm/colony for Carniolan and Italian races and 1st Italian hybrid, representing 43.5 %, 36.4 % and 32.4 %, respectively. In contrast, spring was the lowest one with an average 5gm/colony, representing 15.1 %, 14.7 % and 10.9 % for 1st Italian hybrid, Italian and Carniolan races, respectively.

Table (4): Monthly and seasonal average amounts of propolis collected (gm/colony) from the feeders during 2004/2005.

Months	Propolis amounts (gm/colony)		
	Italian	Carniolan	1 st Italian hybrid
Sep. 2004	4	4	2
Oct.	4	5	4
Nov.	2	3	3
Autumn	10	12	9
Dec.	3	3	3
Jan. 2005	2	2	1
Feb.	3	4	3
Winter	8	9	7
Mar.	4	3	3
Apr.	0	0	0
May	1	2	2
Spring	5	5	5
Jun.	3	5	3
Jul.	4	7	4
Aug.	4	8	5
Summer	11	20	12
Average/year	34	46	33

Table (5): Correlation coefficient values (r) between changes of the monthly average amount of propolis from the feeders in three races and the changes of both temperature and relative humidity during 2004/2005.

Race	Temperature C°	R. H. %
Italian	0.41 ^{ns}	0.72 ^{**}
Carniolan	0.67 [*]	0.64 [*]
F1 Italian	0.37 ^{ns}	0.68 [*]

While, autumn was the second season in the amounts of propolis collected from the feeders for the three races with an average 12, 10 and 9 gm/colony, representing 26.1 %, 29.4 % and 27.3 % for Carniolan, Italian race and 1st Italian hybrid, respectively.

Statistical analysis (table, 5) showed that there were insignificant correlations between the changes of the monthly average amount of propolis collected from feeders in Italian race and 1st Italian hybrid and the mean temperature. While, there was significant correlation between the changes of the monthly average amount of propolis from the feeders in Carniolan race and the mean temperature.

As shown in table (6), statistical analysis for Italian race confirmed that there were insignificant differences between autumn, winter and summer seasons in collected propolis from the feeders. Also, there were insignificant differences between winter and spring season. But, there were significant differences between both (autumn and summer) and spring seasons. For Carniolan race, there was significant difference between summer season and both of autumn, winter and spring seasons. According to 1st Italian hybrid, there were insignificant differences between summer, autumn and winter seasons. But, there was significant difference between summer and spring season in collected propolis from the feeders.

Table (6): Analysis of variance of average amounts of propolis (gm/colony) in different seasons collected from the feeders.

Season	Italian	Carniolan	1 st Italian hybrid
Autumn	10.0 a	12.0 a	9.0 a b
Winter	8.0 a b	9.0 a b	7.0 a b
Spring	5.0 b	5.0 b	5.0 a
Summer	11.0 a	20.0 c	12.0 b
Total	34.0	46.0	33.0
L.S.D. 5%	3.86	5.41	5.26
F. Test	4.19 [*]	13.26 ^{**}	3.67 ^{ns}

There are insignificant differences between the means with the same letters.

3. Propolis gathering activity between frames:

The results tabulated in tables (7 and 8) showed that the amounts of propolis collected between the frames of Italian, Carniolan and 1st Italian hybrid during 2004/2005. The total amounts of propolis collected between the frames during 2004/2005 were 10.9, 8.3 and 8.2 gm/colony for Carniolan, 1st Italian hybrid and Italian race.

Regarding the Italian race, the highest amounts of propolis were produced in September with an average 2 gm/colony, representing 24.3 %. While, April was the lowest month with an average 0.2 gm/colony, representing 2.4 %. According to Carniolan race, the highest amounts of propolis collected between the frames were in September and October with an average 2 and 2 gm/colony, representing 18.3 % for each. In contrast, the lowest amounts of produced propolis were in January and February with an average 0.3 gm/colony, representing 2.7 %. For 1st Italian hybrid, the highest amount of produced propolis was in September with an average 1.4 gm/colony, representing 16.8 %. Meanwhile, the lowest produced amount of propolis was in April with an average 0.2 gm/colony, representing 2.4 %. From table (7) it could be concluded that autumn season produced the highest amount of propolis collected between frames for Italian, Carniolan and 1st Italian hybrid, with an average 4, 4.6 and 3.4 gm/colony, representing 48.8 %, 42.2 % and 40.9 %, respectively.

Table (7): Monthly and seasonal average amounts of propolis collected between frames gm/colony during 2004/2005.

Months	Propolis amounts (gm/colony)		
	Italian	Carniolan	1 st Italian hybrid
Sep. 2004	2	2	1.4
Oct.	1	2	1
Nov.	1	0.6	1
Autumn	4	4.6	3.4
Dec.	1	0.6	0.6
Jan. 2005	0.3	0.3	0.3
Feb.	0.5	0.3	0.5
Winter	1.8	1.2	1.4
Mar.	0.5	0.5	0.5
Apr.	0.2	1	0.2
May	0.3	1	0.3
Spring	1	2.5	1
Jun.	0.5	0.6	1
Jul.	0.5	1	1
Aug.	0.4	1	0.5
Summer	1.4	2.6	2.5
Average/year	8.2	10.9	8.3

Table (8): Analysis of variance of average amounts of propolis (gm/colony) in different seasons collected between frames.

Season	Italian	Carniolan	1 st Italian hybrid
Autumn	4.0 c	4.6 c	3.4 c
Winter	1.8 a	1.2 b	1.4 a b
Spring	1.0 b	2.5 a	1.0 a
Summer	1.4 a b	2.6 a	2.5 b c
Total	8.2	10.9	8.3
L.S.D. 5%	0.68	1.21	1.26
F. Test	35.19***	13.44**	11.84**

There are insignificant differences between the means with the same letters.

Meanwhile, spring season was the lowest one for Italian and 1st Italian hybrid with an average 1 and 1 gm/colony, representing 12.2 % and 12.1 %, respectively. While, winter season was the lowest for Carniolan race with an average 1.2 gm/colony, representing 11.0 %.

For statistical analysis, table (8) showed that there was insignificant difference between winter and spring, winter and summer, and between summer and spring seasons in 1st Italian hybrid. On the contrary, there was significant difference between autumn season and both of winter and spring seasons in 1st Italian hybrid. Also, there was significant difference between summer and spring seasons. While, in Italian race, there was insignificant difference neither between winter and summer nor between summer and spring seasons. But, there was highly significant difference between autumn season and the others. For Carniolan race, there was insignificant difference between summer and spring seasons. On the other hand, there was significant difference between autumn season and the others. Also, significant difference was observed between winter season and both of summer and spring seasons.

Statistical analysis in (Table, 9) indicated that there were insignificant correlations between the changes of the monthly average amount of propolis collected between frames in the three races and both mean temperature and relative humidity during 2004/2005.

Table (9): Correlation coefficient values (r) between changes of the monthly average amount of propolis between frames in three races and the changes of both temperature and relative humidity during 2004/2005.

Race	Temperature C°	R. H. %
Italian	0.08 ^{ns}	0.25 ^{ns}
Carniolan	0.55 ^{ns}	0.09 ^{ns}
1 st Italian hybrid	0.28 ^{ns}	0.24 ^{ns}

Statistical analysis between the three races from table (10) and fig (2), showed that there were insignificant differences among Italian, Carniolan race and 1st Italian hybrid in the average amounts of propolis collected between frames during 2004/2005. Also, an insignificant difference between Italian race and 1st Italian hybrid in amounts of propolis collected from the feeders during the whole year was observed. In addition, an insignificant difference was noticed between Carniolan race and 1st Italian hybrid in amounts of propolis collected from traps. Furthermore, Carniolan race produced the highest significant amounts of propolis collected from the feeders, which were 46 gm/colony. While, it was 34 and 33 gm/colony for Italian race and 1st Italian hybrid, respectively. Similarly, Carniolan race produced the highest amounts of propolis collected between frames, which were 10.9 gm/colony with no significant difference among the three races. In contrast, Italian race produced the highest significant amounts of propolis collected from traps, which were 22.3 gm/colony. Meanwhile, it was 15 and 13 gm/colony for Carniolan race and 1st Italian hybrid, respectively.

Table (10): The average amounts of propolis (gm/colony) collected from the feeders, traps and between frames from different bee races during 2004/2005.

Treatments Race	Feeders	Frames	Traps	Total
Italian	34.0±0.81	8.2±1.25	22.3±1.81	64.5±3.80
1 st Italian hy.	33.0±5.47	8.3±1.87	13.0±0.36	54.3±5.28
Carniolan	46.0±6.40	10.9±0.94	15.0±3.27	71.9±9.19
L.S.D. _{5%}	9.53	2.81	4.33	12.99

Any two means not connected by the same line are significantly different at P= 0.05

From table (10) and Fig (2), it could be concluded that Carniolan race produced the highest amounts of propolis collected from the used three traps with an average 71.9 gm./ colony/ year. Whereas, Italian race came at the second with an average 64.5 gm./ colony/ year. While, 1st Italian hybrid collected the lowest amounts of propolis with an average 54.3 gm./ colony/ year. These results are in agreement with (Starostensko, 1968 and Krupicka, 1972), they reported that some races of honey bee collect propolis more active than others. These results are in accordance with those of (Ashour, 1989, El-Shaarawy, 1989 and Ghazala, 1998), they mentioned that 1st Carniolan hybrid was collecting more quantities of propolis than Carniolan race. Generally, Carniolan race was more active in propolis gathering than Italian race, and this may be due to that Carniolan race is more suitable to collect propolis in Egypt than Italian race.

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دراسة مقارنة بين سلالتى النحل الكرنبولى والإيطالى، والهجين أول إيطالى تبعا لنشاط جمع البروبوليس

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أجريت هذه الدراسة بهدف المقارنة بين سلالة النحل الكرنبولى و الإيطالى و الهجين أول إيطالى تبعا لنشاط جمع البروبوليس. تم جمع البروبوليس باستخدام مصائد خشبية، من بين الأقراص و من على الغذائية وذلك من سبتمبر ٢٠٠٤ إلى أغسطس ٢٠٠٥. أوضحت النتائج تفوق السلالة الكرنبولى فى نشاط جمع البروبوليس خلال فترة الدراسة حيث أعطت ٤٦ جم/ طائفة/ عام من على الغذائية. بينما كان الهجين الإيطالى الأقل حيث أعطى ٣٣ جم / طائفة/ عام من على الغذائية. فى حين تفوقت السلالة الإيطالى فى جمع البروبوليس من المصائد الخشبية حيث أعطت ٢٢,٣ جم/ طائفة/ عام. أما بالنسبة للبروبوليس المجموع من بين الأقراص، تفوقت السلالة الكرنبولى معطية ١٠,٩ جم/ طائفة/ عام، فى حين أعطت كلا من السلالة الإيطالى و الهجين الإيطالى كميات متساوية تقريبا ٨,٢ ، ٨,٣ جم/ طائفة/ عام على الترتيب.