

## COMPARATIVE STUDY ON SOME PRODUCTS OF Italian and Carniolan HONEYBEE HYBRIDS AT KAFR EL-SHEIKH GOVERNORATE

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### ABSTRACT

Study was conducted in an apiary at Manshia, Biala, Kafr El-Sheikh governorate during 2001/2002 and 2002/2003 seasons. Results indicated that the F<sub>1</sub> Italian hybrid performed larger areas of sealed workers brood than Carniolan hybrid with averages of 935.35 and 745.29 inch<sup>2</sup>/colony/month in the first season while they were 917.79 and 774.92 inch<sup>2</sup>/colony/month in the second one, respectively. Also, F<sub>1</sub> Italian hybrid collected the largest amount of propolis (7.18 & 8.89 g/colony) and pollen grains (865.05 & 901.03 g/colony) comparing with F<sub>1</sub> Carniolan hybrid with averages of propolis (3.93 & 4.11 g/colony) and pollen grains (627.87 & 640.90 g/colony) in both seasons, respectively. However, F<sub>1</sub> Carniolan hybrid secreted more royal jelly (95.80 & 21.80 g/colony) than F<sub>1</sub> Italian hybrid (89.40 & 17.5 g/colony) in the first season while it was 102.20 & 22.27 g/colony of F<sub>1</sub> Carniolan hybrid and (92.53 & 16.97 g of F<sub>1</sub> Italian hybrid/colony in the second one by artificial and natural method, respectively. At the end of clover blooming season, the honey yield of F<sub>1</sub> Carniolan hybrid was more (6.5 & 6.25 kg/colony) than F<sub>1</sub> Italian hybrid (4.75 & 5.25 kg/colony) in the two tested seasons. Respectively. Vice versa at the end of cotton blooming, F<sub>1</sub> Italian hybrid was the higher in the honey yield (7.75 & 8.50 kg/colony) than F<sub>1</sub> Carniolan hybrid (5.75 & 6.25 kg/colony) in both seasons, respectively. From the current results, it could be concluded that the F<sub>1</sub> Italian honeybee performed larger areas of worker brood, and greater amounts of propolis, pollen and cotton honey yield than F<sub>1</sub> Carniolan honeybee. By contrast, the F<sub>1</sub> Carniolan achieved larger areas of drone brood, and produced greater amounts of royal jelly and clover honey yielded than F<sub>1</sub> Italian.

### INTRODUCTION

Beekeepers are always looking for information about the behaviour honeybee (*Apis mellifera* L.) and its Italian and Carniolan hybrids under Egyptian ecological conditions since enables beekeepers to gain much successes in their management of apiaries. The honeybee is known since many years ago as an important factor for increasing the yield of various crops and produces different products such as honey, pollen, royal jelly and propolis. Pollen grains are essential for brood rearing of honeybee colonies which are main sources for protein, minerals, fat, vitamins and other materials. Propolis is an aromatic resinous substances gathered by bees from the buds such as poplar or from bark particularly conifers (Taber & Barker, 1974 and Root, 1975). Several investigators evaluate the races and hybrids of honeybee (*A. mellifera* L.) from some aspects about pollen gathering activity, secretion of royal jelly, propolis collection activity and honeybee production such as Khattap (1976), El-Sarrag (1977), Mizis (1978), Marletto and Olivero (1981), El-Shaarawy (1989), Pearson and Braiden (1990) and Kassem (2000).

The aim of the present work was to evaluate the two hybrids of honeybee (*A. mellifera* L.), F<sub>1</sub> Italian and F<sub>1</sub> Carniolan regarding with the following points:

1. Brood rearing activity in two hybrids and in relation to a propolis gathering.
2. Propolis gathering activity.
3. Pollen gathering activity and its relationship to propolis collection by the two hybrids.
4. Royal jelly secretion activity.
5. Honey production.

## **MATERIALS AND METHODS**

The study was carried out in an apiary at Manshia, Biala, Kafr El-Sheikh Governorate, Arab Republic of Egypt, during two successive seasons from the beginning of November, 2001 to the end of October, 2003.

Forty colonies were assigned in the two tested seasons, and divided into two groups, twenty colonies each. All the colonies were approximately equal in strength and in number of combs covered with bees and had sufficient food. Colonies were headed with newly and naturally mated queens; F<sub>1</sub> Italian hybrid (Italian x local drones) and F<sub>1</sub> Carniolan hybrid (Carniolan queen x local drones).

The following aspects were investigated:

**1. Brood rearing activity:**

Ten colonies were used for F<sub>1</sub> Italian bees and another ten for F<sub>1</sub> Carniolan. For estimating the brood rearing activity, sealed brood areas (workers and drones) were measured in square inches at 12-day intervals starting from November, 2001 until October, 2003.

**2. Propolis gathering activity:**

Propolis was gathered at 15-day intervals. The propolis was scrapped from the top of combs, inner sides of hive boxes, bottom and entrance of the hives. Also, the propolis was collected from jute located on tops of cornbs inside the brood chamber. The collected propolis was weighed in grams.

**3. Pollen gathering activity:**

Ten colonies were assigned for this test; five colonies for each hybrid. The pollen traps were placed at the entrance of colonies. The traps were similar to the types used by Sung (1974) and Free (1970). Trapping the pollen started with the broad bean, *Vicia faba* L. from 15<sup>th</sup> February until 15<sup>th</sup> March, clover, *Trifolium alexandrinum* L. from 20<sup>th</sup> April until 15<sup>th</sup> June and maize, *Zea mays* L. from 20<sup>th</sup> June until 15<sup>th</sup> September during the two tested years. The colonies were compensated by pollen substitutes. The traps were emptied every two days and the contents were weighed and recorded.

**4. Royal jelly secretion activity:**

Ten colonies were used; (5 colonies for each hybrid). Each colony contained 9 combs, 5 brood combs, 4 combs of honey and pollen since all combs were covered with young bees. Each colony was headed with

laying recently mated queens naturally produced Royal jelly was collected every 4 days while that produced artificially (Doolittle method, 1909) was collected every 3 days .

**5. Honey production:**

Clover and cotton honey yield was calculated from the difference between weight of honey combs before and after honey extraction.

**RESULTS AND DISCUSSION**

**1. Brood rearing activity in the two hybrids and in relation to propolis gathering:**

Data in Tables (1 & 2) show that the F<sub>1</sub> Italian hybrid performed larger areas of sealed workers brood than F<sub>1</sub> Carniolan hybrid with averages of 935.35 and 745.29 inch<sup>2</sup>/colony/month in the first year while they were 917.79 and 774.92 inch<sup>2</sup>/colony/month in the second one, respectively. The opposite was recorded in case of drones brood; F<sub>1</sub> Carniolan hybrid was higher than F<sub>1</sub> Italian hybrid with averages of 10.3 and 5.0 inch<sup>2</sup>/colony/month in the first year while they were 10.40 and 5.98 inch<sup>2</sup>/colony/month in the second one, respectively. Significant differences were found between Italian and Carniolan hybrids in both sealed worker brood and sealed drone brood, in both years. These results are in agreement with the findings of El-Shaarawy (1989) and Kassem (2000) who indicted that F<sub>1</sub> Italian gave higher amounts of workers brood than F<sub>1</sub> Carniolan hybrid at Kalubia and Menoufia Governorates, respectively. Also, similar results were obtained by Woyke (1984) and Soszka (1996). Also, as indicated in Tables (1 & 2) the highest average of sealed workers brood was found during May (2455 & 1944.5 inch<sup>2</sup>/colony) and July (1864.6 & 1355.20 inch<sup>2</sup>/colony) in the first year while the corresponding values were 2510 & 2110.60 inch<sup>2</sup>/colony and 1770 & 1422 inch<sup>2</sup>/colony in the second one. Shawer (1987), Shawer *et al.* (1987) and Kassem (2000) obtained similar results.

**Table (1): Monthly areas (sq. inch / colony) of sealed brood in two hybrids of honeybees .**

Months	Worker		Drone	
	F <sub>1</sub> Italian	F <sub>2</sub> Carniolan	F <sub>1</sub> Italian	F <sub>2</sub> Carniolan
November, 2001	12.50	18.20	0.25	0.33
December	88.40	115.80	0.50	1.62
January, 2002	189.50	220.50	1.20	1.80
February	399.50	455.0	2.90	6.50
March	1165.80	1240.20	8.70	22.30
April	956.30	875.60	8.50	19.0
May	2455.0	1944.50	11.70	33.20
June	1452.20	768.0	9.20	15.40
July	1864.60	1355.2	9.20	10.50
August	1482.40	1178.50	2.80	6.30
September	882.20	582.0	2.80	4.50
October, 2002	275.80	190.0	2.80	1.70
Total	11224.20	8943.50	59.95	123.15
Mean	935.35	745.29	5.0	10.30
T* calculated	2.51*		2.74*	

T Tabulated at level 0.05 = 2.20

T Tabulated at level 0.01 = 3.11

**Table (2): Monthly areas (sq. inch / colony)of sealed brood in two hybrids of honeybees .**

Months	Workers		Drones	
	F <sub>1</sub> Italian	F <sub>2</sub> Carniolan	F <sub>1</sub> Italian	F <sub>2</sub> Carniolan
November, 2002	22.50	6.80	0.40	1.10
December	60.20	95.80	1.20	2.10
January, 2003	186.0	195.30	1.0	2.40
February	995.60	556.90	2.10	5.80
March	1225.50	1358.0	11.10	25.50
April	1132.30	880.0	10.50	22.50
May	2510.0	2110.60	20.20	28.10
June	1188.30	800.0	7.30	10.50
July	1770.0	1422.0	5.80	10.80
August	1412.60	1165.80	5.40	7.70
September	725.0	495.50	3.80	5.20
October, 2003	285.50	212.50	2.30	2.10
Total	11013.50	9299.0	71.30	124.40
Mean	917.79	774.92	5.98	10.40
T* calculated	2.61*		3.30**	

T Tabulated at level 0.05 = 2.20

T Tabulated at level 0.01 = 3.11

**2. Propolis gathering activity:**

Results in Table (3) indicate that the amounts of propolis gathered by F<sub>1</sub> Italian bees (7.18 & 8.89 g/colony) were greater than those of F<sub>1</sub> Carniolan bees (3.93 & 4.11 g/colony) in the first and second seasons, respectively.

**Table (3): Monthly amount (g/colony) of propolis collected by two hybrids of honeybees.**

Months	2001/2002		2002/2003	
	F <sub>1</sub> Italian	F <sub>2</sub> Carniolan	F <sub>1</sub> Italian	F <sub>2</sub> Carniolan
November	2.45	2.25	3.20	2.75
December	2.70	2.0	1.30	2.0
January	1.55	2.0	2.45	2.10
February	3.20	2.25	2.70	2.50
March	3.80	3.30	4.55	3.25
April	8.76	3.75	9.20	3.50
May	8.50	3.25	7.30	4.25
June	8.25	6.20	8.66	6.0
July	15.25	6.90	10.50	7.25
August	19.25	9.10	18.20	8.40
September	6.30	3.10	5.20	3.30
October	6.20	3.0	4.60	3.25
Total	86.21	47.10	106.66	49.25
Mean	7.18	3.93	8.89	4.11
T* calculated	3.36**		2.86*	

T Tabulated at level 0.05 = 2.20

T Tabulated at level 0.01 = 3.11

Highly significant difference was found between the amount of propolis of two hybrids in the first season while it was only significant in the second one. The highest amount of propolis collected by F<sub>1</sub> Italian bees was found during April (8.76 & 9.20 g/colony) and August (19.25 & 18.20 g/colony). As for F<sub>1</sub> Carniolan bees, they were during August (9.10 & 8.40 g/colony) in the first and second season, respectively. The lowest amounts of propolis gathered by

either hybrid were during November, December and January in both seasons . The amount of propolis harvested per colony depends on many factors such as the race of bees, strength of the hive, plant sources and other vegetation, weather conditions and needs of the hive (El-Shaarawy, 1989). Also, these results are in harmony with the results of Marletto and Olivero (1981), Pidek (1987) and Kassem (2000).

**3. Pollen gathering activity and its relationship to propolis collection by the two hybrids:**

As indicated in Table (4), the largest amount of pollen was gathered during clover nectar flow followed by maize and broad bean for the two hybrids in both seasons. F<sub>1</sub> Italian bees gathered more pollen (2595.15 & 2703.10 g/colony) than F<sub>1</sub> Carniolan bees (1883.60 & 1922.70 g/colony) in the first and second season, respectively. Also, it is obvious that F<sub>1</sub> Italian hybrid exceeded F<sub>1</sub> Carniolan hybrid with reductions of 27.42 and 28.87% in the first and second season, respectively. Data in Tables (3 & 4) revealed that F<sub>1</sub> Italian hybrid collected the largest amount of propolis (7.18 & 8.89 g/colony) and pollen grains (865.05 & 901.03 g/colony) comparing with F<sub>1</sub> Carniolan hybrid with an averages of propolis (3.93 & 4.11 g/colony) and pollen grains (627.87 & 640.90 g/colony) in the first and second season, respectively. These results are in agreement with the finding of Attalah *et al.* (1989) who found that the total amount of pollen was greatest from Egyptian clover followed by corn and broad bean. El-Shaarawy (1989) and Kassem (2000) found that F<sub>1</sub> Italian hybrid gathered more propolis and pollen than F<sub>1</sub> Carniolan hybrid at Qalubia and Menoufia Governorates, respectively.

**Table (4): Collected pollen (g/colony) as influenced by honeybee hybrid, and plant source .**

Sources	Date of collection	2002		%	2003		%
		F <sub>1</sub> Italian	F <sub>1</sub> Carniolan		F <sub>1</sub> Italian	F <sub>1</sub> Carniolan	
Broad bean	15/2-15/3	810.65	515.50	36.41	786.20	488.20	37.9
Egyptian clover	15/4-15/6	964.50	752.50	21.98	1054.50	812.0	23.0
Maize	20/6-20/8	820.0	615.60	24.93	862.40	622.50	27.87
Total		2595.15	1883.60	27.42	2703.10	1922.70	28.87
Mean		865.05	627.87	27.42	901.03	640.90	28.87

**4. Royal jelly secretion activity:**

Results in Table (5) showed that the amounts of artificially produced royal jelly were more higher than natural method for both hybrids in the two tested seasons. F<sub>1</sub> Carniolan hybrid produced higher amount of royal jelly (95.0 & 21.80 g/colony) than F<sub>1</sub> Italian hybrid (89.40 & 17.50 g/colony) in the first season while it was 102.20&22.27g/colony and 92.53&16.97g/colony in the second one, respectively. Also, the highest amount of royal jelly was produced during the period from 1<sup>st</sup> May until 1<sup>st</sup> July (clover nectarflow) comparing with the other periods for both hybrids in the two tested seasons. During this period (clover nectar flow), F<sub>1</sub> Carniolan hybrid gave the higher amount of royal jelly (114.50 & 25.20 g/colony) than F<sub>1</sub> Italian hybrid (99.50 & 18.60 g/colony) by both methods in the first season while it was 122.80 &

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23.80 g/colony and 106.60 & 17.60 g/colony in the second one, respectively. These results are in agreement with the results of Krol (1985) who indicated that the Carniolan bees was the best in royal jelly secretion. The current results are in disagreement with those of Kassem (2000) who showed that F<sub>1</sub> Italian hybrid gave the highest secretion of royal jelly at Menoufia Governorate.

**Table (5): The amounts of royal jelly production (g/colony) naturally and artificially by the two hybrids of honeybee.**

Date of collection	2002				2003			
	Artificial		Natural		Artificial		Natural	
	F <sub>1</sub> Italian	F <sub>1</sub> Carniolan	F <sub>1</sub> Italian	F <sub>1</sub> Carniolan	F <sub>1</sub> Italian	F <sub>1</sub> Carniolan	F <sub>1</sub> Italian	F <sub>1</sub> Carniolan
15/2-15/4	80.20	80.50	19.50	22.0	75.60	85.60	18.80	23.40
1/5-1/7	99.50	114.50	18.60	25.20	106.60	122.80	17.60	23.80
1/7-30/8	88.50	95.40	14.50	18.20	95.40	98.20	14.50	19.60
Total	268.20	287.40	52.60	65.40	277.60	306.60	50.90	66.80
Mean	89.40	95.80	17.50	21.80	92.53	102.20	16.97	22.27

### 5. Honey production:

Data in Table (6) revealed that F<sub>1</sub> Carniolan hybrid was the higher in the honey yield (6.50 & 6.25 kg/colony) than F<sub>1</sub> Italian hybrid (4.75 & 5.25 kg/colony) at the end of clover blooming season while at the end of cotton blooming season the honey yield of F<sub>1</sub> Italian hybrid was more (7.75 & 8.50 kg/colony) than F<sub>1</sub> Carniolan hybrid (5.75 & 6.25 kg/colony) in the first and second season, respectively. It was noted that F<sub>1</sub> Carniolan hybrid tend to achieve more sealed honey combs than do F<sub>1</sub> Italian hybrid. On the other hand, F<sub>1</sub> Italian hybrid tend to store more nectar in new combs than F<sub>1</sub> Carniolan hybrid.

From the current results, it could be concluded that the F<sub>1</sub> Italian honeybee performed larger areas of worker brood, and greater amounts of proplis, pollen and cotton honey yield than F<sub>1</sub> Carniolan honeybee. By contrast, the F<sub>1</sub> Caeniolan achieved larger areas of drone brood, and produced greater amounts of royal jelly and clover honey yielded than F<sub>1</sub> Italian

**Table (6): The amounts of honey yield by the two hybrids during 2002 and 2003 seasons.**

Crop	2002		2003	
	F <sub>1</sub> Italian	F <sub>1</sub> Carniolan	F <sub>1</sub> Italian	F <sub>1</sub> Carniolan
Egyptian clover	4.75	6.50	5.25	6.25
Cotton	7.75	5.75	8.50	6.25

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## دراسة مقارنة على بعض منتجات نحل العسل لاثنتين من السلالات الهجين فى منطقة كفرالشيخ

فريد شوقى سراج الدين

معهد بحوث وقاية النباتات محطة البحوث الزراعية بسغا مركز البحوث الزراعية

أجريت هذه الدراسة بمنحل قرية المنشية مركز بيلا محافظة كفرالشيخ خلال موسمي ٢٠٠١/٢٠٠٢ ، ٢٠٠٢/٢٠٠٣م. اوضحت النتائج المتحصل عليها أن الهجين الأول الإيطالي كان متفوقا في تربية حضنه الشغالات مقارنة بالهجين الأول الكرنبولي ، حيث كانت ٩٣٥,٣٥ ، ٧٤٥,٢٩ بوصة مربعة/طائفة/شهر لكلا السلالتين في الموسم الأول على التوالي ، بينما كانت ٩١٧,٧٩ ، ٧٧٤,٩٢ بوصة مربعة/طائفة/شهر في الموسم الثاني على التوالي. أظهرت للنتائج أيضا ان الهجين الأول الإيطالي جمع كمية اكبر من البروبوليس (٧,١٨ ، ٨,٨٩ جم/طائفة) وكذلك حبوب اللقاح (٨٦٥,٠٥ ، ٩٠١,٠٣ جم/طائفة) مقارنة بالهجين الأول الكرنبولي ، الذى أعطى كمية اقل من البروبوليس (٣,٩٣ ، ٤,١١ جم/طائفة) وحبوب اللقاح (٦٢٧,٨٧ ، ٦٤٠,٩٠ جم/طائفة) وذلك في الموسم الأول والثاني على الترتيب ومع ذلك تفوق الهجين الأول الكرنبولي فى إنتاج الغذاء الملكي (٩٥,٨٠ ، ٢١,٨٠ جم/طائفة) بالمقارنة بالهجين الأول الإيطالي (٨٩,٤٠ ، ١٧,٥٠ جم/طائفة) وذلك في الموسم الأول ، بينما كانت (١٠٢,٢٠ ، ٢٢,٢٧ جم/طائفة) للهجين الأول الكرنبولي ، (٩٢,٣٥ ، ١٦,٩٧ جم/طائفة) للهجين الأول الإيطالي ، وذلك فى الموسم الثاني بالطريقة الصناعية والطبيعية على الترتيب. وجد أيضا انه فى نهاية موسم تزهير البرسيم تفوق الهجين الأول الكرنبولي ، فى محصول العسل (٦,٥٠ ، ٦,٢٥ كجم/طائفة) مقارنة بالهجين الأول الإيطالي ، (٤,٧٥ ، ٥,٢٥ كجم/طائفة) وذلك خلال موسمي الدراسة على الترتيب ولكن حدث العكس فى نهاية موسم تزهير القطن ، حيث تفوق الهجين الأول الإيطالي ، فى محصول العسل (٧,٧٥ ، ٨,٥٠ كجم/طائفة) مقارنة بالهجين الأول الكرنبولي (٥,٧٥ ، ٦,٢٥ كجم/طائفة) فى كلا الموسمين على الترتيب. يمكن ان نستنتج من الدراسة ان الهجين الأول الكرنبولي جاء فى المرتبة الأولى فى إنتاج محصول عسل البرسيم وإنتاج الغذاء الملكي ، بينما جاء الهجين الأول الإيطالي ، متفوقا فى محصول عسل القطن ، وجميع البروبوليس وحبوب اللقاح فى منطقة كفرالشيخ.