

STUDY ON THE POLLEN GATHERING ACTIVITY BY SOME HONEY BEE *APIS MELLIFERA L.*
 STRAINS
 BY

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ABSTRACT

This work was conducted to study the pollen gathering activity by some honeybee strains in two regions (Shebin El-kom and El-Qaumatir) during the years 2003 and 2004. The results revealed that the F₁ Italian was collected more amount of pollen than each of F₁ and F₂ Carniolan and, Also the F₁ Carniolan collected more amount of pollen than the F₂ carniolan during all months of the two years of study at the two regions (Shebin El-kom and El-Qaumatir). There were significant differences between the F₁ Italian and each of F₁ and F₂ Carniolan and between F₁ and F₂ Carniolan. The high monthly amounts of collected pollen by the three strains were during August. While, the low amounts of collected pollen were in December during the two years at the two regions. There were significant differences between the months of the year. The best seasonal amounts of collected pollen by the F₁ Italian, F₁ Carniolan and F₂ Carniolan were during summer season followed by spring, autumn and winter seasons of the two years of study at the two regions. There were significant differences between all four seasons

Key words: Honey bee, pollen, honeybee strains, year months, year seasons, pollen traps.

INTRODUCTION

Honey bee *Apis mellifera* L. is considered one of the most important beneficial insects for the people (Sharaf El-Din, *et al.*, 2000). The pollen is the fine particles formed in plant life and carrying the male germ cell responsible for fruit fertilization and plant embryo formation (Serra-Bonvehí, 1988). Pollen grains are main sources for protein, fat, minerals and vitamins for feeding people, bees and for brood rearing (Lorenzo, 1989). Pollen is collected by honeybees foraging workers from the plant flower in its pollen basket at the hind legs (Davis, 1991). The beekeepers used pollen traps which allows pollen to be harvested continuously without harming honey

bee colony (Cook and Wikinson 1986). The pollen pellets are removed from the bees before the bees enter the hive. There are many designs for pollen traps to easier the clean and the harvest of pollen. The efficiency rarely exceeds 50% i.e. less than 50% of the retiring foragers loose their pollen pellets (Cornejo, 1991). The studies have shown that pollen collected by honeybees foraging workers reflects environmental pollution levels when examined for heavy metals and radioactivity (Free, 1983, Bromenshenk 1985 and Crane, 1990). This work aimed to study the pollen collection activity by F₁ Italian bees, F₁ Carniolan bees and F₂ Carniolan bees.

MATERIAL AND METHODS

The experimentals of the present research were conducted during 2003 and 2004 years. To study the pollen gathering activity by three honey bee strains. In the apiary and laboratory of Economic Entomology and Agricultural Zoology Department, Faculty of agriculture, Minofia University, Shibin El-Kom, Minofia and Apiary of Agriculture Research Centre, Plant Protection Institute, El-Qaunatir, Qalyoubia.

The tested honey bee strains .

The strength honey bee colonies from each of F₁ Italian, F₁ Carniolan and F₂ Carniolan in modern wooden (Langstrouth) hives, The most type of hives wide spread in Egypt were selected . The strength colony contains at least eight standard frames covering with bees. These colonies were headed with equal queen ages.

The tools and equipments.

The sensitive automatic balance (precisa-3500-D), pollen traps and Drying TEQ (model ST-50v).

Pollen gathering activity.

Nine honeybee strength colonies from each of F₁ Italian, F₁ Carniolan and F₂ Carniolan were selected .The colonies have been divided into three groups and each group was divided into three colonies as replicates .Pollen collected periodically every 3 days during the whole year and weighed after dried for one hour at 40° in oven TEQ (model ST-50v) then stored.

The statistical analysis.

The statistical analysis was conducted according to (Snedecor and Cochran, 1973) and M .state Computer analysis program.

RESULTS AND DISCUSSION

The pollen is the fine particles formed in plant life and carrying the male germ cell responsible for fruit fertilization and plant embryo formation .pollen grains are main sources for protein, fat, minerals and vitamins for feeding people and bees

The results in Table (1) showing the collected amounts of pollen per colony for the F₁ Italian, F₁ carniolan and F₂ carniolan bees during 2003 in Qaunatir. The data of the Table (1) cleared that the best results of the collected monthly amounts of collected pollen by F₁ Italian followed by F₁ carniolan then F₂ carniolan bees. The total yearly amounts of collected pollen by F₁ Italian, F₁ carniolan and F₂ carniolan were 5022.00, 4356.77 and 3535.52 g. /colony, respectively. The mean amounts of collected pollen by F₁ Italian, F₁ carniolan and F₂ carniolan were 418.48, 363.07 and 294.63 g. /colony, respectively. It was noticed that the F₁ Italian collect more amounts of pollen during all the months of the year than each of F₁ and F₂ carniolan, also F₁ carniolan collect more amounts of pollen than the F₂ carniolan ones in almost all of the months of the year. The results indicated that there were significantly differences between

F₁ Italian, F₁ carniolan and F₂ carniolan. Like wiz, the high monthly amounts of collected pollen by the strains were during August (797.45, 718.73 and 616.93 g./colony) while the lowest amounts of collected pollen were in December (155.30, 133.80 and 121.53 g./ colony) for F₁ Italian, F₁ carniolan and F₂ carniolan, respectively. In all experimental colonies, the months mean amounts of collected pollen per colony ranged between 136.88 g. in December and 711.04 g. in August. The best amounts of collected pollen in August while the lowest amounts of collected in December. With general mean of 358.73 g. There were significantly differences between months.

The results in Table (2) explained the collected amounts of pollen per colony for the F₁ Italian, F₁ carniolan and F₂ carniolan bees during 2003 in Shibin El-Kom. The results showed that the best strain of the collected amounts of pollen was F₁ Italian. The collected amounts of pollen by F₁ Italian, F₁ carniolan and F₂ carniolan were; 292.25, 251.17 and 215.40 g. /colony, respectively. The total amounts of collected pollen by F₁ Italian, F₁ carniolan and F₂ carniolan were; 3507.00,

3014.17 and 2584.77 g. /colony. There were the best amounts collected of pollen by F₁ Italian and the lowest amounts collected of pollen by F₂ carniolan. The statistical analysis of data showed that there were significant differences between strains. The best monthly

amounts of collected pollen were in August (577.19 g. / colony) and the lowest amounts of collected pollen were in December (51.46 g. /colony). There were significant differences between months.

Table (1): Mean weights g./colony pollen collected by three honeybee strains at Qaunatir station during 2003 months

Months \ Strains	F ₁ Italian	F ₁ Carniolan	F ₂ Carniolan	Total	Mean
January	160.23	140.20	118.66	419.10	139.70h
February	190.20	169.67	149.09	508.96	169.65g
March	382.62	356.71	285.83	1025.17	341.7f
April	470.19	359.85	296.58	1126.63	375.55e
May	494.82	453.16	317.20	1265.19	421.72d
June	722.02	578.14	433.63	1733.79	577.93c
July	725.10	685.47	530.07	1940.64	646.88b
August	797.45	718.73	616.93	2133.11	711.04a
September	530.13	415.33	365.33	1310.80	436.93d
October	210.23	185.47	157.07	552.76	184.26g
November	183.69	160.23	143.60	487.52	162.51gh
December	155.30	133.80	121.53	410.63	136.87h
Total	5022.00	4356.77	3535.52	12914.29	4304.74
Mean	418.48A	363.07B	294.63C	1076.19	358.73

	0.05	0.01
L.S.D. for strains	13.71	18.01
L.S.D. for months	24.43	36.41
L.S.D. for strains x months	47.51	63.07

The results in Table (3) summarized the activity of F₁ Italian, F₁ carniolan and F₂ carniolan bees for collection amounts of pollen at the different seasons during 2003 season in the Qaunatir. The best-collected amounts of pollen were during the summer season followed by spring, autumn and winter seasons. Where, the mean amounts of collected pollen were 1935.85, 1138.94, 783.70 and 446.21 g. /colony for summer, spring, autumn and winter, respectively. The statistical analysis of data in Table (3) cleared that significant differences were found between all four seasons during 2003.

The best amounts of collected pollen were in summer (1935.85 g.) and the low amounts of collected pollen were in winter (446.21 g.). All seasons the best strains collected amounts of pollen were F₁ Italian (1255.44

g.), followed F₁ Carniolan (1089.20 g.) then F₂ carniolan (883.89 g.). The results indicated that there were significant differences between F₁ Italian, F₁ carniolan and F₂ carniolan.

The data in Table (4) summarized the activity of F₁ Italian, F₁ carniolan and F₂ carniolan for collection amounts of pollen at the different seasons during 2003 season in the Fac.Agric, Shabin El-Kom location. The best-collected amounts of pollen were during the summer season followed by spring, autumn and winter seasons. Where, the mean amounts of collected pollen were 1488.00, 778.82, 574.49 and 192.58 g. /colony for summer, spring, autumn and winter, respectively. The statistical analysis of data in Table (4) cleared that significant differences were found between all four seasons during 2003.

Table (2): Mean weights g./colony pollen collected by three honeybee strains at, Fac. Agric.; Shebin El-Kom station during 2003 months

Months	Strains	F ₁ Italian	F ₁ Carniolan	F ₂ Carniolan	Total	Mean
January		79	65	54	198.19	66.06i
February		87	75	63	225.20	75.07i
March		251	210	175	636.25	212.08g
April		272	223	186	681.48	227.16f
May		384	347	288	1018.58	339.53e
June		461	407	365	1232.98	410.98c
July		547	507	445	1499.51	499.84b
August		640	581	510	1731.54	577.19a
September		444	365	300	1109.43	369.81d
October		141	93	80	315.18	105.06h
November		139	89	76	303.23	101.08h
December		62	50	42	154.37	51.46j
Total		3507.00	3014.17	2584.77	9105.94	3035.31
Mean		292.00A	251.17B	215.37C	758.54	252.85

	0.05	0.01
L.S.D. for strains	4.85	6.44
L.S.D. for months	9.71	12.89
L.S.D. for strains x months	16.81	22.32

Table (3): Mean weights of collected pollen (g./colony) by three honeybee strains at Qaunatir station during 2003 seasons.

Seasons	Strains	F ₁ Italian	F ₁ Carniolan	F ₂ Carniolan	Total	Mean
Winter		505.70	443.67	389.27	1338.64	446.21
Spring		1347.46	1169.71	899.64	3416.81	1138.94
Summer		2244.56	1982.35	1580.65	5807.56	1935.85
Autumn		924.05	761.05	665.99	2351.09	783.70
Total		5021.77	4356.78	3535.55	12914.10	
Mean		1255.44	1089.20	883.89	3228.525	

	0.05	0.01
L.S.D. for seasons	52.10	61.28
L.S.D. for Strains	45.12	54.19
L.S.D. for seasons x strains	90.24	96.45

The high amounts of collected pollen were in Summer (1488.00 g.) and the low amounts of collected pollen were in winter (192.58 g.). All seasons the best strains collected amounts of pollen were F₁ Italian (876.01 g.), followed F₁ carniolan (753.54 g.) then F₂ carniolan (646.09 g.). The results indicated that there were significant differences between F₁ Italian, F₁ carniolan and F₂ carniolan.

Table (5) showing the collected amounts of pollen per colony for the F₁

Italian, F₁ carniolan and F₂ carniolan during 2004 in Qaunatir. Studying the data of the Table (5) cleared that the best results of the collected monthly amounts of collected pollen by F₁ Italian followed F₁ carniolan then F₂ carniolan. The total yearly amounts of collected pollen by F₁ Italian, F₁ carniolan and F₂ carniolan were; 8193.20, 6929.77 and 6172.11 g. /colony, respectively. The mean amounts of collected pollen by F₁ Italian, F₁ carniolan and F₂ carniolan were 682.72, 577.42 and 514.26 g. /colony, respectively. It was noticed that the

F₁ Italian collect more amounts of pollen during all the months of the year than each of F₁ and F₂ carniolan, also F₁ carniolan collect more amounts of pollen than the F₂ carniolan ones in almost all of the months of the year. The results indicated that there were significantly differences between F₁ Italian and F₁ carniolan and F₂ carniolan. Like was, the high monthly amounts of collected pollen by the strains were during August (1825.00, 1375.00 and 1193.00 g./colony) while the low

amounts of collected pollen were in December (151.80, 94.76 and 76.11 g./colony) for F₁ Italian, F₁ carniolan and F₂ carniolan, respectively. In all experimental colonies, the months mean amounts of collected- pollen per colony ranged between 107.56 g. in December and 1464.25 g. in August. The high amount of collected pollen in August while the low amounts of collected in December. With general mean of 591.53 g... There were significantly differences between months.

Table (4): Mean weights of collected pollen (g./colony) by three honeybee strains at Fac. Agric.; Shibeh El-Kom station during 2003 seasons

Seasons \ Strains	F ₁ Italian	F ₁ Carniolan	F ₂ Carniolan	Total	Mean
Winter	227.69	190.85	159.2	577.74	192.58d
Spring	906.25	781.1	649.1	2336.45	778.82b
Summer	1648.11	1495.3	1320.6	4464.01	1488.00a
Autumn	721.97	546.91	455.49	1724.37	574.49c
Total	3504.02	3014.16	2584.39	9102.57	
Mean	876.01A	753.54B	646.09C	2275.64	

	0.05	0.01
L.S.D. for seasons	21.53	32.18
L.S.D. for Strains	18.65	25.17
L.S.D. for seasons x strains	37.29	47.67

Table (5): Mean weights of collected pollen (g./colony) by three honeybee strains at Qaunatir station during 2004 months.

Months \ Strains	F ₁ Italian bees	F ₁ Carniolan bees	F ₂ Carniolan bees	Total	Mean
January	170.70	144.80	116.80	432.30	144.10ig
February	176.40	148.30	120.90	445.60	148.54i
March	373.00	313.80	268.00	954.80	318.27h
April	525.20	473.20	424.00	1422.40	474.13f
May	1126.00	1028.00	906.30	3060.30	1019.95d
June	1226.00	1091.00	1027.00	3344.00	1114.67c
July	1370.00	1221.00	1136.00	3727.00	1242.33b
August	1825.00	1375.00	1193.00	4393.00	1464.25a
September	634.10	548.90	501.90	1684.90	561.64e
October	443.90	369.91	292.00	1105.81	368.61g
November	171.10	121.10	110.10	402.30	134.07ij
December	151.80	94.76	76.11	322.67	107.56j
Total	8193.20	6929.77	6172.11	21295.08	7098.36
Mean	682.72A	577.42B	514.26C	1774.59	591.53

	0.05	0.01
L.S.D. for strains	20.00	26.49
L.S.D. for months	40.00	52.97
L.S.D. for strains x months	69.28	91.75

The results in Table (6) explained the collected amounts of pollen per colony for the F₁ Italian, F₁ carniolan and F₂ carniolan bees during 2004 in Fac. Agric., Shiben El-Kom. The results showed that the best strain of the collected amounts for pollen was F₁ Italian. The collected mean amounts of pollen by F₁ Italian, F₁ Carniolan and F₂ Carniolan bees were 309.23, 257.95 and 215.84 g./colony, respectively. The total amounts of collected pollen by F₁ Italian, F₁ carniolan and F₂ carniolan were 3751.10, 3095.39 and 2490.11

g./colony, respectively. There were the best amounts collected of pollen by F₁ Italian and the low amounts collected of pollen by F₂ carniolan. The statistical analysis of data showed that there were significant differences between strains. The best mean monthly amounts of collected pollen were in August (686.43 g./colony) and the low amounts of collected pollen were in January (57.73 g./colony). There were significant differences between months.

Table (6): Mean weights of collected pollen (g./colony) by three honeybee strains Fac. Agric; at Shiben EL-Kom station during 2004 months

Months \ Strains	F ₁ Italian bees	F ₁ Carniolan bees	F ₂ Carniolan bees	Total	Mean
January	72.56	56.48	44.16	173.20	57.73g
February	77.08	63.75	53.41	194.24	64.75g
March	181.80	144.70	127.40	453.90	151.30e
April	357.90	302.60	259.70	920.20	306.73d
May	518.90	437.90	385.35	1342.15	447.40bc
June	538.70	457.80	405.60	1402.10	467.37b
July	578.00	467.80	437.80	1483.60	494.53b
August	843.00	752.80	463.40	2059.20	686.43a
September	257.70	161.50	146.20	565.40	188.44e
October	126.00	104.10	65.11	295.21	98.42f
November	108.40	76.53	60.50	245.43	81.80fg
December	91.06	69.43	41.48	201.97	67.33g
Total	3751.10	3095.39	2490.11	9336.60	3112.20
Mean	309.23A	257.95B	215.84C	778.05	259.35

	0.05	0.01
L.S.D. for strains	12.63	16.77
L.S.D. for months	25.26	33.54
L.S.D. for strains x months	43.76	58.09

The results in Table (7) summarized the activity of F₁ Italian, F₁ carniolan and F₂ carniolan for the collection amounts of pollen at the different seasons during 2004 season in the Qaunatir location. The more collected amounts of pollen were during the summer season followed by spring, autumn and winter seasons. Where, the mean amounts of collected pollen were 3820.75, 1812.32, 1064.32 and 400.21 g./colony for summer, spring, autumn and winter, respectively. The statistical analysis of data in Table (7) cleared that

significant differences were found between all four seasons during 2004.

The best amounts of collected pollen were in summer (3820.75 g.) and the low amounts of collected pollen were in winter (400.21 g.). In all seasons the best strains collected mean amounts of pollen were F₁ Italian (2048.17 g.), followed F₁ Carniolan (1732.27 g.) then F₂ carniolan (1542.77 g.). The results indicated that were significant differences between F₁ Italian, F₁ carniolan and F₂ carniolan..

Table (7): Mean weights of collected pollen (g./colony) by three honeybee strains at Qaunatir Station during 2004 seasons.

Seasons \ Strains	F ₁ Italian	F ₁ Carniolan	F ₂ Carniolan	Total	Mean
Winter	498.94	387.84	313.85	1200.63	400.21d
Spring	2023.65	1815.05	1598.25	5436.95	1812.32b
Summer	4421.00	3686.25	3355.00	11462.25	3820.75a
Autumn	1249.07	1039.93	903.97	3192.97	1064.32c
Total	8192.66	6929.07	6171.07	21292.80	7097.60
Mean	2048.17A	1732.27B	1542.77C	5323.2	1774.40

	0.05	0.01
L.S.D. for seasons	64.16	79.13
L.S.D. for Strains	76.18	87.17
L.S.D. for seasons x strains	96.19	111.19

The data in Table (8) summarized the activity of F₁ Italian, F₁ carniolan and F₂ carniolan for the collection amounts of pollen at the different seasons during 2004 in the Fac.Agric., Shiben El-Kom location. The best-collected amounts of pollen were during the summer season followed by spring, autumn and winter seasons. Where, the mean amounts of collected pollen were 1648.33, 905.30, 368.66 and 189.81 g. /colony for summer, spring, autumn and winter, respectively. The results of data in Table (8) showed that

significant differences were found between all four seasons during 2004.

The high amounts of collected pollen were in Summer (1648.33 g.) and the low amounts of collected pollen were in winter (189.81 g.). In all seasons the best strains collected mean amounts of pollen were F₁ Italian (937.67 g.), followed F₁ carniolan (773.89 g.) then F₂ carniolan (622.52 g.). The results indicated that there were significant differences between F₁ Italian, F₁ carniolan and F₂ carniolan.

Table (8): Mean weights of collected pollen (g./colony) by three honeybee strains Fac. Agric.; at Shiben El-Kom station during 2004 seasons.

Seasons \ Strains	F ₁ Italian	F ₁ Carniolan	F ₂ Carniolan	Total	Mean
Winter	240.7	189.69	139.05	569.44	189.81d
Spring	1058.2	885.25	772.45	2715.90	905.30b
Summer	1959.7	1678.48	1306.8	4944.98	1648.33a
Autumn	492.07	342.12	271.79	1105.98	368.66c
Total	3750.67	3095.54	2490.09	9336.30	3112.10
Mean	937.67A	773.89B	622.52C	2334.08	778.03

	0.06	0.01
L.S.D. for seasons	67.14	77.11
L.S.D. for Strains	81.19	91.17
L.S.D. for seasons x strains	99.85	103.14

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دراسة على نشاط جمع حبوب اللقاح بواسطة بعض سلالات نحل العسل *Apis mellifera* L.

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أجرى هذا العمل لدراسة نشاط جمع حبوب اللقاح بواسطة بعض سلالات نحل العسل في منطقتي شبين الكوم والقناطر الخيرية خلال عامي ٢٠٠٣ و ٢٠٠٤. وأوضحت النتائج أن الهجين الأول الايطالى جمع كمية من حبوب اللقاح أكثر من الهجين الأول الكرنبولي والهجين الثاني الكرنبولي، و الهجين الأول الكرنبولي جمع كمية حبوب لقاح اكبر من الهجين الثاني الكرنبولي وذلك خلال كل شهور السنة في منطقتي الدراسة. وكانت هناك فروق معنوية بين الهجين الأول الايطالى وكل من الهجين الأول الكرنبولي والهجين الثاني الكرنبولي، وبين الهجين الأول الكرنبولي والهجين الثاني الكرنبولي. أعلى كميات شهرية جمعت من حبوب اللقاح بواسطة الثلاث سلالات كانت خلال شهر أغسطس بينما أقل كميات جمعت من حبوب اللقاح كانت في شهر ديسمبر خلال السنتين وفي المنطقتين وكانت هناك فروق معنوية بين شهور السنة. أفضل كميات موسمية جمعت من حبوب اللقاح بواسطة الهجين الأول الايطالى و الهجين الأول الكرنبولي والهجين الثاني الكرنبولي كانت أثناء موسم الصيف ويليه مواسم الربيع والخريف ثم الشتاء خلال سنتي الدراسة في المنطقتين وكانت هناك فروق معنوية بين الفصول الأربعة.