Results AND Discussion

IV. RESULTS AND DISCUSSION

1- Survey on the pollen plants in Moshtohor plantation region:

Pollen gathering activity by honeybee (***Apis mellifera*** L.) foraging workers in Moshtohor plantation area was studies for two years (2004&2005).

More than 50 species of flowering plants or trees were sources for pollen collection by honeybee colonies in the area of study.

More than ten major pollen types were gathered, among which, ***Zea maize, Trifolium alexandarinum, Citrus spp,Vicia faba,Eucalyptus spp.,Brassica spp., Acacia arabica, Rosa sp., Cucurbita spp.,Prunus sp. And Helianthus annus.***

No cotton pollen was found in the pollen loads of returning foraging workers, the honeybees were seen visiting cotton flowers for nectar collecting only.

The flowering plants which were observed during the two years of study were recorded in (Table 1) and illustrated in (Photo. 6 to 35).

The flowering of plants species which produced pollen was detected in the pollen trap samples. The honeybee workers collected significant quantities of pollen from plant species, the main sources in the pollen-collection data, is the high proportion of pollen were (***Citrus spp., Trifolium alexandarinum, Zea maize***) (Table 1).

For both habitats combined, the ranked order of 5 most common pollen sources of 10 types scored in decreasing order are: ***Citrus spp., Trifolium alexandrinum, Zea maize, Vicia faba*** and others, ***Brasica kaber*** and ornamental plants.

The apiary was surrounded by cultivated land planted with many different flowering plants (Table 1), during the year. The most important sources of nectar and pollen yeilding crops were only five. The first source is Citrus trees which begins its blooming from 15 March to middle of April, the second crop is Clover plants which begins its flowering from the start of May till the middle of June, the third of crop plants is Corn "***Zea maize***" which is usually the major source of pollen for the colonies of honeybees, this is start blooming at the middle of June, till the end of August, the fourth sources of pollen are the oriantals and grasses plants which blooming during the different seasons of the year and some sources flowering plants are Leguminaceae plants, (***Vicia faba,Pisum sativum***) and Cruciferae, (***Brassica spp,Eruca sativa,Raphanus sativas*** and some vegetable flowering plants.

Besides the above flowering plants there are some sources for pollen are collect from different trees, plants and weeds (Table,1).

Pollen grains are examined and photographic for each types of pollen found in the earies of the honeybee workers activities (Photo. 6 to 35).

Much of what is known about pollination of plants or pollen and nectar collection in commercial plantations of different plants and trees in Moshtohor region, indicated that the honeybee workers was the major floral visitors for food collection (pollen and nectar) and opportunistic pollinators in the local of studies.

In general the flowers of Citrus (***Citrus spp.),*** **Clover** ***(Trifolium alexandrinum),*** **Corn** ***(Zea maize)*** and Broad bean (***Vicia faba***) are the mean sources of pollen and nectar, besides other flowering plants available in this areas at Moshtohor.

It can be concluded that from the present study the honeybee workers are development of managed for pollen collecting in the suitable seasons are doubtful that any economic program could be introduced to develop lineages of honeybees adapted to habitats, was evident. For virtually all pollen types there was an increase in the abundance of each over the study period, although some species were harvested much later than other. ***Zea maize*** was the first source of pollen collected by the bees in habitates **(Khattab 1976 and 1981)**

The data indicate that the honeybee workers collected pollen from different sources avialable in the areas of studies, while the pollen of Cotton was not collected according to **(Loper, 1986) .**

For example, Corn field could be found within 3 km. of 3 border areas of the cotton, even Zea maize was one of the most abundant pollen types collected by bees. The occurrence of anthers in pollen lead is probably more indicative of the particular types of plants exploited for pollen collected by foraging workers , rather than being typical behaviour of honeybees among Egyptian flora **(Seeley, 1985).**

From the above results, it could be the main sources for economic harvesting pollen were come from Citrus, Clover and Corn in the most of governorates during the active seasons of honeybee colonies.

Table (1): Pollen plant species and its classification which were observed during the period of study:

No.	Latine name	Familly
	January	
1	*Brassica kaber* koch	**Cruciferae**
2	***Vicia faba* L.**	Leguminasae
3	***Oreodoxa regia* L.**	**Palmaceae**
4	***Eucalyptus spp.* Baker**	Myrtaceae
5	***Prunus sp.***	Rosaceae
6	***Clarkia elegans***	Onagraceae
7	***Arctotis aurantiaca***	Compositae
8	***Lonicera jabonica***	
9	*Acacia arabica*	**Leguminasae**
	February	
1	*Brassica kaber* koch	**Cruciferae**
2	***Vicia faba* L.**	Leguminasae
3	***Trifolium alexandrimum* L.**	Leguminasae
4	***Prunus sp.***	Rosaceae
5	***Pisum sativum***	Leguminasae
6	***Clarkia elegans***	Onagraceae
7	***Arctotis aurantiaca***	Compositae
8	***Calandula officinalis***	Compositae
9	***Lonicera japonica***	
10	***Ipomoea pinculata***	Convulvacea
11	*Acacia arabica*	Leguminasae
12	***Alyssum maritimum***	**Cruciferae**
	March	
1	***Citrus spp* L.**	**Rutaceae**
2	***Eucalyptus spp.* Baker**	**Myrtaceae**
3	***Brassica kaber* koch**	Cruciferae
4	***Phoenix dactylifera* L.**	**Palmaceae**
5	***Clarkia elegans***	**Onagraceae**
6	***Calandula officinalis***	**Compositae**
7	***Ipomoea pinculata***	Convulvacea
8	*Acacia arabica*	**Leguminasae**

	April	
1	***Citrus spp* L.**	**Rutaceae**
2	***Trifolium alexandrimum* L.**	**Leguminasae**
3	***Rosa spp.* L.**	Rosaceae
4	***Eucalyptus spp.* Baker**	Myrtaceae
5	***Coriandarum sativum* L.**	Umbelliferae
6	***Clarkia elegans***	Onagraceae
7	***Calandula officinalis***	Compositae
8	***Ipomoea pinculata***	Convulvacea
9	***Acacia arabica***	Leguminasae
10	***Alyssum maritimum***	Cruciferae
	May	
1	***Trifolium alexandrimum* L**	**Leguminasae**
2	***Rosa spp.* L.**	**Rosaceae**
3	***Eucalyptus spp.* Baker**	**Myrtaceae**
4	***Beta vulgaris* L.**	**Chenopodiaceae**
5	***Raphanas sativas* L.**	**Cruciferae**
6	***Clarkia elegans***	**Onagraceae**
7	***Calandula officinalis***	**Compositae**
8	***Acacia arabica***	**Leguminasae**
	June	
1	***Trifolium alexandrimum* L.**	**Leguminasae**
2	***Rosa spp.* L.**	Rosaceae
3	***Eucalyptus spp.* Baker**	Myrtaceae
4	***Zea maize* L.**	Graminae
5	***Arctotis aurantiaca***	Compositae
6	***Calandula officinalis***	Compositae
	July	
1	***Zea maize* L.**	**Graminae**
2	***Rosa spp.* L.**	**Rosaceae**
3	***Helianthus annus* L.**	**Compositae**
4	***Cucumis sativus* L.**	**Cucurbitacea**

	August	
1	*Zea maize* L.	**Graminae**
2	*Lufa cyledrica* L.	**Cucurbitaceae**
3	*Cucurbita spp.*	Cucurbitaceae
4	*Ipomoea pinculata*	Convulvacea
	September	
1	*Zea maize* L.	**Graminae**
2	*Lufa cyledrica* L.	**Cucurbitaceae**
3	*Cucurbita spp.*	**Cucurbitaceae**
4	*Helianthus annus* L.	**Compositae**
	October	
1	*Zea maize* L.	**Graminae**
2	*Rosa spp.* L.	**Rosaceae**
3	*Lufa cyledrica* L.	**Cucurbitaceae**
	November	
1	*Rosa spp.* L.	**Rosaceae**
2	*Cucurbita spp.*	**Cucurbitaceae**
3	*Helianthus annus* L.	**Compositae**
4	*Brassica spp.*	**Cruciferae**
5	*Clarkia elegans*	**Onagraceae**
	December	
1	*Brassica spp.*	**Cruciferae**
2	*Vicia faba* L.	**Leguminosae**
3	*Calandula officinalis*	**Compositae**
4	*Arctotis aurantiaca*	Compositae

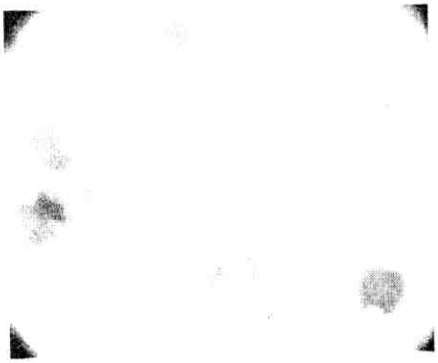


Photo. (6) *Citrus reticulata X* 400

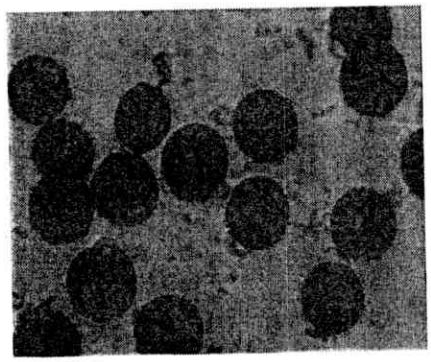


Photo. *(7) Citrus aurantium X* 400

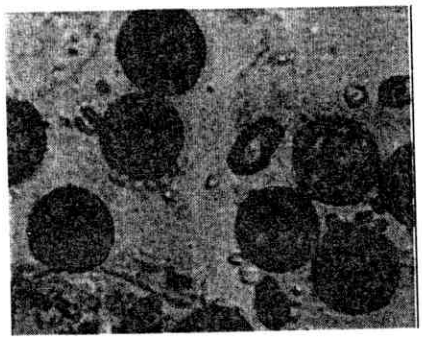


Photo. (8)Citrus aurantifolia X400

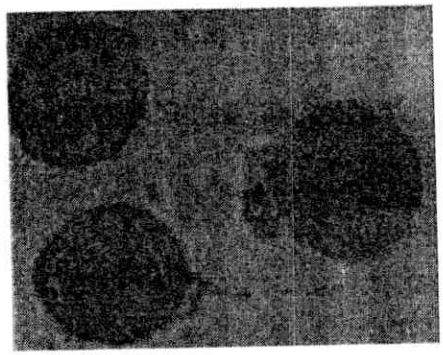


Photo. *(9) Citrus maxima X* 400

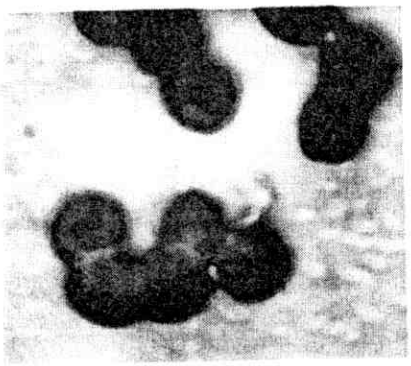


Photo. (10) Brassica rapa X320

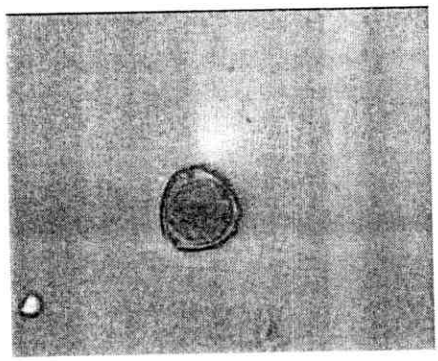


Photo.(11) Pyrus communis X200

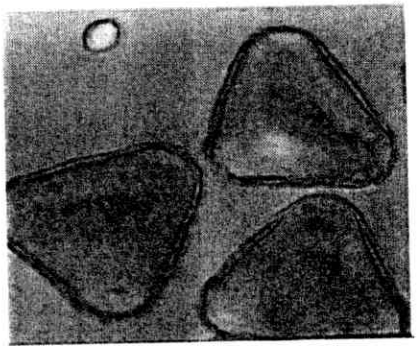


Photo. (12) *Prunus sp.* X 320

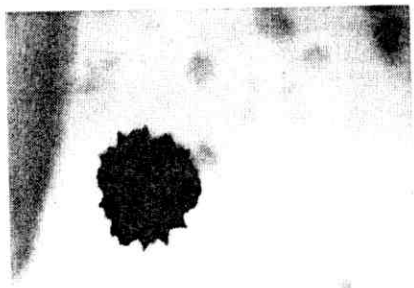


Photo. (13) *Hibiscus rosa sinensis* X 160

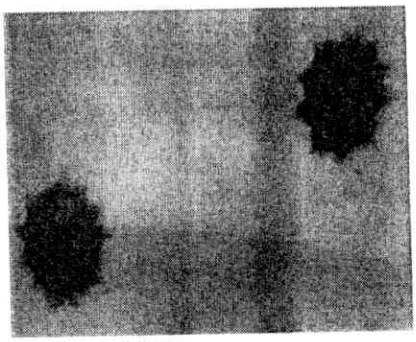


Photo. (14) *Calendula officinalis* X 320

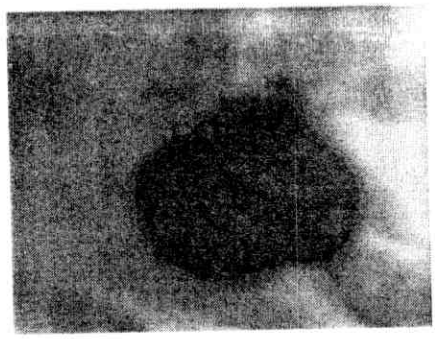


Photo. (15) *Acacia arabica* X 320

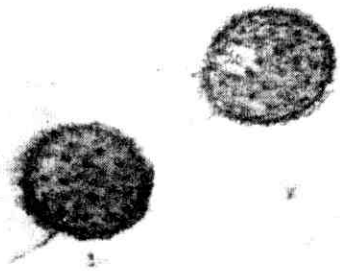


Photo.(16) *Gossypium barbadence* L. X 100

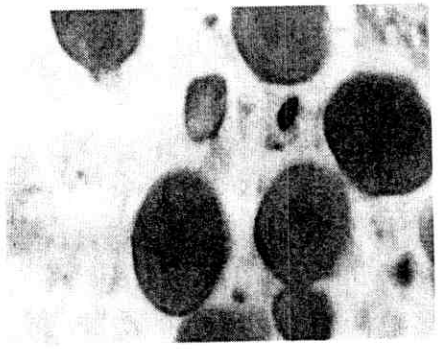


Photo. (17) *Trifolium alexandrinum* L. X 320

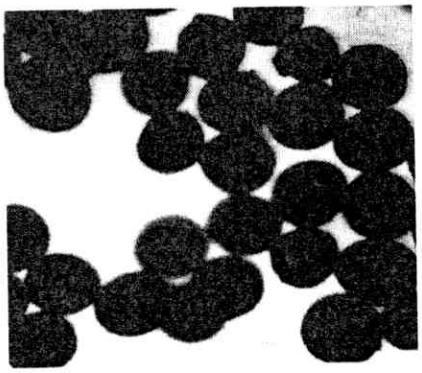


Photo. (18) *Phoenix dactylifera* X 320

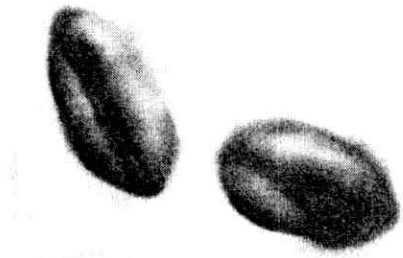


Photo. (19) *Oreodoxa regia* X 400

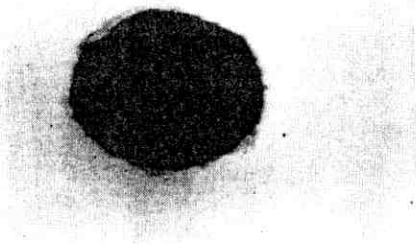


Photo. (20) *Cucurbita spp.* X 100

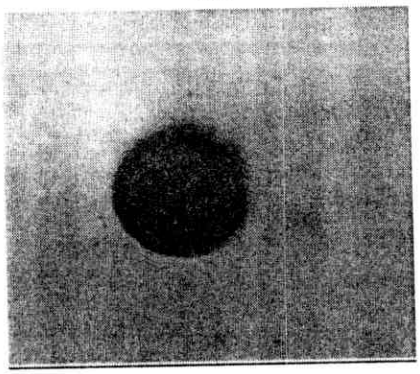


Photo. (21) *Rosa spp.* X 320

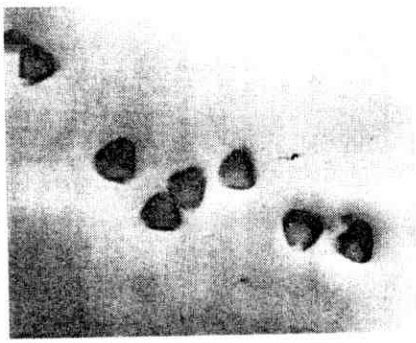


Photo. (22) *Tropealum majus* X 160

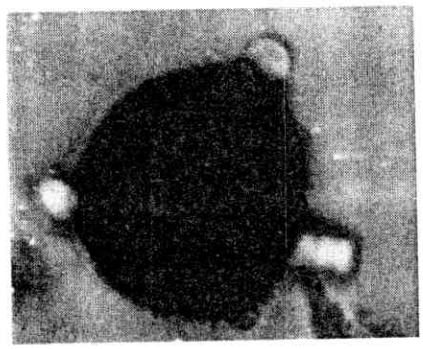


Photo. (23) *Alyssum maritimum* X 200

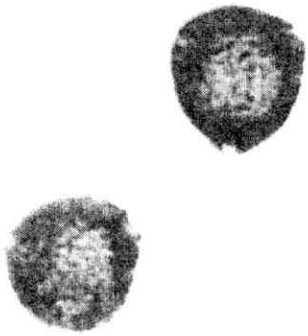


Photo. (24) *Lonicera japonica* X 200

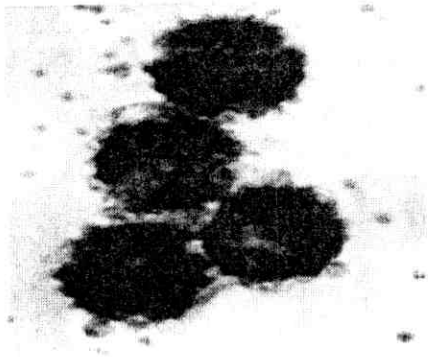


Photo. (25) *Arctotis grandis* X 200

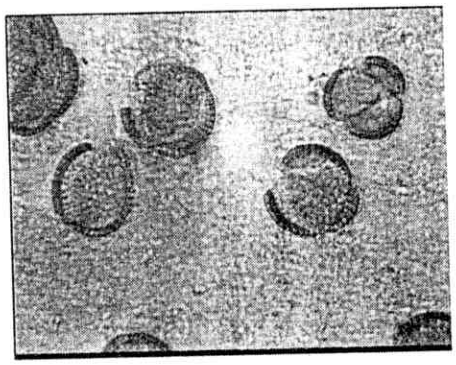


Photo. (26) *Malus domestica* X 200

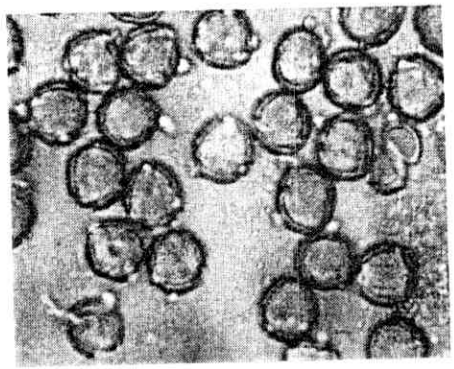


Photo. (27) *Eruca satvus* X 200

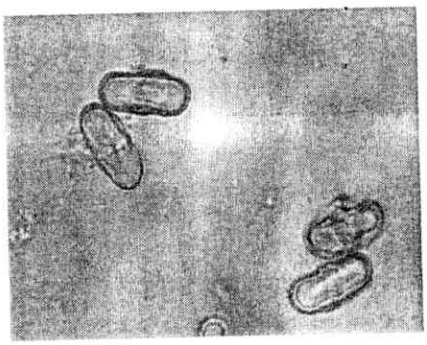


Photo. (28) *Ammi majus* X 200

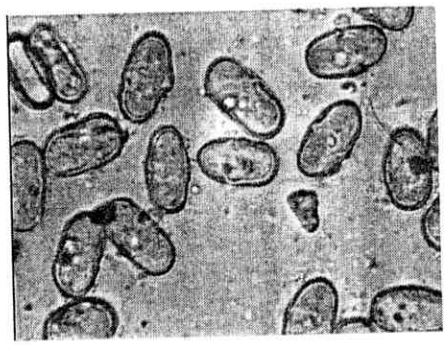


Photo. (29) *Foeniculum fulgare* X 200

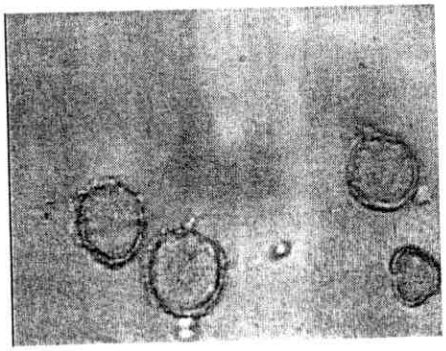


Photo. (30) *Brassica oleraceae var cabitata* X 200

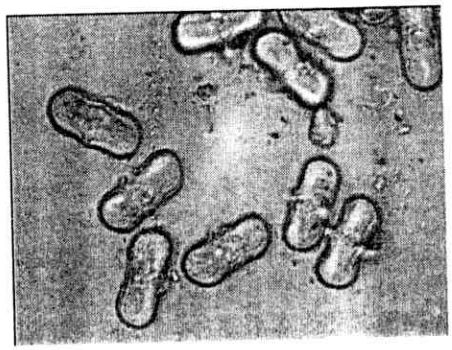


Photo. (31) *Coriandum sativum* X 200

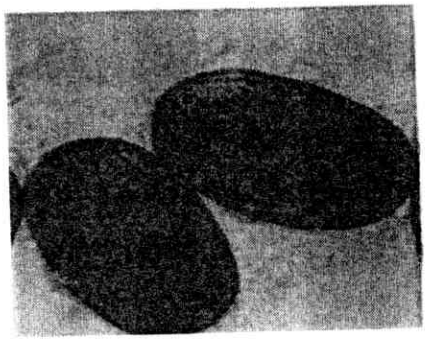


Photo. (32) *Vicia faba* L. X 400

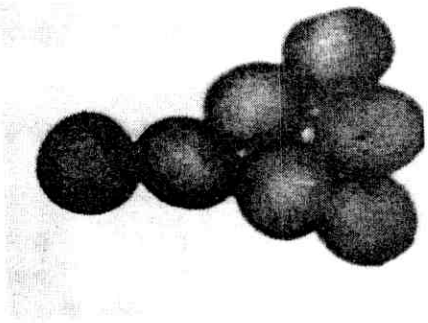


Photo. (33) *Zea maize* L. X 160

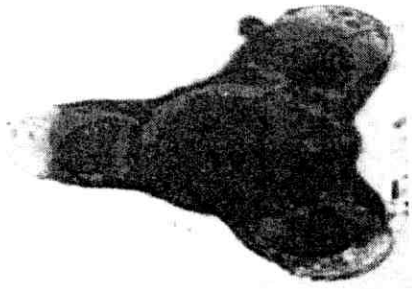


Photo. (34) *Clarkia elegans* X 200

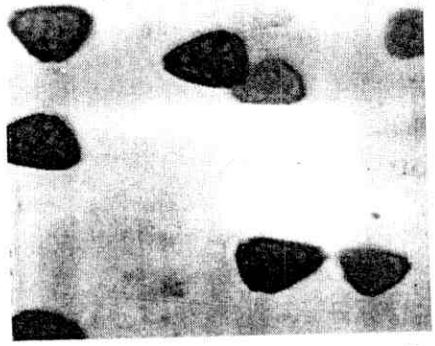


Photo. (35) *Eucalyptus spp.* X 320

2- The activity of honeybee workers on pollen gathering during different seasons:

Comparative studies were made on the foraging behaviour of honeybee ***(Apis mellifera L.)*** at Moshtohor and kafer Elwan region. One who keeps colonies of bees at the location for two years will observe that, the total amounts of pollen collection in the apiary are varies from one year to another, even though that the methods of management are the same. This variation may be due to variation in individual colonies, location of the hive in an apiary, races of honeybee and to differences in the sources of plant flowers at the same weather conditions.

Although the records presented here with may not correspond to those of another area, they will serve to give some ideas of what may happen under somewhat comprable conditions.

During three daily the weighting of the amount the pollen traps were fitted on the hives per aweek of pollen trapped in two races of honeybee colonies (F_1 Carniolan and F_1 Italian bees) during the year 2004 from January to December. (Table 2) show that, the mean amounts of pollen trapped was 3412.5 g/colony yearly in case of F_1 Italian bees, it more than that trapped by F_1 Carniolan bees which collected 2049.5 g/coloney in the same year.

The monthly of pollen trapped are recorded in Table (2) and illustrated in (Fig. 1) clearing that there were an increase as well as decrease in colonies collection of pollen throught the year of study the different months revealed the presence of two periods. The first period began from February to August and the second began from September to January. During the first period the honeybee workers were able to collect more pollen, while in the second period the colonies decreased in pollen trapped. July was the first month in

suitable for pollen collection were 532.25 and 759.50 g/colony in case of F_1 Carniolan and F_1 Italian bees, repectively, while the less amounts of pollen trapped were in December and January, 16.0, 18.0 g/colony in case of F_1 Carniolan bees, while were 24.25, 24.75 g/colony in case of F_1 Italian bees, respectively.

During the second year (2005) the foraging workers collected the highest amounts of pollen, thus it gave the amounts trapped pollen during the whole year; 12278 g. with an average 3059.5 g/colony, while in case of F_1 Carniolan bees, which was less than amount of pollen trapped; 17519 g. with an average 4379.75 g./colony in case of F_1 Italian bees, respectively.

These results are recorded in (Table 3) and illustrated in (Fig 2) shows that, the highest amounts of pollen trapped was in July (772.5 g./colony) in case of F_1 Carniolan bees, while it was (912.75 g./colony) in case of F_1 Italian bees, the less amounts of pollen trapped were during January and December (18.5 g. & 27.25 g. and 24.25 & 35.25 g.)/colony in two hybrids, respectively.

From data in table (2&3) it was found that F1 Italian bees was most active than F1 Carniolan bees in pollen collection in both seasons. The differences between the two races were significant in year 2004 on the contarary, it were non-significant in year 2005.

These observations agree with those recorded by **(Khattab, 1976; Jhajj and Goyal, 1979; Marchini et al, 2000 and Pernal and Currie ,2001)** who mentioned that air temperature and the pollen availability for foragers workers of honeybee colonies, the flowers plants if they were available, the crops were visited, in both races of honeybee are changing froms pollen to nectar collection according to suitable the weather and the flowering plants avialable for foragers workers.

It could be concluded that the above results indicated that, there are two periods during the two years of study, the first period began from October to february which the nectar and pollen sources are scres. In another words; the season between late autumn (October) and early spring (February) is referred to beekeepers as the critical period, because although bees do not cluster in the winter and activity of queen continues, the energy resources provided by flowers are restricted during this period. Therefore beekeepers usually start feeding their bees from October untill the beginning of March whereas the prepration his colonies for Citrus season .

The second periods which begin from March till September in the two years of study show that, most of the plants flowers found an increase between February and August. The spring-flowering group that blooms in March and April is **C**itrus trees, which is a chief pollen and honey sources. The second of honey and pollen is Clover which flowering from May to June followed by **C**orn crop (***Zea maize)*** which is the main source of pollen in Egypt the tasseling in July to September, while, the flowering of Cotton is found in the same period of Corn crop. The Cotton is cultivated in small areas have been treated with insecticides which is more effect and may be damage the colonies of bees, but it is the source for nectar only but not for pollen grains.

From the above results it could be concluded that, the main sources for pollen was during the Citrus, Clover and Corn. Pollen traps were used during these seasons for harvesting the more amounts of pollen per colony specialy from F1 Italian bees. While the artificial feeding must be started from October till March annualy at Moshtohor region.

Table(2): Total amounts of pollen trapped monthly during a year 2004 from 4 colonies of F1Carniolan bees and 4 colonies of F1 Italian bees (in grams)

Months	No of traps fitted with F1 Carniolan bee colonies				Total	Mean	No of traps fitted with F1 Italian bee colonies				Total	Mean	Grand Mean
	1	2	3	4			1	2	3	4			
January	15	18	25	14	72	18	26	23	30	20	99	24.75	21.375
February	98	127	131	95	451	112.75	201	189	226	195	811	202.75	157.75
March	215	287	192	175	869	217.25	374	277	390	326	1367	341.75	279.5
April	365	252	241	216	1074	268.5	511	462	371	415	1759	439.75	354.125
May	283	314	202	310	1109	277.25	616	398	450	273	1737	434.25	355.75
June	310	156	119	261	846	211.5	542	214	336	160	1252	313	262.25
July	523	612	475	519	2129	532.25	716	992	815	515	3038	759.5	645.875
August	111	312	226	314	963	240.75	627	593	617	340	2177	544.25	392.5
September	110	96	75	87	368	92	106	203	265	104	678	169.5	130.75
October	34	21	55	46	156	39	61	95	82	115	353	88.25	63.625
November	25	30	27	15	97	24.25	57	78	52	95	282	70.5	47.375
December	14	21	17	12	64	16	25	18	35	19	97	24.25	20.125
Total	2103	2246	1785	2064	8198	5568.5	3862	3542	3669	2577	13650	3412.5	2731
Mean	170.8						285.3						

L.S.D. value for races at 5% = 31.30
L.S.D. value for monthes at 5% = 76.68
L.S.D. value for interaction at 5% = 108.4

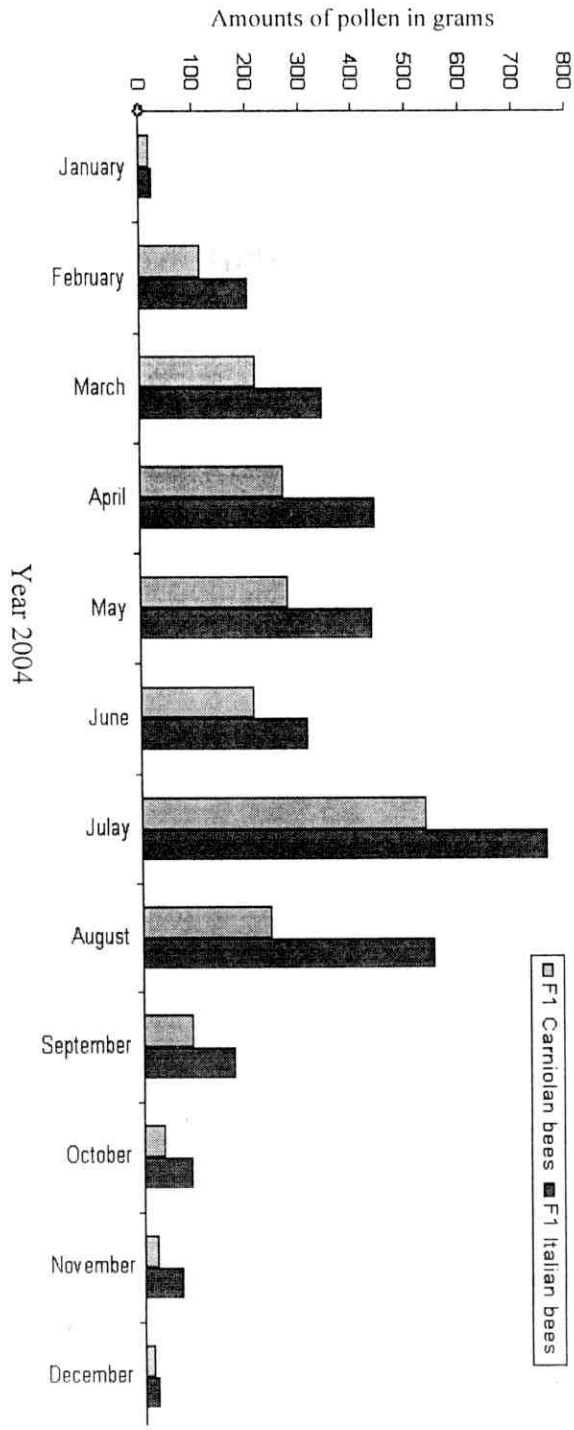


Fig. (1): Total mean amounts of pollen trapped (in grams) monthly during a year 2004 from 4 colonies of F1 Carniolan bees and 4 colonies of F1 Italian bees.

Table(3): Total amounts of pollen trapped monthly during a year of 2005 from 4 colonies of F1 Carniolan bees and 4 colonies of F1 Italian bees (in grams) :

Months	No of traps fitted with F1 Carniolan bee colonies				Total	Mean	No of traps fitted with F1 Italian bee colonies				Total	Mean	Mean
	1	2	3	4			1	2	3	4			
January	21	20	15	18	74	18.5	23	20	27	39	109	27.25	22.875
February	142	125	103	69	439	109.75	190	185	230	300	905	226.25	168
March	294	315	267	187	1063	265.75	341	401	395	458	1595	398.75	332.25
April	786	410	425	292	1913	478.25	857	692	825	589	2963	740.75	609.5
May	574	390	450	610	2024	506	593	650	952	672	2867	716.75	611.375
June	658	515	375	253	1801	450.25	629	817	755	633	2834	708.5	579.375
July	891	965	715	519	3090	772.5	906	1169	861	715	3651	912.75	842.625
August	185	127	315	218	845	211.25	329	226	245	105	905	226.25	218.75
September	121	98	156	185	560	140	210	189	200	294	893	223.25	181.625
October	35	53	47	38	173	43.25	95	112	67	84	358	89.5	66.375
November	45	37	28	49	159	39.75	60	100	59	79	298	74.5	57.125
December	38	19	16	24	97	24.25	26	30	39	46	141	35.25	29.75
Total	3790	3074	2912	2462	12238	3059.5	4259	4591	4655	4014	17519	4379.75	3719.62
Mean	255.0						365.0						

L.S.D. value for races at 5% = 40.0
L.S.D. value for monthes at 5% = 97.98
L.S.D. value for interaction at 5% = 138.6

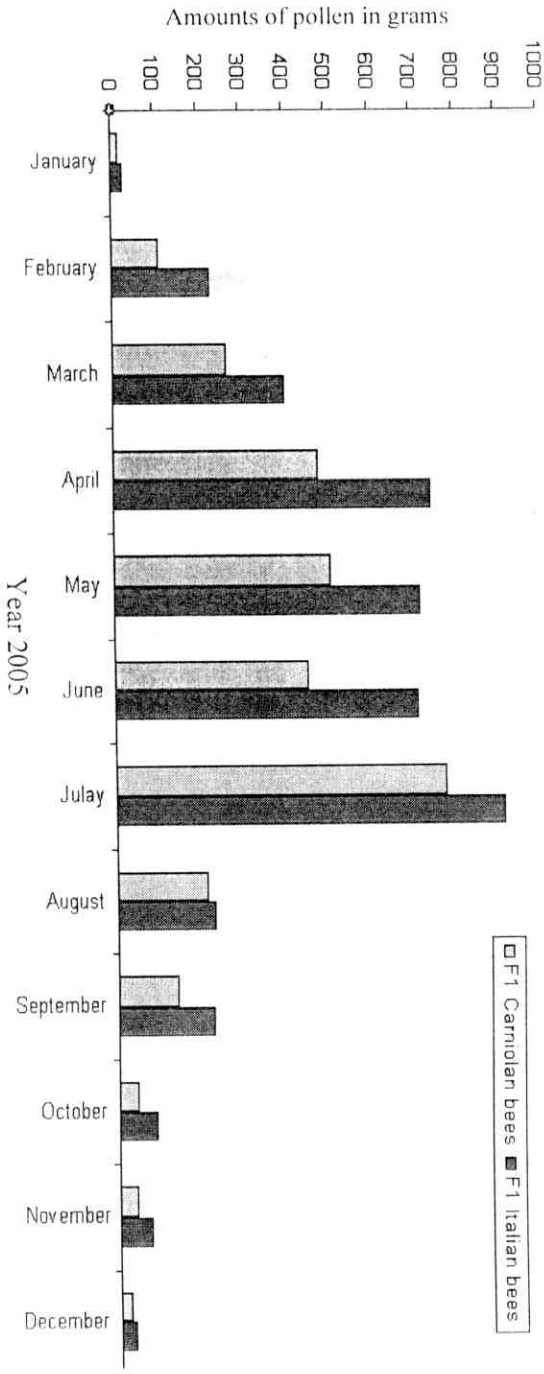


Fig. (2): Total mean amounts of pollen trapped (in grams) monthly during a year 2005 from 4 colonies of F1 Carniolan bees and 4 colonies of F1 Italian bees.

2-A: Determine the trapping pollen collections during the pollen flow periods of Citrus bloosoming season:

Pollen trapping can be used to study pollination and pollen flow during the citrus trees flowering from 1st , March, to the end of April (2004 and 2005). Any beekeepers can be trapped pollen in a particular bee yard to determine the time of pollen flow. This knowledge could be used to determine when pollen substitues or pollen supplement are necessary. The absence of pollen have a significant effect on the strength of a colony and subsequantly the honey production.

One objective of this study was to determine the pollen flow periods available for honeybees workers at the fields of Citrus trees during the main season at Moshtohor region. The other more important objective was to demonstrate how to take this data and the usefulness of it for beekeepers everywhere for obtained good honey crop from citrus seasons when the sources trees is available in the location of the apiary. Table (4) and (Fig 3) indicate that, the total amount of pollen trapped from 4 colonies during the Citrus period or flowering bloosoming (March, 12 to April, 14, 2004) was 397.0 g. with an avarage of 132.3 g./colony in case of F_1 Carniolan bees, while the total pollen trapped was 568 g. with an average of 189.3 g./colony in case of Italian bees, its more than that collection in colonies of this hybrid, this difference was statisticaly highly significant differences.

From data presented in Table (4) it could be concluded that the date 28,29,30 March was the best date for collecting Citrus pollen grains as it gained 30.33 g/colony on the reverse the least

mean value of gathering Citrus pollen was at 12,13,14 April as it gained 11.5 g/colony.

Table (5) and (Fig. 4) show that, the total amount of pollen trapped during the second (2005) of Citrus flowering was 532 g. with an average 177.3 g./colony, in case of F_1 Carniolan bees, this results was less than, that trapped by another hybrid, F_1 Italian bees which gave 787 g. with an average 262.3 g./colony, during the Citrus flow from (March, 12 to April, 14, 2005).

From data tabled in table (5) it could be concluded that 2,3,4 April was the best date for gathering Citrus pollen grains as it gained 42.0 g/colony . On the reverse the least mean value was at 12,13,14 April as it gained 17.5 g/colony.

From the above data we found that F1 Italian bees was most active than F1 Carniolan bees in gathering pollen during the two seasons 2004 and 2005 and it were highly significant .

From the bove results, it mentioned that, the suitability of a location for honey production is dependent on the pollen production as well as the nectar production.

Honeybees in this study depend on citrus trees as much on pollen as on nectar to sustain themselves. The preparation and management the colonies was started early in January have made the amounts of artificial feeding introduced to the honeybee colonies to ativate the colonies for the flowering season of Citrus honey to active the bee to able for collecting more amounts of pollen or nectar during the Citrus season which began from 15, March until 15, April anually **(Khattab, 1976; Nabors, 1997).**

Table (4): Amounts of pollen trapped (in grams) during Citrus honey flow season (2004)

Date of trapped	No of traps fitted with F1 Carniolan bee colonies			Total	Mean	No of traps fitted with F1 Italian bee colonies			Total	Mean	Grand Mean
	1	2	3			1	2	3			
March 12,13,14	12	18	15	45	15	20	22	19	61	20.333	17.666
March 18,19,20	37	21	22	80	26.667	35	31	28	94	31.333	29
March 23,24,25	26	24	19	69	23	37	30	34	101	33.667	28.335
March 28,29,30	35	15	28	78	26	39	36	29	104	34.667	30.335
April 2,3,4	28	16	18	62	20.667	36	35	28	99	33	26.835
April 7,8,9	17	10	14	41	13.667	20	23	19	62	20.667	17.167
April 12,13,14	10	8	4	22	7.333	15	12	20	47	15.667	11.5
Total	165	112	120	397	132.333	202	189	177	568	189.333	160.833
Mean	18.90					27.05					

L.S.D. value for races at 5% = 2.787
L.S.D. value for date at 5% = 5.214
L.S.D. value for interaction at 5% = 7.374

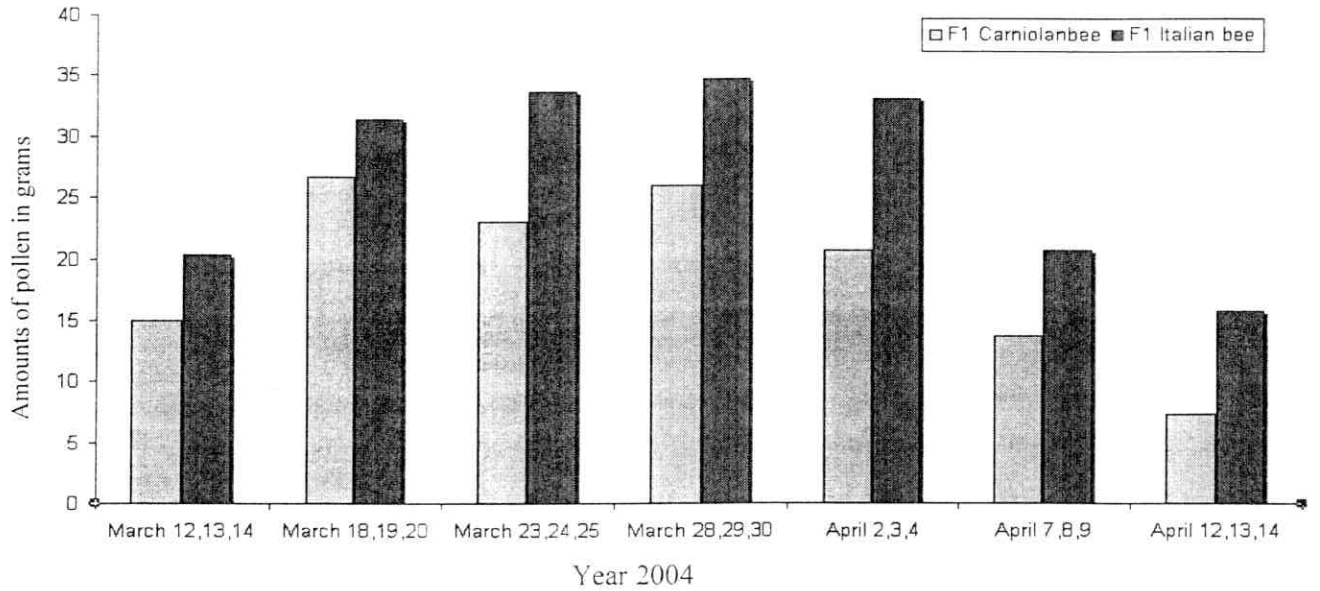


Fig. (3): Total or mean amounts of pollen trapped (in grams) during Citrus honey flow season, 2004.

Table (5): Amounts of pollen trapped during Citrus honey flow season (2005) (in grams)

Date of trapped	No of traps fitted with Carniolan bee colonies F1			Total	Mean	No of traps fitted with Italian bee colonies F1			Total	Mean	Mean in (g.)
	1	2	3			1	2	3			
March 12,13,14	15	17	24	56	18.667	26	26	30	82	27.333	23
March 18,19,20	25	28	21	74	24.667	40	35	42	117	39	31.835
March 23,24,25	31	29	26	86	28.667	50	45	38	133	44.333	36.5
March 28,29,30	32	24	28	84	28	54	46	29	129	43	35.5
April 2,3,4	39	30	34	103	34.333	60	54	35	149	49.667	42
April 7,8,9	26	28	24	78	26	42	35	46	123	41	33.5
April 12,13,14	16	21	14	51	17	18	21	15	54	18	17.5
Total	184	177	171	532	177.333	290	262	235	787	262.333	219.833
Mean	25.33					37.48					

L.S.D. value for races at 5% = 3.689
L.S.D. value for date at 5% = 6.902
L.S.D. value for interaction at 5% = 9.761

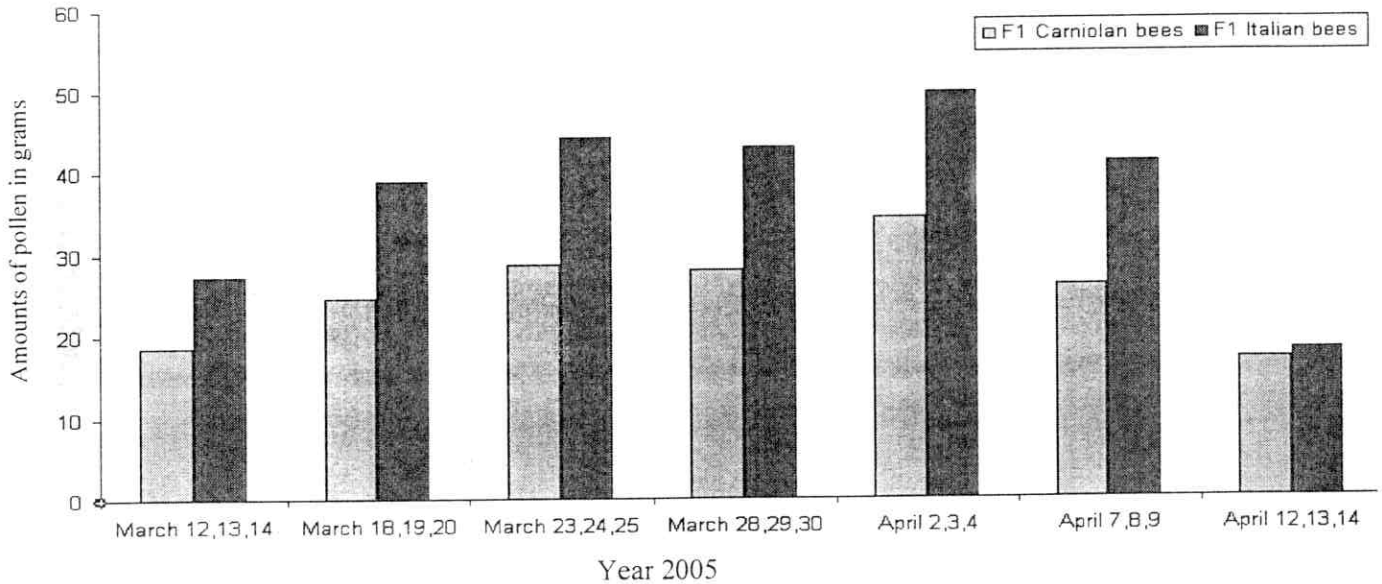


Fig.(4): Total or mean amounts of pollen trapped (in grams) during Citrus honey flow season ,2005.

2-b. Determine the trapping pollen collections during flow periods of Clover blooming season:

The activity of honeybee workers on the collection of clover pollen was started on the first of May until the middle of June. Any beekeeper can be trapped pollen in particular bee yard to determine the time of pollen flow. This knowledge could be used to determine when pollen substitutes are necessary. The absence of pollen had a significant effect on the strength of a colony and subsequently the honey production and more effect on the other hive production.

One objective of this study was to determine the pollen flow periods available for honeybee workers at the fields of clover plants during the main season at Moshtohor region.

The other more important objective was to demonstrate how to take this data and the usefulness of it for beekeepers everywhere for obtained good honey crop and other hive products from clover season when the sources plants are available in the location of the apiary.

Table (6) and Fig. (5) indicate that, the total amounts of pollen trapped from 3 colonies in each race (3 F1 Carniolan and 3 F1 Italian bees) during the clover flowering or bloosoming period (1st of May to the middle of June 2004) was 527.0g with an average of 175.66 g/colony in case of F1 Carniolan bees, while the total pollen trapped was 1029 g with an average of 342.33 g/colony in case of F1 Italian bees, its more than that collection in colonies of this hybrid.

The data analysis showed that the best date for gathering Clover pollen was during 16,17,18 May as it was 60.66 g/colony on the opposite the least mean value of pollen gathering was at 6,7,8 June as it gained 16.834 g/colony in the year 2004.

Table (7) and Fig. (6) show that, the total amount of pollen trapped during the second year (2005) of clover flowering was 698.0 g with an average 232.66 g/colony, in case of F1 Carniolan bees, this result was less than, that trapped by another hybrid F1 Italian bees which gave 1167.0 g with an average 389.0 g/colony, during the clover flow from the 1st of May to the middle of June 2005.

The data analysis showed that the best date for Clover pollen collection was during 21,22,23 May as it was 64.5 g/colony on the reverse the least mean value was at 6,7,8 June as it gained 11.83 g/colony in the year 2005.

From the above results, it mentioned that, the suitability of a location for honey production is dependent on the pollen production as well as the nectar production. Honey bee in this study depend on clover plants as much on pollen as on nectar to sustain themselves. The colonies are under preparation and management with artificial feeding through 20 days after Citrus honey harvested to activate the honeybee workers for started foraging on the Clover flowers during season for collecting of pollen and nectar.

From the above results it could be concluded that there was highly significant between the two races on Clover pollen gathering activity during the two seasons of study as it were F1 Italian bees more active than F1 Carniolan bees on Clover pollen gathering activity.

From the above results; it could be mentioned that, the activity of honeybee workers on clover plants during the bloosoming period dependent on the areas of the cultivation of the clover and the population of the foragers of honeybee colonies.
This results in agreement with **Khattab, 1976** and **Nabors, 1997.**

Table (6): Amounts of pollen trapped (in grams) from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during nectar flow of Clover ,2004.

Date of trapped	No of traps fitted with F1 Carniolan bee colonies			Total	Mean	No of traps fitted with F1 Italian bee colonies			Total	Mean	Grand Mean
	1	2	3			1	2	3			
May 1,2,3	19	22	15	56	18.67	20	27	31	78	26	22.335
May 6,7,8	48	30	34	112	37.33	51	49	46	146	48.667	43
May 11,12,13	67	45	42	154	51.33	75	68	55	198	66	58.66
May 16,17,18	40	60	53	153	51	65	81	65	211	70.333	60.66
May 21,22,23	38	24	36	98	32.67	50	45	49	144	48	40.33
May 26,27,28	22	39	28	67	29.67	35	37	33	105	35	32.35
June 1,2,3	21	15	16	52	17.33	29	22	26	79	25.667	21.5
June 6,7,8	12	10	11	33	11	23	26	19	68	22.667	16.84
Total	267	245	235	527	249	348	355	326	1029	342.333	295.66
Mean	31.13					42.79					

L.S.D. value for races at 5% = 4.149
L.S.D. value for date at 5% = 8.298
L.S.D. value for interaction at 5% = 11.73

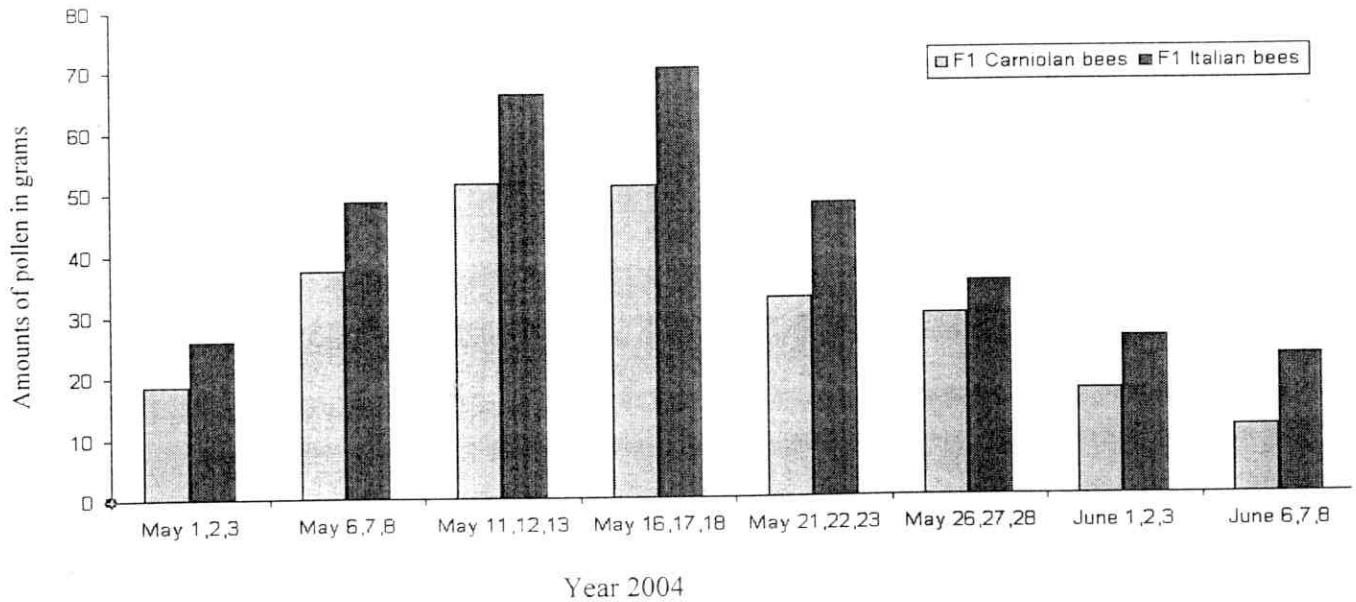


Fig. (5) Total or mean amounts of pollen trapped (in grams) from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during nectar flow of Clover 2004 .

Table (7): Amounts of pollen trapped (in grams) from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during nectar flow of Clover ,2005.

Date of trapped	No of traps fitted with F1 Carniolan bee colonies			Total	Mean	No of traps fitted with F1 Italian bee colonies			Total	Mean	Grand Mean
	1	2	3			1	2	3			
May 1,2,3	16	29	23	68	22.67	25	40	41	106	35.33	29
May 6,7,8	35	39	28	102	34	40	46	52	138	46	40
May 11,12,13	45	32	38	115	38.33	65	42	66	173	57.67	48
May 16,17,18	50	40	39	129	43	69	75	80	224	74.67	58.83
May 21,22,23	52	37	46	135	45	85	91	76	252	84	64.5
May 26,27,28	35	26	28	89	29.67	51	45	62	158	52.67	41.167
June 1,2,3	15	9	12	36	12	28	20	21	69	23	17.5
June 6,7,8	10	8	6	24	8	15	12	20	47	15.67	11.83
Total	258	220	220	698	232.67	378	371	418	1167	389	310.83
Mean	29.08					48.63					

L.S.D. value for races at 5% = 4.072
L.S.D. value for date at 5% = 10.38
L.S.D. value for interaction at 5% = 14.68

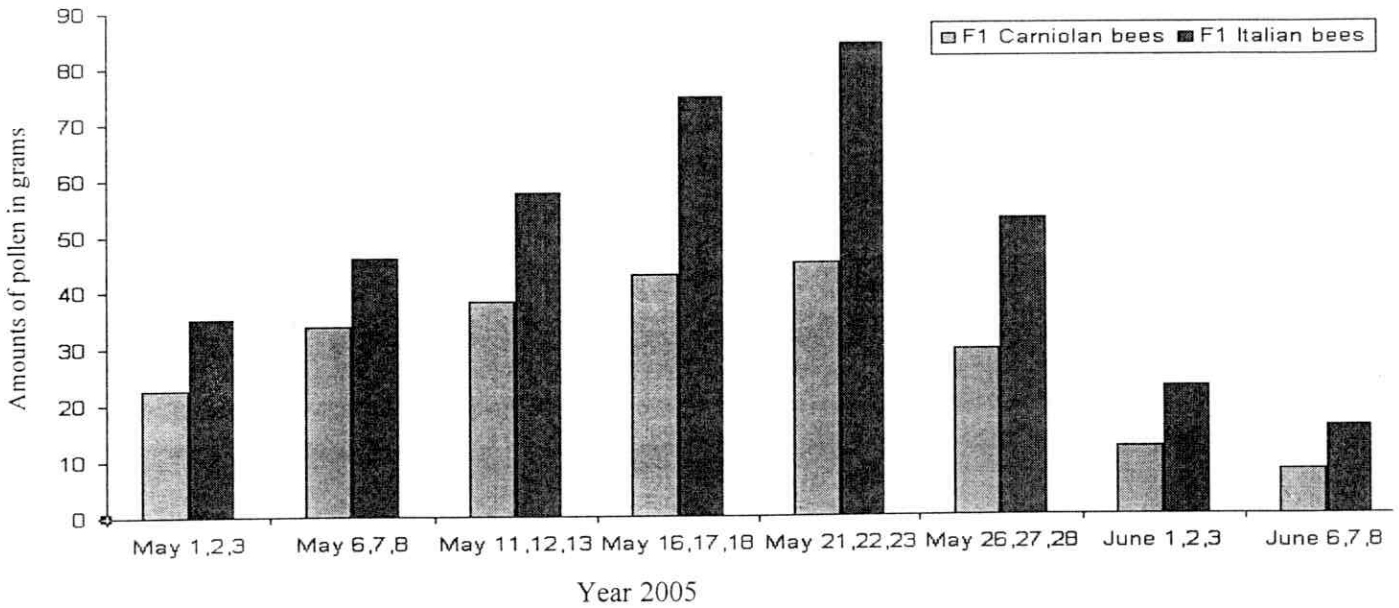


Fig. (6) Total or mean amounts of pollen trapped (in grams) from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during nectar flow of Clover 2005.

2.C.1: The activity of honeybee workers on the gathering of corn pollen (*Zea maize* L.) during 2004 & 2005:

During the tasseling period "flowering plants" of Corn, ***Zea maize*** L. in seasons 2004 and 2005, which started gathering pollen from end of June till the end of August at the region of Moshtohor.

The main source of pollen during the periods of Cotton cultivating is the Corn plants, wherease the source of nectar for honeybee came from Cotton flowers.

Table (8) and Fig. (7) shows six colonies of honeybees from each strain (three colonies of F1 Carniolan bees and three colonies of F1 Italian bees) of the same hybrid stock were placed in the apiary for the activity on the field of Corn.

Pollen traps were placed on six colonies on June, 23 and the first pollen samples were taken at three days from June 28, 29, 30; until August 28, 29, 30; during the two years of study (2004 & 2005). In 2004 the amounts of pollen trapped during the active season on corn was 1118.0 g with an average of 396.0 g / colony, in case of F1 Carniolan bees, while the amounts of pollen trapped at the same period in case of F1 Italian bees was 1922.0 g with an average of 640.66 g/colony.

Data analysis showed that the date of 23,24,25 July was the highst date for Corn pollen gathering as it amounted 79.0 g/colony . On the opposite the least date was 28,29,30 August as it was 5.16 g/colony.

The above results indicated that the race of F1 Italian bee was gathering amounts of pollen more amounts than that gathered

by F1 Carniolan bees, this differences was statistical analysis is highly significant between two races.

The amounts of pollen harvested from pollen traps in corn tasseling periods at three days of the season 2005 is listed in Table (9) and Fig. (8) showed the amounts of pollen trapped in case of F1 Carniolan bees was 2059.0 g with an average of 686.3 g/colony, while the amount of pollen trapped by the colonies of F1 Italian bees was 3473.0 g with an average 1157.6 g / colony.

The data analysis indicated that the best date for gathering Corn pollen was 8,9,10 August followed by 3,4,5 August as they gives 101,83 and 98.83 g/colony, respectively. On the contarary, the least date was 28,29,30 June followed ascendingly by 28,29,30 August as they amounted 33.66 and 33.83 g/colony, respectively.

It could be mentioned that, the pollen collection by F1 Italian bees was more than that gathered by F1 Carniolan bees in the same periods and in the same region of Moshtohor, this differences was highly significant.

The percentage of corn pollen collected by workers was lower in the first experiment, and was high in middle period and then decreased gradually in late period.

The results are in agree with **Traynor, (2001).**

Table (8): Amounts of pollen trapped (in grams)from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during pollen flow of Corn plants (*Zea maize L.*), 2004.

Date of trapped	No of traps fitted with F1 Carniolan bee colonies			Total	Mean	No of traps fitted with F1 Italian bee colonies			Total	Mean	Grand Mean
	1	2	3			1	2	3			
June 28,29,30	37	20	15	72	24	35	27	30	92	30.67	27.35
July 3,4,5	38	25	29	92	30.67	38	32	36	106	35.33	33
July 8,9,10	40	36	28	104	34.67	45	68	57	170	56.67	45.67
July 13,14,15	45	46	35	126	42	60	55	75	190	63.33	52.65
July 18,19,20	65	38	59	162	54	85	66	90	241	80.33	67.16
July 23,24,25	50	41	58	149	49.67	110	94	121	325	108.33	79
July 28,29,30	63	53	34	150	50	89	71	105	265	88.33	69.16
August 3,4,5	50	42	48	140	46.67	69	51	99	219	73	59.83
August 8,9,10	15	16	25	56	18.67	41	31	44	116	38.67	28.67
August 13,14,15	12	15	26	53	17.67	26	22	19	67	22.33	20
August 18,19,20	10	14	17	41	13.67	23	18	20	61	20.33	17
August 23,24,25	5	10	19	34	11.33	15	13	20	48	16	13.66
August 28,29,30	4	0	5	9	3	5	6	11	22	7.33	5.16
Total	434	356	398	1118	396	641	554	727	1922	640.67	518.33
Mean	30.46					49.28					

L.S.D. value for races at 5% = 4.072
L.S.D. value for date at 5% = 10.38
L.S.D. value for interaction at 5% = 14.68

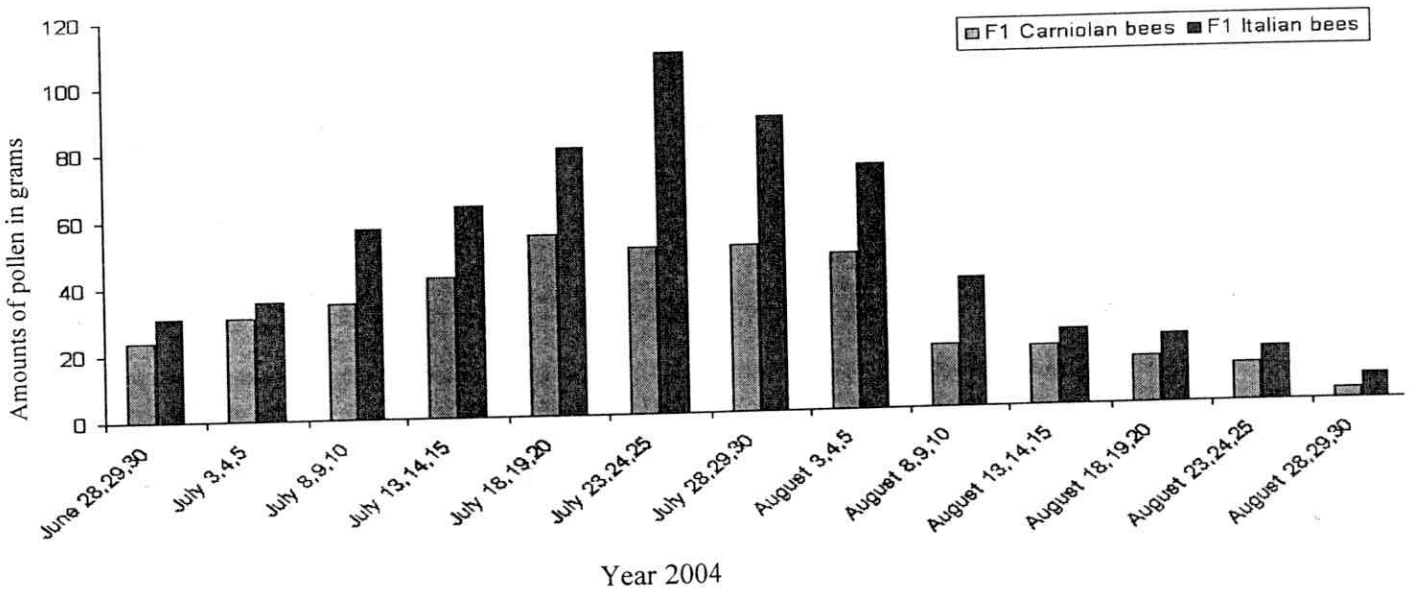


Fig. (7) Total or mean amounts of pollen trapped (in grams) from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during pollen flow of Corn plants (Zea *maiz* L.), 2004.

Table (9): Amounts of pollen trapped (in grams) from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during pollen flow of Corn plants (*Zea maiz L.*), 2005.

Date of trapped	No of traps fitted with F1 Carniolan bee colonies			Total	Mean	No of traps fitted with F1 Italian bee colonies			Total	Mean	Grand Mean
	1	2	3			1	2	3			
June 28,29,30	32	26	28	86	28.67	39	41	36	116	38.67	33.667
July 3,4,5	38	32	33	103	34.33	43	35	39	117	39	36.665
July 8,9,10	40	41	39	120	40	52	62	54	168	56	48
July 13,14,15	65	45	58	168	56	110	135	98	343	114.33	85.165
July 18,19,20	79	51	48	178	59.33	92	101	121	314	104.67	82
July 23,24,25	90	85	67	242	80.67	120	119	105	344	114.67	97.667
July 28,29,30	75	91	53	219	73	112	96	110	318	106	89.5
August 3,4,5	70	86	48	204	68	135	115	139	389	129.67	98.835
August 8,9,10	97	102	66	265	88.33	120	104	122	346	115.33	101.833
August 13,14,15	49	35	32	116	38.67	98	88	98	284	94.67	66.667
August 18,19,20	42	50	38	130	43.33	110	120	132	362	120.67	82
August 23,24,25	40	68	52	160	53.33	112	57	68	237	79	66.165
August 28,29,30	25	16	27	68	22.67	38	59	38	135	45	33.835
Total	742	728	589	2059	686.33	1181	1132	1160	3473	1157.67	922
Mean	52.79					89.05					

L.S.D. value for races at 5% = 4.023
L.S.D. value for date at 5% = 8.046
L.S.D. value for interaction at 5% = 11.38

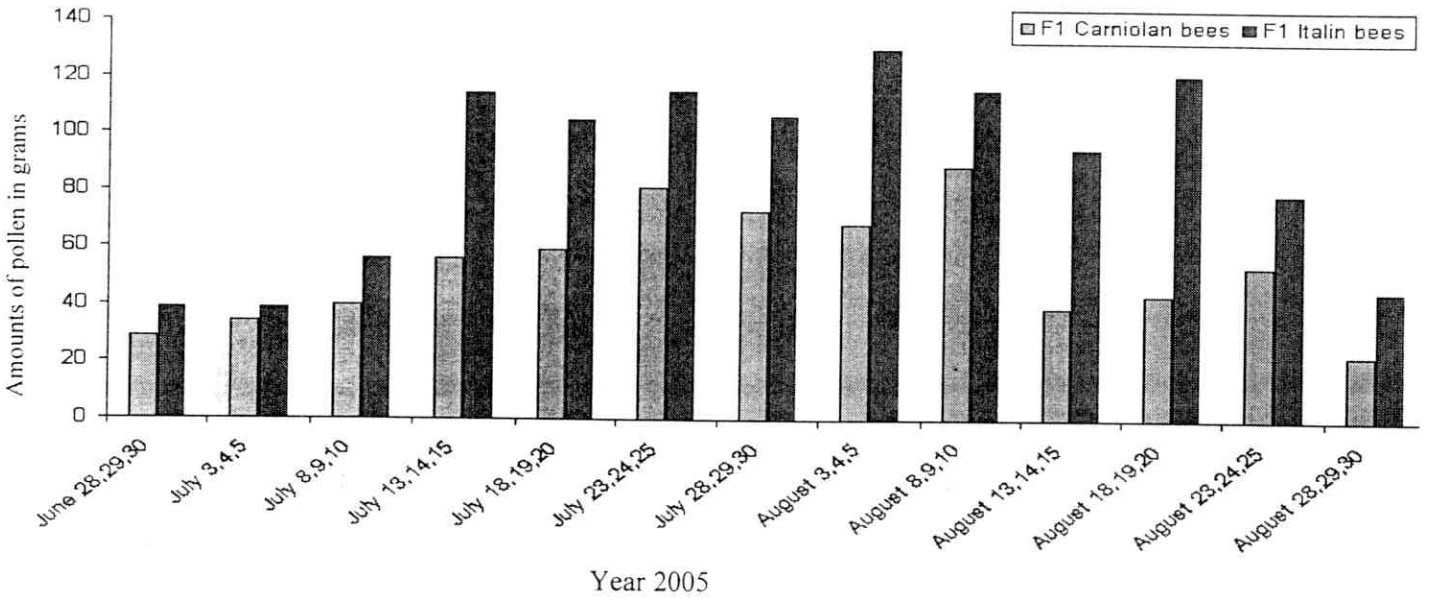


Fig. (8) Total or mean amounts of pollen trapped (in grams) from honeybee colonies (F1 Carniolan bees) and (F1 Italian bees) during pollen flow of Corn plants (Zea *maiz* L.), 2005.

2.C.2: Temporal changes (successive days) in total wet weight of pollen for 3 colonies of honey bees during the tasseling periods (10 days) :

The total wet weight of pollen collected per day by bees significantly increased over the 6-day with a three-fold increase between 2-day and a doubling days 3 and 4, and days 4 and 5 (Table 10&11 and Fig.9&10); after the 6-day, the total wet weight of pollen trapped per day was significantly decreased gradually until the 10-day.

There was a wide range of variation in both the average and total wet weights of pollen among individual bee colonies during the tasseling period of the Corn (***Zea maize)***.

From the above data analysis in table (10) it could be concluded that the highst days in Corn pollen trapping during the 2004 Corn tasseling period were 28 June followed descendingly by 27 June as they amounted 24.0 and 19.7 g/day, respectively. On the reverse, the lowest day was 3 July as it amounted 4.0 g/day. While in table (11) it could be mentoined that the highst days in Corn pollen trapping during 2005 Corn tasseling period were 29 June followed descendingly by 28 June as they gains 34.0 and 30.0 g/day, respectively. On the opposite, the lowest day was 3 July as it gained 8.0 g/day.

Table (10): Successive days in total wet weight "in grams" of pollen trapped samples for 3 honeybee colonies during the tasseling (flowering) periods of Corn plantation on (2004).

Daily of pollen trapped	Trapped pollen in gm.			Total wet weight	Average per day
	1	2	3		
24 June	0	3	2	5	1.7
25 June	7	9	10	26	8.6
26 June	11	14	12	37	12.3
27 June	26	18	25	59	19.7
28 June	21	29	22	72	24.0
29 June	16	20	10	46	15.3
30 June	11	15	12	38	12.6
1 July	6	10	9	25	8.3
2 July	5	7	6	18	6.0
3 July	5	4	3	12	4.0

L.S.D. at 5% = 4.69

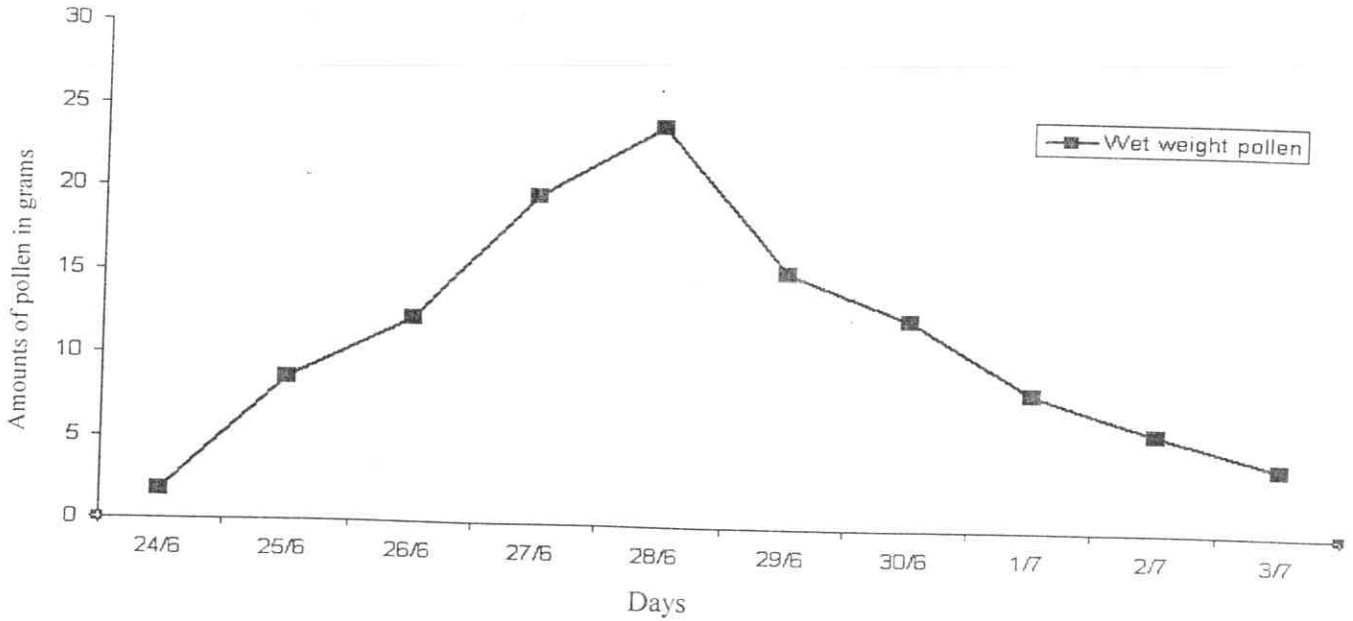


Fig. (9) Average successive days in total wet weight "in grams" of pollen trapped samples for 3 honeybee colonies during the tasseling (flowering) periods of Corn plantation on ,2004.

Table (11): Successive days in total wet weight "in grams" of pollen trapped samples for honeybee colonies during the tasseling (flowering) periods of Corn plantation on (2005).

Daily of pollen trapped	Trapped pollen in gm.			Total wet weight	Average per day
	1	2	3		
24 June	5	2	4	11	3.7
25 June	11	12	10	33	11.0
26 June	15	16	14	45	15.0
27 June	30	24	20	74	24.7
28 June	39	28	25	92	30.6
29 June	41	32	29	102	34.0
30 June	22	12	20	54	18.0
1 July	19	10	12	41	13.6
2 July	16	8	11	35	11.6
3 July	12	5	7	24	8.0

L.S.D. at 5% = 5.25

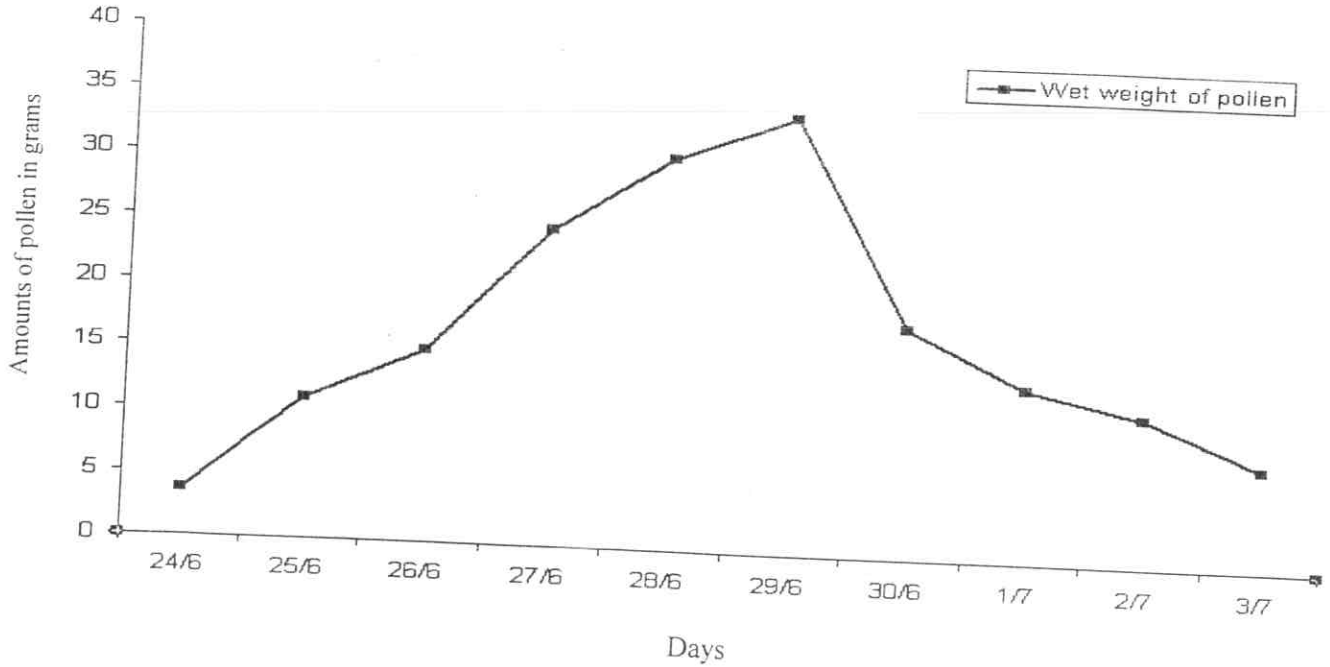


Fig. (10) Average successive days in total wet weight "in grams" of pollen trapped samples for 3 honeybee colonies during the tasseling (flowering) periods of Corn plantation on ,2005.

2.C.3: Amounts of pollen harvested from Corn spikes during the tasseling (flowering) periods in (2004 & 2005):

The foraging honeybee workers had the opportunity to visit the tasseles or spikes (flowers) in the plantation Corn (***Zea maize***) for pollen collection at Moshtohor region, while honeybees workers failed to gather cotton pollen, they did collect significant quantities of pollen from ***Zea maize*** and other plant species on an avilable of the area.

Table (12&13) and Fig. (11&12) shows the main average of pollen produced per a Corn tassele was 0.380 g in 2004, the total amounts of pollen may be produced per faddan was 9.132 kg in 2004.

While the amounts of pollen produced in 2005 per a tassele was 0.465 g therefore the amounts pollen produced per faddan may be 11.620 kg, respectively.

These results reported during the periods of corn tasseles from June, 28 until August, 30 during the two years of study (2004 and 2005).

From data recorded in table (12) it could be concluded that the highst days in the amounts of pollen produced from Corn spikes during tasseling season, 2004 in the area of study were 3,4,5 August followed descendingly by 28,29,30 July as it amounted 0.574 and 0.543 g/a tassel. On the reverse, the least days were 28,29,30 August as it was 0.161 g/a tassel .

From data analysis in table (13) it could be mentoined that the highst days in the amounts of pollen produced from Corn spikes during the tasseling season, 2005 were 28,29,30 July followed descendingly by 3,4,5 August as it gained 0.658 and 0.582 g/a tassel, respectively. On the opposite, the lowest days were 28,29,30 August as it was 0.225 g/a tassel.

These results idicated that the amounts of pollen may be collected by foraging of honeybee workers per faddan cultivated with Corn is expected as (Amounts of pollen per atassel X No. of plant per faddan)

Table (12): Amounts of pollen (in grams) produced from Corn tassles per faddan ,2004.

Date of pollen produced	10 tassels	15 tassels	20 tassels	Total	Average	Average per Faddan
June 28,29,30	2.524	3.505	5.950	11.979	0.2662	6388.8
July 3,4,5	2.685	5.265	6.236	14.186	0.315244	7565.867
July 8,9,10	2.800	5.525	8.704	17.029	0.378422	9082.133
July 13,14,15	3.955	6.545	8.620	19.12	0.424889	10197.33
July 23,24,25	4.200	7.350	10.544	22.094	0.490978	11783.47
July 28,29,30	4.750	8.465	11.250	24.465	0.543667	13048
August 3,4,5	5.535	8.356	11.950	25.841	0.574244	13781.87
August 8,9,10	4.590	6.750	10.205	21.545	0.478778	11490.67
August 13,14,15	3.560	5.425	8.425	17.41	0.386889	9285.333
August 18,19,20	2.580	3.750	7.245	13.575	0.301667	7240
August 23,24,25	2.00	3.650	5.321	10.971	0.2438	5851.2
August 28,29,30	1.560	2.465	3.250	7.275	0.161667	3880
Total Average	3.39	5.59	8.14	17.12	0.380537	9132.889

L.S.D. value at 5% = 0.053

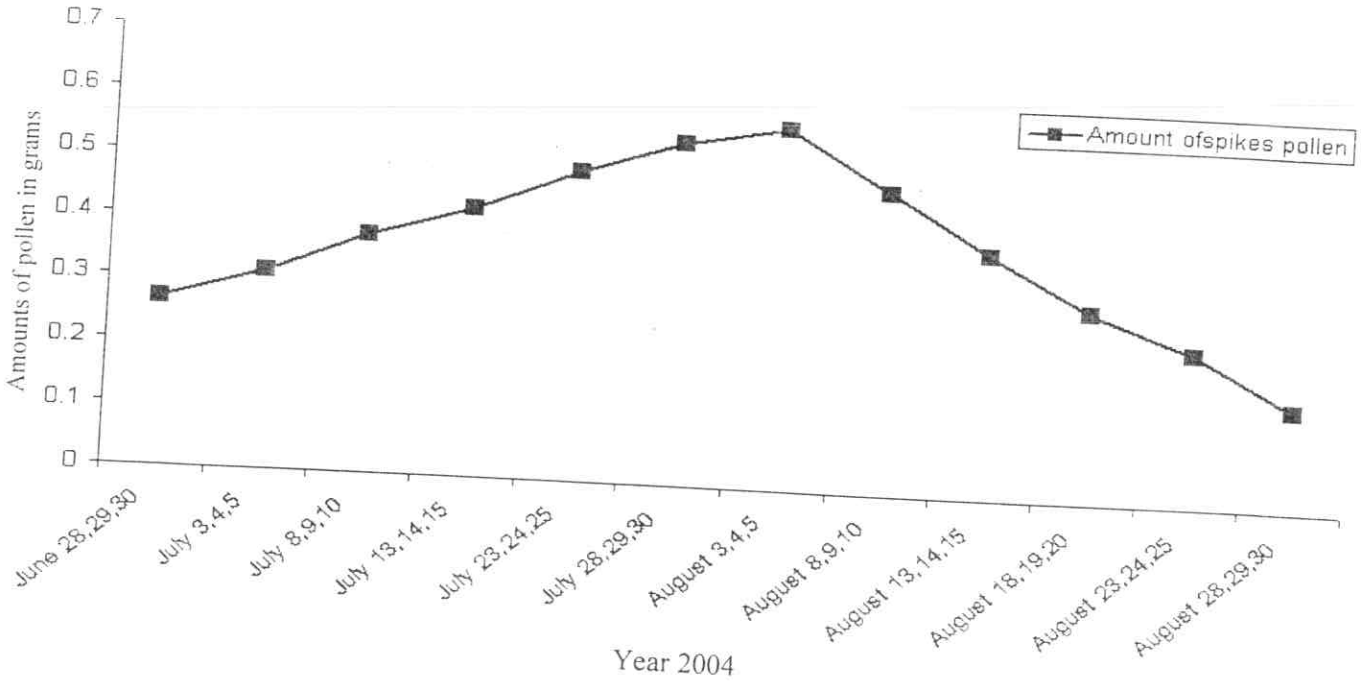


Fig.(11) Average amounts of pollen (in grams) produced from Corn spikes during tassles seasons,2004.

Table (13) Amounts of pollen (in grams) produced from Corn tassles per faddan,2005.

Date of pollen produced	10 tassels	15 tassels	20 tassels	Total	Average	Average per Faddan
June 28,29,30	2.420	5.620	6.505	14.545	0.323222	7757.333
July 3,4,5	4.760	6.840	7.750	19.35	0.43	10320
July 8,9,10	4.550	6.250	10.540	21.34	0.474222	11381.33
July 13,14,15	5.970	7.850	12.125	25.945	0.576556	13837.33
July 23,24,25	5.245	8.230	11.420	24.895	0.553222	13277.33
July 28,29,30	5.320	9.325	14.980	29.625	0.658333	15800
August 3,4,5	4.840	8.115	13.240	26.195	0.582111	13970.67
August 8,9,10	4.525	6.250	10.750	21.525	0.478333	11480
August 13,14,15	5.146	8.260	10.956	24.362	0.541378	12993.07
August 18,19,20	3.582	5.950	9.195	18.727	0.416156	9987.733
August 23,24,25	3.585	4.250	6.650	14.485	0.321889	7725.333
August 28,29,30	2.450	2.852	4.850	10.152	0.2256	5414.4
Total Average	4.37	6.65	9.91	20.93	0.465	11162.044

L.S.D. value at 5% = 0.075

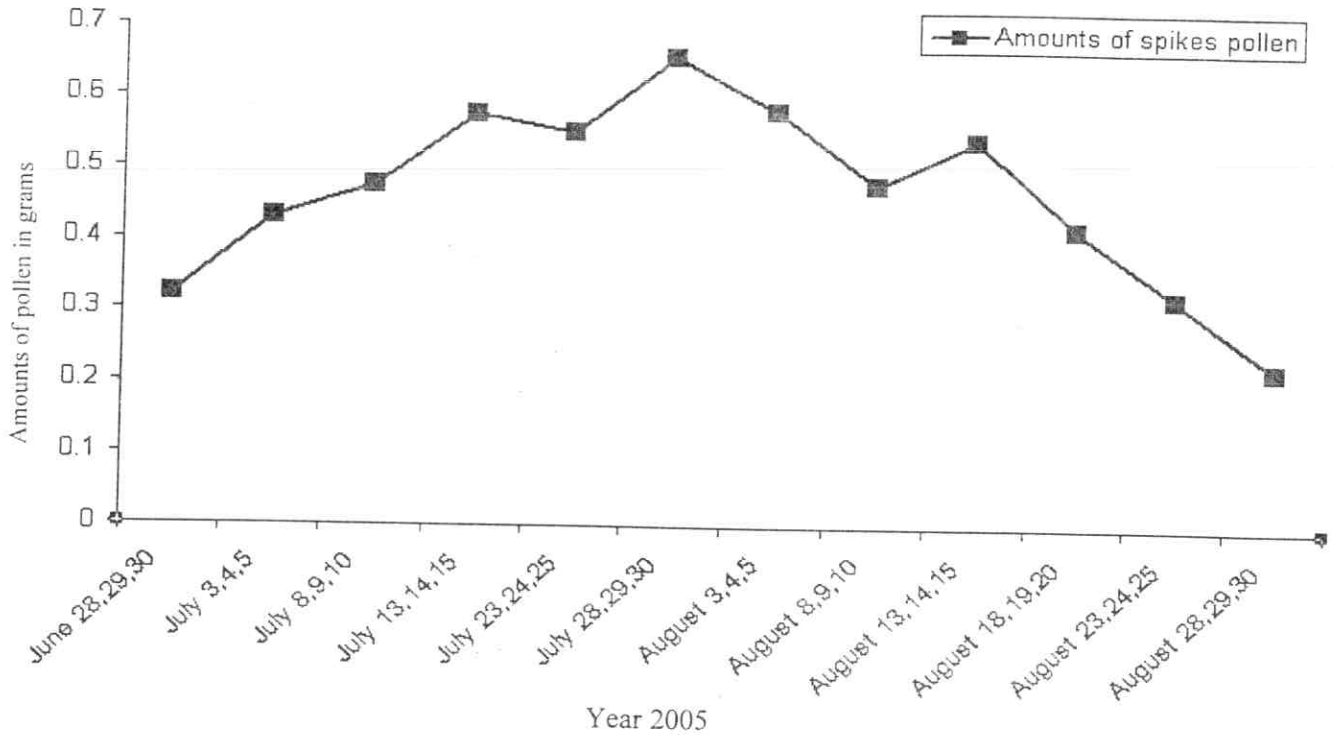


Fig.(12) Average amounts of pollen (in grams) produced from Corn spikes during tassles seasons, 2005.

2.C.4: Comparative behaviour of foragers workers on pollen collection during the tasseling periods (flowering) of corn (*Zea maiz* L.) in (2004 & 2005):

Table (14) shows that pollen of corn availability decreased from morning to afternoon in the two races showed similar behaviour in pollen gathering, with minor differences, the activity of F_1 Italian bees on pollen collection was more than that collected by F_1 Carniolan bees during the pollen flow in (2004 & 2005).

The Corn pollen (***Zea maize***) was the main pollen sources for both races, in addition the main sources, about the 12 flowering plants were observed during our study, most of foragers workers in both races which were collected pollen in the early hours of the day, while in the afternoon some changed to nectar collection, and others apparently remained in the hives.

In both bees the frequency of pollen trips decreased as the day progressed, but that of nectar trips increased.

Goyal (1974) and Erickson *et al.* (1988) mentoined that this explains why bees collecting pollen in the morning from an abundant species start to collect nectar in the afternoon, while honey-bees failed to gather cotton pollen they did collect significant quantities of pollen from other plant species.

Monocotyledonous pollen represented approximatey 96% corn pollen of all pollen collected by all colonies in both races. Our observations are in conformity with findings by **(Free, 1963 and Jhaji and Goyal, 1979).**

Table (14): Number of foragers worker collection pollen at different hours of the day at Moshtohor, season 2004 and 2005 durin the Corn tasseling periods.

	Forager workers	Number of bee observed							
		Up to 10.00	10.00-11.00	11.00-12.00	12.00-01.00	01.00-02.00	02.00-03.00	03.00-04.00	04.00-05.00
2004	**F1 hypride Carniolan bees**								
	Worker collecting pollen	35	41	37	12	16	4	2	0
	Worker collecting nectar	11	14	6	4	15	10	7	5
	F1 hypride Italian bees								
	Worker collecting pollen	43	49	53	22	24	17	9	2
	Worker collecting nectar	5	8	15	11	14	27	13	3
2005	**F1 hypride Carniolan bees**								
	Worker collecting pollen	29	56	34	22	14	12	5	0
	Worker collecting nectar	8	10	6	10	7	2	6	3
	F1 hypride Italian bees								
	Worker collecting pollen	58	77	42	28	26	10	10	2
	Worker collecting nectar	10	15	18	14	17	9	5	4

3- Comparative distribution of major pollen types in pollen traps at two seasons (2004 & 2005):

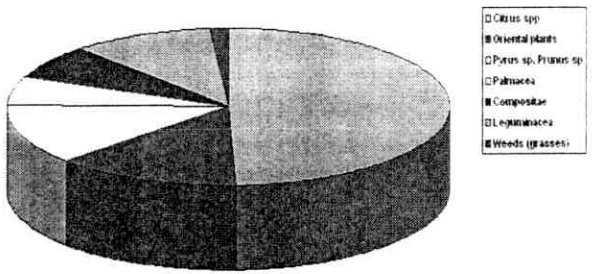
Results in Table (15) and Fig. (13) shows that, the percentage of pollen trapped during Citrus season was 45.9% in 2004 and 53.5% in 2005 with an average 49.7% pollen of ***Citrus spp***. in two seasons while the others sources of pollen were trapped from, ***Vicia faba*** **L., *Pisum sativum, Brassica kaber, Eucalyptus spp., Coriandrum sativum,*** and ***Trifolium alexandrinum.***

In case of clover pollen flow season, the percent of clover (*Trifolium alexandrinum*) trapped in two seasons were 82.5% and 94.5% with an average 88.5%. The other sources come from; ***Eucalyptus spp., Raphanus sativus, Zea maize, Beta vulgaris, Rosa spp.*** and other from oriantamtal and weeds plants.

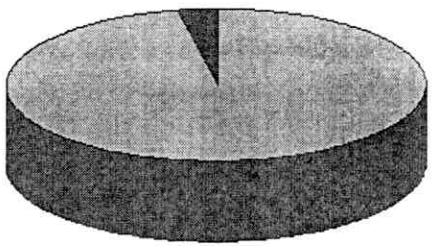
The amounts of pollen trapped during Corn pollen flow (***Zea maize)*** in two seasons of study were 96% and 98% with an average 97%, while the other sources were reported from; ***Helianthus annus, Cucumis sativus, Rosa spp, Lufa cylendrica, cucurbita maxima, Cucurbita pepo.*** and other sources of pollen from different plants cultivated in the same periods .

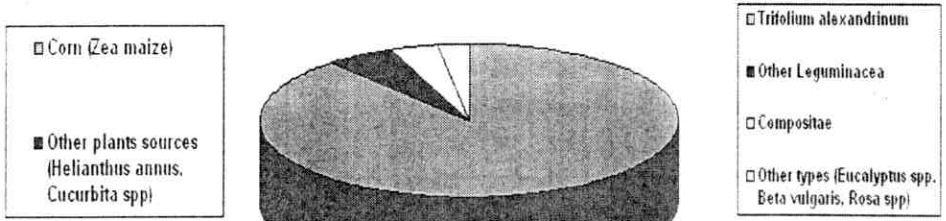
Table (15): Frequency distribution of major pollen types gathered by honeybees foraging workers from 4 colonies in each 3 seasons.

Major pollen types	Percent of pollen trapped		
	Season 2004	Season 2005	Combined Means %
Citrus pollen flow season			
Citrus spp	45.9	53.5	49.7
Oriental plants	11	16	13.5
Pyrus sp, Prunus sp	15	10	12.5
Palmacea	5	7	6.0
Compositae	10	4	7.0
Leguminacea	12	8.5	10.25
Weeds (grasses)	<1.5	<1.2	<1.35
Clover pollen flow season			
Trifolium alexandrinum	82.5	94.5	88.5
Other Leguminacea	9	2	5.5
Compositae	5	2	3.5
Other types (*Eucalyptus spp, Beta vulgaris, Rosa spp*)	3.5	1.5	2.5
Corn pollen flow season			
Corn (*Zea maize*)	96	98	97
Other plants sources (*Helianthus annus, Cucurbita spp*)	4	2	3



Citrus pollen flow season





Corn pollen flow season

Clover pollen flow season

Fig. (13) Frequency distribution of major pollen types gathered by honeybees workers foraging from 4 colonies in each 3 seasons

4- Amounts of pollen stored (bee bread) in the honeybee hives through the years 2004, 2005 (In square inches):

Pollen storage activity was studied and measured in 12 colonies (6 colonies of F_1 Carniolan bees and 6 colonies of F_1 Italian bees) during the two years from March 2004 to March 2006. Data recorded in table (16 & 17).

a) Amount of pollen stored in the hive (bee bread) in 2004:

Table (16) and Fig. (14) indicated that total area of bee bread from 6 colonies was 3057and 3306 in^2 in case of F_1 Carniolan and F_1 and Italian bees, respectively.

The highest period of pollen stored was during July, it was amounted 730.0 and 851.0 in^2/6 colonies with an average 121.667 and 141.833 in^2/colony in case of F_1 Carniolan and F_1 Italian bees. Followed by May, June, April, August with an average 102.167, 86.833, 67.5 and 75.5 in^2/colony in case of F_1 Carniolan bees, respectively, while in case of F_1 Italian bees the average was 118.333, 88.333, 72, 61.667 in^2/colony, for May, April, June, August, respectively.

The lowest period in pollen stored was during January, it was amounted 12.0 and 8.0 in^2 with an average 2.0 and 1.3 in^2/colony in case of F_1 Carniolan and F_1 Italian bees, respectively.

b) Amounts of pollen stored (bee bread) in the hive in 2005 :

Bee bread was measured in 12 colonies (6 colonies of F_1 Carniolan bees and 6 colonies of F_1 Italian bees) during the year from March 2005 to March 2006.

Table (17) and Fig. (15) showed the total area of bee bread from 6 colonies was 2959.0 and 3232.0 in^2 with an average 493.165 and 538.667 in^2/colony in case of F_1 Carniolan and F_1 Italian bees, respectively.

The highest amounts of pollen storage was in July, it was amounted 651.0 and 706.0 in^2/6 colonies with an average 108.5 and 117.667 in2/colony in case of F1 Carniolan and F1 Italian bees, respectively. Followed by May, June, August and April with an average 98.833, 88.667, 68.333 and 62.0 in2/colony, respectively. in case of F1 Carniolan bees. While in case of F1 Italian bees the average was 102.167, 81.833, 75.0 and 73.667 in2/colony for July followed by May, April, August and June, respectively.

The lowest amounts of pollen storage was in January, it was amounted 11.0 and 17.0 in^2/6 colonies with an average 1.833 and 2.833 in^2/colony in case of F_1 Carniolan and F_1 Italian bees, respectively.

From the above results it could be concluded that there were two periods through the year for honeybee activity on pollen collection; the first is during pollen flow seasons from March to October which had a large area of bee bread, while the second period is during the dearth months from November to February.

So we can illustrate that there were non-significant between the two races of honeybee, on pollen storage during all thw years of study.

Table (16): The amounts of pollen stored in the honeybee colonies through the year 2004 (in square inches).

Months	Total amounts of pollen for 6 colonies of F1 Carniolan bees/ in2	Average per colony/ in2	Total amounts of pollen for 6 colonies of F1 Italian bees/ in2	Average per colony/ in2	Mean
March	39	6.5	114	19	12.75
April	405	67.5	530	88.33	73.5
May	613	102.17	710	118.33	100.4
June	521	86.83	432	72	81.1
July	730	121.67	851	141.83	143.1
August	453	75.5	370	61.67	71.8
September	122	20.33	152	25.33	22.83
October	83	13.83	71	11.83	18.0
November	31	5.17	21	3.5	5.6
December	23	3.83	16	2.67	3.3
January	12	2	8	1.33	2.3
February	25	4.17	31	5.17	5.0
Total	3057	518.5	3306	549.49	533.99

L.S.D. value for races at 5% = 1.63
L.S.D. value for manths at 5% = 4.01
L.S.D. value for interaction at 5% = 5.67

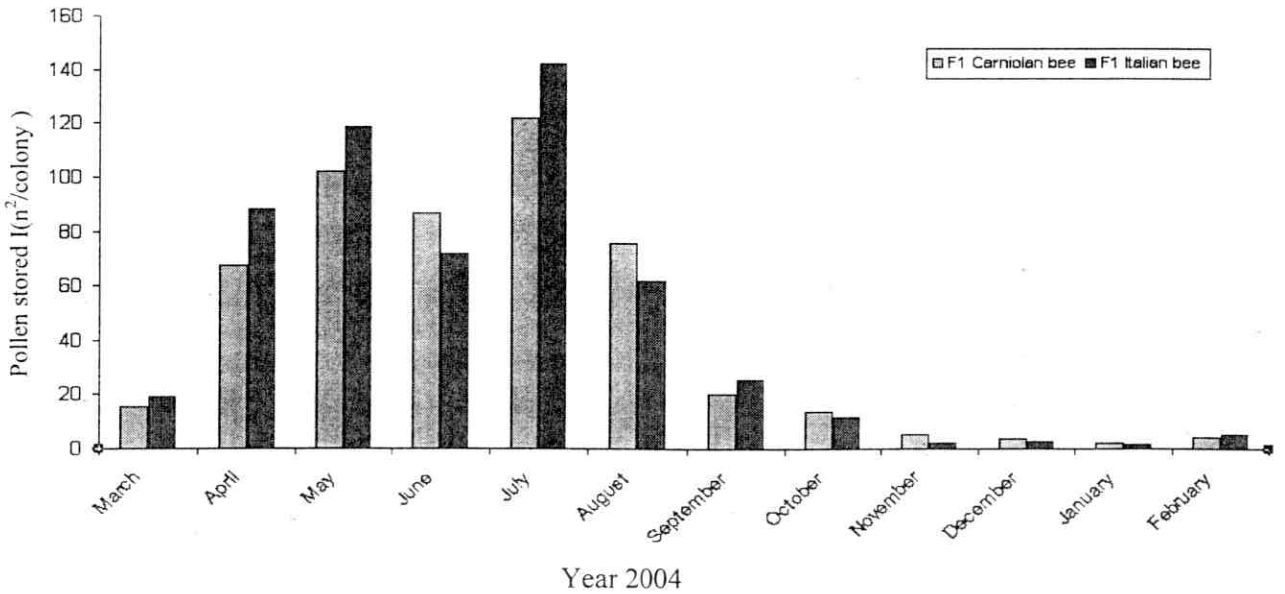


Fig. (14): The amounts of pollen stored in the honeybee colonies through the year, 2004. (in square inches)

Table (17): The amounts of pollen stored in the honeybee colonies through the year 2005 (in square inches):

Months	Total amounts of pollen for 6 colonies of F1 Carniolan bees/ in2	Average per colony/ in2	Total amounts of pollen for 6 colonies of F1 Italian bees/ in2	Average per colony/ in2	Mean
March	95	15.83	110	18.33	17.08
April	372	62	491	81.83	71.92
May	593	98.83	613	102.17	100.5
June	532	88.67	442	73.67	81.17
July	651	108.5	706	117.67	113.08
August	410	68.33	450	75	71.66
September	131	21.83	181	30.17	26
October	97	16.17	120	20	18.08
November	20	3.33	48	8	5.66
December	18	3	22	3.67	3. 35
January	11	1.83	17	2.83	2.33
February	29	4.83	32	5.33	5.08
Total	2959	493.16	3232	538.67	515.92

L.S.D. value for races at 5% = 5.44
L.S.D. value for manths at 5% = 13.35
L.S.D. value for interaction at 5% = 18.87

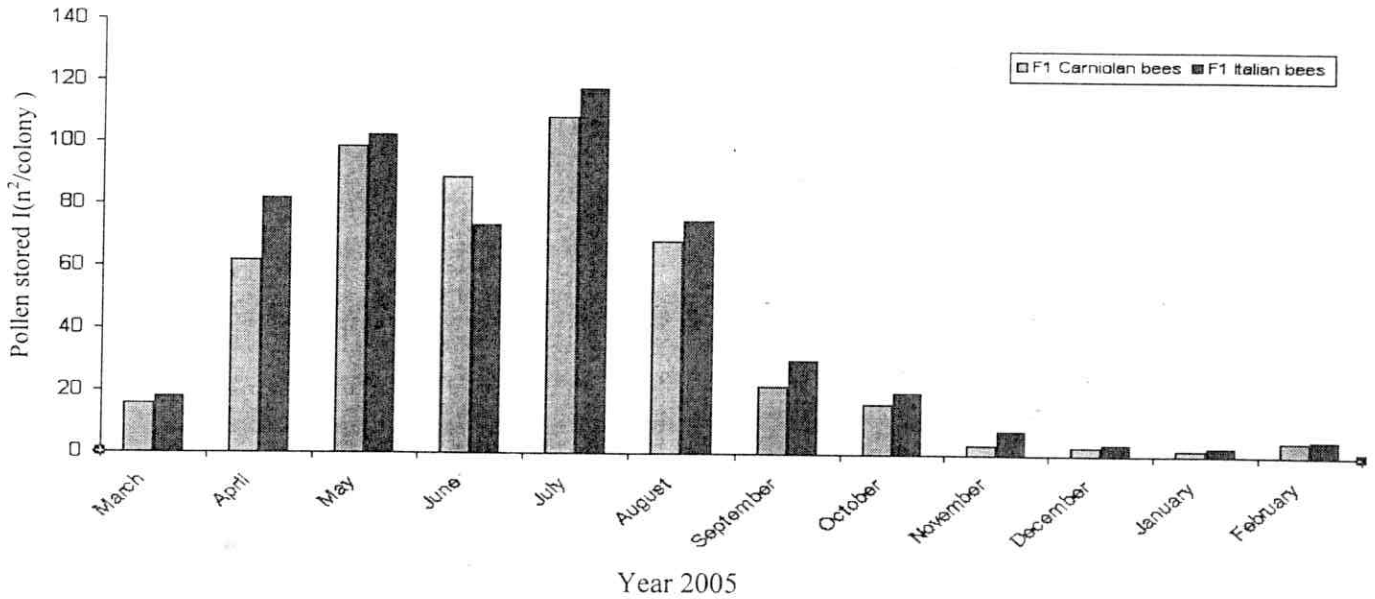


Fig. (15): The amounts of pollen stored in the honeybee colonies through the year 2005. (in square inches)

5- The amounts of pollen stored during the pollen flow seasons:

a) First year2004:

The data recorded in table (18) and fig. (16) indicated that the amounts of stored pollen during the pollen flow seasons through the year 2004 was 2839.2 and 2930.4 g / 6 colonies with an average 473.2 and 488.4g/colony in case of F1 Carniolan bees and F1 Italian bees, respectively in Corn flow season (the main pollen flow season).

This amounts decreased in clover pollen flow season, it was 2381.4 and 2398.2 g / 6 colonies with an average 396.9 and 399.7 g/colony in case of F1 Carniolan and F1 Italian bees, respectivlly.

Bee bread amount decreased in Citrus pollen flow season it was 710.4 and 1030.4 g / 6 colonies with an average 118.4 and 171.173 g / colony in case of F1 Carniolan and F1 Italian bees, respectively.

From the data analysis in table (16) it could be concluded that the honeybee activity in stored pollen were significantly increased in Citrus, Clover and Corn pollen flow season as it amounted 145.1, 398.3 and 480.8 g/colony, respectively.

The decreased in stored pollen of Citrus may be according to the main activity of foragers workers was on Navel orange during the Citrus nectar flow.

b) Second year 2005:

The results in table (19) and Fig. (17) showed that the amounts of stored pollen in Corn pollen flow season was 2546.4 and 2774.4 g / 6 colonies with an average 424.4 and 462.4 g / colony in case of F1 Carniolan and F1 Italian bees , respectivelly.

While it was 2362.5 and 2215.5 g / 6 colonies with an average 393.75 and 369.25 g / colony in case of F1 Carniolan and F1 Italian bees respectivelly in Clover pollen flow season.

The stored pollen amounts were decreased during Citrus pollen flow season as it was 747.2 and 961.6 g / 6 colnies with an average 124.533 and 160.267 g / colony in case of F1 Carniolan and F1 Italian bees, respectively .

From data analysis in table (19) it could be mentoined that the amounts of pollen stored during pollen flow seasons through the year 2005 were significantly increased in Citrus, Clover and Corn pollen flow seasons as it amounted 142.4, 381.5 and 443.4 g/colony, respectively.

Form the above results we can illustrated that there are 3 main pollen flow seasons Citrus , Clover and Corn , and the amounts of stored pollen were different in these seasons , that may be due to the area of pollen producing plants which flowering through this periods in the region.

Also these results indicated that F1 Italian bees was more active in pollen storage than F1 Carniolan bees. The difference between the two races were highly significant.

Table (18): The amounts of pollen stored during the pollen flow seasons through the year 2004 (in grams):

Pollen flow seasons	Total amounts of 6 F1 Carniolan colonies	Average per colony	Total amounts of 6 F1 Italian colonies	Average per colony	Mean
Citrus	710.4	118.4	1030.4	171.733	145.1
Clover	2381.4	396.9	2398.2	399.7	398.3
Corn	2839.2	473.2	2930.4	488.4	480.8
Total	5931	988.5	6359	1059.833	1024.17
Mean		329.5		353.3	

L.S.D. value for races at 5% = 17.98
L.S.D. value for seasons at 5% = 22.02
L.S.D. value for interaction at 5% = 32.4

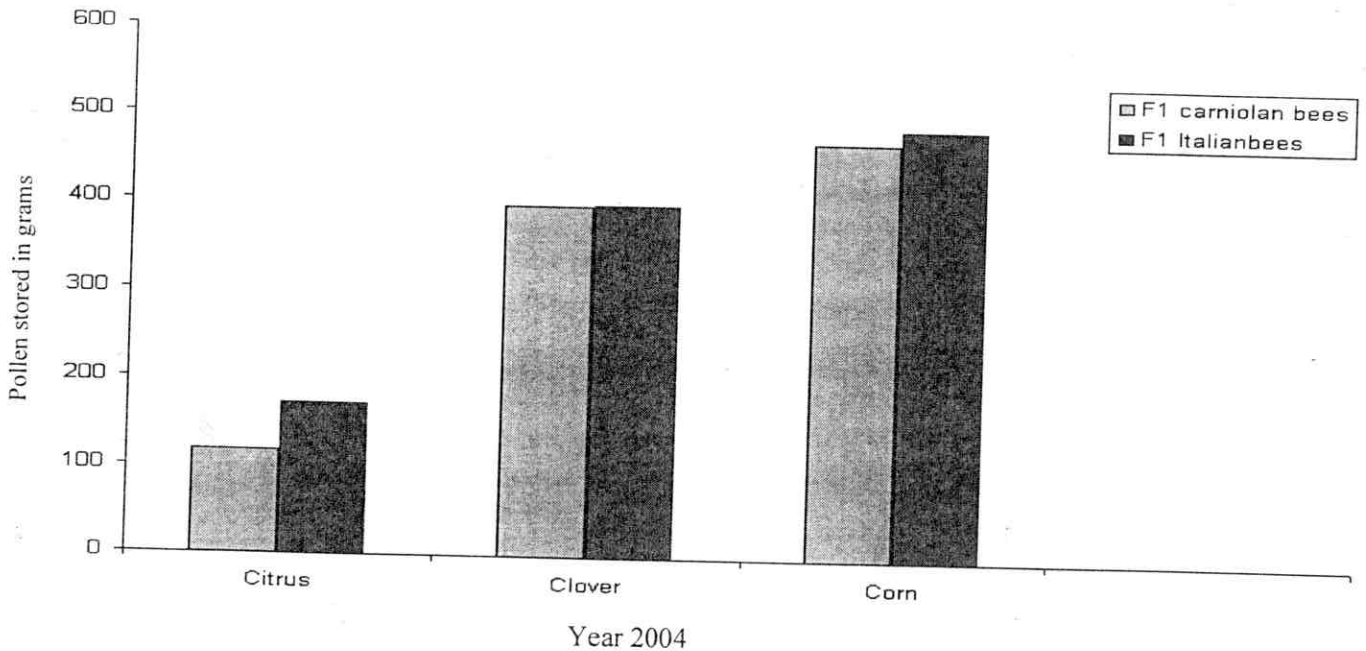


Fig. (16) The mean amounts of pollen stored during the pollen flow seasons through the year 2004. (in grams)

Table (19): The amounts of pollen stored during the pollen flow seasons through the year 2005 (in grams):

Pollen flow seasons	Total amounts of 6 F1 Carniolan colonies	Average per coloney	Total amounts of 6 F1 Italian colonies	Average per coloney	Mean
Citrus	747.2	124.5333	961.6	160.267	142.4
Clover	2362.5	393.75	2215.5	369.25	381.5
Corn	2546.4	424.4	2774.4	462.4	443.4
Total	5656.1	942.683	5951.5	991.917	967.3
Mean		314.2		330.6	

L.S.D. value for races at 5% = 21.05
L.S.D. value for seasons at 5% = 25.78
L.S.D. value for interaction at 5% = 36.45

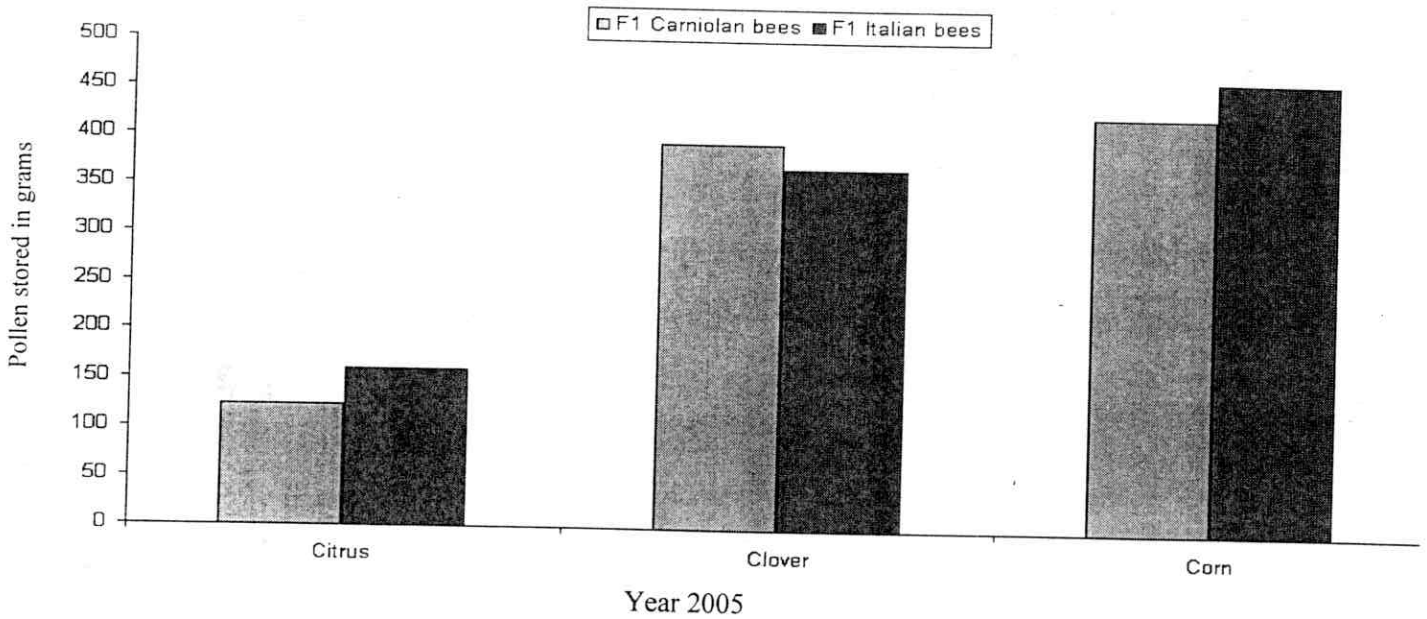


Fig. (17) The mean amounts of pollen stored during the pollen flow seasons through the year 2005. (in grams)

6- The activity of honeybee colonies on brood rearing during the pollen flow seasons :

a) Brood rearing activity in honeybee colonies throughout a year 2004 :

The brood rearing activity was studied in 12 colonies (6 conlonies of F_1 Carniolan bees and 6 colonies F_1 Italian bees) during the year from March 2004 to March 2005. The data listed in table (20).

Table (20) and Fig. (18) indicated the total amounts of worker sealed brood area from 6 colonies was 37820.0 in^2 and 49055.0 in^2 with an average 524.8 and 682.4 in^2/colony in case of F_1 Carniolan and F_1 Italian bees, respectively.

From this results we can illustrate that there is highly significant between the two races in brood rearing activity.

Data in table (20) indicated that there are three main periods for brood rearing, the highly amounts of worker sealed brood was during March, it was mesurred 7163.0 and 8693.0 in^2 with an average 1193.833 and 1448.833 in^2/colony in case of F_1 Carniolan and F_1 Italian bees. March followed by August, it measured 5340.0 and 7204.0 in^2 with an average 890.0 and 1200.667 in^2/colony in case of F_1 Carniolan and F_1 Itablian bee, respectively.

August followed by June, it measured 4891.0 and 6870.0 in^2 with an average 815.167 and 1145 in^2/colony in case of F_1 Carniolan and F_1 Italy bees. On the reverse, the lowest period in brood rearing activity were during January, it amounted 823.0 and 998.0 in^2 with an average 137.167 and 166.333 in^2/colony in case of F_1 Carniolan and F_1 Italian bees, respectivley.

b) Brood rearing activity in honeybee colonies throughout a year2005:

The brood rearing activity was studied in 12 colonies (6 colonies of F_1 Carniolan bees and 6 colonies of F_1 Italian bees) during the year from March 2005 to March 2006.

Table (21) and Fig. (19) indicated the total measured of worker sealed brood area from 6 colonies was 38819.0 in^2 with an average 537.0 in^2/colony in case of F_1 Carbiolan bees while it was 48826.0 in^2 with an average 677.8 in^2/colony in case of F_1 Italian bees. This results were highly significant between the two races in brood rearing activity.

The highest measured of sealed brood was during March, it was amounted to 8006 and 9370.0 in^2 with an average 1334.334 and 1561.667 in^2/coloney in case of F_1 carniolan bees and F_1 Italian bees, respectively.

March followed August, it measured to 6272.0 and 7964.0 in^2 with an average 1045.333 and 1327.333 in^2/colony in case of F_1 Carniolan and F_1 Italian bees, respectively.

August followed June, it measured to 5078.0 and 6569.0 in^2 with an average 846.334 and 1094.833 in^2/colony in case of F_1 Carniolan and F_1 Italian bees, respectively.

The lowest month in brood rearing activity was January, it mesurred 909.0 and 1125.0 in^2 with an average 151.5 and 187.5 in^2/colony in case of F_1 Carniolan and F_1 Italian bees.

From the above results we can illustrate that there were three main periods through the year for brood rearing, this periods are at the main three pollen flow seasons in Egypt, Citrus season (15^{th}, March to 15^{th}, April), Clover season (1^{st}, May to 15^{th}, June) and Corn season (1^{st}, July to the end of August).

Table (20): The amounts of worker sealed brood (in square inches) reared during the year 2004 in two races of honeybee colonies.

Months	Total amounts of pollen for 6 colonies of F1 Carniolan bees	Average per colony	Total amounts of pollen for 6 colonies of F1 Italian bees	Average per colony	Mean
March	7163	1193.833	8693	1448.833	1321.0
April	3104	517.333	4212	702	609.7
May	4010	668.333	4911	818.5	723.7
June	4891	815.167	6870	1145	977.5
July	3204	534	3406	567.667	550.8
August	5340	890	7204	1200.667	1045.0
September	1984	330.667	3351	558.5	444.5
October	1405	284.167	2632	438.667	368.0
November	1310	218.333	1454	242.333	230.1
December	1430	238.333	1313	218.8333	223.6
January	823	137.167	998	166.333	151.7
February	3156	526	4011	668.5	597.3
Total	37820	6353.333	49055	8175.833	7264.583
Mean		524.8		682.4	

L.S.D. value for races at 5% = 26.00
L.S.D. value for months at 5% = 63.68
L.S.D. value for interaction at 5% = 90.06

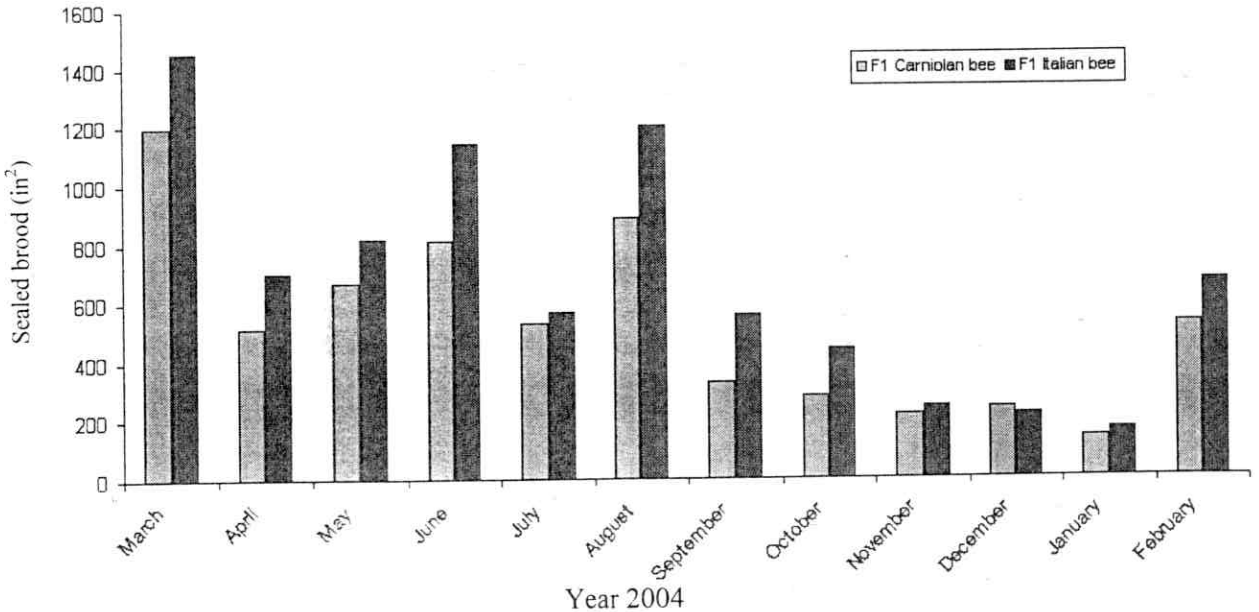


Fig. (18): The measured of worker sealed brood (in square inches) reared during the year 2004 in two races of honeybee colonies.

Table (21): The amounts of worker sealed brood (in square inches) reared during the year 2005 in two races of honeybee colonies.

Months	Total amounts of pollen for 6 colonies of F1 Carniolan bees	Average per colony	Total amounts of pollen for 6 colonies of F1 Italian bees	Average per colony	Mean
March	8006	1334.334	9370	1561.667	1448.0
April	2936	489.333	2515	419.167	452.5
May	3948	650	5781	963.5	860.8
June	5078	846.334	6569	1094.833	962.9
July	3633	605.5	3803	633.833	618.8
August	6272	1045.333	7964	1327.333	1186.0
September	2147	357.834	3154	525.666	441.7
October	1384	230.666	2420	403.333	317.0
November	963	160.5	1622	270.334	215.4
December	1264	210.666	1432	238.666	224.6
January	909	151.5	1125	187.5	169.5
February	2279	379.833	3071	511.833	445.8
Total	38819	6461.833	48826	8137.665	7299.75
Mean		537.0		677.8	

L.S.D. value for races at 5% = 10.78
L.S.D. value for months at 5% = 26.4
L.S.D. value for interaction at 5% = 37.34

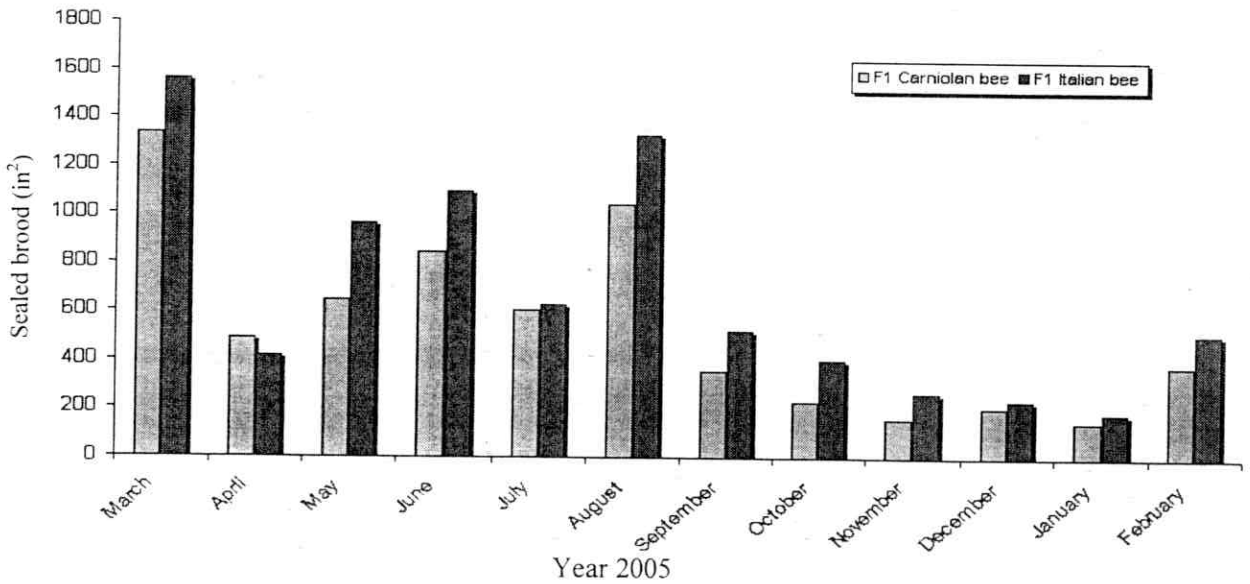


Fig. (19): The measured of worker sealed brood (in square inches) reared during the year 2005 in two races of honeybee colonies.

7- Identification of Honey Sources and types by pollen analysis of honeys from the some apiaries and markets during different seasons:

In Egypt as not publications are known concerning the pollen analysis of honey from honey produced in apiaries and commercial markets, an investigation was carried out on 16 samples obtained from 13 location (apiaries and markets) during the period from 2004 to 2005.

Table (22) shows the main sources of honey was analysis, the first season is citrus, the second season is clover and the third season is the cotton, besides the above three sources of listed, there are many sources as few other plants in different localities as well as ***Eucalyptus sp***, Broad bean (***Vicia Faba)***, sunshine ***(Helianthus annus)*** and many sources for pollen which will be listed in text of this work.

Data in Table (22) are summarized for the pollen species observed in honey samples, the percentage of the honey samples that contained specific species, and species percentages of the total numbers of pollen grains in the sediment of honey.

Primary experiment for examination of adulteration of honey was carried out on samples of honeys before analysis of pollen grains which found in the sediment of honey.

Table (22) presents the relative of sequence of pollen types found. Apart from ***Citrus spp.*** was the activity of honeybee workers start from 15 March until 15 April for citrus nectar collection annually, also the source of Citrus pollen is available at same period as shown in sample No II which indicate the percentage of honey samples is 78.3% and the Citrus pollen in the sediment was

38.4%, while the samples No.1 shows the honey types is ***Eucalyptus spp.***. the percentage of honey samples having the pollen is 96% and the pollen in the honey sediment is 25.5%.

In case of Honey sample No III the results indicate that, the type of honey is mixture from **Citrus**, **Eucalyptus** and **Clover** with the percentage of pollen 72.7%, 18.0% and 9.1% ,respectively.

The adulteration of honey are listed as in No. III, which was found mixed with Compositeae and Corn pollen in the solution of concentrated sugars, while in sample No. IV shows decrease of pollen which was 2 cells of pollen in an one microscopic field examined, the solution of this honey was concerned sugars making like honey.

Samples V and VI indicate the samples of honey were adulterated of honey, No V mixed with little pollen (one/ microscopic field).

From the above results it could be concluded that the main sources of pollen in Egypt were correlated with the nectar flow seasons as following :

I -Citrus nectar or pollen flow :

This season starts from 15 March until the middle of April anualy, from the above results indicated that, percentage of honey harvesting the Citrus pollen ranging from 62.7% to 83.3% besides of ***Vicia faba***, ***Eucalyptus spp.***, ***Coriandrum sativum***, ***Trifolium alexandrinum***, ***Brassica Kaber***. The pollen percentage in the honey sediment was ranged from 32.5% to 75% the ideal honeys type was found in sample X and VIII also the same found in sample XIV the amount of pollen in the sediment of this samples indicated that as a control or plank.

II- Clover nectar or pollen flow:

This season start from 1st May until the middle of June annually from the above results indicated that, percentage of honey harvesting clover pollen ranging from 77.7 %to 79.1% besides of ***Eucalyptus spp, Raphanus sativus, Zea maize, Beta vulgaris, Rosa spp.***

And the pollen percentage in the honey sediment was ranged from 52% to 55% the ideal honeys type was found in samples IX and XI.

III-Cotton nectar or Corn pollen flow:

The cotton nectar flow start from 15 June until the end of August annually, while the corn pollen flow start at the same time or was parallel with Cotton-nectar flow because the honeybee workers are not gather the pollen of Cotton, but have collecting nectar from Cotton flowers or from the extra nectar in leaves or stems.

Helianthus annus, cucumis sativus, Lufa cylendrica, cucurbita maxima, Cucurbita pepo and ***Rosa spp.*** Were other pollen species found in the honey samples .

The above results are in agreement with **Khattab, 1976, Adams, *et al.*, (2002).** Who indicate the pollen analysis of honeys in different localities for obtain the main sources of pollen collected by the forager workers and contaminated with honeys.

It could be concluded that the analysis of honey for incidance of pollen grains can be used for obtain the adulteration of honey in our country.

This results in agreement with **Kaya *et al.* (2005).**

Table (22) Identification of honey sources and types by pollen analysis of honeys from the apiaries and markets during different seasons.
(Examination by light microscope at magnification X160)

Honey samples	Average No. of pollen /microsc. field	Main source of pollen found in sediment.	% of honey samples having pollen	Pollen % in the honey sediment	Plant species visiting during the active season	Types of honey examined
I	5 9 9	5 *Eucalyptus spp.* 9 *Eucalyptus spp.* 9 *Eucalyptus spp.*	96%	25.5%	*Eucalyptus spp., Acacia arabica, Cassia sp*	Eucalyptus honey
II	6 8 9	5 *Citrus spp.*+1 *Eucalyptus spp.* *1 Vicia faba*+2 *Eucalyptus spp.*+5 *Citrus spp* 8 *Citrus spp.*+*1 Vicia faba*	78.3%	38.4%	*Citrus spp., Eucalyptus spp., Vicia faba*	Citrus honey
III	10 13 37	8 Compositae +*2 Zea maize* 12 Compositae +*1 Zea maize* 31 Compositae +*6 Zea maize*	76.2% pollen of sunshine	25%	*Helianthus annus, Zea maize, Gossypium barbadence*	Cotton honey

Table (22): Continued

IV	2 – –	*Citrus spp.* ——— ———	———	———	*Citrus spp., Eucalyptus spp. , Prunus sp., Vicia faba*	May be adulteration honey
V	1 1 1	*Zea maize* Clover *Zea maize*	———	———	*Eucalyptus spp, Raphanus sativus, Zea maize, Beta vulgaris, Rosa spp.*	May be adulteration honey
VI	– – –	——— ——— ———	———	———	*Eucalyptus spp, Raphanus sativus, Zea maize, Beta vulgaris .*	Adulteration honey
VII	3 4 4	1 Eucalyptus +*2 Citrus spp.* 1 Clover+1 Eucalyptus+2 Citrus 4 Citrus	72.7%Citrus 18%Eucalyp. 9.1% Clover	27.2%	*Eucalyptus spp, Citrus spp., Trifolium alexandrinum*	Mixed honey Citrus+ Eucalyptus +Clover

Table (22): Continued

VIII	12 11 21	1 Compositae+1 *Vicia faba*+3 Eucalyptus+7 Citrus 1Cucurbitaceae+3Compositae +7Citrus 2Eucalyptus +18 Citrus +1 Cucurbitaceae	72.2% Citrus	32.5%	*Vicia faba* , *Eucalyptus spp.*, *Coriandrum sativum*, *Brassica Kaber*	Citrus honey
IX	15 19 14	6 Eucalyptus+9Clover 2 Eucalyptus+17 Clover 2 Eucalyptus+12 Clover	79.1% Clover	52%	*Eucalyptus spp, Zea maize, Beta vulgaris,*	Clover honey
X	22 18 12	6 Clover+2 Eucalyptus+14 Citrus 1 *Coriandum sativum*+5 Clover+12 Citrus 3 Clover+ 9 Citrus	67.3% Citrus	61%	*Vicia faba* , *Eucalyptus spp.*, *Coriandrum sativum*, *Trifolium alexandrinum*, *Brassica Kaber*	Citrus honey
XI	110 64 118	21 Eucalyptus+89 Clover 15 Eucalyptus+49 Clover 29 Eucalyptus+ 89 Clover	77.7% Clover	55%	*Eucalyptus spp, Raphanus sativus, Zea maize, Beta vulgaris , Trifolium alexandrinum*	Clover

Table (22): Continued

XII	75 80 57	44 Citrus +31 Eucalyptus 54 Citrus +26 Eucalyptus 35 Citrus+ 20 Eucalyptus+2 Vicia faba	62.7% Citrus	70%	(From market)	Citrus honey
XIII	3 2 4	3 Citrus 1Citrus+1 Compositae 1 Corn+2 Citrus+ 1Compositae	———	———	(From market)	May be adulteration honey
XIV	92 60 46	81 Citrus+11 Eucalyptus 53 Citrus+7 Eucalyptus 31 Citrus+15 Eucalyptus	83.3% Citrus	75%	*Vicia faba* , *Eucalyptus spp.*, *Coriandrum sativum*, *Trifolium alexandrinum*, *Brassica Kaber*	Citrus honey
XV	3 3 —	3 Eucalyptus 2 Citrus+ 1 Eucalyptus ———	———	———	(From market)	May be adulteration honey
XVI	5 2 2	2*Vicia faba* +3 Citrus 1 Citrus+ 1Corn 1 *Coriandum sativum* +1Citrus	———	———	(From market)	May be adulteration honey

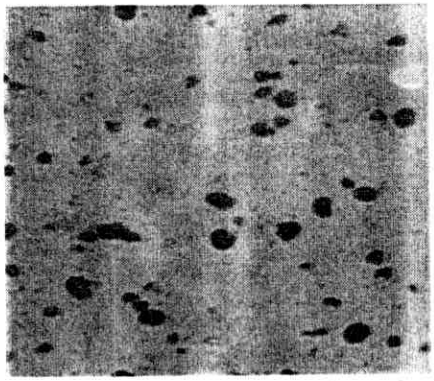


Photo. (36) Honey sample I

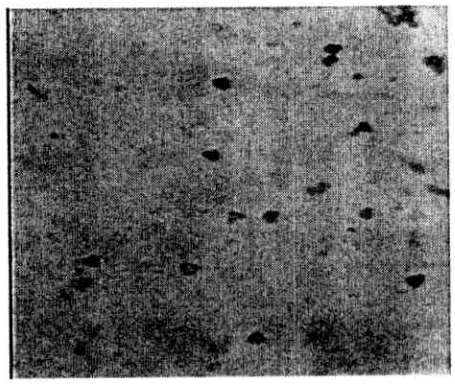


Photo. (37) Honey sample II

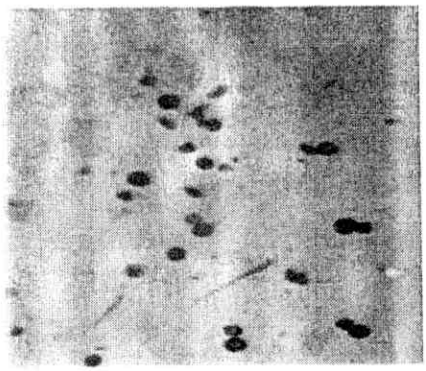


Photo. (38) Honey sample III

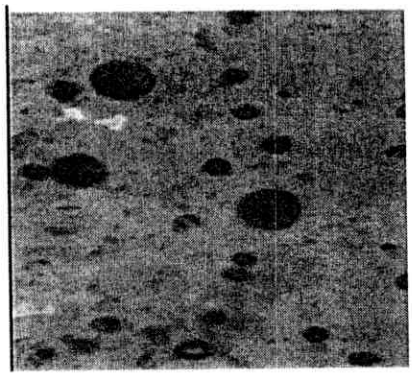


Photo. (39) Honey sample IV

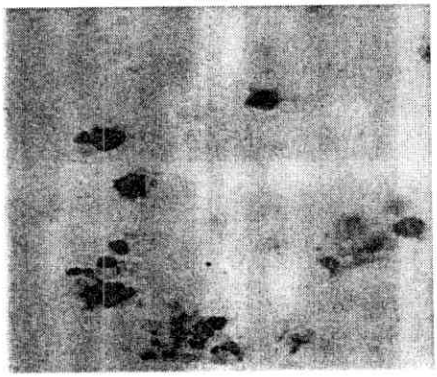


Photo. (40) Honey sample V

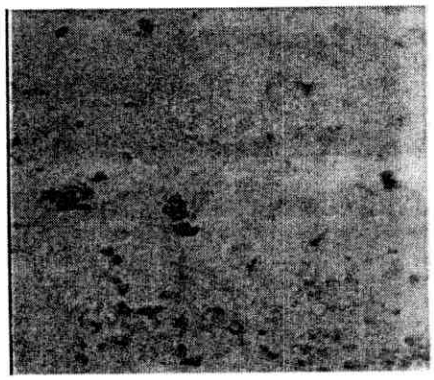


Photo. (41) Honey sample VI

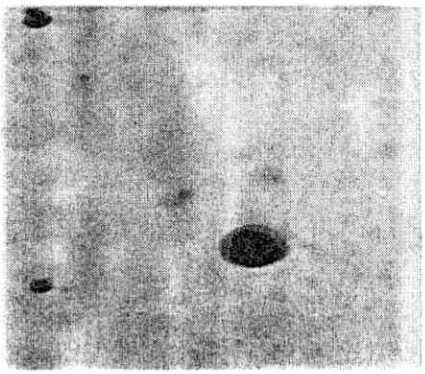


Photo. (42) Honey sample VII

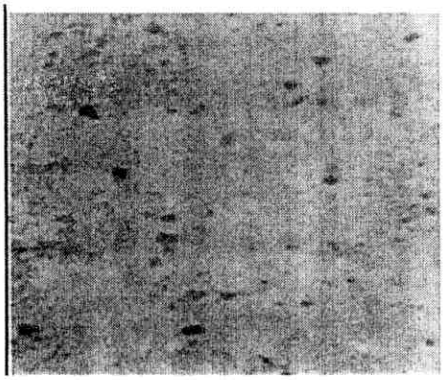


Photo. (43) Honey sample VIII

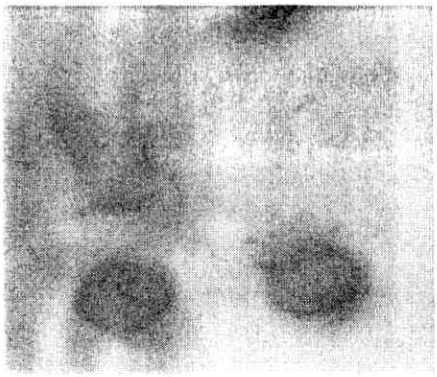


Photo. (44) Honey sample IX

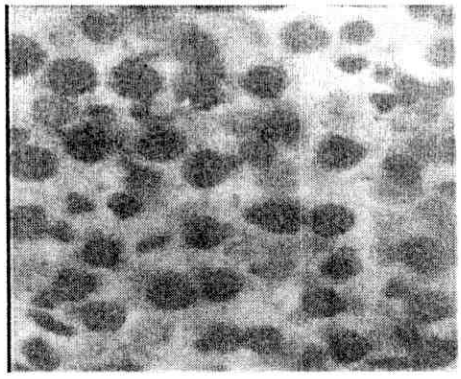


Photo. (45) Honey sample X

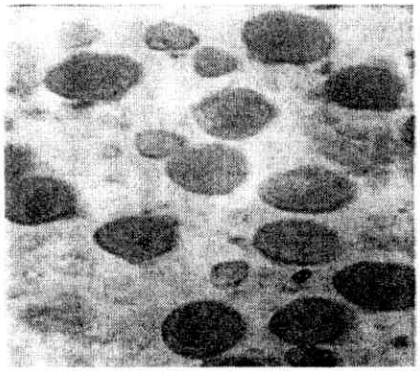


Photo. (46)Honey sample XI

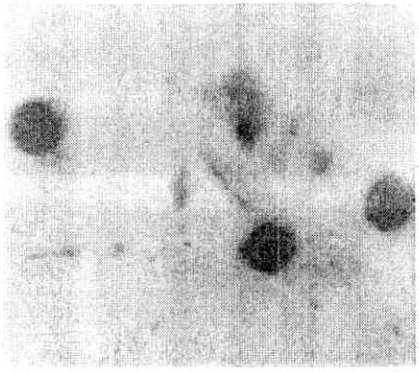


Photo. (47) Honey sample XII

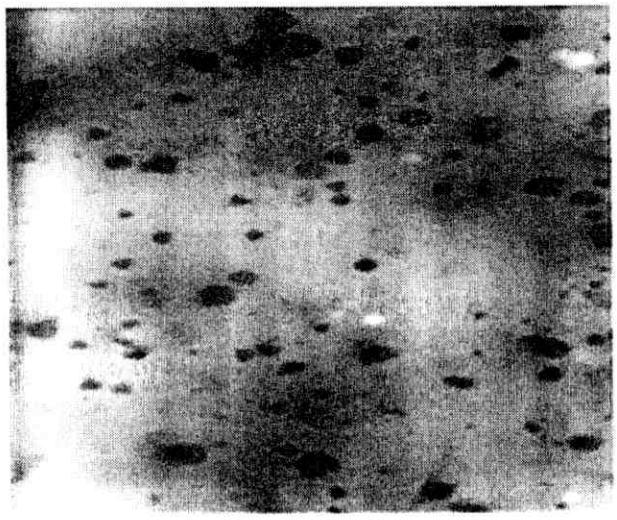


Photo. (48) Honey sample XV

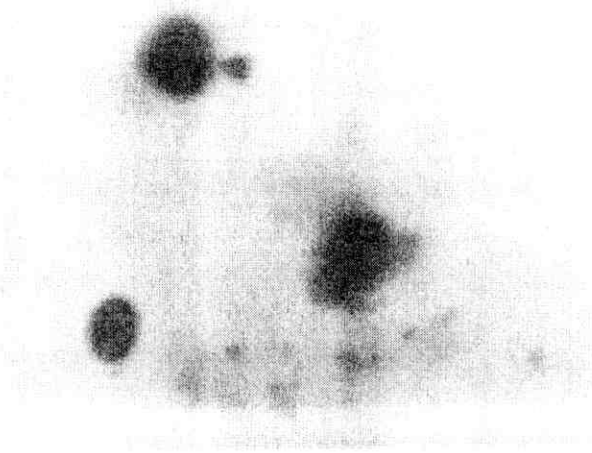


Photo. (49) Honey sample XVI

8- Consideration on pollens of Royal Jelly and its geographical origin:

The qualitative and quantitive pollen analysis of royal jelly produced in different times and places, of the crop content of the nurse bees and of intestinal content of larvae pointed out that:

- The royal jelly pollen mainly comes from secondary contamination, through the nurse bees.
- The structure alterations of the pollen grains are caused by larvae digestive juice.
- A correspondence between royal jelly contamination and pollens foraged in the same period by the honeybees was pointed out.

Table (23) shows the numbers of pollen observed in the samples of royal jelly harvested during the different active seasons as follow:

I. Citrus season:

The numbers of pollen grains examined in 3 samples indicate the range between 3 to 13 pollen in the microscopic field of the R.J sediment, the percentage of the main source ***(Citrus spp.)*** was ranged 61.5% to 75.0%. The other pollens were ***Prunus spp, Eucalyptus spp, Crucifera***, some of **Compositae**, ***Brasica sp.*** and others were found during this season (Photo.36).

II. Clover season:

The numbers of pollen grains examined in 3 samples of R.J produced during this season indicated that, the numbers ranged between 3 to 7 pollen in the microscopic field witch prepared from the R.J. sediment, also the percentage of main sources pollen (**Clover, *Trifolium alexandrinum)*** was ranged between 35.3% to 55.5%.

The other pollens species were ***Eucalyptus spp.*** , ***Zea maize,*** ***Brassica spp.*** , ***Cucurbita spp.*** and ***Raphanus sativus*** .

III. Cotton season:

The observation of samples indicate the numbers of pollen grains in R.J sediment in the microscopic examination for 3 samples during this season was ranged between 5 to 12 pollen/ microscopic field, these represented was 50% to 74.2% for corn pollen which the main sources during this season, because the workers not collect pollen from cotton. (Photo.37).

The other pollen species found in R.J. samples were ***Zea maize,*** ***Cucumis sativus*** , ***Helianthus annus*** , ***Brassica spp.*** and ***Cucurbita spp.***

IV Chinese Royal Jelly:

Table (23) indicated the examination of Chinese R.J., which bought from local markets, the amounts of pollen grains in samples were ranged between 1 to 9 pollen/microscopic field the percentage of the main pollen ***(Austraglus sinicus)*** was 41.2% and 96.2%. The other pollen were plamacea and *Prunus sp.* (Photos.38, 39).

These observations agree with those recorded by **(d'Albore, *et al.*, 1977 and d'Albore and Bernardini, 1978).** Who indicated that the geographical origin of royal jelly.

A palynological research was carried out in order to verify the possibility of establishing origin of royal jelly by means of the pollen sectrum study.

For chinase R.J the our examination indicate that, the sample is adulteration of R.J when compared with chine R,J **(d'Albore and Bernardini, 1978).**

Table (23) Pollen grains found in Royal Jelly of honeybee colonies during different seasons :
(Examination by light microscope at magnification X160)

Royal Jelly samples		Averag No. of pollen per microscopic field	% Water	Pollen species found in R.J.	% for main pollen source	% of pollen in the cedimen t	Flowering plants during the R.J. harvesting
Citrus season	I	5 6 13	62.5 %	2 Eucalyptus+ 3 Citrus 2 Eucalyptus+ 4 Citrus 1 Cucurbitaceae+ 1 *Vicia faba* +11 Citrus	75.0 %	55.5 %	*Citrus spp* , *Eucalyptus spp* , *Vicia faba L.* , *Coriandrum sativum* , *Brassica kaber* , *Rosa spp*
	II	3 7 3	64.2 %	3 Citrus 2 Eucalyptus+2 Compositae+3 Citrus 1 Compositae +2 Citrus	61.5 %	49.0 %	
	III	8 4 3	65.1 %	7 Citrus +1 Rosaceea 3 Citrus +1 Compositae 2 Rosaceae +1 Compositae	66.6 %	33.5 %	

Table (23): Continued

Clover season	I	7 5 6	65.5 %	7 Citrus +4 Cruciferae 4 Clover +1 Compositae 3 Clover +2 Cucumber + 1 Rosaceae	55.5 %	28.0 %	*Trifolium alexandrinum* , *Eucalyptus spp.* , *Zea maize.* , *Brassica spp.* , *Cucurbita spp.* , *Raphanus sativus*
	II	6 3 6	67.2 %	4 Clover +2 Convulvaceae 2 Clover+1 Brassicaceae 3 Clover +1 Compositeae +2 Rosaceae	50.0 %	36.5 %	
	III	5 5 7	65.2 %	3 Clover +2 Rosaceae 2 Eucalyptus +3 Brassicaceae 3 Clover +2 Compositae+2 Cruciferae	35.3 %	27.7 %	
Corn season	I	7 9 12	67.5 %	4 Corn+1 Brassicaceae+2 Compositeae 5 Corn+2 Rosaceae+2 Cucurbitaceae 5 Corn+5 Compositae+2 Cruciferae	50.0 %	42.0 %	*Zea maize* , *Helianthus annus* , *Brassica spp.*,

Table (23): Continued

	II	10 12 9	65.3 %	7 Corn+2 Brassicaceae+1 Compositeae 9 Corn+1 Compositeae+2 *Coriandum sativum* 7 Corn+1 Compositeae+1 Cucurbitaceae	74.2 %	39.5 %	*Cucurbita spp.* , *Cucumis sativus*
	III	5 6 11	64.5 %	4 Corn+1 Compositeae 4 Corn+1 Cucurbitaceae+1 Compositeae 6 Corn+3 Compositeae+2 Brassicaceae	63.6 %	41.5 %	
Chinase R.J.	I	13 2 3	70.5 %	3 *Astragalus sinicus*+6 Palmaceae+4 *Pronus sp* 1 *Pronus sp*+1 Palmaceae 1 Palmaceae+2 *Astragalus sinicus*	69.2 %	12.5 %	
	II	9 7 1	71.5 %	3 Palmaceae+6 *Astragalus sinicus* 2 Palmaceae+5 *Astragalus sinicus* 1 *Pronus sp*	41.2 %	10.9 %	

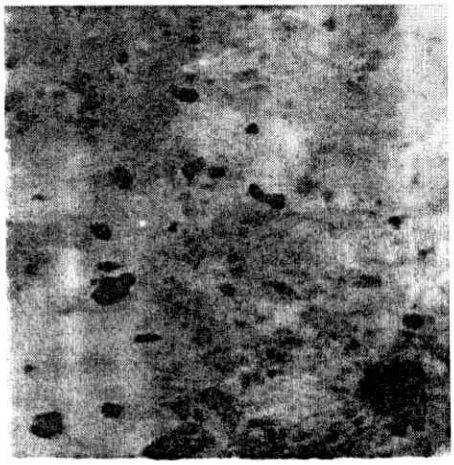


Photo. (50) Royal jelly sample 1

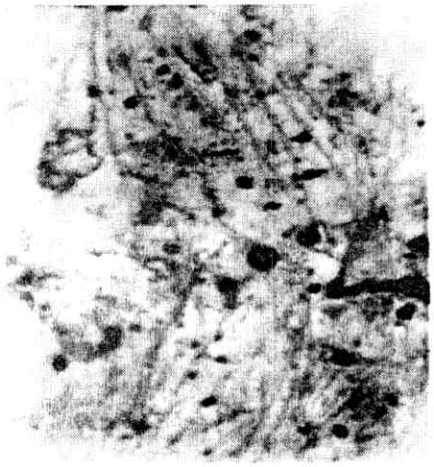


Photo. (51) Royal jelly sample 2

Photo. (52) Royal jelly sample 3

Photo. (53) Royal jelly sample 4

9- Pollen grains in propolis of honeybee colonies at different sources:

Propolis is aresinous, sticky gum, whose colour varies from yellow-green to dark brown. The usual method was to extract the fraction soluble in alcohol, called the resin fraction, leaving the alcohol non-soluble or wax fraction. Propolis "balsam" refered to that fraction of the gross composition of propolis.

Table (24) presumably based on samples from various sources, the mean of propolis composition an fractionation were 73.7 % bees-wax, 5.3% balsam, 7.4% volatile oils, 7.9% materials was soluble in alcohol and 5.8% pollen grains from different sources. The numbers of pollen in crude propolis represented at 5.5 pollen in the field of microscope at (10x20X) magnification. (Photos. 54 to 59)

The above results are agreement with **Ghisalberti, 1979 and Khattab, 2000.**

Table (24) **Fractionation of bee-propolis for obtaining the polln grains in samples collected from different apiaries during (2004&2005) :**

Local apiaries	Percentage of fraction %						Plants sources
	Wax %	Balsam %	Volatile oils %	Soluble in alcohol %	Pollen grains %	No. of pollen in microsc. fields	
1	70.9	5.0	6.0	12.9	5.2	5	*Acasia arabica, Citrus spp., Eucalyptus spp., Zea maize, Trifolium alexandrinum, Prunus sp., Helianthus annus*
2	78.6	3.8	6.1	5.0	6.5	7	
3	76.7	5.4	5.5	5.5	6.9	6	
4	68.5	7.1	4.5	8.4	4.5	4	
Mean	73.675	5.325	5.525	7.95	5.775	5.5	

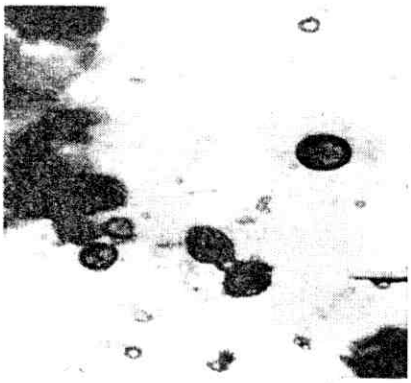


Photo. (54) Propolis sample 1

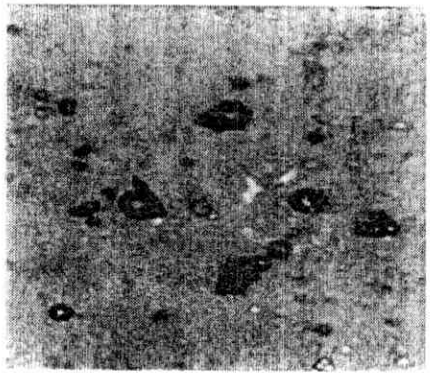


Photo. (55) Propolis sample 2

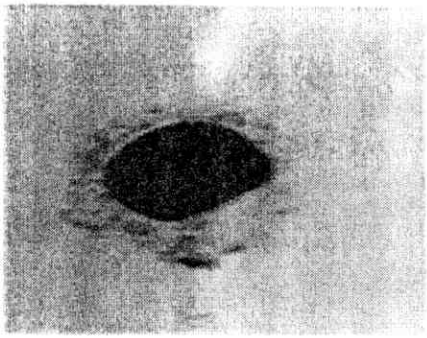


Photo. (56) Propolis sample 3

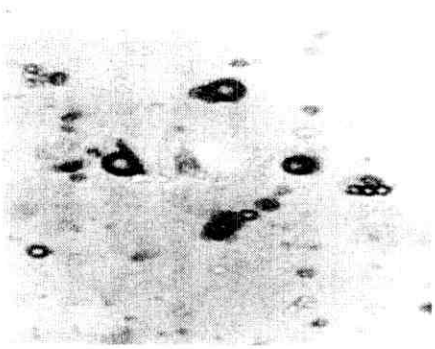


Photo. (57) Propolis sample 4

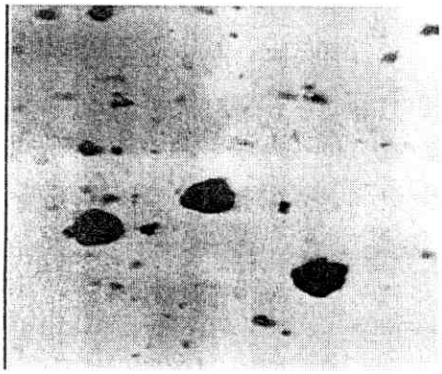


Photo. (58) Propolis sample 5

Photo. (59) Propolis sampl 6

10- Wax secretion activity during pollen flow in the hive of honeybee colonies, (2004 & 2005):

For estimating the activity of honeybee workers on wax secretion during the pollen flow was carried out by using 5 colonies of F1 Carniolan bees and 5 colonies F1 Italian bees, it housed in langstroth hives with strength young workers headed with fertilized queens at the same age. Three empty frames added to each colony for natural comb builder. The builder combs was weighed in the end of expermental season.

Table (25) and Figs. (20 & 21) indicate that, the amounts of wax produced per colony was 475.2 g. in Citrus season, 2004 for F1 Carniolan bees, while it was 519.0 g./colony in F1 Italian bees. The amounts of wax secreted in Clover season was 358.4 g. in F1 Carniolan bees; and was 435.5 g. in F1 Italian bees. The amount of wax secreted during Cotton and Corn pollen flow was 415.6 g./colony in F1 Carniolan bees and was 540.3 g/ colony in case of F1 Italian bees .

The amounts of wax produced per colony in 2005 was 379.1g.; 448.2g. and 372.3 g. during Citrus; Clover and Cotton and Corn seasons in case of F1 Carniolan bees. While in case of F1 Italian bees, the amounts of wax produced was436.7 g. in Citrus season; 581.3 g. in Clover season and 456.5 g. in Cotton or Corn pollen flow, respectively.

From the above results it could be concluded that the wax secretion was higher during the active seasons (Citrus, Clover and Cotton or Corn pollen-flow), where the available sources of pollen grains and nectar flow for honeybee colonies **(Khattab, 1976 and 1981).**

Table (25): Wax secretion activity in the hive of honeybee colonies during pollen flow seasons (2004&2005) (in grams per colony)

Seasons		F1 Caraniolan bees	F1 Italian bees
2004	Citrus	475.2	519.4
	Clover	358.4	435.5
	Cotton and Corn	415.6	540.3
Total		1249.2	1495.2
Mean		416.4	498.4
2005	Citrus	379.0	436.7
	Clover	448.2	581.3
	Cotton and Corn	372.3	456.5
Total		1199.5	1474.5
Mean		399.8	491.5

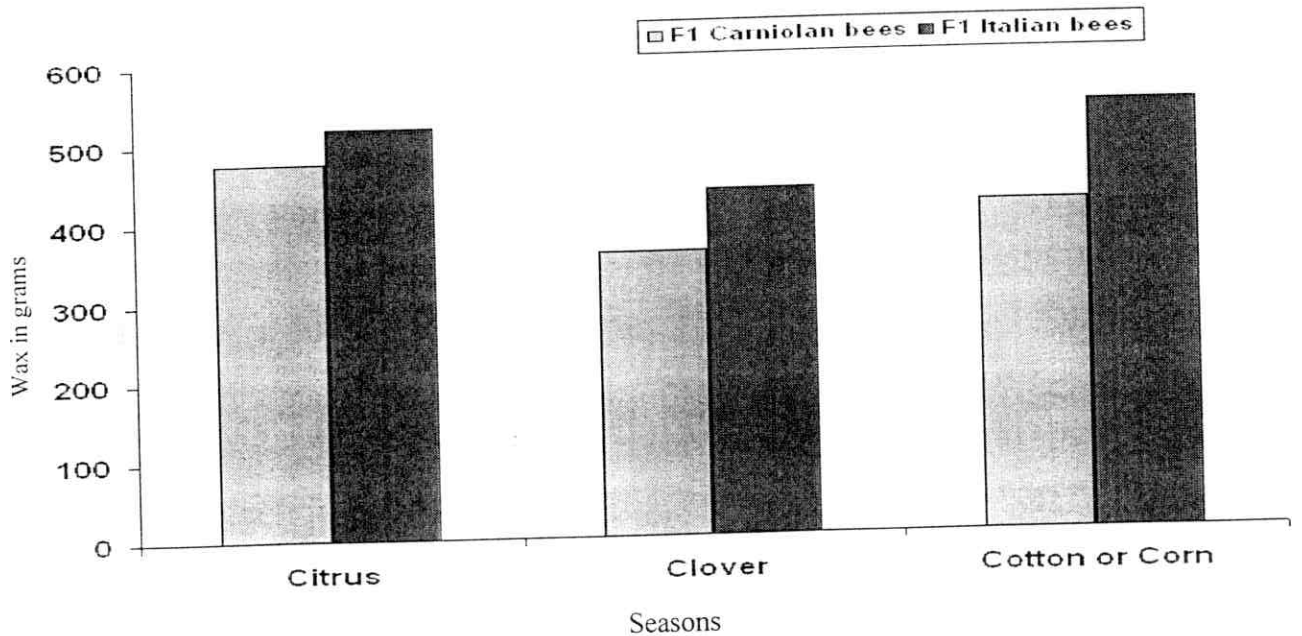


Fig.(20) Wax secretion activity in the hive of honeybee colonies during pollen flow season ,2004 (in grams per colony)

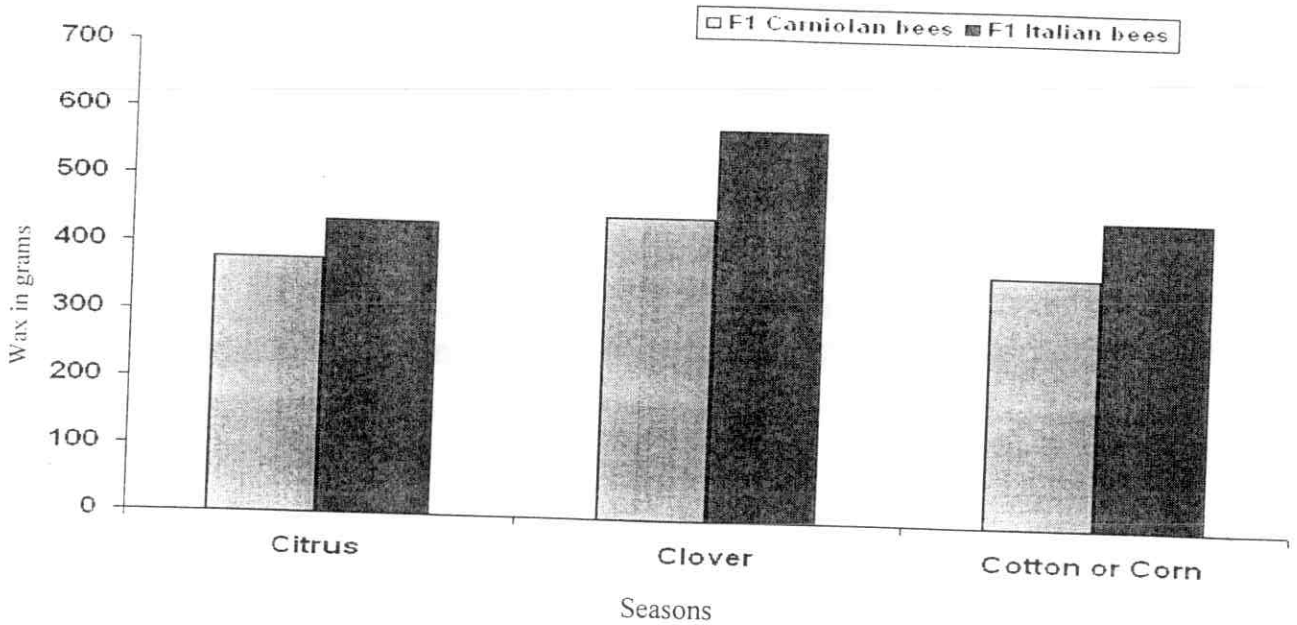


Fig.(21) Wax secretion activity in the hive of honeybee colonies during pollen flow season ,2005 (in grams per colony)

11-The relationship between pollen stored in the hives (honeybee colonies) and other products during the nectar flow:

Table (26) showed that there was a relationship between pollen stored in honeybee colonies and other products during the nectar flow seasons (2004 & 2005).

1- The active seasons in 2004:

During citrus season, 2004 the average amount of bee bread was 118.49 g/colony and the averages of other products were 3.5 kg. Honey , 9.59g. Royal jelly, 11.2 g. propolis and 475.29g. bee-wax per colony, in case of F1 Carniolan bees, while in case of F1 Italian bees, the averages amounts of bee bread was 171.73 g/colony and the average of other products was 3.2 Kg. Honey, 11.4 g. Royal jelly, 14.59. Propolis and 519.4 g. bee-wax / colony; respectively.

The averages amount of bee bread during Clover season, 2004 was 396.9 g/colony and the averages of others products was 5.9 Kg. Honey, 9.3 g. Royal jelly, 12.79 propolis and 358.4 g. bee-wax / colony in case of F1 Carniolan bees. While the average amount of bee bread was 399.7 g/ colony and the averages of other products were 4.2 Kg Honey, 12.59. Royal jelly, 15.2 g. Propolis and 435.59 bee-wax / colony in case of F1 Italian bees; respectively.

During the Cotton flow season or Corn pollen flow season, 2004, the averages amount of bee bread was 473.3 g/ colony and the averages of other products were 3.5 Kg honey, 7.5 g Royal jelly, 9.7 propolis and 415.69 bee-wax/ colony in case of F1 Carniolan bees, while the average amount of bee bread was 488.49 / colony and the averages of other products were 3.5 Kg. Honey, 10.5 g. Royal jelly, 13.59 proplis and 540 g. bee-wax / colony in case of F1 Italian bees, respectively.

2- The active seasons in 2005:

The recorded data in Table (26) indicated that the average amount of bee bread in Citrus season, 2005 was 124.53 g/ colony and, the averages of other products were 2.5 kg. Honey, 10 g Royal jelly, 13.5 g.propolis and 379 g bee-wax, in case of F1 Carniolan bees bees, the average amounts of bee bread was 160.27 g/ colony and the averages of other products were 4.6 kg. Honey, 13.59. Royl jelly, 16.4 g. prppolis and 346.79 bee-wax / colony in case of F1 Italian bees; respectively.

During the Clover season of 2005 the average amount of pollen stored as bee bread was 393.75 g/colony and the averages of other products were 4.2 Kg Honey, 9.09g Royal jelly, 10.39 Propolis and 448.2 g bee-wax / colony in case of F1 Carniolan bees. While in case of F1 Italian bees, the average amounts of bee bread was 369.25 g/ colony and the averages of other products were 3.5 Kg. Honey, 12.39. Royal jelly, 12.5 g Propolis and 581.39 bee-wax / colony; respectively.

The average amount of bee bread was 424.4 g/ colony during Cotton or Corn pollen flow season and the averages amounts of other products were 3.0 Kg. Honey, 9.5 g Royal Jelly, 12.59 g propolis and 372.3 g bee-wax / colony in case of F1 Carniolan bees. While the averages amounts of bee bread was 462.49 g/ colony and the averages amounts of other products were 4.0 Kg. Honey, 11.5 g. Royal jelly, 12.0 g Propolis and 456.59. bee-wax / colony in case of F1 Italian bees; respectively.

From the above results it could be concluded that the increase of stored pollen in the hive gave the increase in the other hive products of honeybee, the main seasons in the activity of honey bee was started from March till the end of August yearly at the our location. Therfore, the programe of artificial feeding for honeybee colonies during September, October and November annualy .

The results agreement with **(Khattab, 1976 and 1981).**

Table (26) The relationship between pollen stored (Bee bread) in the hive of honeybee colonies and other products during the nectar flow seasons (2004&2005) :

Honey flow seasons		Average products per colony									
		F1 Carniolan bees					F1 Italian bees				
		Bee bread (in g.)	Honey (in kg.)	R.J. (in g.)	Propolis (in g.)	Wax (in g.)	Bee bread (in g.)	Honey (in kg.)	R.J. (in g.)	Propolis (in g.)	Wax (in g.)
2004	Citrus	118.40	3.5	8.5	11.2	475.2	171.73	3.2	11.4	14.5	519.4
	Clover	369.90	5.9	9.3	12.7	358.4	399.70	4.2	12.5	15.2	435.5
	Cotton	473.20	3.5	7.5	9.7	415.6	488.40	3.5	10.5	13.5	540.3
Total		988.5	12.9	25.3	33.6	1249.2	1059.5	11.9	34.4	43.2	1495.2
Mean		329.5	4.3	8.4	11.2	416.4	353.2	3.96	11.5	14.4	498.4
2005	Citrus	124.53	2.5	10.0	13.5	379.0	160.27	4.6	13.5	16.4	436.7
	Clover	393.75	4.2	9.0	10.3	448.2	369.25	3.5	12.3	12.5	581.3
	Cotton	424.40	3.0	9.5	12.5	372.3	462.40	4.0	11.5	12.0	456.5
Total		942.7	9.7	28.5	36.3	1199.5	991.9	12.1	37.3	40.9	1474.5
Mean		314.2	3.2	9.5	12.1	399.8	330.6	4.03	12.4	13.63	491.5

12- The effect of giving pollen and sugar syrup to honeybee colonies on the amount of pollen collected:

Table (27&28) and Fig. (22) show the feeding of honeybee colonies during the Corn pollen flow when giving pollen for feeding in the hive reduced the amount of pollen collected by the colony, while the feeding of honeybee colonies with sugar syrup was increased the amounts of pollen gathered, the mean averaged were 12.62(± 2.8) g/colony, while not feeding was 8.12 (± 1.25) g/ colony fed on pollen and was 20.5 (± 3.0) g/ colony in case of feeding with sugar syrup, 2004.

The amounts of pollen collected in 2005 was 18.9 (± 2.7) g/ colony not feeding, while increase amounts of pollen produced when colonies fed on pollen 11.1 (± 2.1) g/ colony and the higher amounts of pollen produced in case of feeding colonies with sugar syrup fortified by fruit syrup 28.61 (± 6.0) g/ colony.

From the above results it could be concluded that there were highly significant between the colonies which fed with sugar syrup and which not fed with it during the pollen flow season in pollen gathering.

It could be mentioned that, for hnhancement the activity of honeybee colonies on pollen collection could be feeding sugar syrup with fruit joice during the pollen flow or pollination crops activity **(Khattab, 1976& 1981)**.

Table (27): Effect of feeding colonies with pollen or sugar syrup on pollen gathering activity durin the Corn pollen flow season, 2004. (daily collection in grams)

Colonies groups treated	Colonies not feeding	Colonies fed pollen	Colonies fed on sugar syrup and fruit syrup
A	14.2(±2.6)	7.1(±0.5)	21.5(±4.1)
B	15.2(±3.0)	12.6(±2.5)	23.2(±3.7)
C	11.5(±2.1)	8.5(±1.5)	19.4(±2.3)
D	9.6(±1.5)	4.3(±0.5)	17.9(±2.0)
Mean average	12.625 (±2.3)	8.125 (±1.25)	20.5 (±3.025)

Table (28): Effect of feeding colonies with pollen or sugar syrup on pollen gathering activity durin the Corn pollen flow season, 2005. (daily collection in grams)

Colonies groups treated	Colonies not feeding	Colonies fed pollen	Colonies fed on sugar syrup and fruit syrup
A	15.5(±2.4)	13.5(±2.6)	28.1(±4.5)
B	21.4(±2.1)	11.5(±2.0)	31.5(±10.5)
C	16.5(±3.5)	9.0(±1.5)	25.4(±4.0)
D	22.3(±2.9)	10.4(±2.3)	29.5(±5.1)
Mean average	18.925(±2.725)	11.1(±2.1)	28.625(±6.025)

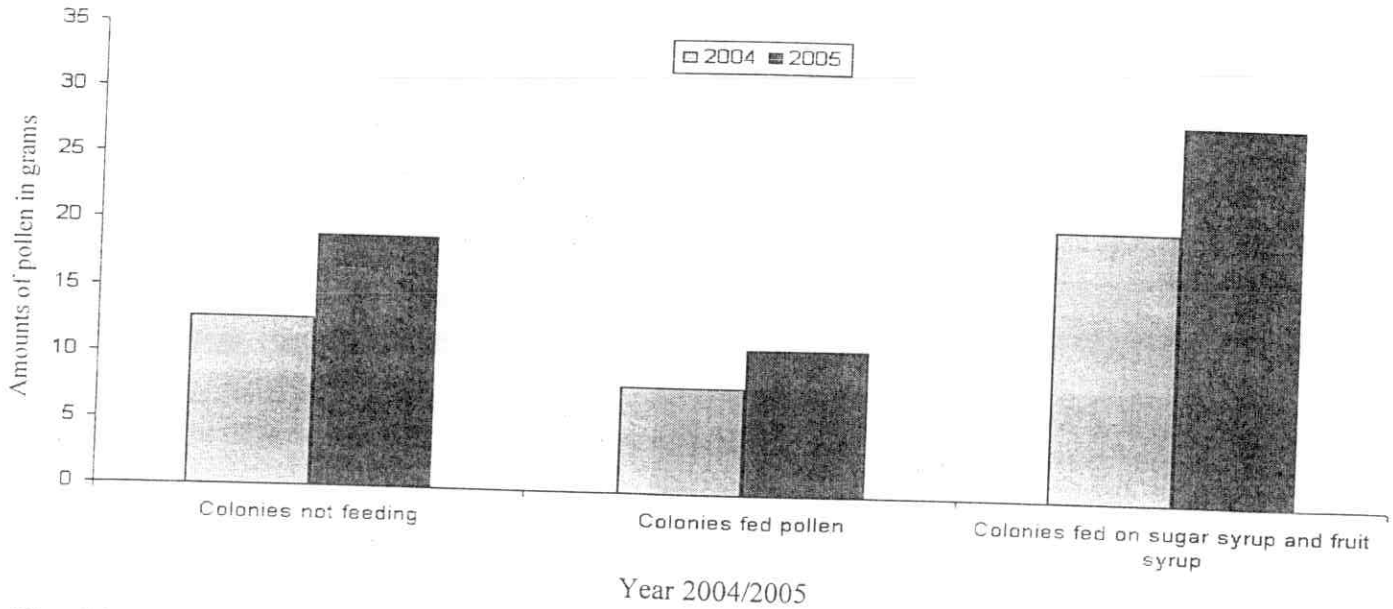


Fig. (22): Effect of feeding colonies with pollen or sugar syrup on pollen gathering activity during the Corn pollen flow season, 2004 & 2005. (daily collection in grams)

13- Pollen traps as a methods of Varroa mites control:

Table (29) and fig. (23) showed that the using of pollen traps for ***Varroa destractor*** mites control was about 55.6%, while in case of Varroazal as antivarroa for controlling, the number of mites fall on the sticky board was 86%, while the number of mites falling on the sticky broad in case of using pollen traps and Varroazal treatment was 93%. The untreated colonies as a control was averaged of 12.8% mites fall.

The statistical analysis indicated that the difference btween treatments was highly significant.

It could be concluded that, the pollen traps did reduce the number of Varroa mites in the colonies treated for controlling over of 50%.

The amount of reduction was not enough to control Varroa mites. The reduction in Varroa mite build up could reduce mite populations enough to allow of mite control, but the using of pollen trap in the program of Varroa mites control in IPM will be inhansment the colonies heighen .

It could be pointed out :-

1- The use of 6 mesh false floor with at least a 1" clearance to reduce mite populations within the hive.

2-The combinations using pollen traps with Varroazal keep mites in less population in the hive without miticide applications.

3- Traps and useable and effective mesh false bottom for beehives that will be manufactured or easily made by beekeepers.

4- Damage of drone brood during the active seasons used also for Varroa control. These methods plus pollen traps are more effective in program for IPM control of Varroa mites

Table (29): Pollen traps as a new methods for Varroa mites control :

(% of mites fall during experiments at 32 days in active seasons 2004 and 2005)

No. of colonies treated	Varroa mite % fall on the sticky board of hives			
	Pollen traps	Varroazal ®	Pollen traps & Varroazal	Untreated colonies (control)
10	61%	89%	96%	16%
10	50%	92%	95%	17%
10	47%	81%	92%	10%
10	55%	90%	94%	12%
10	63%	78%	88%	9%
Average of %	55.6%	86%	93%	12.8%

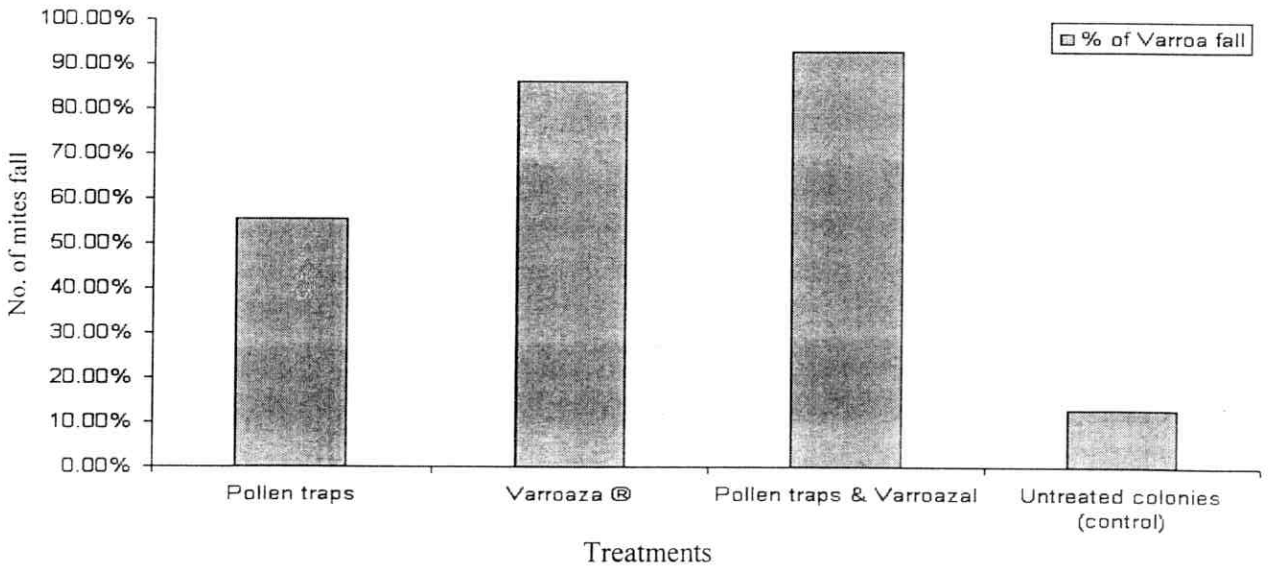


Fig. (23) Pollen traps as amethods of Varroa mites control.

(% of mites fall during experiments at 32 days in active seasons 2004 and 2005).