

# The Effect of Pollen Supplementary Feeding on Some Activities of Honeybee Colonies During Summer Season in Riyadh, Saudi Arabia

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**Abstract.** Supplementary feeding with pollen patty is very necessary for honeybee colonies during summer season (May-September) under Riyadh area conditions. Pollen supplementary feeding increased the population density and brood rearing activity of the tested colonies during the pollen dearth period. Moreover, it also encouraged the activities of honeybee colonies upto the late summer. The colonies which were provided with pollen supplementary feeding, presented the maximum activities related to population density, brood rearing, and pollen storage, in indiginous bee colonies (*Apis mellifera yemenitica*) followed by Carniolan bee colonies (*Apis mellifera carnica*) and Italian bee colonies (*Apis mellifera ligustica*) respectively. Whereas in storing honey activity the Carniolan bee colonies (*Apis mellifera carnica*) surpassed the indiginous bee (*Apis mellifera yemenitica*) and Italian bee colonies (*Apis mellifera ligustica*).

**Key Words:** *Apis mellifera yemenitica*, *Apis mellifera carnica*, *Apis mellifera ligustica*, Pollen, Supplementary feeding.

## Introduction

The Kingdom of Saudi Arabia imports thousands packages of bees and queens annually from different countries. The major three races of bees kept in Saudi Arabia were; indiginous bees (*Apis mellifera yemenitica*), Carniolan bees (*Apis mellifera carnica*) and Italian bees (*Apis mellifera ligustica*).

Although majority of the beekeepers in Saudi Arabia are still using traditional log hives for keeping the indiginous bee race (*Apis mellifera yemenitica*), there are little knowledges about this race. El-Sarag (1988) stated that *Apis mellifera*

*yemenetica* in Yemen surpassed *Apis mellifera carnica* in the following traits: brood rearing activity, storage of honey and pollen, wax working, swarming, migration and superseeding behaviour. In (1993) he studied some factors affecting brood rearing activity of honeybee colonies (*Apis mellifera carnica*) in two apiaries under Riyadh conditions. Among the effects of the prevailing climatic factors on colony activities, only sunshine showed moderate correlation with worker brood rearing, drone brood rearing and pollen collection and storage. No significant correlation's existed with the maximum and minimum temperatures, relative humidity and wind speed. The first study

**Table 1.** Effect of supplementary feeding with pollen patty on colony strength, sealed brood, pollen stored and honey areas in *Apis mellifera carnica* colonies from May to September 2000.

Date	No. of combs		Areas (In square inches)					
	covered with bees		Sealed brood		Pollen stored		Honey area	
	Fed	Non-fed	Fed	Non-fed	Fed	Non-fed	Fed	Non-fed
1/5	2.42	2.42	175.67	185.33	82.33	58.00	595.7	4097
	b-h	b-h	bcd	bcd	ab	ab	jkl	l
13/5	2.75	3.00	179.00	152.00	57.00	61.33	722.0	450.3
	b-f	a-e	bcd	b-e	ab	ab	g-l	kl
25/5	2.50	2.50	261.00	198.67	66.33	37.33	799.7	667.3
	b-g	b-g	a	bc	ab	b	e-k	i-l
6/6	2.25	2.08	260.33	165.33	48.67	29.33	870.0	678.3
	c-h	e-h	a	bcd	ab	b	c-j	h-l
18/6	3.08	2.17	200.33	135.00	72.33	62.33	1012.0	752.3
	a-d	d-h	bc	def	ab	ab	a-i	f-j
30/6	3.17	2.17	187.33	106.00	82.67	65.00	1093.0	1059
	abc	d-h	bcd	efg	ab	ab	a-f	a-g
12/7	2.83	1.50	171.00	86.67	81.33	51.33	1277.0	1210
	b-f	h	bcd	fg	ab	ab	ab	a-d
24/7	3.33	2.17	196.00	79.00	65.67	56.00	1299.0	1233
	ab	d-h	bc	g	ab	ab	a	a-d
5/8	3.00	2.08	206.00	104.00	52.33	67.00	1332.0	1131
	a-e	e-h	b	efg	ab	ab	a	a-e
17/8	3.83	2.00	177.67	61.00	91.33	63.00	1235.0	1033
	a	fgh	bcd	g	ab	ab	abc	a-h
29/8	2.67	1.58	151.33	77.33	101.7	65.00	1240.0	1135
	b-f	gh	b-e	g	ab	ab	ab	a-e
10/9	2.58	1.92	154.00	78.67	71.67	77.33	1170.0	912.0
	b-f	fgh	b-e	g	ab	ab	a-d	b-j
22/9	2.75	1.50	144.00	69.67	130.7	78.00	1200.0	866.3
	b-f	h	cde	g	a	ab	a-d	d-j

Means in each parameter followed by the same letters are not significantly differed.

about the indigenous bees (*Apis mellifera yemenitica*) in Saudi Arabia was made by Al-Qarni 1995, who stated that this race significantly surpassed the Carniolan bee with respect to the monthly pollen storage, worker and drone brood rearing but no significant differences were observed between the different genotype.

Many colonies were lost in Riyadh area specially during summer period (May-September) due to the sharp decreased of egg laying activity by the queens which resulted in weakened colonies.

The aim of the present study was to investigate the effect of pollen

supplementary feeding on some activities of the following honey bee races: indigenous bee race, (*Apis mellifera yemenitica*) and two imported races, Carniolan bees (*Apis mellifera carnica*) and Italian bees (*Apis mellifera ligustica*).

## Materials and Methods

This work was carried out in Riyadh , Central region, Saudi Arabia, during the summer season (May-September), 2000 in which the beekeepers usually suffer great losses of their colonies. Three honey bee races were selected for this study, the indigenous bee race, (*Apis mellifera*

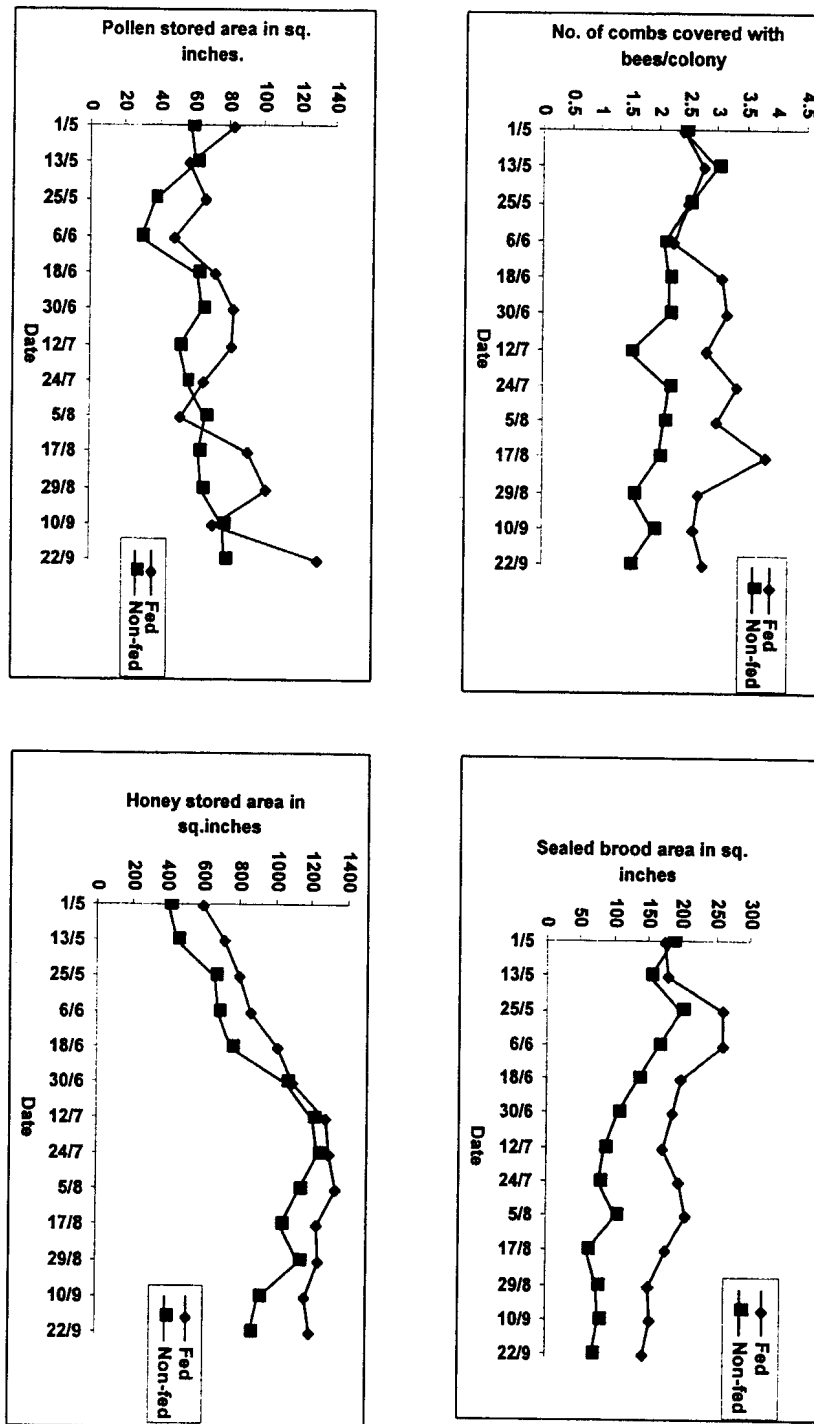


Figure 1. Variations of bees population, sealed brood, honey and pollen stored areas in *Apis mellifera carnica* colonies under feeding with pollen patty during 2000 in Saudi Arabia.

**Table 2:** Effect of supplementary feeding with pollen patty on colony strength, sealed brood, pollen stored and honey areas in *Apis mellifera ligustica* colonies from May to September 2000.

Date	No. of combs		Areas (In square inches)					
	covered with bees		Sealed brood		Pollen stored		Honey area	
	Fed	Non-fed	Fed	Non-fed	Fed	Non-fed	Fed	Non-fed
1/5	2.50	2.50	240.3	194.0	49.33	42.00	321.0	235.3
	ab	ab	a	abc	ab	abc	a-f	b-g
13/5	2.67	2.75	143.0	119.7	38.00	25.00	218.3	202.7
	ab	ab	cde	def	abc	bcd	c-g	d-g
25/5	3.00	2.75	200.7	170.0	57.33	23.33	323.3	274.3
	a	ab	ab	bcd	a	bcd	a-f	a-g
6/6	2.50	2.17	175.7	130.7	37.33	12.33	317.7	293.0
	ab	a-d	bcd	de	abc	cd	a-f	a-f
18/6	2.42	2.42	171.0	141.3	12.67	33.33	357.3	371.3
	abc	abc	bcd	cde	cd	a-d	a-e	a-d
30/6	2.42	2.17	112.0	88.33	18.00	29.33	322.3	328.7
	abc	a-d	efg	e-i	bcd	a-d	a-f	a-f
12/7	1.42	1.92	99.33	72.33	14.67	32.67	451.3	387.0
	b-e	a-e	e-h	e-j	cd	a-d	a	a-d
24/7	2.00	2.08	121.3	11.00	17.67	15.67	422.0	300.0
	a-e	a-d	def	f-j	bcd	cd	ab	a-f
5/8	2.58	1.58	98.33	44.67	14.33	9.33	358.0	256.0
	ab	a-e	e-h	hij	cd	cd	a-e	a-g
17/8	2.00	1.33	99.55	35.00	12.60	9.00	413.3	172.3
	a-e	b-e	e-h	ij	cd	cd	abc	efg
29/8	1.58	0.92	53.00	29.33	14.00	18.60	268.7	149.3
	a-e	cde	hij	j	cd	bcd	a-g	fg
10/9	1.42	0.83	56.67	36.00	30.33	10.33	224.7	96.00
	b-e	de	g-j	ij	cd	a-d	c-g	g
22/9	0.75	0.50	66.00	21.33	34.60	3.67	223.3	95.00
	de	e	f-g	j	a-d	d	c-g	g

Means in each parameter followed by the same letters are not significantly differed.

*yemenitica*) which was brought from Southern region of Saudi Arabia and two imported races, the first was Carniolan race (*Apis mellifera carnica*) that was imported from Egypt and the second was Italian race (*Apis mellifera ligustica*) was imported from Australia.

The indigenous bee colonies were brought in early February in log hives (traditional hives) and transferred into Langstrouth hives where they were fed on sugar syrup and pollen till April. Carniolan bee colonies were imported from Egypt in the end of February as

packages where as the Italian bee mated queens were imported from Australia in February and introduced in Carniolan colonies and both races were fed as above.

Six honeybee colonies from each tested race at the same strength (3-combs covered with bees) were selected. The colonies of each honeybee race were divided into two groups (3-colonies/group). The first group of each race was fed on 250 gm pollen patty/colony/week plus the natural food sources in the apiary area. The second group of each honey bee race was left without pollen supplementary feeding

## The effect of pollen feeding honeybee

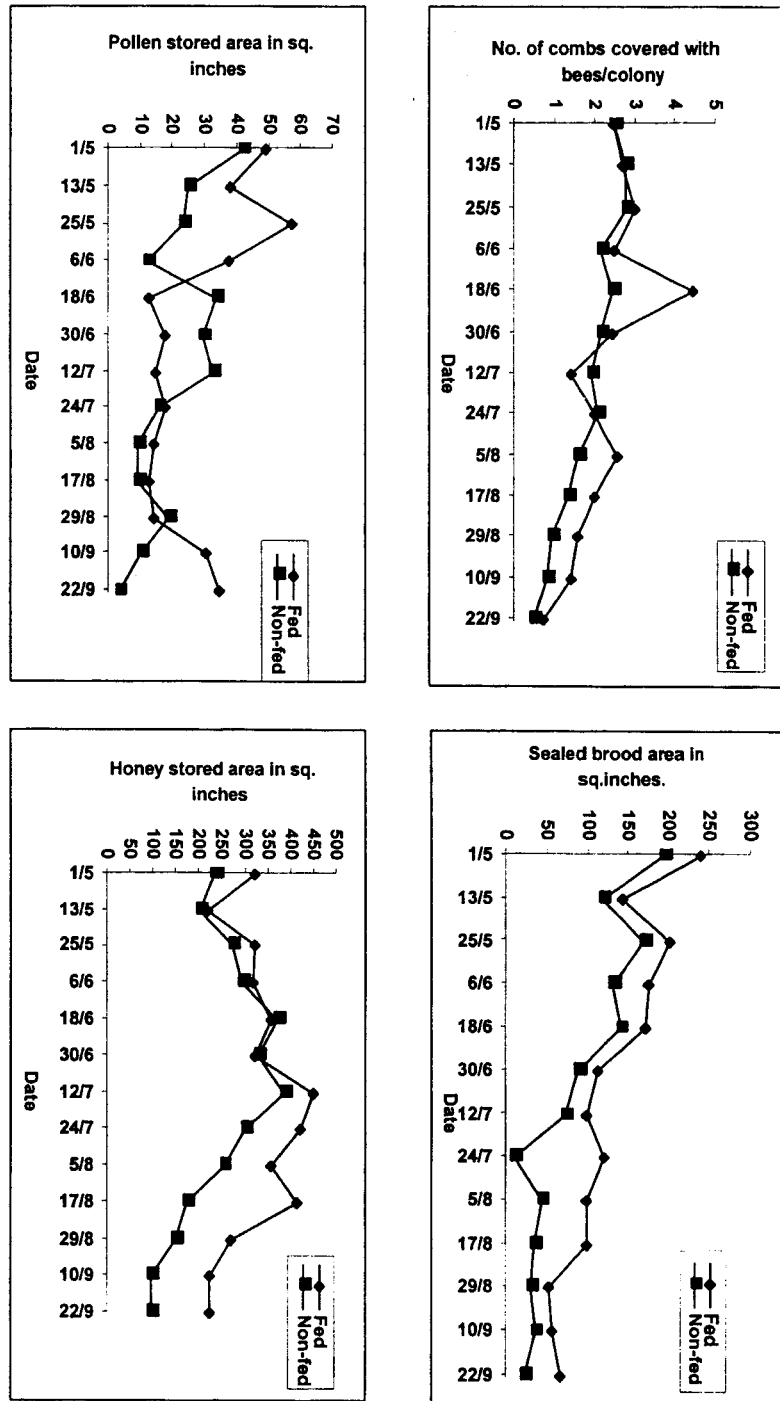


Figure 2. Variations of bees population, sealed brood, honey and pollen stored areas in *Apis mellifera ligustica* colonies under feeding with pollen patty during 2000 in Saudi Arabia.

**Table 3.** Effect of supplementary feeding with pollen patty on colony strength, sealed brood, pollen stored and honey areas in *Apis mellifera yemenetica* colonies from May to September 2000.

Date	No. of combs		Areas (In square inches)					
	covered with bees		Sealed brood		Pollen stored		Honey area	
	Fed	Non-fed	Fed	Non-fed	Fed	Non-fed	Fed	Non-fed
1/5	2.50	2.67	283.7	158.3	75.0	65.3	92.3	212.3
	f	ef	a-e	e	de	e	h	fgh
13/5	3.17	3.33	250.0	199.0	71.3	76.7	116.7	144.3
	def	c-f	b-e	de	e	de	gh	fgh
25/5	4.50	3.92	337.7	268.0	73.3	65.3	300.0	304.3
	a-f	b-f	a-d	a-e	de	e	e-h	e-h
6/6	4.50	4.42	281.7	275.3	116.0	92.7	462.7	384.7
	a-f	a-f	a-e	a-e	a-e	cde	c-f	d-h
18/6	5.50	5.17	293.3	290.0	130.0	69.0	681.3	557.3
	a-d	a-d	a-e	a-e	a-e	e	bcd	b-e
30/6	5.17	5.08	383.7	338.3	113.7	81.0	819.3	702.0
	a-d	a-e	ab	a-d	b-e	de	ab	bcd
12/7	6.00	5.33	312.7	248.0	120.0	102.7	830.7	885.0
	ab	a-d	a-d	b-e	a-e	b-e	ab	ab
24/7	5.83	4.50	283.0	284.0	170.0	131.7	1094.0	893.0
	abc	a-f	a-e	a-e	a-e	a-e	a	ab
5/8	5.75	4.58	313.0	234.0	187.0	97.7	844.7	760.0
	abc	a-f	a-d	cde	a-d	cde	ab	bc
17/8	5.67	4.83	306.0	240.0	145.7	93.7	612.3	588.3
	abc	a-f	a-d	b-e	a-e	cde	b-e	b-e
29/8	6.08	5.75	353.7	257.0	228.3	134.3	590.0	454.3
	ab	abc	abc	a-e	a	a-e	b-e	c-f
10/9	5.91	5.75	261.3	282.7	216.0	199.0	464.3	458.0
	ab	abc	a-e	a-e	ab	abc	c-f	c-f
22/9	6.58	6.00	399.0	351.3	104.3	149.3	422.0	458.0
	a	ab	a	abc	b-e	a-e	c-g	c-f

Means in each parameter followed by the same letters are not significantly differed.

(control colonies). No sugar syrup was introduced to all the test colonies during the experimental period.

In all test colonies, sealed brood, stored pollen and honey area were estimated every 12 day interval for each colony using a standard Langstroth frame divided by wire into square inches from 1<sup>st</sup> May to 22<sup>nd</sup> September 2000. The population density was also determined by counting and recording the number of combs covered with bees every 12 days intervals for each colony during the experimental period.

## Results and Discussion

As shown in Table(1) and Fig. (1) the Carniolan bee colonies which were fed on pollen patty supplementary feeding during the test period indicated highest levels of population density, brood rearing and pollen and honey storage than the control one.

The number of combs covered with bees in colonies supplemented with patty, increased gradually during June, July, and August while showed a marked decline in September. In contrast, control colonies which survived only on natural food

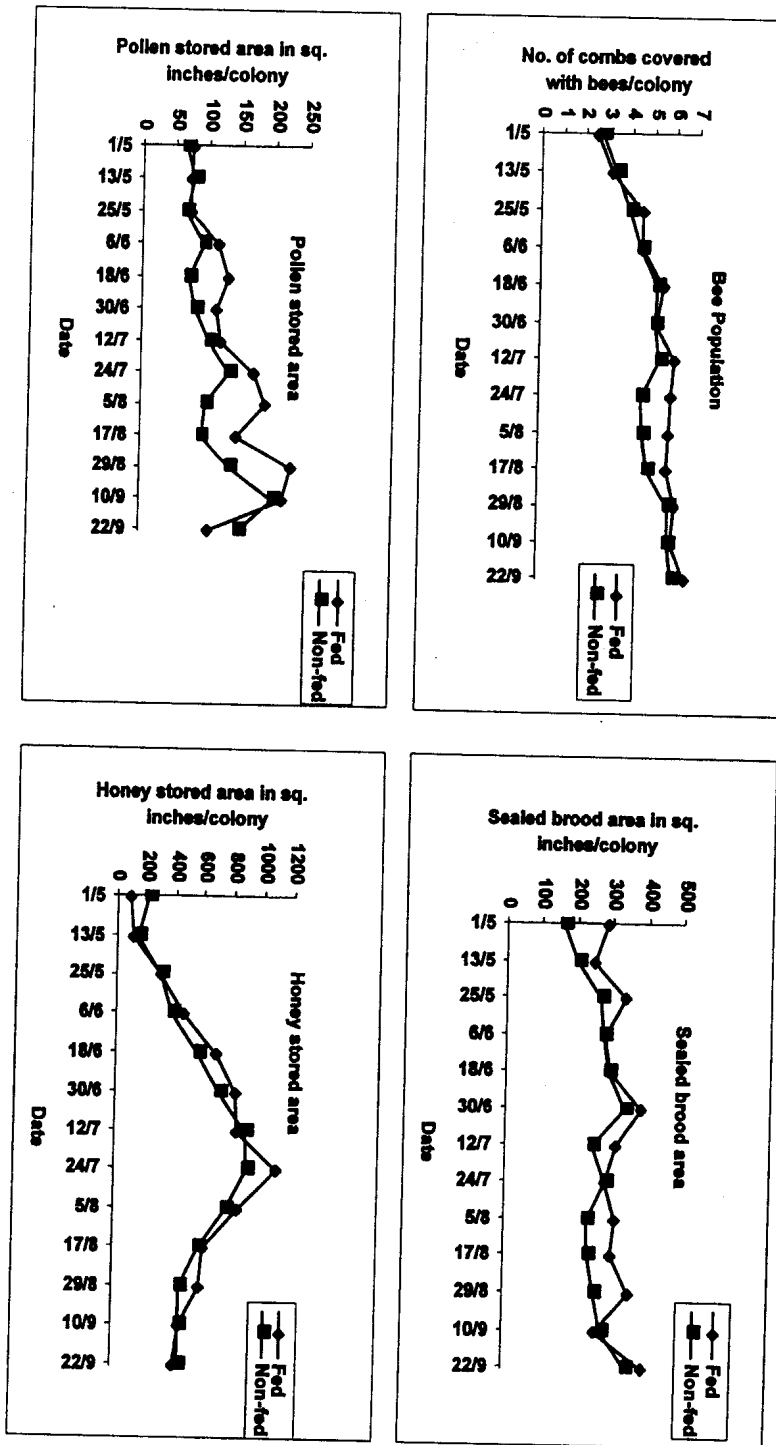


Figure 3. Variations of bees population, sealed brood, honey and pollen stored areas in *Apis mellifera yemenitica* colonies under feeding with pollen patty during 2000 in Saudi Arabia.

sources in the apiary area, the number of combs covered with bees were clearly decreased during June, July and reached at the minimum in September. The results also presented that *Apis mellifera carnica* colonies supplemented with pollen patty performed much better as compared to colonies fed only on natural food sources, in brood rearing and pollen and honey storage.

The data recorded to ascertain the response of *Apis mellifera ligustica* against pollen patty as supplementary feeding in Table(2) revealed that the colonies which were offered pollen patty also performed much better as compared to colonies only fed on natural food sources in all test parameters.

The results of the effect of pollen patty supplementary feeding on the performance of *Apis mellifera yemenetica* presented in Table(3) and Fig. (3) depicted a sharp increase in population density, brood area and pollen and honey storage in colonies fed on pollen patty supplementary feeding as compared to control colonies which only fed on natural food sources during May-September.

Statistical analysis revealed significant differences between the Carniolan, Italian and Indigenous bee colonies supplemented and un-supplemented with pollen patty supplementary feeding in the test parameters during the experimental period (Table. 1, 2 and 3).

The results of the study proved the importance of supplementing pollen patty with the natural food sources during summer season as it encouraged the honeybee colonies of each race to perform better in rearing brood which resulted in high colonies population densities and in fact it made the colonies able to collect and

store more amount of pollen and honey. The indigenous bee colonies showed a better performance as compared to other two races in all parameters except honey storage. This might be due to more acclimatization to high temperature and activeness of the indigenous bees in collecting and storing more pollen as compared to *carniolan* and *italian* bees. In storing honey the *carniolan* colonies surpassed the *indigenous* and *Italian* colonies.

The obtained results were found in agreement with those of EL-Sarrag *et al.* (1988a) they found that brood rearing activity of *Apis mellifera sudanensis* was increased during autumn and winter rather than in summer. The main reason behind that was pollen's availability. The findings were also close to Rashad and Parker (1958) and Moeller (1958) who reported that many factors affect the brood amount in the honeybee colony: queen efficiency, colony strength, egg longevity, food abundance, diseases and the conditions that affect the honey flow. The results were also found in line with Todd and Reed (1970) found a positive correlation between amount of pollen stored and brood reared and Khanbash (1989) stated that Carniolan colonies collected and stored more pollen than Italian colonies. The findings of the study about honey storage were not found in agreement with El-Sarrag (1988b) and Al-Qarni (1995) who stated that the *Apis mellifera yemenetica* produced more honey than Carniolan bees.

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## تأثير التغذية الاضافية بحبوب اللقاح صيفاً على معيشة طوائف نحل العسل فى المملكة العربية السعودية

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**الملخص :** أثبتت الدراسة أهمية التغذية الاضافية بفضيرة حبوب القمح خلال موسم الصيف (مايو - سبتمبر ) تحت ظروف منطقة الرياض بالمملكة العربية السعودية . فقد وجد أن التغذية بحبوب اللقاح أدت الى زيادة قوة الطوائف وتربية الحضنة خلال فترة ندرة الغذاء كما لوحظ إمتداد نشاط طوائف النحل مع التغذية حتى نهاية فصل الصيف . وبوجه عام فقد وجد أنه مع استخدام التغذية الاضافية بحبوب اللقاح أثناء موسم الصيف (مايو - سبتمبر ) فى ظروف منطقة الرياض حدوث ازدياد فى نشاط النحل المحلى ونمو طوائفه بنجاح تلاه فى الاستجابة سلالة النحل الكرنيولى بينما أظهرت طوائف النحل الايطالى استجابة غير ملموسة قد يكون مرجعها الى عدم تأقلمه على الظروف البيئية بالمنطقة.

أمكن من خلال الدراسة ترتيب سلالات النحل المختبرة بناء على قياس قوة الطوائف ومساحات الحضنة وتخزين حبوب اللقاح كالتالى : النحل المحلى فى المرتبة الأولى فالكرنيولى ثم الايطالى . ولكن وجد أنه من حيث صفة تخزين العسل فإن طوائف النحل الكرنيولى جاءت فى المرتبة الأولى تلاها طوائف النحل المحلى ثم النحل الايطالى .