

## **DETERMINATION OF NITROGEN CONTENT IN WORKER BEE BODY PRODUCED BY DIFFERENT RACES AND THEIR HYBRIDS DURING DIFFERENT SEASONS.**

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### **ABSTRACT**

The present study was carried out during 2007, 2008 in the apiary of faculty of Agriculture, Al-Azhar University at Naser City. This study compared the nitrogen content of worker bee body produced by different races and their hybrids. From data obtained during spring and summer, it was found no significant different among nitrogen level of worker bee body resulted from different races and their hybrids during spring and summer, while it was significant difference in late summer. The nitrogen content of worker bee body produced by different races and their hybrids were 11.85% and 10.09% for Italian and Carniolan race, while it was 11.10% and 9.74% for both Italian F<sub>1</sub> and Carniolan F<sub>1</sub> respectively. From above data it is clear that the biological and economic value of the locally of Italian race in both summer and late summer season in more obvious and statistically significant. Therefore they may recommended for use in the commercial a piaries.. It is also true that the biochemical variation can be useful in separating at least some population within *Apis mellifera*, L.

### **INTRODUCTION**

Proteins are required by colonies of honey bees (*Apis mellifera*) for normal growth of individual bees, body nitrogen, hypopharyngeal gland and fat body development. The protein requirements of honey bees are normally satisfied by the consumption of pollen, but not all pollens have the same biological influence (Maurizio 1950). Ivanov and Spasov (1990) stated that the total nitrogen, lipids and dry matter and also invertase, amylase, glucose and catalase, activity were determined invertase, amylase and glucose oxidase activities were highest in summer and autumn but catalase activity was highest in winter. Nitrogen and lipid contents were highest in summer. Body weight and head weight highest in summer while decreased in winter.

Martin (1967) concluded that some variation in the protein patterns were observed dependent on the age of bees and also on the season of the year. Nation and Robinson (1968) concluded that addition of a small amount of pollen ash to an artificial diet for adult honey bees improved their ability to rear brood.

Imdorf, A. *et al.* (1988) concluded that bee colonies were prevented from collecting pollen, and the effect on brood rearing and on the N,P,K, Ca, Na and Mg contents of pupa was studied. Under these conditions brood rearing was reduced and fully stopped, which lead to increase in population size, whereas control colonies with access to pollen developed normally. Only significant differences were found in chemical analysis in pupa and worker bees of colonies with and without access to pollen, it is concluded that

the major feature of honey bee response to pollen storage is a termination of brood rearing and that those pupa still reared contain similar quantities of nitrogen and minerals as pupa reared during good foraging conditions. Hydak (1937), studied the changes in weight and nitrogen content of adult worker bees under different feeding and seasons conditions. Atallah *et al.* (1978) found that the nitrogen content of bees determined at weekly intervals as a measure of effectiveness of pollen substitutes. He added that bees fed fresh pollen had higher means of nitrogen levels than bees fed the other diets. Poltev and Karbaskova (1969) mentioned total nitrogen content was highest in bees fed Manchurian-nut pollen as a source of protein.

This study aimed to determine nitrogen content of worker bee body produced by different races and their hybrids during different periods.

## **MATERIALS AND METHODS**

After obtain on the virgin carmelan and Italian pure queen races, the newly emerged virgin queens were introduced to mating boxes, each one placed under spherical cages on unripe honey comb. This work carried out through three different periods spring, summer and late summer.

The bees emerged from each genotype were incubated in incubation colonies. After 24 hour, so emerged bee were put in the previous cages (three cages) for each genotype. The caged bees were incubated at 30°C and 60% humidity according to Kirk (1950).

Samples of different bees each were collected from each cage every three days for chemical analysis to determine nitrogen content of worker bee body produced by different races and their hybrids during different periods. This work aimed to determine nitrogen content of different races and their hybrids produced in different periods.

### **Total nitrogen determination**

Total nitrogen was determined by modification of Micro-Kjeldahl method of (A.O.A.C, 1965). Each 30 ml Kjeldahl flask, containing two weighted dry workers as a sample was digested for two hours and distillation was made as soon as the digested solution was cooled. Approximately 15 ml of the distillate were collected in a flask containing 5 ml of a 5% boric acid solution and methyl red-methylene blue indicator. The distillate was titrated with 0.02N HCl until end point or first appearance of violet. This procedure was applied to the three previously mentioned types of workers. The nitrogen content is calculated as follows

$$\text{Nitrogen content (\%)} = \frac{(T - B) \times N \times 14 \times 100}{1000 \times S}$$

Where,

T = sample titration ml standard acid.

B = Blank titration ml standard acid.

N = Normality of standard acid (= 0.005).

S = Sample dry weight.

## RESULTS AND DISCUSSION

### Nitrogen content of worker bee body produced by different races and their hybrids during different periods:

#### - Spring season:

The nitrogen and protein content at emergence depends on the availability of food outside live during the nursing season, the difference between bees raised during good condition amount to more than 13% (Kunert *et al.*, 1987).

Data listed in table (1) and illustrated in Fig. (1) showed that mean nitrogen content of worker bee body produced by different races and hybrids during spring for Italian and Carniolan race were 12.59% and 10.62% respectively. While it was found for Italian F<sub>1</sub> and Carniolan F<sub>1</sub> 12.41% and 11.06% respectively during spring season. The statistical analysis showed that there were non significant difference among the nitrogen level of worker bee body resulted from different races and their hybrids during spring season.

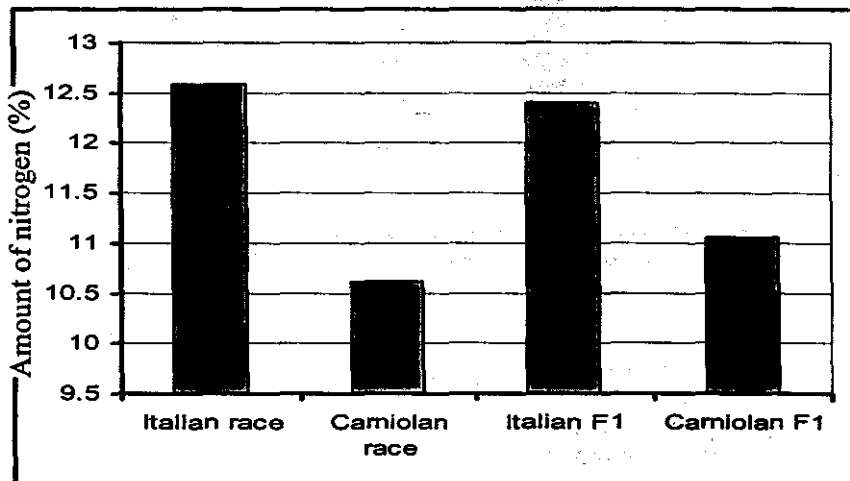
**Table (1): Mean of nitrogen amount in body of honey bee workers produced by different races and their hybrids during spring season (%).**

Sort of bees	Amount of nitrogen (%)			Total	Mean
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>		
Italian race	12.50	12.75	12.52	37.77	12.59
Carniolan race	10.43	10.29	11.13	31.85	10.62
Italian F <sub>1</sub>	12.56	12.23	12.43	37.22	12.41
Carniolan F <sub>1</sub>	10.85	11.23	11.08	33.16	11.06

\* Significant

L.S.D. at 1% = 1.006

L.S.D. at 5% = 0.691



**Fig. (1): Mean of nitrogen amount in body of honey bee workers produced by different races and their hybrids during spring season (%).**

**Summer season :**

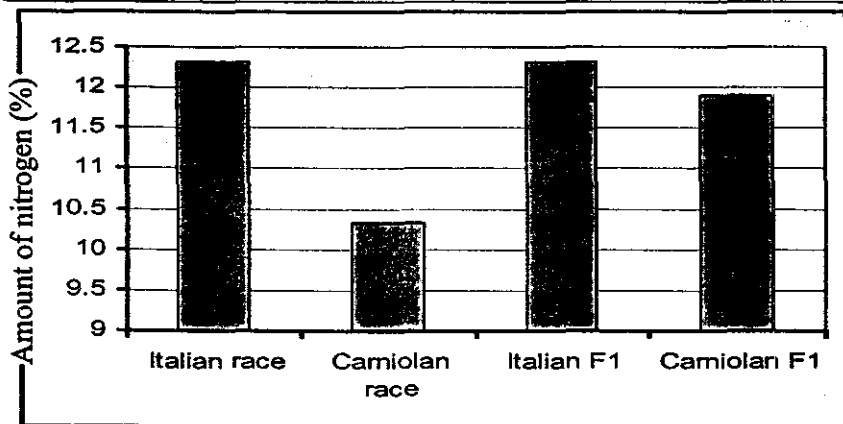
The results given in Table (2) and illustrated in Fig. (2) showed that mean content of worker bee body produced by different races and their hybrids for Italian and carniolan race were 12.32% and 10.34% respectively.

While it was found for Italian F<sub>1</sub> and carniolan F<sub>1</sub> 12.33% and 11.91% respectively.

The statistical analysis showed that there were non significant difference among the nitrogen level of worker bee body resulted from different races and their hybrids during.

**Table (2): Mean of nitrogen amount in body of honey bee workers produced by different races and their hybrids during summer season.**

Sort of bees	Amount of nitrogen (%)			Total	Mean
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>		
Italian race	12.23	12.42	12.33	36.98	12.32
Carniolan race	10.02	10.12	10.89	31.03	10.34
Italian F <sub>1</sub>	12.39	12.52	12.08	36.99	12.33
Carniolan F <sub>1</sub>	11.79	12.44	14.52	35.72	11.91



**Fig. (2): Mean of nitrogen amount in body of honey bee workers produced by different races and their hybrids during summer season.**

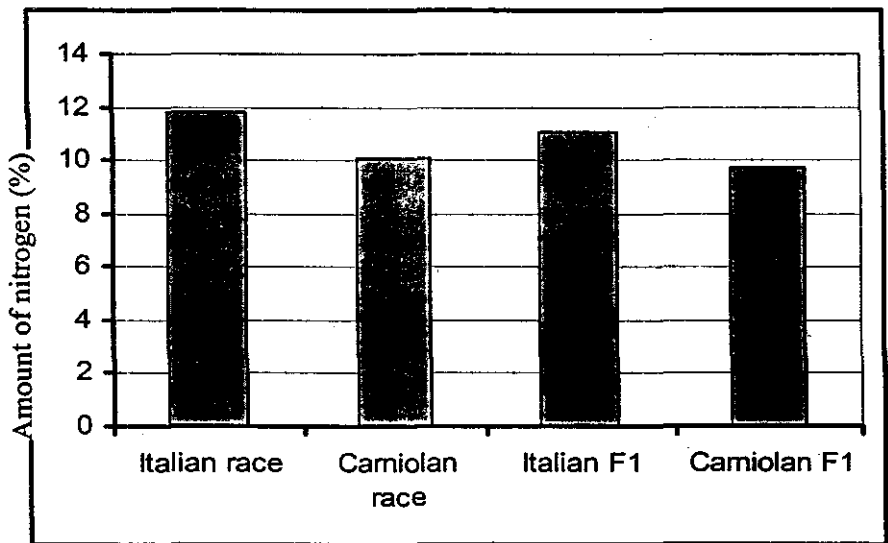
**Late summer period:**

The data recorded in Table (3) illustrated in Fig. (3) indicated that mean nitrogen content of worker bee body produced by different races and their hybrids during late summer for Italian and carniolan race were 11.85% and 10.09% respectively. While it was found for Italian F<sub>1</sub> and carniolan F<sub>1</sub> 11.10% and 9.74% respectively during late summer period. From data obtained, it could be said that, protein and nitrogen metabolism may play an important role in reproductive development. It was found too that the biological and economic value of the locally of Italian race in both spring and

summer seasons in more obvious and statistically significant. Therefore they may recommended in the commercial apiaries. It is also true that the biochemical variation can be useful separating at least, some population within *Apis millefera*. In my opinion protein requirements of colonies vary depending on the time of year and condition of the colony. Although, nitrogen content of the bee body affected greatly with feeding on different diets content of different protein. On the other hand, pollen was the best food for bees which produced significant value of nitrogen content of the head which affected greatly the hypopharyngea gland and hence royal jelly production Hydak (1934) showed that the nitrogen content increased by 93% in the head, 76% in the abdomen and 37% in the thorax of feed on pollen. Hydak (1935) reported that the weight of emerged bees and their nitrogen content are directly influenced by pollen consumption of the nurse bees.

**Table (3): Mean of nitrogen amount in body of honey bee workers produced by different races and their hybrids during last summer period.**

Sort of bees	Amount of nitrogen (%)			Total	Mean
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>		
Italian race	11.66	11.82	12.09	35.52	11.85
Carniolan race	10.92	9.82	9.54	30.28	10.09
Italian F <sub>1</sub>	11.50	11.80	10.00	33.30	11.10
Carniolan F <sub>1</sub>	10.67	9.15	9.41	29.23	9.74



**Fig. (3): Mean of nitrogen amount in body of honey bee workers produced by different races and their hybrids during last summer period.**

Schatton and Engels (1990) found that when the total protein content decreased the number of deformed bees increased and body weight were decreased Ivanov and Spasov (1990) they found that body weight and head weight were highest in summer and decreased in winter. Nitrogen and lipid contents were highest in summer. El-Shakao and Shahin (1987) they found that the nitrogen and mineral content during the early life bee were high and declined with age. Salem (2002) found that the percentage of nitrogen content in the body ash of newly emerged queens increased through different months April was the highest month (6.95%) in this respect. The nitrogen content varied with different queen rearing method.

The nitrogen content in adult honey bee worker is the result of interaction between environmental factors such as diet and genetic factors.

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### تقدير نسبة النيتروجين في بعض سلالات وهجن نحل العسل خلال المواسم المختلفة

عادل دياب محمد و إبراهيم عبد الرازق شحاته  
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أجريت هذه الدراسة خلال عام ٢٠٠٨ بكلية الزراعة - جامعة الأزهر - القاهرة - وذلك لمقارنة نسب النيتروجين المختلفة الموجودة في أجسام شغالات نحل العسل الناتجة من بعض السلالات وهجنها المختلفة - ولقد أتضح من نتائج هذه الدراسة أنه لا توجد فروق جوهرية لمستوى النيتروجين الموجود في أجسام الشغالات خلال موسمي الربيع والصيف ولكن أتضح أنه توجد فروق معنوية لمستوى النيتروجين خلال موسم الصيف المتأخر وأظهرت النتائج تفوق السلالة الإيطالية على الكرنيولي في مستوى النيتروجين حيث كانت للإيطالي ١١,٨٥% بينما كانت هذه النسبة ١٠,٠٩ للكرنيولي.