



**Effect of Italian and Carniolan honey bee hybrids rearing colony within bar's level on acceptance mean and royal jelly production**

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**Abstract:**

The honey bee queen diet is a white creamy substance consists mainly of proteins, sugars and lipids called royal jelly. It's one of the most valued products of honey bee colonies, it secreted in the acceptance royal cub. This study aimed to investigate some factor affecting the acceptance mean and royal jelly quantity production. Twelve Italian and Carniolan honey bee hybrid colonies (six/each) were used through two years (2017-2018). The Italian hybrid recorded the highest acceptance means (64.0). As the highest royal jelly quantity mean (148.1 mg/cup) recorded in the Carniolan hybrid. Also, the second year recorded the highest acceptance mean (61.8) more than the first years. As the lower bar showed the highest royal jelly quantity means (154.2 mg/cup). It could be concluded that, the best hybrid for producing royal jelly was the Carniolan while the Italian hybrid has the highest acceptance mean.

**Introduction**

The honey bee queen is an integral part of a normal honey bee colony, the singularity of its presence makes its a subject of special scientific interest of equal or greater importance is that the queen performs the major female reproductive role in the colony and therefore it is essential for the welfare and development of a normal colony. The relationship between the queen's reproductive capacity and honey production in the colony is extremely important to the bee keeping industry itself (J. rangel *et al.*, 2013). The queen also controls the production of queen

cells and laying workers by means of her scent and the secretion of "queen substances" from her mandibular glands. The amount of produced royal jelly increased by increasing the number of grafted queen cell cups to reach the maximum. Thus a fuller know ledge of queen rearing is desirable in order to understand her physiology, functions, and performance. The queen rearing industry is an essential part of commercial beekeeping in Egypt every year, thousands of queens are reared and used to found new colonies for honey, royal jelly, which is secreted from the

hypopharyngeal gland and mandibular gland of the worker honey bee, is the exclusive food for the queen honey bee and larvae (Satomi *et al.*, 2004). Royal jelly has an important commercial appeal and nowadays it is used in many industries like food and pharmaceutical characteristics (Sabatini *et al.*, 2009) as anti-tumor (Tamura and Kuboyama, 1987), anti-bacterial (Sauerwald *et al.*, 1998), anti-hypercholesterolemic (Nakajin *et al.*, 1982), anti-allergic (Kataoka *et al.*, 2001 and Oka *et al.*, 2001), anti-fatigue (Kamakura *et al.*, 2001), insulin-like (Okuda *et al.*, 198) , wound-healing properties (Fujii *et al.*, 1990) and wax production. Therefore, it has become increasingly necessary to better understand the factors which influence the production of high quality queens so that recommendations can be made to queen breeders concerning the best queen rearing procedures to follow. The purpose of this paper is to study the efficacy of Italian and Carniolan honey bee hybrids rearing colonies under grafting bar's level on royal jelly production and the queen cub acceptance rates.

#### **Material and methods**

The experiments were conducted under the conditions of Kafr Elsheikh Governorate during two years of 2017 and 2018. Twelve honey bee colonies were used in the experiment. Six colonies for each hybrid (Italian and Carniolan).

The bee colony under the study was as follows:

**1.** Choose the parent colony of the Italian and Carniolan bee hybrid to lay the eggs between the folded brood tablets to force the queen to lay eggs and follow until the hatching was completed three days later. The fourth day is the first larval age (larvae of one day) which takes the shape of the crescent.

**2.** Processing of breeding frames with three bars arranged in three different

locations (upper, middle, bottom) each frame carrying 15 plastic cups. The breeding frame is then exposed to the breeding colony for two hours before the grafting.

**3.** Colonies : Each colony has 8 comps covered with bee divided as follows: five sealed brood comps plus three honey and pollen comps plus plastic honey bee feed. The queens of the breeding colony were removed for 48 hours. The method of Doolittle was obtained in 1909 - wet method of grafting (1 gram of royal food: 1 cm distilled water).

**4.** Grafting: The one day larvae were transferred into the plastic cup by the grafting needle and then the breeding frame that carried three wooden par placed between the sealed brood comps in the breeding chamber. The Italian grafting larvae was rearing in Italian colony and the Carniolan grafting larvae was rearing in Carniolan colony.

**5.** The nutrition: Sugar solution with concentrate of 1kg sugar: 1.5 water was used. Energized feed was done before grafting. Each colony fed on half a liter of the solution every three days until the experiment was finished.

On the day following the grafting, we collect the number of acceptable royal cups and calculate the acceptance ratio. On the same date of grafting, after 72 hours the breeding frames were raising from the breeding colonies and removing the larvae from the plastic cups, then collecting the royal jelly from the successful royal cups with a wooden spoon according to the location of the the bar (upper, middle, lower). The royal jelly stored in plastic containers which were weighed empty and full with royal jelly and numbered with a code number, the capacity of each container was five grams. Each bar cubs were weighed according to its location. The royal jelly was stored in the fridge. The grafting process is repeated every three days.

Statistical analysis using Duncan's Multiple Range Test (Duncan, 1955).

**Results and discussion**

Effect of different hybrids within bar's level in two different years:

**1. Queen acceptance:**

Data in Table (1) showed the grafted queen cups acceptance mean under Italian and Carniolan hybrids rearing colony with bar's level. At the first year, the highest acceptance means were (66.1 and 56.7%) recorded in the Italian and Carniolan hybrids colonies with middle

bar's level, respectively. while the lowest acceptance means were (50 and 57.9%) recorded in the Carniolan and Italian hybrids colonies with upper bar's level, respectively. At the second year, the highest acceptance percentage means were (67.6 and 62.2%) recorded in the Italian and Carniolan hybrids colonies in middle bar's level, respectively. while the lowest acceptance means were (53.1 and 59.6%) recorded in the Carniolan and Italian hybrids colonies with upper bar's level, respectively.

**Table (1): Queen cups acceptance means under Italian and Carniolan hybrids rearing colony within bar's level.**

| Bar Level | First Year |           |             | Second Year |           |              |
|-----------|------------|-----------|-------------|-------------|-----------|--------------|
|           | Hybrids    |           | Mean ±S.E   | Hybrids     |           | Mean ±S.E    |
|           | Italian    | Carniolan |             | Italian     | Carniolan |              |
| Upper     | 57.9       | 50        | 54±3.783    | 59.6        | 53.1      | 56.4±7.540   |
| Middle    | 66.1       | 56.7      | 61.4±4.273  | 67.6        | 62.2      | 64.9±2.525   |
| Lower     | 65.6       | 54        | 59.8±5.323  | 67.2        | 61.2      | 64.2±2.885   |
| Mean      | 63.2       | 53.6      | 58.4±2.893B | 64.8        | 58.8      | 61.8±21.424A |

Mean / Hybrids Colony Italian 64.0±1.973A Carniolan 56.2±2.147B

Mean in each factor designated by the same letter are not significantly different at 5 % level using Duncan's Multiple Range Test.

The results concluded that, the Italian hybrid has acceptance mean more than the Carniolan with significant differences between them. As the middle bar showed the highest acceptance mean with significant differences between it and upper bar and non- significant differences between middle and lower bars. Moreover, the second year showed the highest acceptance mean with significant differences between first and second years. Many researchers had discussed these findings , ex. Sharaf El-Din *et al.* ,2000; Osipitan *et al.* ,2012 and Shah ,2000.

**2. The royal jelly quantity:**

Data in Table (2) showed the royal jelly quantity mean (mg/cups) from bar's level in Italian and Carniolan hybrids rearing colony under queenright and queenless colonies. At the first year, the highest royal jelly quantity means were (152.8 and 152) recorded in the Italian and Carniolan hybrids colonies

with lower bar's level respectively. while the lowest royal jelly quantity means were (128 and 134.5) recorded in the Carniolan and Italian hybrids colonies with upper bar's level respectively. At the second year, the highest royal jelly quantity means were (157.4 and 151) recorded in the Carniolan and Italian hybrids colonies with lower bar's level respectively. while the lowest royal jelly quantity means were (143 and 146.9) recorded in the Italian and Carniolan hybrids colonies with upper bar's level respectively.

The following conclusions can be drawn; the Carniolan hybrid has royal jelly quantity means more than the Italian with non-significant differences between them. As the lower bar showed the highest royal jelly quantity means with non-significant differences between treatments. Additionally, the second year showed the highest royal jelly quantity means with significant differences

between first and second years. Many researchers had discussed these findings and found that, there are several factors affecting royal jelly production (Pahinler, 2005 and Sharaf El-Din, 2010). The most important of them are the age of transferred larvae (Sahinler and KaftanoŪlu, 1997), feeding (Fuhai *et al.*, 1993), number of transferred queen

cell cups (Pahinler and Pahinler, 2002), harvesting interval (Ali, 1994 and Sharaf El-Din, 2010), whether the colony is queenless or queenright (Van-Toor and Littlejohn, 1994), age of nurse workers (Ali, 1994) and bee race (Shibi *et al.*, 1993 and Lian-Fei *et al.*, 2016).

**Table (2): Royal jelly quantity mean (mg/cups) from bar level in Italian and Carniolan hybrids rearing colony under queenright and queenless colonies.**

| Bar Level | First Year |           |                    | Second Year |           |                    |
|-----------|------------|-----------|--------------------|-------------|-----------|--------------------|
|           | Hybrids    |           | Mean $\pm$ S.E     | Hybrids     |           | Mean $\pm$ S.E     |
|           | Italian    | Carniolan |                    | Italian     | Carniolan |                    |
| Upper     | 134.5      | 128       | 131.3 $\pm$ 4.233  | 143         | 146.9     | 146.0 $\pm$ 4.705  |
| Middle    | 149.9      | 151.5     | 150.7 $\pm$ 2.176  | 149.9       | 153       | 151.4 $\pm$ 3.143  |
| Lower     | 152.8      | 152       | 152.4 $\pm$ 3.585  | 151         | 157.4     | 154.2 $\pm$ 3.646  |
| Mean      | 145.7      | 143.8     | 144.8 $\pm$ 5.007B | 148         | 152.4     | 150.2 $\pm$ 2.832A |

Mean / Hybrids Colony

Italian 146.8 $\pm$ 3.408A

Carniolan 148.1 $\pm$ 4.966A

Mean in each factor designated by the same letter are not significantly different at 5 % level using Duncan's Multiple Range Test.

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