

## Genetics of Ovariole Number in Hybrid Queenbees (*Apis mellifera* L.) *Carnica* X *Fasciata* and *Ligustica* X *Fasciata*<sup>1</sup>

M. A. EL-BANBY AND S. M. ABOU-KORAH<sup>2</sup>

### ABSTRACT

The F<sub>1</sub> queenbees had fewer ovarioles than the maternal varieties: *carnica* and *ligustica*. The deterioration was significant (7.5%) in the F<sub>1</sub> *Carnica* and slight (2.5%) in the F<sub>1</sub> *Ligustica*. A hybrid vigour was noticed in both crosses as compared with the means of both maternal and paternal races. The heterosis percentage was 4.1% in the Carniolan hybrid and 11.9% in the Italian hybrid.

### INTRODUCTION

The production of a colony of bees depends, to a great extent, upon its numerical strength, and this condition requires a high egg-laying rate by the queen for several weeks or months at a time. The factors which govern the ability of a queenbee to lay a large number of eggs are not well understood, but in the absence of information to the contrary, it may be assumed to depend upon the physiological condition of the queen, the size of her ovaries, her mating and certain inherited characteristics (1,2,5).

The senior author found out that the brood rearing activity of the Egyptian race (*Fasciata*) is very low due to the small numbers of ovarioles in the queen's ovaries (3). From his investigations (4) on the three standard races; Caucasian, Carniolan and Italian, he noticed a distinct relation between the brood rearing activity of the race and the number of its queens' ovarioles; as the Caucasian is the most inferior and the Italian is the most superior in both characters.

The present studies were carried out to investigate the mode of inheritance of ovariole numbers in queenbees of Carniolan (*carnica*) and Italian (*ligustica*) races when crossed with Egyptian (*fasciata*) race to help in predicting the egg-laying capacity of the queenbees of F<sub>1</sub> and F<sub>2</sub> colonies in Egypt.

<sup>1</sup> This study was conducted in the Faculty of Agriculture, Shebin-el-Kom, Egypt.

<sup>2</sup> Professor of Entomology, Faculty of Agriculture, University of Tripoli, Libyan Arab Republic, and Assistant Lecturer, Faculty of Agriculture, Shebin-el-Kom, Arab Republic of Egypt, respectively.

## MATERIALS AND METHODS

The pure Carniolan and Italian honeybee races used in these studies were brought from strains kept for several years in isolated or semi-isolated districts in Egypt. Queens were reared from these two strains and mated in an Egyptian native apiary as far as possible from imported bees to produce  $F_1$  Carniolan and  $F_1$  Italian colonies. From the same apiary three colonies were brought as a sample from the paternal race.

Queenbees were naturally reared from the three pure races and their two  $F_1$ 's under similar conditions. Samples of 10 queens from each group were dissected and their ovaries were kept in Bouin's solution for approximately ten minutes, to let the ovarioles harden sufficiently to permit their separation without tearing or breaking.

The numbers of ovarioles were counted under a dissecting microscope. To facilitate the count, the terminal third of each ovary was cut off and the ovary divided longitudinally as the count progressed into ten to fifteen parts.

## RESULTS AND CONCLUSIONS

The ovariole numbers of the Ligustica queenbees were insignificantly more than those of the Carnica. They averaged  $264.3 \pm 11.9$  and  $252.7 \pm 11.23$ , respectively. Queens of both races significantly surpassed those of the variety *fasciata* which averaged  $197.3 \pm 8.82$  ovarioles. When the queenbees of varieties *carnica* and *ligustica* had been mated to *fasciata* drones, the  $F_1$  queens had fewer numbers of ovarioles than those of the maternal variety. The deterioration was significant only in the  $F_1$  Carniolans (7.5%) while it was slight (2.5%) in the  $F_1$  Italians.

The  $F_1$  Carnica queens which averaged  $233.7 \pm 13.13$  ovarioles significantly sur-

Table 1 Number of ovarioles in the queen honeybee

a) Analysis of variance:

| Source of variance | D.F. | S.S.  | M.S. | F                  |
|--------------------|------|-------|------|--------------------|
| Replicates         | 9    | 4857  | 540  | 2.07               |
| Bee groups         | 4    | 29216 | 7304 | 27.98 <sup>a</sup> |
| Error              | 36   | 9391  | 261  |                    |

L.S.D. (5%) = 14.6769

b) Comparisons by L.S.D. test:

| Races and crosses           | Means              |
|-----------------------------|--------------------|
| Fasciata                    | 197.3 <sup>a</sup> |
| Carnica $\times$ Fasciata   | 233.7 <sup>a</sup> |
| Carnica                     | 252.7              |
| Ligustica $\times$ Fasciata | 257.7              |
| Ligustica                   | 264.3              |

<sup>a</sup>Significantly less (at 5% level) than the following means.

passed the paternal race *fasciata* but was significantly inferior to the pure varieties *carnica* and *ligustica* and the  $F_1$  *Ligustica* too.

The  $F_1$  *Ligustica* queens averaged  $257.7 \pm 9.31$  ovarioles; significantly more than those of the race *Fasciata* and the  $F_1$  *Carnica*, but their difference from both pure *Carnica* and pure *Ligustica* were insignificant.

However, when the ovariole numbers of the hybrid queenbees were compared with the means of both maternal and paternal races together, a slight hybrid vigour (4.1%) was noticed in the  $F_1$  *Carnica* and a higher hybrid vigour (11.9%) was noticed in the  $F_1$  *Ligustica*.

### LITERATURE CITED

1. Eckert, J. E. 1934. Studies in the number of ovarioles in queen honeybees in relation to body size. *Journal of Economic Entomology* 27 (3):632-633.
2. Eckert, J. E. 1937. Relation of size to fecundity of queen honeybees. *Journal of Economic Entomology* 30(4):647.
3. El-Banby, M. A. 1954. The biology and behaviour of the Egyptian honeybee, *Apis fasciata*, Later M.Sc. Thesis, Ain-Shams University, Cairo, Egypt.
4. El-Banby, M. A. 1958. Studies on different races of the honeybees *Apis mellifera* L. Ph.D. Thesis, Ain-Shams University, Cairo, Egypt.
5. Farrar, C. L. 1960. Genetic control of size in queen honeybees. *Bee World* 41:191.

## وراثة عدد فريعات المبيض في هجن ملكات النحل الكرنيولى مع المصرى والايطالى مع المصرى

محمد على البنى - سعيد محمد أبو قوره

### المستخلص

نظراً لانتشار خلايا النحل البلدية التي تربي فيها سلالة النحل المصرى في معظم أنحاء جمهورية مصر العربية فان ملكات النحل الكرنيولية والايطالية التي يربيهها معظم النحالين لزيادة محصولهم من العسل تتعرض للتهجين مع السلالة المصرية ، وحيث أن انتاجية طائفة النحل تعتمد الى حد كبير على قوتها العددية التي هي بالتالى تتوقف على قدرة الملكة على وضع البيض ، فقد أجريت هذه الدراسة لتقدير عدد فريعات المبيض في كل من ملكات النحل الكرنيولية والايطالية والمصرية والملكات الناتجة من تهجين السلالتين الاولتين مع السلالة الأخيرة لاعطاء فكرة عن طريقة توارث هذه الصفة ، لكي تساعد في التنبؤ بمستوي كفاءة الملكات المرباة محلياً في وضع البيض .

وظهر من هذه الدراسة أن فريعات المبيض في ملكات الجيل الأول أقل عددا مما في سلالتى الأمهات الكرنولية والايطالية ، بسبب قلة فريعات مبيض السلالة المصرية ، وكان التدهور مؤكداً ومقداره  $\frac{1}{3} \times 7\%$  في هجين الكرنولى ، وبسيطا ومقداره  $\frac{1}{3} \times 2\%$  في هجين الايطالى ، ولكن عند مقارنة الهجن مع متوسط أبويها لوحظت قوة هجن مقدارها  $1\%$  في هجين الكرنولى و  $11\%$  في هجين الايطالى .