Genetics of Ovariole Number in Hybrid Queenbees (Apis mellifera L.) Carnica X Fasciata and Ligustica X Fasciata[1]

M. A. EL-BANBY AND S. M. ABOU-KORAH[2]

ABSTRACT

The F_1 queenbees had fewer ovarioles than the maternal varieties: *carnica* and *ligustica*. The deterioration was significant (7.5%) in the F_1 Carnica and slight (2.5%) in the F_1 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_1 and F_2 colonies in Egypt.

[1] *This study was conducted in the Faculty of Agriculture, Shebin-el-Kom, Egypt.*

[2] *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 ± 11.9 and 252.7 ± 11.23, respectively. Queens of both races significantly surpassed those of the variety *fasciata* which averaged 197.3 ± 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 ± 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[a]
Error	36	9391	261	

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

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

Races and crosses	Means
Fasciata	197.3[a]
Carnica × Fasciata	233.7[a]
Carnica	252.7
Ligustica × Fasciata	257.7
Ligustica	264.3

[a]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 ± 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

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

محمد على البنبى – سعيد محمد أبو قوره

المستخلص

نظراً لانتشار خلايا النحل البلدية التى تربي فيها سلالة النحل المصرى في معظم انحاء جمهورية مصر العربية فان ملكات النحل الكرنيولية والايطالية التى يربيها معظم النحالين لزيادة محصولهم من العسل تتعرض للتهجين مع السلالة المصرية ، وحيث أن انتاجية طائفة النحل تعتمد الى حد كبير على قوتها العددية التى هى 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 هـذه الدراسة أن فريعات المبيض في ملكات الجيل الأول أقل عـددا ممـا في سلالتى الأمهات الكرنيولية والايطالية ، بسبب قلة فريعات مبايض السلالة المصرية ، وكان التدهور مؤكدا ومقداره ٢/١ ٧ ٪ في هجين الكرنيولى ، وبسيطا ومقداره ٢/١ ٢ ٪ في هجين الايطالى ، ولكن عنـد مقارنة الهجن مع متوسط أبويها لوحظت قوة هجن مقدارها ١ر٤ ٪ في هجين الكرنيولى و ٩ر١١ ٪ في هجين الايطالي .