J. Agric. Sci. Mansoura Univ., 29 (8): 4745 - 4750, 2004

RELATIONSHIP BETWEEN DENSITY OF BRISTLES COVERING THE FOREWING AND THE NUMBER OF OVARIOLES OF HONEYBEE QUEENS

Mazeed, A. M. M.[1] and E. E. Tharwat[2]

[1] **Department of Economic Entomology and Pesticides, Faculty of Agriculture, Cairo University, Giza, Egypt**

[2] **Department of Bee Research, Plant Protection Research Institute, Dokki, Egypt**

ABSTRACT

Three genetical backgrounds of honeybee queens were chosen to establish the relation between number of ovarioles and bristles covering the forewing. For counting the bristles, an vedio camera connected with a binocolar and a monitor were used to display the mounted wing, and with the aid of a lined plastic sheet the count of the bristles on the second discoidal cell was done. The results indicated that the relation between the two parameters in the three groups was linear and negatively correlated with each other. The coefficient of regression was estimated as 0.52, 0.32 and 0.29 for Egyptian, Italian and hybrid bees, respectively. This study may help for detremining the number of ovarioles of honeybee queens without needing for killing and dissected them.

INTRODUCTION

The distinguish between different honeybee races was one of the most interested field used for a long time by many scientists. For this purpose, the external morphological characters were mostly used. Most of these studies were concentrated in using morphometrical characters on honeybee workers.

The morphometrical characters of honeybee queens were also used, although not frequently, for distinguishing between different honeybee races. Klebs (1995) used three parameters of the forewing of the queens for detecting the presence of any hybridization within Carniolian race. Also, Chaud-Netto and Bueno (1979) used the number of queen ovarioles to differentiate three honeybee races. Woyke (1977) used the number of bristles on the queen forewing for distinguishing between different races of honeybee originating from different geographical areas.

The morphometrical characters were also used to make a relationship between other kinds of characters in both honeybee and other insects. Sokal and Hunter (1955) found that, the number of abdominal bristles can be taken as indicator of the resistance status of housefly to DDT. Schluenis *et al* (2003) stated that the sperm numbers in drone honeybees depend on the size of their wings. Souza *et al* (2002), carried out some correlations between some morphological characters of worker honeybees and honey production and established a high significant correlation between honey production and both of tibia length and corbicula size.

More extensive relationship was carried out by Woyke (1987), who used the number of bristles located on a specific area of the forewing as a

More extensive relationship was carried out by Woyke (1987), who used the number of bristles located on a specific area of the forewing as a function for the number of ovarioles of honeybee queens. In this study, the difference in number of ovarioles and the density of bristles covering the forewing of queen honeybees as well as the relationship between these two parameters were studied in three group of honeybee queens, which belong to different bee populations in Egypt.

MATERIALS AND METHODS

Twenty virgin queens were reared artificially from each of Egyptian *(A.m.lamarcki)*, Italian (*Apis mellifera ligustica)* and Carniolian-hybrid colonies and after their emerging they were left 5-6 days in their nursering colonies and then taken to the laboratory.

From each virgin queen, right forewing was pulled by using fine forceps. All 20 wings of each genotype were mounted on three slide glass and numbered from 1 to 20. At the same time, all virgin queens, from which the forewing was pulled out, were put separately in a small tubes numbered from 1 to 20. After that, each virgin queen was dissected and the right ovary was pulled, put on a slide glass and with a drop of distilled water the number of its ovarioles was determined.

For counting the bristles on the forewing, the slide-glasses holding the forewings were put under a binocular and the bristles were counted in the middle of the second discoidal cell on the forewing (Fig. 2). The number of bristles covering an area of 0.8 x 0.5 mm = 0.4 mm^2 on the forewing was counted according to Woyke (1977). For this purpose, the following equipments were used (Fig.1):

1. Binocular,
2. Video camera,
3. Monitor

By using an ocular micrometer scaled by 0.1 mm and a suitable magnification (100x), the size of the selected area on the discoidal cell was calibrated by adjusting it with the magnification used by putting the ocular micrometer under the binocular field, and after displaying it on the monitor the scales of ocular lens was drawn horizontally (0.8 mm) and vertically (0.5 mm) making an rectangular shape on a transparent plastic sheet clipped on the monitor face. The slide-glass holding the wings were then put under the binocular field and then the video camera displayed the image on the monitor using the previous magnification (100x). The number of bristles on the surface of the big discoidal cell was then counted on the displayed wing.

The resulted measurements of both ovarioles and bristles number were statistically analyzed using regression analysis to determine the relationship between the two parameters. The analysis was carried out by using Almo-statistic-package system developed by Holm (1997).

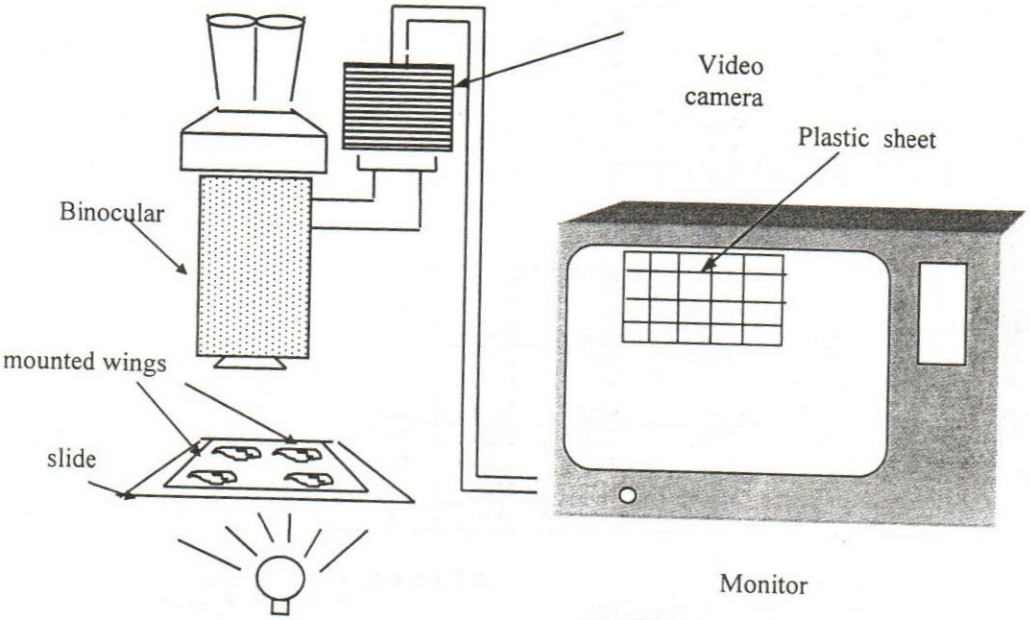

Figure (1): The equipments used for counting the bristles on the forewing

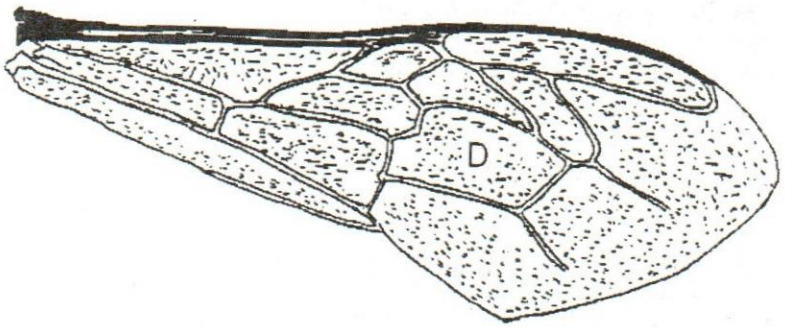

Figure (2): The second discoidal cell (D) of the forewing.

RESULTS AND DISCUSSION

the effect of number of bristles as independent parameter on the number of ovarioles as dependent parameter is shown in figure (3)
The relationship in three groups were established by the following formula :

Y= - 0.52X + 218.47	For Egyptian bees
Y= - 0.32X + 219.47	For Italian bees
Y= - 0.29X + 179.26	For Hybrid bees

Where: --
Y = number of ovarioles, and X = number of bristles.

For the three regression equations, the regression coefficients were significantly deviant from zero in the negative direction ($p < 0.05$).The results indicate that for every increasing of ten bristles, the number of ovarioles would decrease by 5.2 , 3.2 and 2.9 ovarioles, in Egyptian, Italian and hybrid bees, respectively.

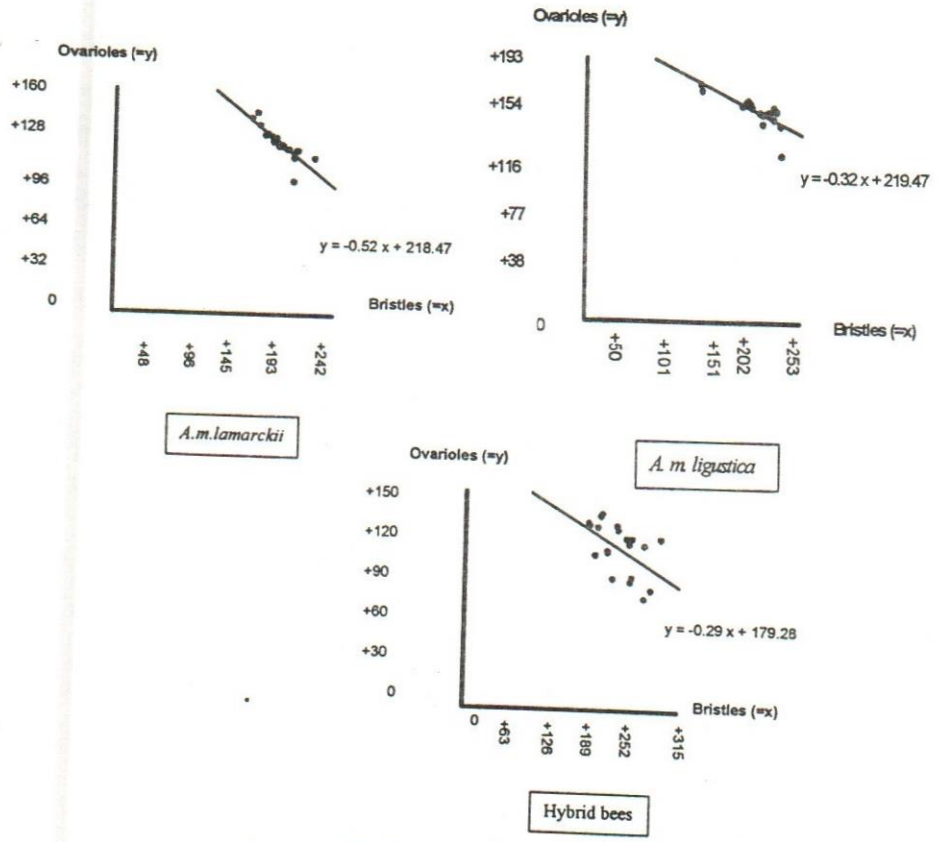

Figure (3): Regression of the three groups

The coefficient of determination was calculated for the three equations. The results indicated that 26.85%, 59,88% and 71.66% of the variation of the number of ovarioles can be explained by the variation of the number of bristles in hybrid, Italian and Egyptian bees, respectively.

For testing the homogeneity of the slopes of the three regression lines, the method of Sokal and Rohlf (1995) was applied. The results indicated that three slopes originated from a common population, and can be expressed by a common slope as follows:

$Y = -0.34X + 199.13$ For the three groups

The result of this study is not coinciding with the those of Woyke (1987), who found a positive relationship between both parameters. The difference in the relationship between this work and Woyke may be attributed to the different experimental design being used in his study. He carried out the regression among groups of queens reared from different larval ages, and hence the amount of food taken by queens larvae my represent a common cause between these parameters (Sokal and Rohlf, 1995), and may be responsible for the appearing of a positive relationship in his work. The positive correlation in his results or at least some of it may due to general size, that is, bigger queens will have big organs. The big wing of a queen has a high number of bristles and a big ovary has a high number of ovarioles as resulted in his work. This would be analogous with the situation when comparing the number of bristles between worker and queen honeybees (Woyke, 1977). This common factor may hide the direct effect of the number of bristles on the number of ovarioles, which appear negative in this study.

From this study it could be concluded that, the number of ovarioles in the ovary can be estimated by using previous formula while the queens are alive, without needing for killing and dissecting them.

REFERENCES

Chaud-Netto, J. and Bueno, O. C. (1979): Number of ovarioles in workers of *Apis mellifera adansonii* and *Apis mellifera ligustica*: A comparative study. *J. Apic. Res.*, 18 (4): 260-263.

Holm, K. (1997): Almo-Statistik-System, Univ. Linz, Austria.

Klebs (1995): Rasseneinheit–Bestimmung von Carnicaherkuenften anhand morphometrischer Untersuchungen an Koeniginnenfluegeln. *Scheiz. Bienen-Zeitung,* 118(12), 699-703.

Schluens H., Schluens, E. A. , Praagh, J and Moritz, R. F. (2003): Sperm numbers in drone honeybees depend on body size. *Apidologie*, 34: 577-584.

Sokal, R. R. and Hunter P. E. (1955): A morphometric analysis of DDT-resistant and nonresistant housefly strains. *Ann. Entomol. Soc. Amer.* 48: 499-507.

Sokal, R.R.; Rohlf, F.J. (1995): Biometry. W.H.Freeman and Company, New York.

Souza, D.C. Cruz, C.D., Campos, L. A and Regazzi A. J. (2002): Correlation between honey production and some morphological traits in Africanized honey bees (*Apis mellifera*). Ciencia Pural, 32(5): 869-872.

Woyke J. (1977): The density of bristles covering the wings as discrimination value between African and other races of honeybee. In *African bees: Taxonomy, Biology and Economic Use (Fletcher DJC, ed) Apimondia,* Pretoria, 15-24.

Woyke J. (1987): Can the number of ovarioles of honeybee queens be estimated by external characters of living queens?. *Proc. Apimondia Symp.* Poland, 152-155.

العلاقة بين عدد فروع المبيض والشعيرات المغطاة للجناح الأمامى لملكات نحل العسل

عادل محمود محمد مزيد[1] و عماد عز الدين ثروت[2]

[1]قسم الحشرات الاقتصادية والمبيدات-كلية الزراعة-جامعة القاهرة-مصر

قسم بحوث النحل-معهد بحوث وقاية النبات- وزارة الزراعة-مصر [2]

فى هذا البحث تم دراسة العلاقة بين عدد فروع المبيض والشعيرات المغطاة للجناح الأمامى لملكات نحل العسل تنتمى لمصادر وراثية مختلفة. بالنسبة لعملية عد الشعيرات فقد تم استخدام كاميرا فيديو متصلة بمجهر وشاشة تلفزيون وذلك كوسيلة لعرض الجناح، وباستخدام رقيقة من البلاستيك مقسمة تم عد الشعيرات الموجودة داخل خلية محددة من خلايا الجناح الأمامى وذلك على سطح شاشة التلفزيون. هذا وقد أظهرت النتائج وجود علاقة خطية سالبة بين هاتين الصفتين فى كل من المجاميع الوراثية تحت الدراسة. وعلى ذلك يمكن استنتاج امكانية معرفة عدد فروع المبيض لمجموعة من الملكات بمعلومية عدد الشعيرات فى هذه المنطقة على الجناح الأمامى دون الحاجة لقتل وتشريح هذه الملكات.