CHANGES IN WING MORPHOLOGY AS AN INDICATOR OF INBREEDING IN HONEY BEES

Dariusz Gerula, Paweł Węgrzynowicz, Beata Panasiuk, Małgorzata Bieńkowska
Research Institute of Horticulture, Apicultural Division, ul. Kazimierska 2, 24-100 Puławy, Poland
e-mail: dariusz.gerula@inhort.pl

Introduction

The classification of honeybee subspecies is performed by examining some of the morphometric traits typical for the subspecies. It is noted that the morphometric characteristics change in the population even when the controlled selection within subspecies is done.

The aim of the study was to verify whether inbreeding honeybee influences some of morphometric characteristics of bee workers.

Material and methods

Three morphometric traits were studied: width of fourth tergit, length of proboscis and cubital index (Fig. 1). Two sub-populations of Carniolan bees originating from one queen (P) were compared. In each population two generations of queens were reared. In one population, queens of successive generation were mated with closely related drones (inbred). Brother-sister mating system was used (high inbred population, HIP). The second population (control) was related to the first population only by the founder's queen. The queens of the successive generations were mated with unrelated drones (low inbred population, LIP).

Figure 1. Wing and body features: the width of the fourth tergit, the length of proboscis and the cubital index (in Alpatov notation a/b x 100).

Results

The width of the fourth tergit of honeybee, showing the size of bees, in the population (HIP) did not change significantly in subsequent generations as compared to bees originating from queen (P), and to control group (LIP) (Fig. 2). The length of proboscis of bees from the inbred population (HIP) increased significantly in the F2 generation as compared to the generation P and F1, but did not differ significantly from the population (LIP) (Fig. 3). The greatest effects were observed for the trait related with the wing venation. The cubital index (In Alpatov notation) in the experimental population (HIP) significantly decreased, from 46.1% in the generation P to 38.9% in the generation F2. While in the control population, the cubital index (LIP) was 48.7% (Fig. 4).

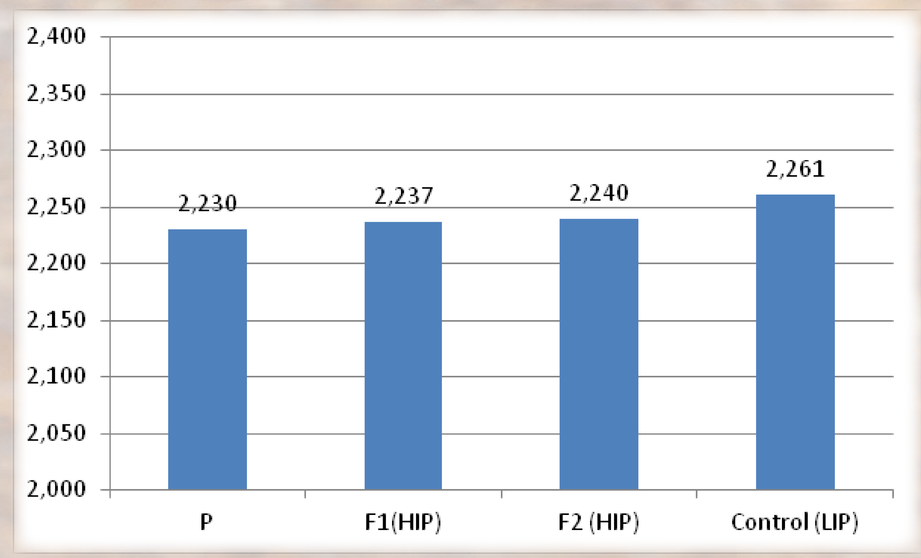

Figure 2. The average width of fourth tergit of Carniolan bees (mm) originaiting from founders queen (P), high inbred population (HIP) and low inbred population, both generation together (LIP).

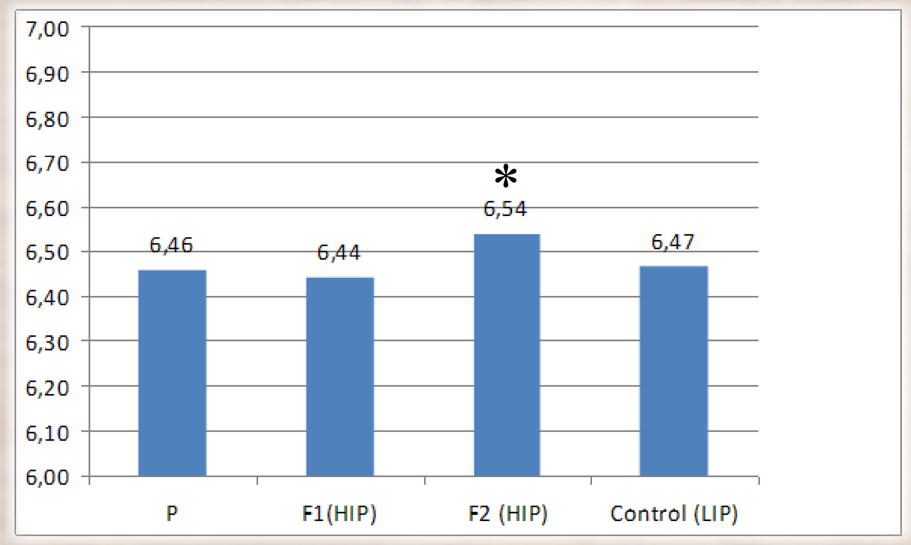

Figure 3. The average length of proboscis of Carniolan bees (mm) originaiting from founders queen (P), high inbred population (HIP) and low inbred population, both generation together (LIP).
*Significant differences at p<0.05

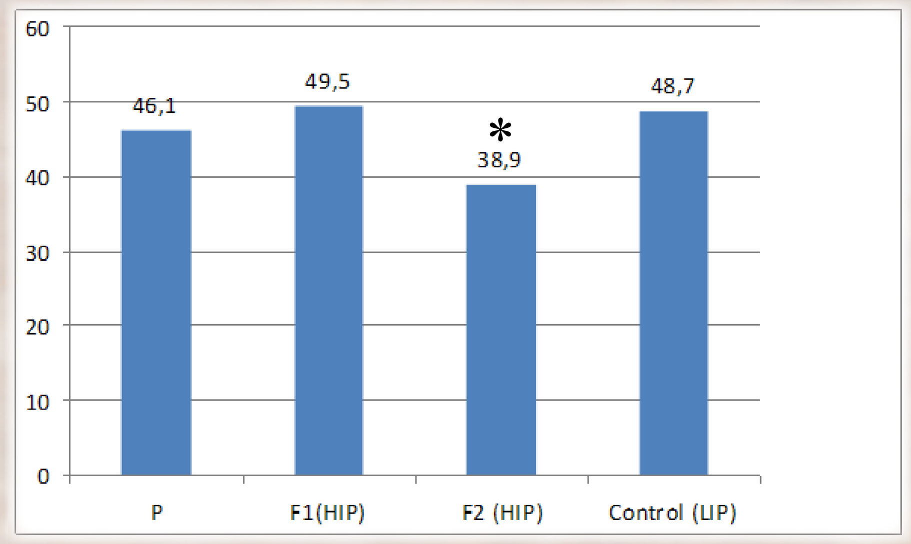

Figure 4. The average cubital index of Carniolan bees (%) originaiting from founders queen (P), high inbred population (HIP) and low inbred population, both generation together (LIP).
*Significant differences at p<0.01

Summary

In the populations of bees that were mated inbred in two generations, some morphometric characteristics that are used for subspecies classification have changed. The lowest changes were observed in the width of fourth tergite. Significant changes were observed in the length of proboscis and the third submarginal cell wing venation which is used for cubital index characterization. The changes in cubital index caused some problems in subspecies classification, while the other characteristics changes were typical within the range.

The study was financed from the Longterm Programme of The Research Institute of Horticulture, task 6.4.