SIMILARITY OF POLISH LINES OF BEES BASED ON THE MORPHOLOGICAL FEATURES

Dariusz Gerula1, Paweł Węgrzynowicz[1], Adam Tofilski[2]
[1]Research Institute of Pomology and Floriculture, Apiculture Division in Pulawy, Kazimierska 2, 24-100 Pulawy. Poland
[2]Bee Research Department, Agricultural University, 29 Listopada 52, 31-425 Krakow. Poland

INTRODUCTION

There were 45 registered breeding lines of bees in 2008 and they belonged to three races: *Apis mellifera carnica*-33, *A. m. caucasica*-8, *A. m. mellifera*-4. Only 15% of them originated from Polish geographical area, other ones were imported. Large-scale import of bees began in the 60's. Imported bees were placed in several large state breeding apiaries and then to smaller apiaries and to individual beekeepers. Many of currently maintained bee lines have common ancestors. The objective of the study was to assess the diversity of bees bred in Poland on the basis of morphological features measured on the body and on the wing of bee workers.

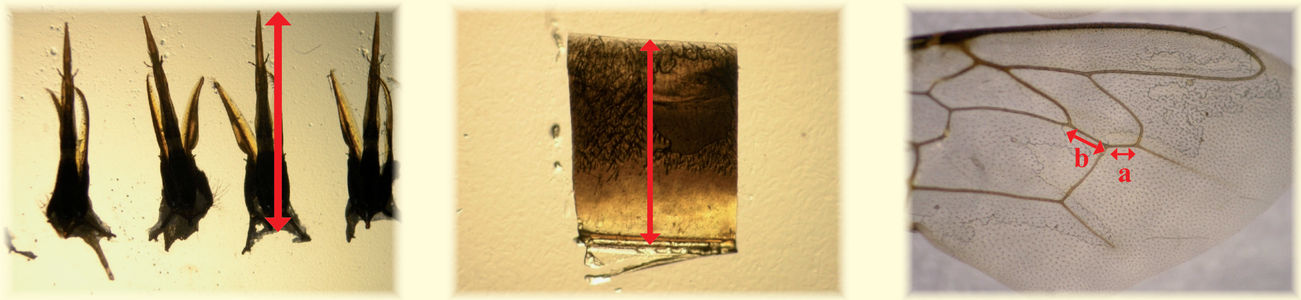

Figure 1. Body & wing features: the cubital index (in Alpatov notation), the width of the fourth tergit and the length of the proboscis used for assessment of similarity of bees

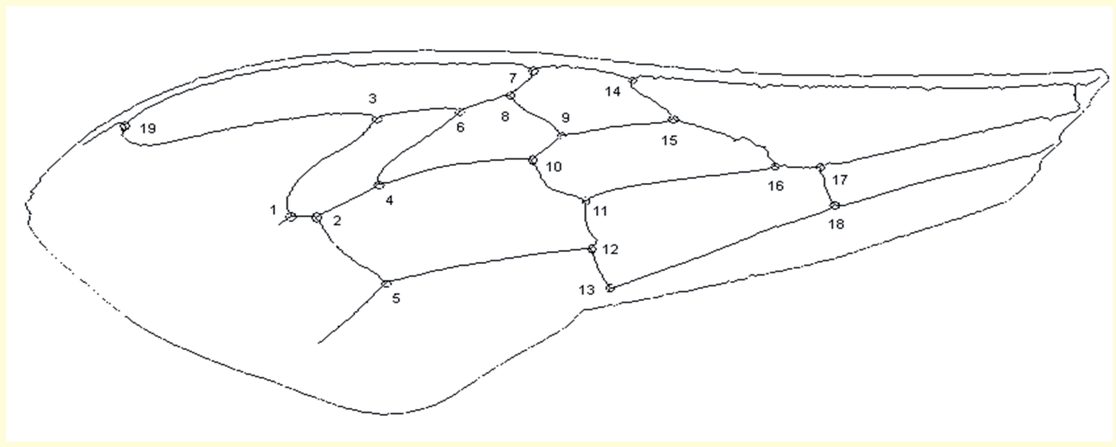

Figure 2. Wing features: system of veins and wing size used for assessment of similarity of bees

METHODS

Samples of bees for morphometric measurements (20 bee workers from each colony) were taken from 952 colonies of all breeding lines (45). Following characteristics were measured: cubital index (in Alpatov notation), the width of the fourth tergit and the length of the proboscis (body & wing features) (Fig. 1) as well as the coordinates of the junctions of veins on the wing and the size of the wing (wing features). In every wing image the coordinates of 19 vein junctions (Fig. 2) were determined automatically using DrawWing software (Tofilski, 2004). Results of these measurements were subjected to the cluster analysis with Ward's method of agglomeration rule. Bee lines were then grouped in accordance with similarity of morphometric characteristics. The first analysis was based on body & wing features (3 variables), the other one used wing features (39 variables).

RESULTS

Both hierarchical tree diagrams showed three different groups according to the bee race, declared by the breeder. In hierarchical tree diagram based on three variables (Fig. 3), only two bee lines did not fit its race group. Euclidean distances were low within the lines of native Black and lines of Carniolan bees and also for several breeding lines of one bee race kept in individual breeding apiary. Hierarchical cluster tree based on wing features showed that 6 bee lines did not fit the group of declared race (Fig.4). It can be explained by the fact that the only cubital veins (two measured distances) of the wing had been used in the selection and the cubital index is not always correlated to the remaining points on the wing, which are characteristic for given bee race.

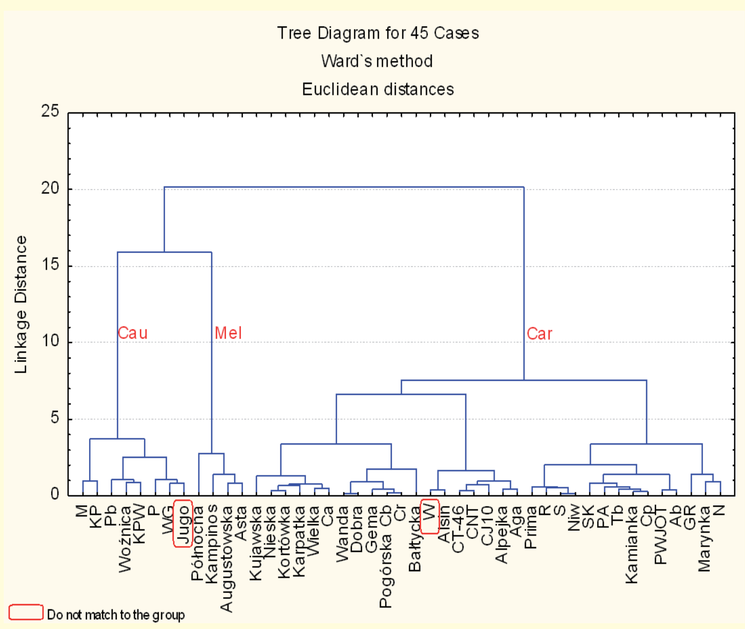

Figure 3. Tree diagram based on three variables: cubital index (in Alpatov notation), the width of the fourth tergit and the length of the proboscis (body & wing features).

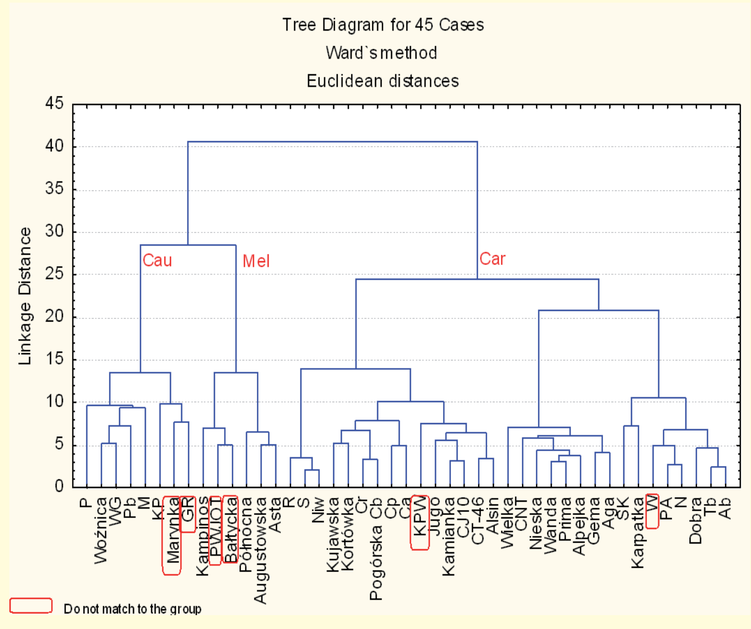

Figure 4. Tree diagram based on 39 variables of wing (wing features).

REFERENCES

Tofilski A. (2004) - DrawWing, a program for numeral description of insect wings. *J. Insect Sci.* 4:1-5.