

# VETERINARY SCIENCES

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## MORPHOLOGICAL ANALYSIS OF HONEY BEES AND THEIR INFLUENCE ON THE COLONY POPULATION

**Lishchuk Svitlana Georgiivna,**  
Ph. D. in Agriculture, assistant  
**Savchuk Lyubov Bronislavivna,**  
Ph. D. in Agriculture, docent  
State University in Podilya  
Kamianets-Podilskyi, Ukraine

**Abstract:** The article presents the results of the analysis of data from the morphological study of working individuals of different breeds of honey bees. It was found that both breeds are characterized by intrabreed morphological heterogeneity of the complex of exterior features according to the main morphometric parameters - various wing indices, in particular cubital and tarsal indices.

**Key words:** *Apis mellifera* L., honey bees, morphology, population.

Beekeeping is one of the oldest branches of agriculture in Ukraine. Information about bee breeding in the territory of modern Ukraine can be found since the time of the Kiev principality. Over a century of development, this industry has become not only an important sector of the economy, but also an integral part of Ukrainian culture and traditions.

In the Podilsky region, in accordance with the natural, climatic and honey collection conditions of Ukraine, the two most common species of bees were formed and became widely distributed: the Ukrainian steppe bee (*Apis mellifera sossimai*) and the Carpathian bee (*Apis mellifera carpatica*) [1, p. 247].

It is worth noting that local bees branched out into many local populations with

unique characteristics over a long period of time. Therefore, there is a need to study the morphological characteristics of local bee populations located in different regions of Podilliya, genotypic differences between populations, population sizes and boundaries, patterns of their spatial divergence.

The research material was a sample of working individuals of *A. mellifera* of the autumn generation, the Ukrainian steppe bee and the Carpathian bee. The volume was 840 bees from 14 bee families of three districts of the forest-steppe and steppe honey collection zones (Kamianets-Podilska, Dunayevetska and Novoushytska united territorial communities) taking into account the internal features, which were located in different natural and climatic zones of the region. Bees were selected from healthy colonies (without clinical signs of infectious diseases) located in Khmelnytskyi region (hybrids between Carpathian, Ukrainian steppe and Caucasian breeds). The selection was carried out three times: in October, November and December, 20 individuals from each family.

The morphology of worker bees was assessed according to the generally accepted method [2, p. 37]. Also, two insect wing indices were additionally investigated: the cubital index, or wing index, and the tarsal index. The results of the morphometric study were compared with the averaged external features of workers of different breeds of bees.

Morphological features were measured using a Biolam light microscope at 900x magnification (eyepiece 10×, objective 90×). Linear measurements were converted into millimeters by dividing the readings of the eyepiece-micrometer by the price of the division of the lens-micrometer [3, p. 172]. Statistical processing of data was carried out by the method of variational statistics, using computer technology in Microsoft Office Excel, 2010 with the calculation of the arithmetic mean value ( $M$ ) of the error of the mean arithmetic value ( $\pm m$ ) [4, p. 74]

The results of the morphometric study of the exterior features of workers of the studied bee breeds are shown in the table. 1

**Table 1**

**Morphometric indicators of working individuals  
of different breeds of bees**

Indexes	Breeds of bees	
	Ukrainian steppe bee ( <i>Apis mellifera sossimai</i> ) <b>6,3-6,7,</b> <b>M±m</b>	Carpathian bee ( <i>Apis mellifera carpatica</i> ), <b>M±m</b>
Proboscis length, mm	6,47±0,02	6,52±0,05
The length of the front wing, mm	9,24±0,06	9,31±0,02
Front wing width, mm	3,17±0,08	3,20 ±0,07
Length of the third tergite, mm	2,29±0,03	2,31±0,04
Length of the fourth tergite, mm	2,41±0,02	2,45±0,01
Length of the 1st joint of the right hind leg, mm	4,23±0,06	4,30±0,11
Width of the 1st joint of the right hind leg, mm	2,28±0,04	2,31±0,02

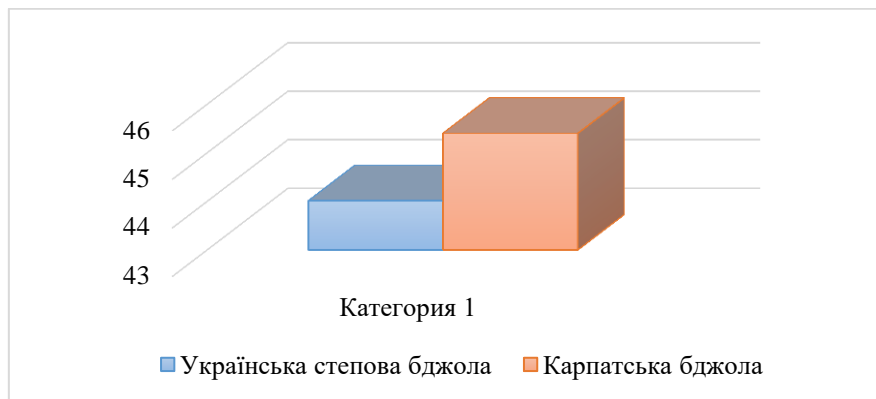
The width and length of the wings do not clearly show the differences between the studied breeds of bees, but they are important in selection and to some extent characterize the honey-gathering ability of bees. The length of the proboscis in all studied individuals met the standards of the breed and was slightly larger (by  $0.5\pm 0.05$ ) in representatives of *Apis mellifera carpatica*. Data on the length of the right front wing of workers also indicate the superiority of the latter. A similar situation is observed in terms of the width of the front wing. As can be seen from the data in Table 1, the studied feature in all bees does not exceed the relevant standard (3.17-3.20 mm).

As a result of the data we obtained, it was established that the length and width of the 1st segment of the right hind leg were larger in individuals of the Ukrainian steppe bee by  $0.07\pm 0.06$  and  $0.04\pm 0.06$  mm.

In a number of studies of the morphometric parameters of honey bees, the informativeness of various wing indices, including the cubital and dumbbell indices, discoidal displacement is evaluated. It is noted that the diagnostic value of individual

morphometric indicators of the wing needs to be revised. However, the high informativeness of individual morphometric indicators is indicated only with their complex use [5, p. 53].

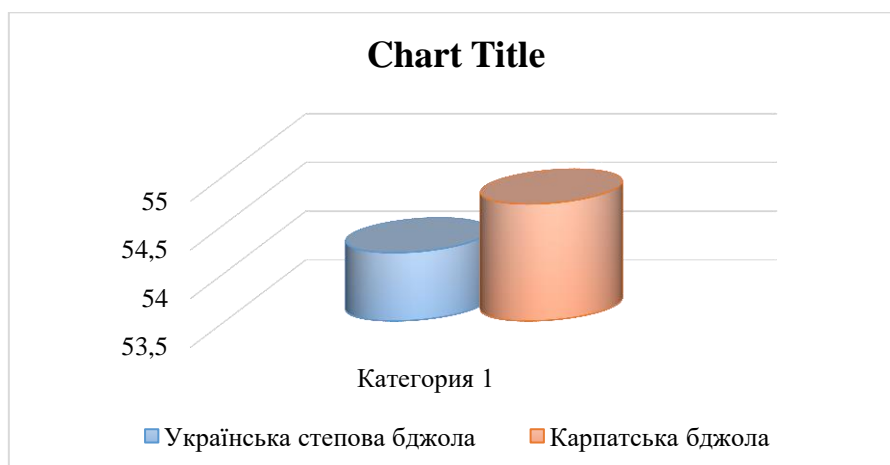
The cubital index is most often used to analyze the purebredness of bees (Fig. 1). This sign is practically not amenable to seasonal changes and is weakly correlated with other exterior signs [5, p. 68].



**Fig. 1. Cubital index of purebred bees**

The cubital index in both breeds was within the breed standard and was 44.1% in bees of the Ukrainian steppe breed and 45.4% in individuals of the Carpathian bee.

The tarsal index (Fig. 2), which indicates the broad-footedness of bees and is determined by the ratio of the width of the first segment of the right hind leg to its length, was 0.5% greater in *Apis mellifera carpatica* worker bees.



**Fig. 2. Tarsal index of studied insects**

The presented data of the morphometric study of the exterior features of the

working individuals of the studied bees show that intrabreed morphological heterogeneity of the complex of exterior features is characteristic of both breeds. The results of the conducted research supplement the scientific information on the biological characteristics of Ukrainian bees and contribute to the revival and preservation of the productive qualities of the species *Apis mellifera* L. In the conditions of the Podilskiy region.

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