

## RESEARCHES REGARDING THE MORPHOMETRICAL CHARACTERIZATION OF THE BEE POPULATIONS FROM BANAT AREA

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### Abstract

The study was carried out on 160 working bees, belonging to the *Apis mellifera carpatica* breed, taken from 4 apiaries from Timiș County (BUASMVT apiary), 2 apiaries from Caraș-Severin County (Secu, Reșița) and one apiary from Arad County. The measurements were performed at the Department for Apiculture and Sericulture in the period 15.05.2017 – 15.06.2017, with the help of the stereomicroscope with digital camera. The bees are characterized by the following morphological indices: proboscis length ranges between 5.862 mm and 6.580 mm, the anterior wing length ranges between the limits 8.5875-9.1075 mm, and the width of the anterior wing is 2.650-3.0550; the length of the posterior wing is between 6.0650 mm and 6.3450 mm, and the width of the posterior wing is 1.7175 mm – 2.00 mm. The femur length is comprised within 2.99 mm and 3.40 mm; shin length is 2.14 - 2.81 mm, and the width is 0.7225 – 0.810 mm. Metatarsal length is 1.6950 mm - 2.0950 mm, and the width is 0.7375 - 0.91 mm. Tarsus length, in the bees taken from the 4 apiaries, was comprised within 1.52 mm and 1.77 mm.

**Key words:** morphometrical characterization; bee population; Banat area

### INTRODUCTION

Of the Iranian-Mediterranean group, *Apis mellifera carpatica* lives on the territory of Romania. This autochthonous bee has got adapted to the conditions specific to temperate-continental climate from the Carpathian-Danube region, becoming a distinct breed [4]. The morpho-metric measurements represent an important element of bee selection programmes [1]. The size measurements are correlated to each other, and it is recommended to carry out several body measurements to obtain an accurate population characterization [3]. In the case of the morpho-metric measurements on bees, the proboscis, wings and legs represent the body regions that provide the most information regarding the population characterization and geographic variability [2, 5]. During the last decades, as a result of the pasture apiculture practised by most beekeepers, the bees belonging to the *Apis*

*mellifera carpatica* breed showed a mixing tendency of the morpho-metric characters of the autochthonous ecotype- bees.

### MATERIAL AND METHOD

The biological material was represented by 160 *Apis mellifera carpatica* worker bees. The samples were taken from four apiaries from different counties – Timiș County (BUASVMT Apiary), two apiaries from Caraș-Severin County (Secu and Reșița) and an apiary from Arad County. The measurements were carried out at the Department of Apiculture and Sericulture between 15<sup>th</sup> May 2017 and 15<sup>th</sup> June 2017.

The bee samples submitted to morpho-metric examination were taken from beehives in the same period, from frames with honey. After sampling, the bees were introduced in alcohol until the detachment of the respective anatomic segments: proboscis, anterior wing, posterior wing and posterior leg; after this, they were fixed on plate.

The measurements were performed according to the Alpatov and Goetze method, with the stereomicroscope with camera,

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available at the Department of Apiculture, and the statistical data processing was carried out with the Minitab 17 software.

## RESULTS AND DISCUSSIONS

In the Laboratory of Apiculture, we carried out the following measurements: proboscis length; anterior wing length; anterior wing width; posterior wing length; posterior wing width; femur length; shin

length; shin width; metatarsus length; metatarsus width; tarsus length.

Table 1 reveals the results of measurements on proboscis length. These had values of 5.862 mm – 6.580 mm, the biggest ones being recorded in the case of the bees from the apiary Secu. Statistically significant differences were observed between the bees from the apiaries from Caraş-Severin County and the ones from the apiaries from Timiş and Arad counties.

Table 1 Results of measurements on the proboscis length character of the worker bees from the apiaries studied

No.	Experimental variants	n	Statistical indexes		
			$\bar{x} \pm S\bar{x}$	s	C.V. (%)
1	BUASVMT - Timiş	40	6.26 ± 0.0721	0.2081	7.29
2	Secu – Caraş-Severin	40	6.580 ± 0.107	0.459	10.30
3	Clocotici – Caraş-Severin	40	6.3925 ± 0.0684	0.1874	6.77
4	Arad	40	5.862 ± 0.117	0.551	12.66

The length of the anterior wing had values of 8.5875 mm in the case of the bees from the BUASVMT apiary and 9.1075 mm in those from Secu, Caraş-Severin County. From a statistical point of view, there were significant differences for ( $p < 0.05$ ) and ( $p < 0.001$ ) between the worker bees from Timiş, Caraş-Severin and Arad counties.

Regarding the anterior wing character, the most reduced values were recorded in the bees from BUASVMT apiary (2.4650 mm), and the biggest values in the case of the bees from Secu, Caraş-Severin County (3.0550 mm). Statistically, we recorded significant differences ( $p < 0.001$ ) between the bees from Secu and the ones from Arad; also the differences were significant ( $p < 0.05$ ) between the bees from Clocotici and Secu and between the bees from Clocotici and Arad. Between the bees from the BUASVMT apiary and the other apiaries, there were statistically significant differences ( $p < 0.001$ ).

The posterior wing length of the bees studied had values between 6.065 mm in the bees from Arad and 6.345 mm in those from Secu. Regarding the posterior wing width, in the 4 apiaries analyzed, we recorded values between 1.71 mm in the case of the bees from Arad and 2.00 mm in those from

BUASVMT apiary. From a statistical point of view, the posterior wing length character revealed significant differences between the bees from the apiaries from Caraş-Severin County.

The values representing the posterior wing width revealed significant differences ( $p < 0.001$ ) between the bees from Arad and those from the apiaries from Caraş-Severin County. Between the apiaries from Caraş-Severin County, there were statistically significant differences ( $p < 0.05$ ) in this character.

The shin width had values between 0.7225 mm in the bees from Arad and 0.0810 mm in those from Secu; there are significant differences regarding this character between the two apiaries ( $p < 0.01$ ). Significant differences were also recorded between the shin width of the bees from the apiary from Arad and those from Clocotici ( $p < 0.01$ ). Between the apiaries from Caraş-Severin County, there were not any significant differences regarding this character, and between the bees from BUASVMT apiary and the other apiaries we found out statistically significant differences for  $p < 0.05$ .

Table 2 Results of measurements on anterior and posterior wing length and width of the worker bees from the apiaries studied

No.	Experimental variants	n	Statistical indices		
			$\bar{x} \pm S\bar{x}$	s	C.V. (%)
Anterior wing length					
1	BUASVMT - Timiș	40	8.5875 ± 0.0401	0.0642	2.95
2	Secu – Caraș-Severin	40	9.1075 ± 0.0321	0.0412	2.23
3	Clocotici– Caraș-Severin	40	8.9975 ± 0.0292	0.0341	2.05
4	Arad	40	8.9025 ± 0.0309	0.0382	2.20
Anterior wing width					
1	BUASVMT - Timiș	40	2.4650 ± 0.0418	0.0700	10.74
2	Secu – Caraș-Severin	40	3.0550 ± 0.0182	0.0133	3.78
3	Clocotici – Caraș-Severin	40	2.9650 ± 0.0083	0.0223	5.04
4	Arad	40	2.8925 ± 0.0285	0.0325	6.23
Posterior wing length					
1	BUASVMT - Timiș	40	6.1025 ± 0.0236	0.0223	2.45
2	Secu – Caraș-Severin	40	6.3450 ± 0.0353	0.0497	3.51
3	Clocotici – Caraș-Severin	40	6.1600 ± 0.0336	0.0450	3.44
4	Arad	40	6.0650 ± 0.0247	0.0244	2.57
Posterior wing width					
1	BUASVMT - Timiș	40	2.000 ± 0.0134	0.0072	4.24
2	Secu – Caraș-Severin	40	1.9550 ± 0.0209	0.0174	6.75
3	Clocotici– Caraș-Severin	40	1.8750 ± 0.0195	0.0153	6.59
4	Arad	40	1.7175 ± 0.0171	0.0117	6.31

The measurements at bee posterior leg level were focused on: femur length, shin length and width, metatarsus length and width and tarsus length (table 3).

The femur length of the bees studied was comprised between 2.99 mm in the case of the bees from Arad and 3.4 mm in those from Secu; there are statistically significant differences between these two apiaries ( $p < 0.001$ ). The same statistical interpretation is available for the other apiary from Caraș-Severin County.

Shin length of the bees studied had values between 2.775 mm in the case of the bees from Timișoara and 2.8525 mm in those from Secu, Caraș-Severin County; there are statistically significant differences between these two apiaries ( $p < 0.001$ ).

Regarding the metatarsus length and width characters in the worker bees from the apiaries studied, they had values between 1.695 mm and 2.095 mm, respectively 0.7375-0.910 mm, with statistically significant differences between apiaries ( $p < 0.001$ ).

Regarding the tarsus length, we observed that this character had dimensions of 1.520 mm – 1.770 mm, with the biggest values in the case of the worker bees from Secu; there were statistically significant differences between these and the bees from the other apiaries ( $p < 0.001$ ). The differences were also significant ( $p < 0.001$ ) between the bees from Clocotici and those from Arad, and between the bees from Secu and those from Arad and Timișoara as well.

Table 3 Results of measurements on posterior leg level of the worker bees from the apiaries studied

No.	Experimental variants	n	Statistical indices		
			$\bar{x} \pm S\bar{x}$	s	C.V. (%)
Femur length					
1	BUASVMT - Timiș	40	3.1900 ± 0.0314	0.0394	6.22
2	Secu – Caraș-Severin	40	3.4000 ± 0.0374	0.0559	6.95
3	Clocotici – Caraș-Severin	40	3.1925 ± 0.0348	0.0484	6.89
4	Arad	40	2.9900 ± 0.0112	0.0050	2.37
Shin length					
1	BUASVMT - Timiș	40	2.775 ± 0.0216	0.0187	6.01
2	Secu – Caraș-Severin	40	2.8525 ± 0.0326	0.00426	9.16
3	Clocotici – Caraș-Severin	40	2.8450 ± 0.0268	0.00287	7.90
4	Arad	40	2.8175 ± 0.0147	0.0087	3.30
Shin width					
1	BUASVMT - Timiș	40	0.7650 ± 0.0122	0.0059	10.06
2	Secu – Caraș-Severin	40	0.810 ± 0.0223	0.0189	17.41
3	Clocotici – Caraș-Severin	40	0.800 ± 0.0148	0.0087	11.67
4	Arad	40	0.7225 ± 0.0131	0.0069	11.51
Metatarsus length					
1	BUASVMT - Timiș	40	1.9100 ± 0.0185	0.0137	6.14
2	Secu – Caraș-Severin	40	2.095 ± 0.0263	0.0277	7.94
3	Clocotici – Caraș-Severin	40	1.992 ± 0.0154	0.0094	4.87
4	Arad	40	1.695 ± 0.0189	0.0143	7.06
Metatarsus width					
1	BUASVMT - Timiș	40	0.8900 ± 0.0167	0.0112	11.88
2	Secu – Caraș-Severin	40	0.9100 ± 0.0189	0.0143	13.12
3	Clocotici – Caraș-Severin	40	0.8825 ± 0.0168	0.0112	12.01
4	Arad	40	0.7375 ± 0.0142	0.0080	12.16
Tarsus length					
1	BUASVMT - Timiș	40	1.5926 ± 0.0118	0.0038	3.87
2	Secu – Caraș-Severin	40	1.770 ± 0.0243	0.0237	8.70
3	Clocotici – Caraș-Severin	40	1.6750 ± 0.0174	0.0122	6.59
4	Arad	40	1.520 ± 0.0081	0.0026	3.40

## CONCLUSIONS

1. The Banat bee is characterized by the following morphological indices: proboscis length ranges between 5.862 mm and 6.580 mm, anterior wing length ranges between 8.5875-9.1075 mm, and anterior wing width between 2.650-3.0550; posterior wing length has 6.0650 mm – 6.3450 mm and posterior wing width is 1.7175 mm – 2.00 mm. Femur length is comprised between 2.99 mm and 3.40 mm; shin length has values of 2.14 mm and 2.81 mm, width of 0.7225 – 0.810 mm. Metatarsus length is between 1.6950 mm and 2.0950 mm, and metatarsus width is 0.7375 mm – 0.91 mm. Tarsus length of the bees from the four apiaries was comprised between 1.52 mm and 1.77 mm.

2. Regarding the proboscis length, the biggest value was recorded in the bees from Secu (6.58 mm), Caraș-Severin County, at

insignificant differences compared to the bees from the Clocotici apiary and statistically significant compared with the bees from BUASVMT apiary ( $p < 0.05$ ) and Arad apiary ( $p < 0.001$ ).

3. Regarding the anterior length and width characters, the bees from Secu presented the biggest value (9.1075 mm, respectively 3.055 mm), at statistically significant differences compared with the other apiaries (Clocotici  $p < 0.05$ ; Timișoara and Arad  $p < 0.001$ ).

4. The posterior wing length revealed significant differences ( $p < 0.001$ ) between the bees from Secu and Clocotici, Secu and Arad. In the case of the posterior wing width, we remarked the bees from the BUASVMT apiary, with a value of 2.00 mm, with significant differences compared with the bees from Secu ( $p < 0.05$ ), Arad and Clocotici ( $p < 0.001$ ).

5. In terms of femur length, the bees from Secu presented significant differences compared to the bees from the other apiaries ( $p < 0.001$ ).

6. In the case of the shin length and width characters, the biggest values were observed in the bees from Secu apiary (2.85 mm, respectively 0.81 mm). The differences were statistically significant for the length character compared with the bees from Clocotici ( $p < 0.05$ ), Arad and Timișoara ( $p < 0.001$ ), and for the width character compared with the bees from Timișoara ( $p < 0.05$ ) and Arad ( $p < 0.01$ ).

7. The biggest values of the metatarsus length and width characters were recorded in the case of the bees from Secu, at significant differences ( $p < 0.001$ ) compared with the bees from Arad and Timișoara.

8. The tarsus length revealed again the bees from Secu, whose dimensions were statistically significant bigger compared with the bees from the other apiaries ( $p < 0.01$  – Clocotici apiary;  $p < 0.001$  Timișoara and Arad apiaries).

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