HYGIENIC BEHAVIOR IN DISEASE RESISTANCE OF TWO HONEYBEE ECOGEOGRAPHIC VARIETIES (APIS MELLIFERA CARINICA) FROM SERBIA

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Introduction

The behaviour of honeybees, as that of other animals, is dictated by some internal and external factors, being, at the same time, genetically predisposed in the same way as any other physical feature of the honeybee organism. On the basis of the results obtained so far it is believed that the honeybee’s hygienic behaviour is determined by two independent genetic loci. One of them controls the uncapping of the diseased brood (U-uncap), whereas the other removes larvae and pupae (R-remove). The honeybees that are recessive homozygotes (uurr) clean the brood, eliminating from it the larvae and pupae infected with pathogens, whereas those whose genotype contains the alleles U and R, regardless of the type of combination, do not do it (ROTHENBUHLER, 1964a, b; SPIVAK and GILLIAM, 1993). Therefore, the hygienic behaviour of workers is inherited as a recessive property in the European honeybee, whereas the same behaviour is a predominant feature in the species Apis cerana.

The hygienic behaviour in honeybees, as well as in other organisms at a higher phylogenetic stadium, basically contribute to the maintenance of the body hygiene, of the progeny, the hygiene in hives, for a shorter or longer periods after birth, and is, therefore, inseparable from their resistance to certain diseases. In this work the investigations of hygienic behaviour were carried out in order to determine the level of hygienic behaviour of the two honeybee ecogeographic varieties from Serbia – yellow bees from Machva region and grey bees from Rudnik region, and in order to answer the question: do intra- and interpopulation differences exist between the investigated ecogeographic varieties (ecogenotypes) with reference to this extremely important property of honeybee colonies, especially from the point of its resistance to some diseases, with a view of improving selection and rearing of quality queens.

Materials and Methods

The analysis of the hygienic behaviour of honeybee workers was conducted in 20 localities in Serbia (10 localities from Machva region and 10 localities from Rudnik region): 10 potent colonies with one-year old queens, 10 potent colonies with two-year or three-year old queens, 10 medium potent colonies and 10 weak colonies were analysed on each locality, i.e. 40 colonies on each locality – altogether 800 colonies in the two above mentioned regions. The examination and evaluation of the hygienic behaviour of the chosen honeybee colonies were done according to the method of TABER (1982), modified by KEFUSS et al. (1996) and STANIMIROVIC et al. (2000).

Results

In Machva region, from total number of 200 investigated potent honeybee colonies, regardless queen age, the ability to remove more than 95% pin-killed pupae on 30 cm² piece of comb, within 48 hours, was demonstrated by 180 colonies from 90 localities. Those colonies, according to KEFUSS et al. (1996), are qualified as superhygienic honeybee colonies (Fig. 1). Meanwhile, in all investigated weak colonies and in 80 medium potent colonies, efficiency of pupae removing on sampled area was less that 90%, so those colonies are qualified as nonhygienic colonies (Fig. 1). Only potent colonies from locality Shtitar, regardless queen age, and medium potent colonies from localities Shevarice and Majur were hygienic colonies, with efficiency of pupae removing on sampled area between 90% and 95%.

In each locality in Machva region, a great variability in exertion of hygienic behaviour was affirmed between the analysed colonies: LSD test showed highly significant statistical differences (p<0.01) in the manifestation of the investigated feature between potent colonies and less potent colonies (medium potent and weak honeybee colonies). Highly significant statistical differences (p<0.01) also were affirmed between medium potent and weak colonies, while significant differences (p<0.05) were noticed only between potent colonies with one-year old queens and potent colonies with two-year old queens, with an average number of removed pupae being higher by 1.3 in favour of the colonies with one-year old queens.

In Rudnik region, all investigated potent honeybee colonies, regardless queen age (200 colonies from 10 localities), showed the ability to remove more than 95% pin-killed pupae on 30 cm² piece of comb, within 48 hours, so that qualified them as superhygienic colonies. (graph 2). The medium potent colonies from 8 localities were hygienic colonies, with efficiency of pupae removing on sampled area between 90% and 95%. Meanwhile, medium potent colonies from locality G. Crnunca pertained to category of superhygienic
colonies. In medium potent colonies from locality G. Branetic and in all investigated weak colonies efficiency of pupae removing on sampled area was less that 90%, so those colonies are qualified as nonhygienic colonies (fig. 2).

In Rudnik region, a great variability in the manifestation of the hygienic behaviour between the analysed colonies was affirmed on each locality. LSD test showed highly significant statistical differences (p<0.01) in the manifestation of the investigated feature between potent colonies and less potent colonies (medium potent and weak honeybee colonies). Highly significant statistical differences (p<0.01) also were affirmed between medium potent and weak colonies. The results showed no significant differences between potent colonies with one-year old queens and potent colonies with two-year old queens.

The results of comparison of percentage values of removed pupae between honeybee colonies from Rudnik and Machva regions are presented on Fig. 3.

Discussion and Conclusion

The obtained results of hygienic behaviour show that the honeybee colonies from the Rudnik region have a more expressed form of this behaviour compared to those colonies from the region of Machva (Fig. 3).
The analysis variance proved the existence of group differences, whereas the LSD test detected the presence of statistically highly significant (p<0.01) differences in the monitored behaviour between the analysed honeybee colonies at the two regions, in favour of the colonies originating from Rudnik localities, with an average number of removed pupae being higher for 2.6. Based on results of analysis of hygienic behaviour in honeybee colonies altogether, regardless to strength, it could be concluded that yellow bees from Machva region as well as grey bees from Rudnik region belong to a category of the hygienic colonies, as the efficiency of elimination of damaged pupae amounted to 91.45% in Machva honeybees, and 93.60% in Rudnik honeybees (Fig. 3). Our results point to an indisputable relationship between hygienic behaviour and the strength of honeybee colonies, i.e. the potent colonies have more expressed hygienic behaviour. Those results are in agreement with those of STANIMIROVIC et al. (2000).

We concluded that the hygienic behaviour of the investigated yellow bees from Machva and grey bees from Rudnik, is a reality and a special potential, being more expressed at the population level, supported by the observed high intra- and interpopulation variabilities of the studied feature. Those results are in agreement with those of STANIMIROVIC et al. (2000).

The superhygienic potent honeybee colonies (regardless queen age) in 9 investigated localities in Machva region and in 10 investigated localities in Rudnik region could be used as breeding colonies for rearing of quality queens.

The obtained data concerning hygienic behaviour of yellow and grey bees in Serbia, especially the fact that variability is higher at population level (intra- and interpopulation variability) compared with global expression of this feature in bees from investigated regions, indicate that investigated behaviour is genetically unfixed and polygenic feature. Therefore, the level of hygienic behaviour do not obligatory inherit from parents to offsprings. Our interpretations of results are in agreement with those of SPIVAK and GILLIAM (1993), KEFUSS et al. (1996) and STANIMIROVIC et al. (2000).

**REFERENCES**


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