

EFFICIENCY OF HYGIENIC BEHAVIOR OF WEST-EUROPEAN ECOTYPE HONEY BEE¹

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Abstract: Honeybee has wide area of spreading with few important races. Our honeybee (*Apis mellifera carnica*) belongs to southeast-European group, and because of its wide spreading, its populations are undergoing variations and lots of ecotypes with different morphologic and biologic characteristics are found.

For modern apiculture certain lines of ecotypes that have very good production properties are important, and where its hygienic behavior is studied.

Experiment was done on bee societies placed in LR beehives with ten frames. Hygienic behavior was studied in two lines of honeybees (G and K) in interval 24/48 hours. Based on obtained results it was determined that bee societies of line G had for 14.25% (after 24 h), and 15.05% (after 48 h) more expressive hygienic behavior considering line K.

Key words: honeybee, hygienic behavior, ecotype

Introduction

Varroa destructor is one of the most distributed parasites of honey bee and synthetic acaricides are mostly used for their control (Konstatinović *et al.*, 1994; Nedić *et al.*, 2002). This *Inoxidae* increases resistance with regard to traditional varroacides every year. Their use carries great risk of occurrence of residue in honey, wax and propolis and because of that its use is increasingly restrictive. Besides these failures, the occurrence of the resistance of varroa to chemical synthetic preparations is increasing.

However, the selection of more resistant bees, with hygienic behaviour can represent the solution of the problem of diseases in bee colonies. Selection of bees with better defense mechanism will enable longer period of tolerance to diseases with regard to unselected bee colonies.

Hygienic behaviour of bees is defined through natural resistance of bees towards the instigators of American plague disease (Rothenbuhler, 1964) and lime brood (Spivak and Gilliam 1998a, 1998b). The bees with hygienic behaviour discover fast and eliminate diseased larvae and cocoons from the colony. They also discover the diseased cocoons infested with the *Inoxidae Varroa destructor* (Peng *et al.*, 1987; Boecking and Drescher, 1991). Bees open and eliminate infested individuals with varroa 4 to 7 days after the capping of cells (Spivak 1996; Thakur *et al.*, 1997).

Elimination of infested cocoons limits the brood of varroa and interrupts its development cycle (Fries *et al.*, 1994). Hygienic behaviour of bees is determined by two genic loci, one of which is controlled by the uncapping of the diseased brood, and the other by content elimination. However, a small number of colonies exhibits a high level of hygienic behaviour due to the recessive inheritance of this characteristic.

Material and method

The experiment was conducted on a bee hive in the vicinity of Kraljevo. In the experiment, bee colonies of domestic carnica (*Apis mellifera carnica*) were used, placed in the standard ten-frame LR bee hives. Bee colonies originated from two different lines, and their mother queen bees originated from different regions of Serbia.

Hygienic behaviour was tested according to pin-killed method, with one frame with open brood extracted from each bee hive and a rhomboid including 100 worker bee cells was placed on it. After that, with one prick with entomological needle, cocoons were sacrificed in a marked field. The frames were returned to the bee hive and after 24, i.e. 48 hours reading was conducted.

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Results and discussion

The results of studying hygienic behavior in two lines of honey bee, during 24 hours, have been presented in table 1. Line G bees showed greater instinct of hygienic behaviour and after 24 hours they had by 5.91 more clean cells on an average. However, this difference was statistically insignificant.

Our results are in accordance with the results of *Woyke et al.* (2004) stating that the hygienic behaviour of bees varied in wide range from 37 to 74%. *Spivak and Downey* (1998) in their research state that the hygienic behaviour was 61.6%, while in Starline it was 49.9%. However, the stated differences occurred above all as a consequence of planned work on the selection of colonies with non-hygienic behaviour and are not the consequence of initial selection of different populations of honey bee.

Table 1. Results of hygienic behavior of bees after 24 hours
Tabela 1. Rezultati ispitivanja higijenskog ponašanja pčela nakon 24 sata

Line	No. of colonies	Average uncapped cells	F _{exp.}
G	8	47,37	0,56 ^{ns}
K	13	41,46	

After 48 hours G line (table 2) had 8.6 cleaner cells in comparison with the K line. In comparison with the first period of monitoring, in the following 24 hours bee lines cleaned 18.38 (G), i.e. 15.69 (K) more cells, which represents 38.80%, i.e. 37.84% increase. Statistically non significant differences were established in hygienic behaviour between two different lines in 24/48 hours period.

However, *Pejović* (2001) states the efficiency of elimination of damaged cocoons of 91.45% in bee colonies in Mačva and 93.60% in bees from Rudnik, while *Spivak* (1996) states the value of 60% for hygienic behaviour. A high percentage of clean cells can be a consequence of greater presence of bees of medium age - younger than collectors (*Arathi et al.*, 2000), but also greater damages on tested cells (*Woyke et al.*, 2004).

Table 2. Results of hygienic behavior of bees after 48 hours

Line	No. of colonies	Average uncapped cells	F _{exp.}
G	8	65,75	1,62 ^{ns}
K	13	57,15	

Conclusion

Based on testing hygienic behaviour of honey bee of the West European ecotype, we can conclude that G bee lines cleaned 14.25% in 24 hours, and in 48 hours 15.05% more cells than K bee lines. The determined differences were statistically insignificant with regard to high variation within the observed treatments. The studies determined that both bee lines cleaned around 1/3 more cells between 24 and 48 hours..

The natural potential of honey bee of the West European region with regard to hygienic behaviour represents the basis of further selection work, since this characteristic is closely related to the resistance towards the *Inoxidae varroa*. High variability of this characteristic in the populations of our honey bee offers the possibility of selection of colonies with highly pronounced hygienic behaviour, thereby not neglecting other economically important characteristics of productivity, temperament and dilligence.

EFIKASNOST HIGIJENSKOG PONAŠANJA MEDONOSNE PČELE ZAPADNOSRBIJANSKOG EKOTIPA

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Rezime

Medonosna pčela ima širok areal rasprostranjenja sa nekoliko privredno značajnih rasa. Naša medonosna pčela (*Apis mellifera carnica*) pripada jugoistočno – evropskoj grupi i zbog širokog rasprostranjenja

posедуje značajno variranje populacija, te se zbog toga javlja više ekotipova, sa posebnim morfološkim i biološkim osobinama.

Za savremeno pčelarstvo posebno su značajne određene linije ekotipova koje se odlikuju dobrim proizvodnim osobinama, pored kojih se prati njihovo higijensko ponašanje.

Ogled je izveden na pčelinjim društvima smeštenim u desetoramnim LR košnicama. Ispitivano je higijensko ponašanje kod dve linije medonosnih pčela (G i K) u razmaku 24/48 sati. Na osnovu rezultata istraživanja utvrđeno je da su pčelinja društva linije G imala za 14,25% (nakon 24 h), odnosno za 15,05% (nakon 48h) izraženije higijensko ponašanje u odnosu na liniju K.

Ključne reči: medonosna pčela, higijensko ponašanje, ekotip

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