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Effects of the Beehive Type and Queen-Bee Descent on the Development of the Bee-Diseases at Apiaries

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A B S T R A C T

An increased occurrence of disease at various members of the honeybee brood (queen-bee, workers, and drones) settled in the beehive, become evident recently. It is already known that various factors, primary ecological, determine disease development. The aim of the study was to discover which diseases at apiaries corresponds to similar ecological conditions at different beehive types. Effects of the following factors were studied: beehive type and building material, type and descent of the queen-bee, variable of the environmental conditions. All honeybee broods, belonging to the European Apis mellifera carnica rase, used identical honeyfull plants pastures.

***Key words**: beehive, queen-bee, disease, ecological factors*

Introduction

According to Decree regulating the animal protection from the infectious and parasitic diseases, all apiarists, holders of the beehives have an obligation of delivering samples for the analyses and evaluation of the zoohygienic conditions at apiaries[1]. The most common bee-diseases in Croatia are caused by the microscopic animals: *Nosema apis* and *Varroa mite*. Endeavoring the increase of the honey production, various types of the beehive have been invented and constructed from different materials. For the same reason, it is common to introduce queen-bees descending from sites which are not native to the honeybee brood.

Material and Methods

The material for the analyses was sampled at the apiaries situated in the area of Vukovar-Srijem County (North-

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east Croatia), from the beehive types: Albert-Žnidaršić (A-Ž), Langstroth-Root (L-R) and Dadant-Blatt (D-B) (Table 1, Figure 1), beehive were constructed from two different materials: fir timber and lime timber (Table 2)[2,3]. The queen-bees originated from various selection types. The honefull plants pastures consisted mainly of the following species: Oil-seed Rape (*Brassica oleracea* subsp. *oleifera*), False-acacia (*Robinia pseudacacia*), Lime tree (*Tilia* spp.), Horse-Chestnut (*Aesculus hip- pocastanum*), Sunflower (*Helianthus annuus*), Goldenrod (*Solidago* spp.), Mint (*Mentha* spp.), False-indigo (*Amorpha fruticosa*), Meadow Sage (*Salvia pratensis*)[4–7]. For the Nosema disease detection, sampled material (30 dead honeybees from the beehive's floor – winter mortality) was crushed in the mortar, adding 1 ml of water. A drop of the suspension was transferred by the pipette on a microscopic slide, covered by a cover glass and observed under the microscope magnification. The *Nosema apis* spores have elongate and oval shape with thick mantle disrupting the light intensity[8]. For the confirmation of *Varoa mite* honeybee parasite, samples consisting the waste from the beehive's floor were dried overnight in the thermostat[9,10]. After that, the material was sieved – first with a sieve with holes in diameter of 2 mm^2, than with a sieve with holes in diameter of 1 mm^2. A small portion of the residual material after the second sieving was put on the microscopic slide, covered with a cover glass and analyzed under the microscope, searching for the presence of parasite.

TABLE 1
NUMBER OF EXAMINED BEEHIVES

Beehive type	Number of examined beehives
AŽ	3,856
LR	2,475
DB	1,634
Total	7,965

Results and Discussion

Long-term investigations indicated the presence of various diseases at different beehive types (Tables 3–6). Past experience with usage of A-Ž, L-R and D-B beehives in Croatia reveals advantages and flaws in theirs functionality. Practical bee-keeping showed that convenient choice of beehive type is important as choice of their building material too. Some material used for the construction of beehives favoring development of certain bee-diseases. Descent of the queen -bee in the apiary is also important. In the last twenty years in Croatia two types of queen-bees have been used: »native«[11–14], cultivated in the natural habitat of the honeybee brood, and »selected«, which are bought from various producers[11,15,16]. From the results of the study it is obvious that usage of selected queen -bees can initiates many difficulties connected with development of diseases, thus increasing the number of ill honey-bees.

Epizootiological situations in the surveyed area of Vukovar-Srijem County, in the 10–15 km surround from the apiaries that have been examined, is characterized by the diminutive presence of other

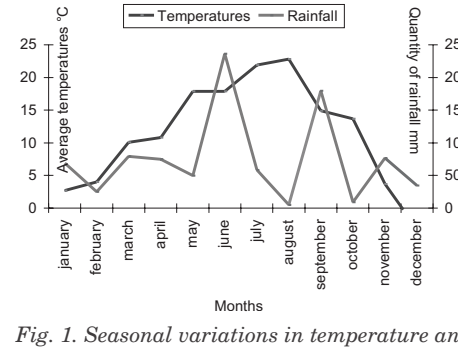

Fig. 1. Seasonal variations in temperature and rainfalls

TABLE 2
PROPORTIONS (%) OF TIMBER USED IN THE CONSTRUCTION OF BEEHIVES

Timber type	Beehive type (%)		
	AŽ	LR	DB
Fir timber	79.98	81.01	78.94
Lime timber	20.02	18.99	21.06

TABLE 4
PERCENTAGE (%) OF HONEYBEES ILLNESS FROM VAROSIS AT DIFFERENT BEHIVE TYPES

Timber type	Beehive type (%)		
	AŽ	LR	DB
Fir timber	16.95	41.67	60.70
Lime timber	15.08	43.17	59.03

A-Ž : L-R**, A-Ž : D-B**, L-R : D-B**
**p<0.01

bee-diseases, documented abundance of the American Foulbrood disease is 0.001 %[9,10] and for the Chalk brood disease is

TABLE 3
PERCENTAGE (%) OF HONEYBEES ILLNESS FROM NOSEMOSIS AT DIFFERENT BEEHIVE TYPES

Timber type	Beehive type (%)		
	AŽ	LR	DB
Fir timber	59.40	11.24	74.35
Lime timber	52.41	12.06	75.77

A-Ž : L-R**, A-Ž : D-B**, L-R : D-B**
**p<0.01

0.01%[9,10]. Sporadically incidents of the honeybee broods intoxication during the incautiously treatments of weeds with herbicides have been noticed.

Conclusions

Data analysis performed by means of testing the warrantableness of differences between two samples confirms the following:

TABLE 5
PERCENTAGE OF THE ILLNESS (%) FROM NOSEMOSIS IN HONEBEY BROODS, COMPARABLE WITH DESCENT OF THE QUEEN-BEE AND DIFFERENCES IN BEEHIVE TYPE

Timber type	Beehive type (%)					
	AŽ		LR		DB	
	Native	Selected	Native	Selected	Native	Selected
Fir	31.00	69.00	7.29	92.71	54.00	46.00
Lime	36.00	64.00	13.08	86.92	50.00	50.00

A-Ž : L-R**, A-Ž : D-B**, L-R : D-B**
**p<0.01

TABLE 6
PERCENTAGE OF THE ILLNESS (%) FROM VAROSIS IN HONEBEY BROODS, COMPARABLE WITH DESCENT OF THE QUEEN-BEE AND DIFFERENCES IN BEEHIVE TYPE

Timber type	Beehive type (%)					
	AŽ		LR		DB	
	Native	Selected	Native	Selected	Native	Selected
Fir	11.20	88.80	40.40	59.60	42.22	57.78
Lime	12.90	87.10	51.00	49.00	59.08	40.92

A-Ž : L-R**, A-Ž : D-B**, L-R : D-B^{ns}
**p<0.01

1. Distribution of two timber types (Table 2): fir and lime as a main constructing material within different beehive types (A-Ž, L-R, D-B) is not statistically significant ($p<0.05$).

2. Total number of honeybees illness from the Nosemosis and Varosis connected to examined beehive types shows a statistically significant differences (Tables 3 and 4).

3. Percentage of honeybee illness from the Nosemosis and Varosis at the same beehive type with same timber type, but different descent of the queen-bee (native vs. selected), is statistically significant, except in case of Varosis where LR : DB is not significant (Tables 5 and 6).

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UTJECAJ TIPA KOŠNICA I PODRIJETLA MATICA NA RAZVOJ BOLESTI U PČELA

SAŽETAK

U posljednje vrijeme svjedoci smo sve veće prisutnosti bolesti kod pojedinih članova pčelinje zajednice (matice, radilice i trutova) u košnicama. Poznato je da na razvoj bolesti utječu brojni čimbenici, prvenstveno ekološki. Rad je imao za cilj otkriti koji sve čimbenici utječu na razvoj bolesti pčelinje zajednice u istim ekološkim uvjetima. Analizirali smo utjecaj sljedećih čimbenika na razvoj bolesti: tip košnica, materijal od kojih su košnice građene, podrijetlo matica (prirodne i umjetno uzgojene). Sve pčele korištene u istraživanju pripadaju europskoj rasi pčela Apis mellifera carnica race, i koristile su istu medonosnu pašu u prehrani.