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Effect of Honeybee Broods (Queen-Bee Different Lineage) Moving on Disease Development at Various Beehive Types and Allergy Reaction Cause in Humans

Zvonimir Tucak[1] and Marin Periškić[2]

[1] University of »J. J. Strossmayer« Osijek, Faculty of Agriculture, Osijek, Croatia
[2] Croatian Veterinary Institute Zagreb, Veterinary Department Vinkovci, Vinkovci, Croatia

A B S T R A C T

The change of the location of the beehives on the diverse honeyfull pastures is the usual apiarists activity in the Republic of Croatia. The main reasons are the climatic and vegetation diversity, and richness of the floral composition, with numerous bee forage plants. Our study aimed to detect consequences of honeybee broods (Queen-bee of different lineage) moving, from one habitat to another at various type of beehives. The Alberti-Žniderščič (AŽ), Langstroth-Root (LR) and Dadant-Blatt (DB) beehive types, constructed of (lime-tree), have been used. After the bee forage on the Oil-seed Rape in the beginning of April, the honeybee brood has been veterinary inspected (based on the Law of animal health protection in the Republic of Croatia) for varrosis, nosemosis and American foulbrood diseases. The same procedure was done after bee forage (False acacia) at the end of May. All of the honeybees belong to the European race Apis mellifera carnica. The results of the study pointed out that different beehive types and the Queen-bee lineage (natural and selected) affect development of disease inside the honeybee brood, during the relocation and change from one dominant bee forage plants to another. Certain allergy reactions occurring in people can be caused by the pollen of some honefull plants such as birch, grasses, ragweed, goldenrod and hazel. Such cases are also included in our investigations. Beekeepers and nature lovers sensitive to pollen allergens of some honeyfull plants should, in some calendar period, avoid ecological milieu with such plants.

Key words: *beehive, queen-bee, honeyfull plants, pollen, disease, allergic disease*

Introduction

Our investigations were stimulated by increased number of honeybee broods while moving from one honefful plants to other ones. We focused on various beehive types used in honeybee broods moving and Queen-bee lineage (natural and selected)[1–7].

Material and Methods

The investigation was carried out in the area of Vukovar-Sirmium County, Eastern Croatia. Climate conditions in the study area during the period January-July, 2004 (weather station Gradište) are presented in Figure 1. The Alberti-Žniderščič (AŽ), Langstroth-Root (LR) and Dadant-Blatt (DB) were the types of beehive. Material used for the construction of beehives was wood of lime-tree[8,9].

The honeyfull pastures consisted of the following plants: Oil-seed Rape (*Brassica oleracea* subsp. *oleifera*), Lime-tree (*Tilia platyphyllos*), Horse-chestnut (*Aesculus hippocastanum*), Sunflower (*Helianthus annuus*), Mint (*Mentha arvensis*), False indigo (*Amorpha fruticosa*), Goat willow (*Salix caprea*), Wild cherry (*Prunus avium*), Hawthorn (*Crataegus laevigata*), Dead-nettle (*Lamium purpureum*), False-acacia (*Robinia pseudacacia*), Goldenrod (*Solidago spp.*), Grasses (*Salvia pratensis*), Birch (*Betula sp.*), Hazel (*Corylus sp.*), Ragweed (*Ambrosia artemisiifolia L*) and other forests and meadow plants[11–13]. According to Decree regulating the

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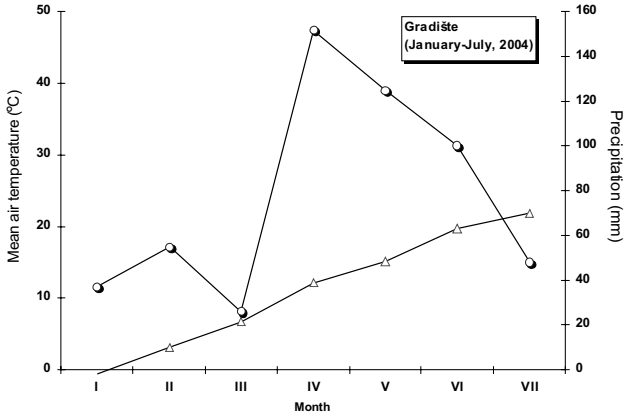

Fig. 1. Climate conditions for the study area, presented with graphs of temperature and precipitation.

animal protection from the infectious and parasitic diseases, it is obligatory to analyze samples from the apiaries in order to control diseases as varrosis, nosemosis and American foulbrood disease.

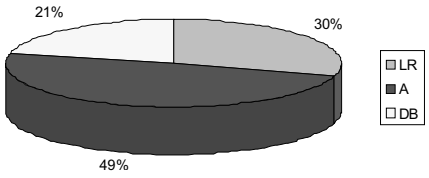

Fig. 2. Percentages (%) of the investigated beehive types.

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 analyzed under microscope magnification. The spores of *Nosema apis* have elongate and oval shape with thick mantle disrupting the light intensity[14–16].

Fort the confirmation of *Varroa mite* honeybee parasite, samples consisting the waste from the beehive's floor were dried overnight in the thermostat. After that, the material was sieved – first with a sieve which holes are 2 mm^2 in diameter, then with a sieve with 1 mm^2 diameter holes.

A small portion of the material remained after the second sieving was put on the microscopic slide and analyzed under the microscope searching for the presence of parasite[14–16].

American foulbrood is a disease of the larval stage of the honey bees. The causative organism is *Paenibacillus* larvae subsp. Larvae. The bacterium is a slender rod-shaped (bacilli) with slightly rounded ends and a tendency to grow in chains. The spores are oval. They are extremely heat stable and resistant to chemical agents. Only spores are capable of inducing the disease.

The capping of the cell that contains a disease larva appears moist and darkened and becomes concave and punctured as the infection progresses.

The larva changes color, first to a creamy and eventually to a dark brown. The larvae become glutinous in consistency. A very unpleasant foul odor develops at this stage, resembling that of animal glue. The diseased brood eventually out to from characteristic brittle scales that adhere tightly to the lower sides of the cell[14–16].

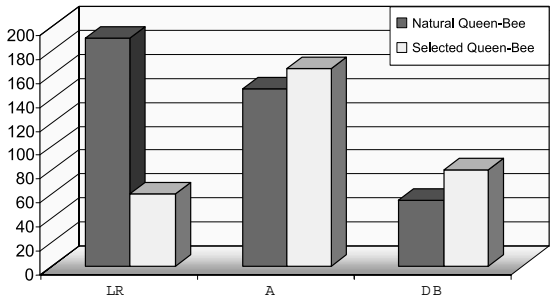

Fig. 3. Percentages (%) of the Queen-bee lineage in the various beehive types.

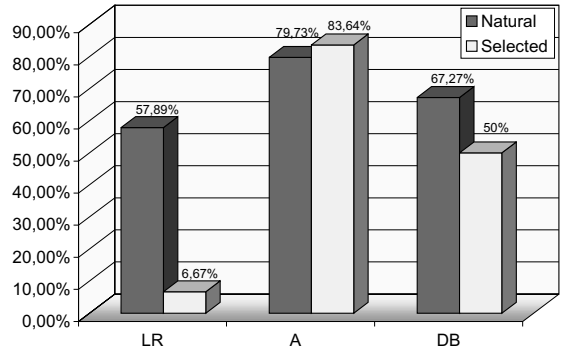

*Fig. 4. Percentages (%) of the Varrosis illness during the first honeyfull pasture (Brassica oleracea ssp. oleifera) according to beehive types. Natural: LR (%) : AŽ (%)**, LR (%) : DB (%)ns, AŽ (%) : DB (%)ns Selected: LR (%) : AŽ (%)**, LR (%) : DB (%)**, AŽ (%) : DB (%)**, **p<0.01, n.s.=non significance*

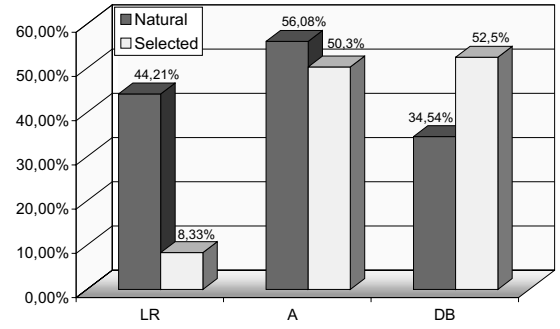

Fig. 5. Percentages (%) of the Nosemosis illness during the first honeyfull pasture (Brassica oleracea ssp. oleifera) according to beehive types.

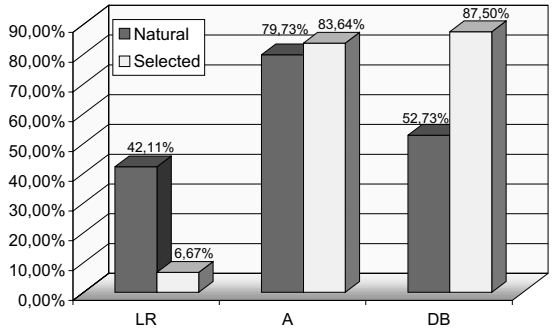

*Fig. 6. Percentages (%) of the Varrosis illness during the second honeyfull pasture (Robinia pseudacacia) according to beehive types. Natural: LR (%) : AŽ (%)**, LR (%) : DB (%)n.s., AŽ (%) : DB (%)** Selected: LR (%) : AŽ (%)**, LR (%) : DB (%)**, AŽ (%) : DB (%)n.s. **p<0.01, *P<0,05, n.s.=non significance*

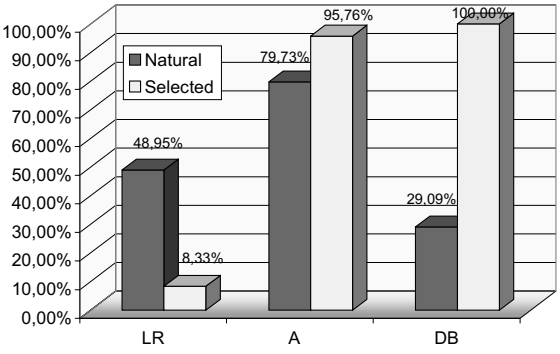

Fig. 7. Percentages (%) of the Nosemosis illness during the second honeyfull pasture (Robinia pseudacacia) according to beehive types.

American foulbrood can be diagnosed in the field by visual inspection of the affected comb. When diagnosis requires confirmation, a laboratory test is available. Most cases are diagnosed by light microscopy. A simple stain, such as Gram, is used for diagnosis. This differentiates the bacteria by their morphology.

Glutinous cell content with the remains of disease larvae is placed on a cover-slip, dried and Gramstained. Immersion oil is dropped on sample surface. Then the slide is examined by high-power microscopy, observing the vegetative cells and spores of the infectious agent.

Differences between the groups was determined using the test of the attributive characteristics, at the level $p>0.05$; $p<0.05$ and $p<0.01$.

Results and Discussion

The results obtained indicate that various beehive types and Queen-bee lineage have a great influence on changes occurred in honeybee broods health condition.

The least number of the honeybee's illness of the varrosis is recorded in the LR beehive type (6.67% with natural and 57.89% with selected Queen-bee). Significant difference exists between honeybee brood with natural Queen-bee at LR and AŽ beehives ($p<0.01$), and between all three beehive types, when the selected Queen-bee is present.

A high percentage in Nosemosis illness (56.08%), during the first honeyfull pasture is recorded in AŽ beehive, while only 8.33% of illness is recorded inside LR beehive with selected Queen-bee. Significant difference at the honeybee brood with natural Queen-bee was between LR and AŽ ($p<0.05$), and between AŽ and DB ($p<0.1$), as well as between honeybee brood with selected Queen-bee between LR and AŽ ($p<0.01$), and between LR and DB ($p<0.01$) beehive type.

During the second period of honeyfull pastures, significant differences were confirmed between LR and AŽ, and AŽ and DB beehive types ($p<0.01$), with presence of the natural Queen-bee, and between LR and AŽ, and LR and DB ($p<0.01$), with presence of the selected Queen-bee.

Beehives belonging to LR and DB have the lowest honeybee brood illness of the Nosemosis during the second honeyfull pasture: 8.33% with natural, and 29.09% with selected Queen-bee. Beehive type significantly ($p<0.01$) influenced percentage of the illness when the natural Queen-bee is present (differences exists between all three beehive types). Significant differences ($p<0.01$) have been found at honeybee brood with selected Queen-bee, between LR and AŽ, and LR and DB beehive types.

American foulbrood disease was not found inside the investigated beehives.

Of 300 beekeepers only one developed mild allergic disease (allergy rhynitis – catarrh) caused by hazel while dealing with LR hive having a natural queen-bee.

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Z. Tucak

Faculty of Agriculture, University »J.J. Strossmayer«, P.O.Box 719, Trg Sv. Trojstva 3., 31000 Osijek, Croatia

UTJECAJ SELJENJA PČELINJE ZAJEDNICE (RAZLIČITOG PODRIJETLA MATICE) NA RAZVOJ BOLESTI U RAZLIČITIM TIPOVIMA KOŠNICA I IZAZIVANJU ALERGIJSKIH REAKCIJA KOD LJUDI

S A Ž E T A K

Seljenje košnica pčela na raznolike medonosne paše tijekom godine uobičajeno je u Republici Hrvatskoj. Razlog tome su raznoliki klimatski i vegetacijski pojasevi prožeti bogatom medonosnom pašom. Naša istraživanja imala su za cilj utvrditi posljedice seljenje pčelinje zajednice (različitog podrijetla matice) s jedne medonosne paše na drugu u različitim tipovima košnica. U istraživanju su korišteni sljedeći tipovi košnica, izrađeni od lipovog drveta (materijala): Albert-Žnidaršić (AŽ), Langstroth-Root (LR) i Dadant-Blatt (DB). Poslije medonosne paše početkom 4. mjeseca (uljna repica) izvršeno je vrcanje meda i zdravstveni pregled pčelinje zajednice na bolesti: varozu, nozemozu i američku gnjiloću, na temelju Zakona o zdravstvenoj zaštiti životinja u Republici Hrvatskoj. Isti postupak izvršen je poslije medonosne paše (bagrem) – kraj petog mjeseca. Sve pčele, korištene u istraživanju, pripadaju europskoj rasi pčela *Apis mellifera carnica*. Rezultati istraživanja ukazuju da različiti tipovi košnica i podrijetlo matica (prirodne i selekcionirane) utječu na razvoj bolesti kod seljenja pčelinjih zajednica s jedne na drugu medonosnu pašu. Pelud nekih medonosnih biljaka može izazvati određene alergijske reakcije kod ljudi, primjerice, pelud breze, trava, ambrozije, zlatošipke i lijeske. Naša istraživanja ukazuju i na takve slučajeve. Pčelari i ljubitelji prirode, osjetljivi na alergene peludi pojedinih medonosnih biljaka, trebaju u određenom kalendarskom razdoblju izbjegavati ekološki milje u kojem se takve biljke nalaze.