
The prophylaxis of major bacterial infections in the *Apis mellifera carpathica* bee through honey, pollen and bee bread control

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Abstract

For the purpose of controlling the evolution of major bacterial diseases in bees, which decimate bee colonies in Europe and Romania, respectively, we examined samples (honey, pollen and honeycombs) in the apicultural year 2016, from all over Romania. Sample collection and testing were done with the purpose to prevent the contamination of bee colonies with the etiological agents of major bacterial diseases, considering that worker bees and the food entering the hive (honey, pollen) represent the main contamination ways. The diagnosis method observed OIE regulations (2008) and was adapted in an original way in the Bee Pathology Laboratory in Bucharest. A total of 73 samples were examined, representing honey (51), honeycombs (6) and pollen/bee bread (16), from private apiaries all over the country, that presented depopulation without clinical evolution of contagious diseases in bees, and in which we diagnosed the presence of etiological agents of major bacterial bee diseases (36.98 %), while the rest of the samples were negative (63.02%). Of the 51 samples of honey that were examined, we identified 39.22% positive samples and 60.78% negative ones. Of the pollen samples that were examined, 31.25% were positive and 68.75% were negative, and the honeycombs samples showed 33.33% positive and 66.66% negative. Previous researches indicated that the positive samples (honey, pollen, bee bread), from apiaries in all the regions of the country, represented the basis for the prophylaxis of major bacterial diseases so that, by avoiding using them in bee nutrition, the evolution of major bee diseases did not confirm clinically or paraclinically in the following season (January-April 2017).

Keywords: *Apis mellifera carpathica*, honey, pollen and bee bread control

Introduction

Major bacterial diseases in bees, including the American foulbrood and the European foulbrood, represent a group of diseases with devastating action in bee hives, that also cause economic losses in apiculture. The American foulbrood and the European foulbrood affect young larvae, causing changes in smell and aspect and their death [1, 2, 4, 7], and adult bees carry the etiological agents of major bacterial diseases. Both diseases are declarable and quarantinable, quarantine measures being enforced to avoid spreading the disease, with emphasis on prophylaxis by natural nonaggressive means. According to legislation in effect, treatment by antibiotics are forbidden because of residues in hive products [1, 3, 7]. It is allowed in some countries but antibiotics only suppress the symptoms without eradicating the disease. Bacterial spores of the American foulbrood are not destroyed by treatment with antibiotics. Frequent use of treatment by antibiotics enables growth of resistant bacterial strains [3, 4].

Material and method

In the apicultural season 2016-2017 a total number of 73 samples were collected, from honey (51), pollen (16) and bee combs (6), in private apiaries all over Romania, to identify etiological agents of the American foulbrood and of the European foulbrood, as the apiaries presented depopulation without a clinical evolution of contagious diseases in bees. The diagnosis

method observed OIE regulations (2008) [4, 5] and was adapted in an original way in the Bee pathology Laboratory in Bucharest.

Results and discussions

The microscopic laboratory test permitted identification of etiological agents of major bacterial diseases in bees in a number of 27 samples (36.99%), while 46 samples were diagnosed negative (63.01%) (Fig. 1 and 2).

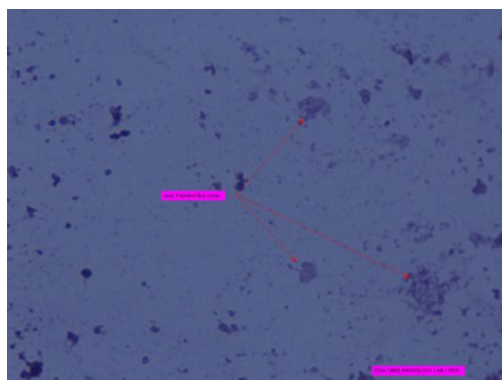


Fig. 1. Presence of the etiological agent of the American foulbrood (col. Gram x 1000)

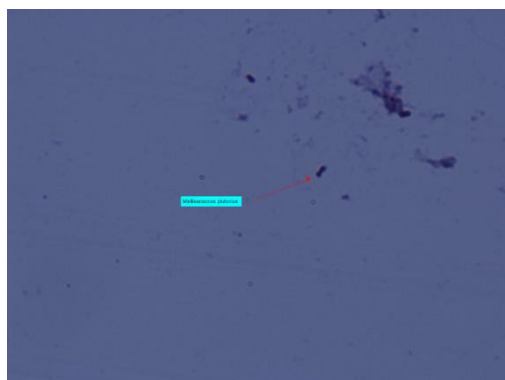


Fig. 2. Presence of the etiological agent of the European foulbrood (col. Gram x 1000)

As regards the presence of etiological agents of major bacterial diseases in bees in the 3 types of samples, laboratory tests showed the following results as in table 1.

Table 1. The presence of etiological agents of major bacterial diseases in samples examined microscopically

Type of sample	No. of examined samples	No. of positive samples			No. Of negative samples (%)
		Etiologic agent of the American foulbrood (LA)	Etiologic agent of the European foulbrood (LE)	Etiologic agents LA+LE	
1. Honey	51	4 (7.84%)	15 (29.41%)	1 (1.96%)	31 (60.79%)
2. Pollen/Bee bread	16	2 (12.50%)	3 (18.75%)	-	11 (68,75)
3. Honey combs	6	1 (16.67%)	1 (16.67%)	-	4 (66.66%)
TOTAL	73	7 (9.60%)	19 (26.02%)	1 (1.37%)	46 (63.01%)
		27 (36.99%)			

Table 1 shows that out of 51 honey samples examined (100%), 4 samples (7.84%) presented the etiological agent of the American foulbrood (spores of *Paenibacillus larvae*), 15 samples (29.41%) presented the agents of the European foulbrood (*Mellisococcus plutonius* and associated flora), while one sample (1.96%) presented a combined infection, both the etiological agents of the American foulbrood and of the European foulbrood. Of the total of honey samples examined, 31 samples (60.79%) were negative. Examination of the pollen/bee bread showed the

presence of the American foulbrood agent in 2 samples (12.5%), of the European foulbrood agents in 3 samples (18.75% showed the presence of the European foulbrood agents while 11 samples (68, 75%) were negative. Samples of honey combs presented in 7 samples (9.6%) spores of *Paenibacillus larvae*, 19 samples (26.02%) were diagnosed with agents of the European foulbrood and one sample (1.37%) presented a combined infection. The presence of the etiological agents of major bacterial diseases in the examined samples is showed in Figure 3.

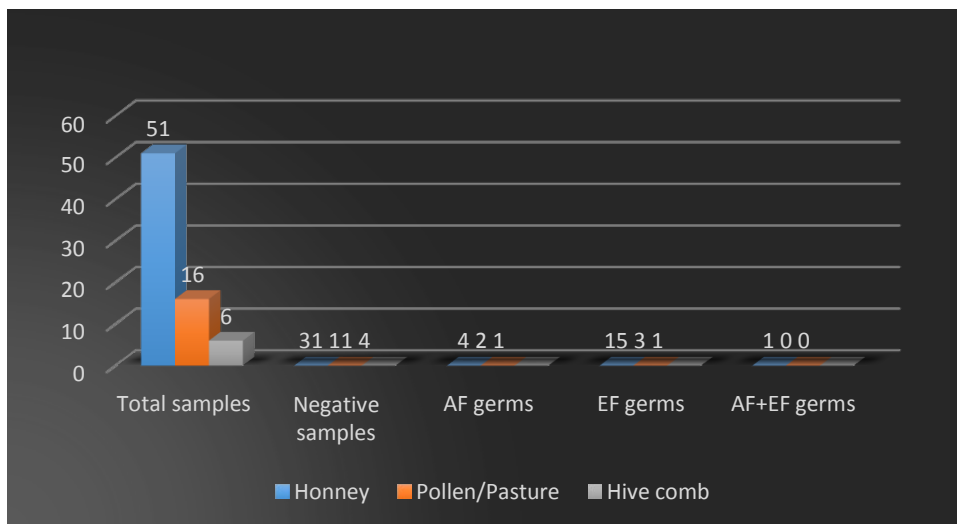


Fig. 3 The presence of germs of major bacterial diseases in examines samples (AF - American foulbrood; EF - European foulbrood)

Although examined sampled came from private apiaries all over the country that presented depopulation without clinical evolution of contagious diseases in bees, the diagnose of the presence of etiological agents of major bacterial diseases in bees in the examined samples imposed removing contaminated honey, pollen and combs from bees' food during the inactive season (winter), as these constitute sources of contamination in bees and a potential for serious bacterial diseases evolution in bees. Removing these sources from bees' food and feeding them in the winter with honey and pollen lacking in pathogens led to the absence of the clinical evolution of major bacterial diseases in bees in the following season (January-April 2017). Early identification of pathogens by bacterioscopic lab examination in the sample constituting food source for bees in the winter and removing them from bees' food was an efficient prophylaxis means for the major bacterial diseases that should be introduced as a mandatory examination prior to the inactive season of bees.

Conclusions

1. Of a total of 72 samples of honey, pollen/bee bread and combs examined by the bacterioscopic method, 27 samples (36.99%) were positive for etiological agents of major bacterial diseases in bees and 46 samples (63.01%) were negative.
2. The presence of the etiological agents of major bacterial diseases in bees per types of examined samples was the following: 7 samples of honey, pollen and combs (9.6%) were positive for the American foulbrood agent, 19 samples (26.02%) were positive for the etiological agent of the European foulbrood and one sample was diagnosed with combined infection (American foulbrood and European foulbrood), the rest of the samples being negative.

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3. The fact that samples tested positive imposed removing contaminated food and feeding bees with honey, pollen/bee bread lacking in pathogens of major bacterial diseases in bees, being aware of the role of these sources in contaminating bees and the subsequent evolution of major bacterial diseases in the contaminated bee colonies.
 4. Removing these sources from bees' food and feeding bees in the winter with honey and pollen lacking in pathogens led to the absence of clinical evolution of major bacterial diseases in bees in the following season.
 5. Early identification of pathogens in the bacterioscopic lab examination of samples that constitute food source for bees in the winter should be introduced as a mandatory examination prior to bees' inactive season as a prophylaxis means in major bacterial diseases in bees.

Acknowledgments

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