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RESEARCH ON THE USE OF ESSENTIAL OILS ON THE HEALTH OF BEE FAMILLIES

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Abstract: *The use of essential oils (thyme, rosemary, basil, juniper, oregano, cloves, mint, cinnamon) in complementary feeding, applied to bee families in autumn, can have favorable effects in improving their health. The incorporation of essential oils in a dose of 2 drops / liter of sugar syrup had the effect of reducing the total number of germs in the intestine of the analyzed worker bees. This was observed mainly 20 days after their administration, in all the experimental variants analyzed, the best results being observed in the case of the batches in which the essential rosemary, oregano and clove essential oils were used ($p<0.05$).*

Keywords: *antimicrobial activity, bees, essential oils*

Introduction

Bee diseases, followed by pollution, are the main causes of losses of bee families [1]. Worldwide, it has been shown by numerous studies that the main cause of failure in the treatment of infectious diseases is bacterial resistance [2]. The studies conducted by [3] and [4], highlighted that the excessive use of antibiotics leads to the development of bacterial resistance, increasing in recent years, thus decreasing their effectiveness on antimicrobial agents [5-6].

Plant extracts are represented by a variety of medicinal properties, which produce a relevant range of functional secondary metabolites [7]. [8], highlighted that medicinal plant extracts contain significant amounts of antimicrobial products. Multiple studies have highlighted their anti-inflammatory, antifungal, antiviral and antibacterial properties [9-11].

Material and method

The experiments were performed on 18 bee families maintained in Dadant and multi-storey hives. The bee families were fed between 7th-28th of September, with 1:1 sugar syrup, in an amount of 3 l/week. Essential oils were incorporated into the sugar syrup (table 1).

Experimental variant	Essential oil administered	Dose administered
Control lot	-	-
Lot 1	Thyme	2 drops/l syrup
Lot 2	Rosemary	2 drops/l syrup
Lot 3	Basil	2 drops/l syrup
Lot 4	Juniper	2 drops/l syrup
Lot 5	Oregano	2 drops/l syrup
Lot 6	Clove	2 drops/l syrup
Lot 7	Mint	2 drops/l syrup
Lot 8	Cinnamon	2 drops/l syrup

Results and discussions

Table. 2. Determination of the number of germs after the administration of essential oils

Lot	**Moment of determination**		
	Beginning of experiment $\bar{x} \pm SD$	After 10 days $\bar{x} \pm SD$	After 20 days $\bar{x} \pm SD$
Control	493,17 ± 127,196 [a]	451,80 ± 67,807 [a]	466,70 ± 67,335 [a]
Thyme	535,50 ± 119,212 [a]	526,50 ± 79,043 [a]	399,33 ± 138,785 [a]
Rosemary	502,50 ± 132,128 [a]	485,00 ± 123,140 [a, b]	366,33 ± 56,344 [b]
Basil	457,83 ± 120,907 [a]	422,67 ± 89,997 [a]	400,33 ± 79,645 [a]
Juniper	485,50 ± 201,379 [a]	444,17 ± 145,740 [a]	354,00 ± 124,704 [a]
Oregano	499,33 ± 140,829 [a, b]	508,67 ± 152,479 [a]	336,83 ± 113,731 [b]
Cloves	530,17 ± 91,287 [a]	525,50 ± 84,025 [a]	397,17 ± 124,926 [b]
Mint	455,67 ± 167,940 [a]	411,17 ± 109,314 [a]	319,17 ± 182,762 [a]
Cinnamon	358,50 ± 153,838 [a]	387,17 ± 184,151 [a]	297,00 ± 70,088 [a]

Conclusions

The essential oils studied can improve the health and development of bee families. The positive effects of the studied essential oils were highlighted, especially those of thyme, rosemary, oregano, cloves, mint, which determined the reduction of the total number of germs in the intestine of working bees by 0.88 - 9.77%, compared to the first control, and by 25.08 - 32.54% compared to the second control. Oregano essential oil showed the best results 20 days after the first administration, significantly reducing the total number of germs. It is necessary to continue researches in order to evaluate these essential oils on their bioproductive potential.