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The Effects of Propolis Production Methods and Honeybee Genotypes on Propolis Yield

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Abstract: The effects of propolis production methods and the honeybee genotypes were investigated in this study. Honeybee genotypes were as the Caucasica (*Apis mellifera caucasica*), Carniolan (*Apis mellifera carnica*), Italian (*Apis mellifera ligustica*) and Anatolia (*Apis mellifera anatoliaca*). Propolis harvesting was repeated 4 times every 15-day interval during 1 October-30 November 2004. Average propolis yield in Caucasica (*Apis mellifera caucasica*), Carniolan (*Apis mellifera carnica*), Italian (*Apis mellifera ligustica*) and Anatolia (*Apis mellifera anatoliaca*) bee genotypes were found as 27.34, 26.93, 26.12, 39.67 g, respectively. Propolis productions Anatolia genotype was about 23.25, 25.45 and 82.47%, higher than those of Caucasica, Carniolan and Italian genotype, respectively. Anatolia bees were found to be more suitable propolis production than the other bee genotypes under the experimental conditions.

Key words: Propolis production, *Apis mellifera*, season, genotype, production methods

INTRODUCTION

Propolis is a mixture of various amounts of bees wax and resins collected by the honeybee from plants, particularly from flowers and leaf buds. Since it is difficult to observe bees on their foraging trips the exact sources of the resins are usually not known. Bees have been observed scraping the protective resins of flower and leaf buds with their mandibles and then carrying them to the hive like pollen pellets on their hind legs and bring them back to the hive to cover the cracks and crevices, reduce the hive entrance and coat the large insects like moths, butterfly, beetles, cicadas etc.[1-3]. Bees also use the propolis to cover the inside of the hive and mix it with bees wax during building combs to protect the colony and larvae from the pathogen microorganisms[4].

Due to anti-bacterial, anti-fungal, anti-viral properties and other beneficial biological properties such as anti-inflammatory, anti-ulcer, local anaesthetic, anti-tumour etc. of propolis, thousands of adult bees and developing bees (larvae, pupae) can be protected from these pathogens[3,5-7]. Propolis usage for medicinal purposes has been carried out since antiquity. Also propolis is used in cosmetic area day by day[8,9]. It was reported that propolis has got antibacterial effects on *Bacillus sublitus, Bacillus alvei* and *Proteus vulgaris* and *galangin*. Flavors isolated from propolis had responsible for this antibacterial effect. In other study, it was also established that propolis contain essential oil[5,10]. It was established that propolis has considerable anti-biotic effects on *Salmonella, Staphyloccus aureus, proteus vulgaris* and *Esherichia coli*. The composition of propolis varies with the origin of the plant species. Bees tend to collect these resins from a large variety of trees and shrubs to take advantage of the anti-bacterial, anti-fungal and anti-viral effects[4].

Many research were studied on propolis its anti-bacterial, anti-fungal, anti-viral properties and chemical composition[1,5,9,10]. However, no research carried out in propolis by different production methods in Hatay Region so far. Therefore this research was conducted to determine the effects of different production methods and different genotypes on propolis production.

MATERIALS AND METHODS

Bee races: Research was carried out in Hatay Province of Turkey. Total of 35 colonies were used during the experiment. Colonies having similar strength (five bee covered frame) from each genotype; Italian (*Apis mellifera ligustica*), Anatolia (*A. mellifera anatoliaca*) Caucasica (*Apis mellifera caucasica*) and Carniolan (*A. mellifera carnica*) were used.

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In this research three different production methods were used. The 1st method was propolis trap, the 2nd pollen trap and the 3rd was control (back of hive entrance). Propolis traps were prepared with plastic grid inner cover (8×15 cm), pollen traps (only its plastic grid part (6×30 cm)) was mounted on the top part of board cover. Propolis harvesting was repeated 4 times every 15-days interval during 1 October-30 November 2004.

Statistical analysis: Repeated measures experimental design model for three factors was used testing of main and interaction effects and the Duncan's Multiple Comparison Test was used the comparison of the means. SPSS 9.05 windows of version statistical software were used to statistical analysis of all data[11,12].

RESULTS AND DISCUSSION

The results for each genotype in propolis yield according to different production methods are given in Table 1. The effects of period on the propolis yield were found significant and the effects of bee genotypes on propolis yield were not significant ($p>0.05$) statistically.

The average propolis yield in period 1, 2, 3 and 4 were determined to be average of 9.54±0.94, 8.02±0.72, 7.60±0.48 and 5.13±0.41, respectively. The propolis production was the highest in first period and the lowest in fourth period in all genotype. Average propolis yield in Caucasica (*Apis mellifera caucasica*), Carniolan (*Apis mellifera carnica*), Italian (*Apis mellifera ligustica*) and Anatolia (*Apis mellifera anatoliaca*) bee genotypes were found as 27.34, 26.93, 26.12 and 39.67 g, respectively (Table 1).

Propolis yield was the highest (65.49) in *Apis mellifera anatoliaca* in propolis trap and the lowest (26.12 g) in *Apis mellifera ligustica* in pollen trap. However, the average propolis production in Anatolia genotype was about 23.25, 25.45 and 82.47%, higher than Caucasica, Carniolan and Italian genotypes, respectively.

The average propolis yield throughout the season was 27.34, 26.93, 26.12 and 39.67 g in Caucasica, Carniolan, Italian and Anatolia genotype, respectively (Table 1). Besides the average propolis yield according production methods were found to be 46, 33.17 and 41.57 g in propolis trap, pollen trap and hive entrance method, respectively. Many researchers[13-18] reported that the average propolis yield were 15.30, 10-300, 10-300, 50-250, 50-250, 50-250 and 24.2 g, respectively in their studies. That difference should be explained by difference in terms of florae, genotype, production methods, harvesting interval and production season. Propolis yield in this study was lower than the previous studies, except Kutluca[13]. Proplis yield in this study was agreed with the result of the Kutluca[13]. Gul and Sahinler[19] reported that propolis yield 2.07, 1.26, 1.45 g/per colony/2 weeks in Anatolia, Italian and Carniolan bee genotype, respectively. Propolis yields from Anatolia (2.07±018), Italian (1.26±010) and Carniolan(1.45±0.12) bee genotypes similar to previous study[19].

The present findings indicated that high propolis production was obtained from propolis trap method and Anatolia bee genotype colonies in autumn.

Table 1: The means and ranges of values for each genotype in propolis yield according to different production methods

Genotypes	Traps	N	Periods 1	2	3	4	Traps means	Genotype means ($\bar{x}\pm S_x$)
Caucasica	Propolis Trap	3	9.95	8.26	10.2	6	34.41	11.47±1.67
	Pollen trap	2	3.44	4.24	3.96	1.76	13.4	6.70±0.64
	Hive entrance	2	4.92	3.97	3.72	5.66	18.27	9.14±0.36
	Mean ($\bar{x}\pm S_x$)	7	6.10±1.97	5.49±1.39	5.96±2.12	4.47±1.36	22.03±6.35	9.10±0.89
Carniolan	Propolis trap	2	5.3	6.49	6.35	2.98	21.12	10.56±2.42
	Pollen trap	2	4.87	5.81	8.12	5.08	23.88	11.94±0.66
	Hive entrance	3	4.17	4.4	2.93	1.8	13.3	4.43±0.35
	Mean ($\bar{x}\pm S_x$)	7	4.78±0.33	5.57±0.62	5.80±1.52	3.29±0.96	19.43±3.17	8.98±1.14
Italian	Propolis trap	4	6.53	7.96	10.62	5.52	30.63	7.65±0.52
	Pollen trap	3	8.01	5.61	3.64	3.9	21.16	7.053±0.82
	Hive entrance	3	12.42	10.43	8.06	5.3	36.21	12.07±1.65
	Mean ($\bar{x}\pm S_x$)	10	8.99±1.77	8.00±1.39	7.44±2.04	4.91±0.51	29.33±4.39	8.92±1.00
Anatolia	Propolis trap	4	22.56	13.37	15.88	13.36	65.17	16.29±1.65
	Pollen trap	3	10.23	5.03	3.97	3.18	22.41	7.47±0.58
	Hive entrance	4	22.09	20.62	13.75	6.98	63.44	15.86±0.96
	Mean ($\bar{x}\pm S_x$)	11	18.29±4.03	13.01±4.50	11.20±3.67	7.84±2.97	50.34±13.97	13.21±1.06
	Total mean ($\bar{x}\pm S_x$)	35	9.54±0.94	8.02±0.72	7.60±0.48	5.13±0.41	30.28±2.68	10.05±1.02

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