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Some Characteristics of Queenbees (*Apis mellifera* L.) Rearing in Queenright and Queenless Colonies

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Abstract: This study was carried out to determine the differences in terms of the rate of accepted larvae, lenght of sealed queen cell, queen weight at emergence, rate of mating, pre-oviposition period of queen bees in the colonies queenright and queenless in rearing queens. The differences of the rate of accepted larvae among rearing groups were found very significant in the months of June and August ($p<0.01$) and significant in July ($p<0.05$). As the season passed, the amount of accepted larvae decreased in both groups. The differences between the values obtained from the colonies queenright (25.13±0.18 mm) and queenless (30.71±0.14 mm) in terms of the average length of sealed queen cell were found significant ($p<0.01$), while those between the values of queen weight at emergence, rate of mating and pre-oviposition period were found insignificant ($p>0.05$).

Key words: Honey bee, queen rearing, characteristic of queens, queenright and queenless colonies

INTRODUCTION

The most important single bee in a colony is the queen bee. She is the largest bee in the hive and responsible for keeping the hive alive by laying eggs. For this, the benefit of beekeepers from a colony depends largely on the quality of queen bee. Various environmental factors are effective on queen bee quality in queen bee rearing. These factors are the age of transferred larvae, origin of larvae, the number of young worker bee and food presence of starter and finisher colonies and mated queen bees with enough number of drone bees (Morse, 1979).

One of the methods of queen rearing is to rear queen bee in the queenright colonies. The method consists of raising frames of brood above a queen excluder in a strong colony and grafting 12-18 h old larvae into queen cell cups next to the brood in the upper chamber (Wilkinson and Brown, 2002).

Productivity of queen bee depends on her age, breed, breeding term, weight in emergency, age of larvae and grafting methods, number of ovariol, diameter of spermatheca, number of spermatozoa in spermatheca and if she has anatomical disorder or not (Wen and Chong, 1985). One of the most important factors, affecting queen quality is the age of larvae. According as the increase in the age of larvae grafted, a significant decrease has been observed in the body weight, the size of spermatheca diameter and the number of ovarioles in virgin queens (Woyke, 1967).

The aim of the current study, was to compare of queen bees reared in queenright and queenless colonies with regard to the rate of accepted larvae, lenght of sealed queen cell, queen weight in emergence, rate of mating and pre-oviposition period.

MATERIALS AND METHODS

This research was conducted in June, July and August, 2006. The grafted larvae raised with Doolittle method were introduced into starter queen-right and queen-less colonies. Larvae <24 h old were grafted onto royal jelly that was diluted with water in proportion of 1:1. In each period, 4 starter colonies were used and 30 larvae were grafted into each of them. During the experiment, queen bee rearing colonies were fed with sugar syrup (1:1). A total of 360 (120×3) larvae were transferred into queen cell cups in each period and placed into incubator (33.0±0.05 C and 60-65% RH) after the queen cells cups kept in feeder colony were completely closed. Shortly after emergence queens were weighed. In each period, total 60 queen bee (weigh <180 mg) were randomly placed in mating colonies (nuclei).

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Queen bees given to mating colonies for natural mated were controlled 2 times every day as from the 6th day and their laying dates and mating rates were determined.

In this research, differences between rearing methods were determined by evaluating the rate of acceptance rate, height of queen cell, emergence weight, mating rate and pre-oviposition period.

Data on larvae accepted rates and mating rates were tested according to Z-test. The mean of height of queen cell and emergence weight values were analyzed with student's t-test. Pre-oviposition period of queen bees were compared with one way analysis of variance.

RESULTS AND DISCUSSION

The rates of acceptance larva in starter colony for each group in each period were given in Table 1. The differences of the rate of accepted larvae among queenright and queenless rearing groups were found very significant ($p<0.01$). The larvae acceptance rate in both groups were found as 95.00 and 78.33% in June, respectively, which are higher than that of other months (July and August). The reason of higher acceptance rates obtained in queenless colonies might be assumed to be depending on the absence of queen. Therefore, the bees showed more interest to the grafted larvae to have a queen. The result of the larvae acceptance rates in queenless colonies was higher than the result (93.33%) obtained by Dodologlu and Emsen (2007). In another study, the average acceptance rates in queenright colonies in June, July and August were determined as the average of 75.1, 70.9 and 68.3%, respectively (Sahinler and Kaftanoglu, 2005). Dodologlu *et al*. (2004) reported that the average acceptance rate in queenless colonies was 95% and this result was in agreement with the finding of current study.

A total of 90 queen bees on the brink of 30 queen bees from both group for 3 periods were given to matingcolonies. Finally, a total of 180 queen bees were evaluated and from this 162 queen bees were mated (Table 1). The rate of mating in queenright colonies and queenless colonies in the months of June, July and August were found 96.66, 83.33 and 93.33, 93.33, 86.66 and 86.66%, respectively. There was no significant difference between 2 groups. According to Genc *et al*. (2005) the rate of mating of queen bees reared in June, July and August did not show any significant difference. The result of mating rates obtained by same researches was lower than our findings. On the other hand, the longest pre-oviposition period in both groups was found in July, while the shortest pre-oviposition period was determined in August (Table 2). The interaction of rearing months on pre-ovipositon period of queen bees was found significant ($p<0.01$). However, there was no significant difference in both rearing groups with regard to pre-oviposition period. This result was agree with the result of 12.15±0.39 day recorded in the controlled reared queen bee and 12.36±0.43 day for the queen bees reared in the natural queen cell cups (Dodologlu and Genc, 1997).

The rate of queen bee emergence in the present study was found as 100.00% in both rearing groups, which is similar to the finding recorded by Dodologlu and Emsen (2007) but higher than the findings 70 and 69% reported by Emsen *et al*. (2003). The emergence weight was obtained at 198.20±8.74 mg in queenright colonies, while the emergence weight was 199.07±7.55 mg in queenless colonies (Table 2). These findings are lower than the finding 206.13±3.20 mg reported for queenrigth colonies and higher than the finding 178.47±2.05 mg obtained for queenless colonies (Dodologlu *et al*., 2004). However, similar findings on the emergence weight were found in previous studies (Emsen, 2004; Genc *et al*., 2005).

The mean of the height of sealed queen cell was found 25.13±0.18 mm in queenright colonies, while the same value was measured as 30.71±0.14 mm in queenless colonies. These results show that queenless colonies build longer cells compared to queenright colonies. In a previous study, the height of queen cell in queenless.

Table 1: Results of the rate of accepted larva raised with different methods and mating rates of queen bees (%)

			Larva acceptance rates		
Groups	No. grafted larvae	No. accepted larvae	June (%)	July (%)	August (%)
Queenright colony	180	127	78.33	71.66	61.66
Queenless colony	180	156	95.00	86.66	78.33
Total	360	283	86.66	79.16	69.99
Significancy		**	**	*	**

		Mating rates			
Groups	No. queen bee	June	July	August	$\bar{X}$
Queenright colony	82	96.66	83.33	93.33	91.11
Queenless colony	80	93.33	86.66	86.66	88.88
Total	162	94.99	84.99	89.99	89.99

**$p<0.01$; *$p<0.05$

Table 2: The results of pre-oviposition period of queen bee raised in different periods and the length of sealed queen cell and emergence weight

	Queenright colony		Queenless colony	
Periods	N	$\bar{x} \pm S_{\bar{x}}$	N	$\bar{x} \pm S_{\bar{x}}$
June	29	11.79±0.67[b]	28	11.53±0.64[b]
July	25	13.64±0.49[a]	26	13.71±0.46[a]
August	28	11.43±0.50[c]	26	11.23±0.43[c]
Other features				
Sealed queen cell length (mm)	127	25.13±0.18[b]	127	25.13±0.18[b]
Emergence weight (mg)	126	30.71±0.14[a]	126	198.68±8.11

[a,b,c]Means within columns, by category comparisons not followed by the same letter are significantly different ($p<0.01$)

colony was 30.82 mm and this result was in agreement with our finding, while the value of 26.70 mm measured in queenright colonies was higher than our results (Wilkinson and Brown, 2002). Emsen *et al*. (2003) found that the height of sealed queen cell was 25.20±0.04 mm in queenless colonies which is similar to the result recorded in the present study.

CONCLUSION

Consequently, there was no significant difference in terms of queen weight at emergence, mating rate and pre-oviposition period, while the acceptance rates of queen bees raised from different groups were changed depending on rearing methods. On the other hand, in spite of the variables of low grafting yield in queenright colonies, queen bees were reared in queen cells and brood activity was continued. According to the results, obtained in this study, we can conclude that rearing queen bees in queenright colonies is more advantageous than in queenless colonies.

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