

THE EFFECT OF SUGAR FEEDING ON BEHAVIOR OF ACCEPTANCE OF 1 AND 2 DAY OLD LARVAE IN UPPER AND LOWER BARS OF THE GRAFTED FRAMES OF HONEYBEE, *APIS MELLIFERA* FOR QUEEN REARING

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Abstract

The acceptance of one and two day old larvae in upper and lower bars of the grafted frames were studied among the sugar and control groups of feeding. The percentage of accepted larvae that were grafted with dilute royal jelly among groups showed statistically difference between acceptance of 1 and 2 day old larvae among the upper and lower bar of the grafted frames. The groups accepted more two-day-old larvae as compared to one-day-old larvae. Moreover more larvae were accepted in lower bar as compared to upper bar of the grafted frames.

Key words: Feeding, grafting, 1 and 2 day old larvae, *Apis mellifera*, upper and lower bar, grafted frames, acceptance ratio.

Introduction

Honeybees, an insect that live in socially organized communities with well-defined tasks, have formed a "living unit" called colony, consisting of 60,000 workers and from zero to 400-500 drones (depend on seasonal activities).

To continue the life span, honeybees need energy, which is obtained by honeybee from nectar, pollen and sugar syrup. The aim and purpose of feeding is Sericulture to help honey bee colonies from starving to death, to stimulate brood rearing, for pollination and quality of queen rearing.

Taber (1987) suggested to dissolve dry sugar by stirring in some water so that no crystals of sugar remain in water. Delaplane (1992) recommended thin syrup (1:1) in spring to stimulate brood rearing and heavy syrup (1:2) in autumn for dense winter food stores.

Dolittle (1888) promoted the larval transportation (grafting) for queen rearing (Pickard and Kither 1983). Woyke (1971) observed that grafting of youngest larvae produced best queens.

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Material and Method

The research was conducted in Faculty of Agriculture, Department of animal sciences Ankara University, Turkey. Two groups of honeybee colonies of *Apis mellifera*, having three hives in each group, were arranged to find out the acceptance ratio of 1 and 2-day-old larvae in upper and lower bar of the grafted frames. For feeding purpose sugar syrup was prepared by dissolving 1 ½ kg of sugar in equal quantity of hot water. After cooling 1/2 liter of syrup was poured in each three feeders to sugar feeding group and the other control group remained without feeding. The sugar was fed for 5 days before and after grafting. About 200 artificial queen cells were prepared from fresh bee wax with the help of round stick usually using for preparation of artificial queen cells. Out of 200 artificial queen cells, 192 were fixed on grafted frames with the help of melted wax. For easy transportation of larvae and getting more successful results, a drop of diluted royal jelly was put in queen cells before grafting. Larvae were obtained from good colonies. The larvae were grafted in a grafted room under control temperate and humidity. High humidity prevents the larvae and royal jelly from drying during grafting operation (Hasting 1967).

Each hive having 9 frames of bees with sealed brood. 32 grafted larvae were grafted in such a way that each grafting frame having 16 each of one and two day old larvae and 16 each of two and one-day-old larvae simultaneously. The grafted frames were immediately transferred in covered towel to feeding group. To save the time and avoid the grafted larvae from dryness, the grafted frames were put gently in already empty space in each hive. The grafted larvae were examined on next day and their acceptance ratio was noted.

Results and Discussion

Control group having three colonies remained without feeding. In each hive of control group having ten frames (eight frames of brood and bees, one grafted frame and one empty feeder) were arranged. The grafted frames were inserted in middle of sealed brood frames. The purpose of empty feeder was to balance the brood chamber of the honeybee colonies as compare to sugar group.

The data obtained during research by grafting of one and two day old larvae and their acceptance ratio among the control and sugar feeding groups were analyzed statistically. During grafting of 1 and 2 day old larvae among two groups, it was pointed out that sugar feeding hives acceptance high percentage of larvae as compared to control group. To get such a high percentage of acceptance ratio of grafted larvae, the honeybee colonies should be fed before and after grafting of larvae.

Table 1 shows hive wise acceptance ratio of 1 and 2 day old larvae. It is clear from the table that hive no.2 has accepted more 1 and 2 day old larvae as compared to other hives. In the upper bar 100% one-day-old larvae and 87.5% each two-day-old larvae were accepted by hive no.2. In general, out of 48 one-day-old larvae total 25 larvae with 52.08% and 38 larvae with 79.16% of two day old larvae were accepted by the control group. It is clear from the table that 32 in upper bar and 31 in lower bar were noted. It is clear that acceptance percentage of 2 day old larvae was noted more as compare to 1-day-old larvae.

Table 1. Grafting percentage ratio of one and two-day-old larvae among control group.

Group	Hive No	1 day old larvae				Total 1 day old larvae accepted		2 day old larvae				Total 2 day old larvae accepted	
		U.bar		L.bar				U.bar		L.bar			
		n	%	n	%	n	%	n	%	n	%		
Control	1	3	37.5	4	50.0	7	43.75	5	62.50	7	87.5	12	75.00
	2	8	100.0	3	37.5	11	68.75	7	87.50	7	87.5	14	87.50
	3	2	25.0	5	62.5	7	43.75	7	87.50	5	62.5	12	75.00
Total		13	54.16	2	50.0	25	52.08	19	79.16	9	79.16	38	79.16
Sugar	1	6	75.0	3	37.50	9	56.20	6	75.00	8	100.0	14	87.50
	2	6	75.0	6	75.00	12	75.00	5	62.50	6	75.00	11	68.50
	3	3	37.5	6	75.00	9	56.20	7	87.50	6	75.00	13	81.25
Total			62.5	5	62.50	30	62.80	18	75.00	20	83.33	38	79.16

Similarly, in sugar syrup total 68 one-and-two day old larvae were accepted, out of 68 larvae 30 with 62.80 % of 1 day old larvae in upper and 38 with 79.16% of 2 day old larvae in lower bar were generally accepted by the sugar feeding hives of honeybee colonies. It was noted in the following table that sugar group accepted more number of 2-day-old larvae as compared to 1-day-old larvae. This may be due to more easily grafting of larvae as compare to 1 day old larvae. As it is clear from the table that 33 number of larvae in upper bar and 35 larvae in lower bar of the grafted frame among the hives were accepted.

In table 2, hive number 1 and 3 accepted 19 larvae with $(\bar{x} \pm S\bar{x}) 59.40 \pm 15.60$, hive number 2 accepted 25 larvae with 78.13 ± 9.37 . The reason of more acceptances of larvae in hive number 2, showing more sealed brood as compare to other hives. In the sugar group the average acceptance ratio in table was noted as $71.85 \pm 15.70 (\bar{x} \pm S\bar{x})$ among hive 1 and 2 and low average $68.70 \pm 12.55 (\bar{x} \pm S\bar{x})$ in hive number 3.

Table 2. The percentage of acceptance ratio of 1 and 2 day old larvae in upper and lower bar of the grafted frame.

Feeding group	% of accepted 1 and 2 day old larvae in upper and					
	Hive.no	n	\bar{x}	$S\bar{x}$	Minimum	Maximum
Control group	1	19	59.40	15.6	43.80	75.00
	2	25	78.13	9.37	68.75	87.50
	3	19	59.40	15.6	43.80	75.50
Sugar group	1	23	71.85	15.7	56.20	87.50
	2	23	71.85	3.15	86.70	75.00
	3	22	68.70	12.50	65.30	81.20

Results

As a general total 192 number of one and two-day-old larvae were grafted in upper and lower bar of the grafted frame. Out of 192 grafted larvae 65 were accepted in upper bar and 66 in lower bar of the grafted frames.

Statistically difference in groups and acceptance ratio among 1 and 2 day old larvae in upper and lower bar were noted. The sugar group accepted 68 larvae as compared to control group.

Moreover, more larvae were accepted in lower bar as compare to the upper bar of the grafted frames, which shows honeybees naturally prefer to lower margin or lower side of the frame as compare to upper side or upper bar of the frames.

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