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REARING LARGER HONEYBEE WORKERS

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Introduction

Larger honeybee workers with longer proboscis could collect nectar from flowers with a longer corolla. Therefore, trials were made to rear larger bees by selection or by rearing them in larger comb cells.

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Here, an original method is presented. Worker bees were reared in different rearing conditions. A comparison was made between the worker bees reared in queenright colonies and those reared in queenless ones or headed by egg-laying workers. The amount of food supplied for larvae was compared and then, the size of the workers reared in different conditions was measured.

Materials and Methods

Two *Apis mellifera* colonies were divided into equal parts. However, one part was queenright and the other was queenless. Larval food was collected from 10 cells with larvae of the same age. The food was soaked into small glass tubes. At first, the empty and then the filled tubes were weighed. The difference represented the amount of food present in 10 cells with larvae of the same age. The food collection was repeated 6 times. Thus, food from 60 cells, containing larvae of the same age, was collected every day. The food was collected from cells containing 1, 2, 3 and 4 days old larvae. Thus, larval food from 240 cells was collected every day. The food was collected from the 1st to the 6th day after dividing the colonies. Thus, food from 1,080 larvae was collected in every part of the colonies. Altogether, larval food from 4,320 brood cells was collected from the four parts of the colonies.

Morphological investigations were conducted on workers from Italian (*A. mellifera ligustica*) and Cape (*A. mellifera capensis*) bees. The Italian workers were reared in queenright and queenless colonies. In Cape colonies, egg-laying workers appeared very soon. Therefore, the Cape workers were reared in 3 queenright colonies and in 3 colonies headed by egg-laying workers.

The combs with sealed brood were removed from the colonies. They were put into isolators and were placed in an incubator at 34.5°C. The emerging workers were collected daily. They were killed in boiling water and were preserved in 75% alcohol. Morphological measurements of the different body parts of 25 or 30 worker bees from each part of the colonies were conducted according to the standard methods.

Results

The Larval Food Amount in Queenright and Queenless Colonies

The results presented in Table 1 show that the average amount of food found in 10 cells with 1, 2, 3 and 4 days old larvae was of 13, 33, 109 and 144 mg, in the queenright nests and of 16, 42, 122 and 162 mg in the queenless ones, respectively. Thus, the larvae of the ages presented above received with 3, 9, 13 and 18 mg respectively, more food in the queenless nests than in the queenright ones. Also, the increase in the amount of food in the queenless colonies was higher in the cells with older larvae than in the ones with younger larvae. The relationship between the amount of food in queenright colonies and the one in queenless colonies was also calculated. The amount of food in the cells with 1, 2, 3 and 4 days old larvae in the queenless colonies was 127, 127, 112 and 112% of that found in the same cells in queenright colonies. Thus, the increase in the amount of food in queenless colonies was relatively higher in cells with younger larvae.

Table 1

Average Amount of Food (mg) in 10 Cells with Larvae of Different Ages in Two Queenright and Two Queenless Colonies

Age of the larvae	Milligrams of food in successive days						avg
	1	2	3	4	5	6	
Queenright colonies							
1	13.0	13.5	12.0				12.8
2	32.5	33.0	33.0	34.0			33.1
3	109.5	108.5	108.5	109.5	108.5		108.9
4	143.6	144.0	143.5	145.0	145.0	145.5	144.4
Queenless colonies							
1	16.5	16.0	16.5				16.3
2	43.0	42.0	42.0	41.0			42.0
3	126.0	124.5	121.5	121.0	118.0		122.2
4	167.5	165.0	162.0	161.0	160.0	157.5	162.2

The amount of food in the cells with larvae of the same age was almost constant in the queenright colonies during the following days. However, the food amount varied in the queenless colonies. In cells with 4 days old larvae, 117, 115, 113, 111, 110 and 108% of the food was found during the following days in comparison to the food amount present in the queenright colonies. Thus, the increase of larval food supply was the highest during the first days after dequeening the colonies. Later on, the increase declined.

Morphology of the Worker Bees Reared in Queenright and in Queenless Colonies

The results presented in Table 2 show that the body parts of the Italian worker bees reared in queenless colonies were larger than those of the workers reared in queenright colonies. Statistical calculations showed that the differences between their body parts were significant. Thus, the workers reared in queenless colonies were larger than those reared in queenright colonies.

Table 2

Body Size (mm) of *A.m. ligustica* Workers Reared in Different Colony Conditions (L = length)

Body part	Queenright	Queenless
Mandibles L.	1.34	1.43
Tibia L.	4.23	4.42
1st wing L.	9.25	9.57
4th tergite L.	8.54	8.86
4th sternite L.	6.13	6.26

Morphology of the Worker Bees Reared in Colonies with Queen and Egg-laying Workers

The results presented in Table 3 show that the body parts of the Cape worker bees reared in colonies headed by egg-laying workers were larger than those of the workers reared in queenright colonies.

Body Size (mm) of *A.m. capensis* Workers Reared in Different Colony Conditions (L = length)

Body part	Queenright	With egg-laying workers
Mandibles L	1.30	1.36
Tibia L	4.22	4.40
1st wing L	9.47	9.49
No bristles on wing	96.00	102.00
4th tergite L	8.98	9.12
4th sternite L	5.32	5.81
Weight (mg)	104.30	118.20

Statistical calculations showed that the differences between their body parts were significant, except for the length of the wings. Thus, the *A.m. capensis* workers reared in colonies headed by egg-laying workers were larger and heavier than the workers reared in queenright colonies.

Thus, by changing the rearing conditions, larger worker bees can be reared in comb cells of the same size.