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CONTRIBUTION OF SUCCESSIVE DRONES TO THE INSEMINATION OF A QUEEN

Introduction

The queens are inseminated artificially mostly with semen of several drones. In our earlier investigation Woyke (1960) it was stated that each next cu. mm. added to the whole amount of injected semen increased the number of sperms in the queen's spermatheca slower," than the previous one. Therefore a question arises whether, every successive drone contributes equally to the insemination of a queen or is it possible to get an overweight of a desire drone.

Method

Queens homo- or heterozygous for two or three genes, namely chartreuse, brick and cordovan, and drones wild or having only one of the mentioned genes were used. The queens were inseminated mostly with 9 cu. mm. of semen of wild or mutant drones in different terms. All the drones used for the insemination of one queen were brothers in similar age. The volume of semen of each genetically marked drone was 1 cu. mm. When the brood produced by the above mentioned queens was in the age near to emerge, the combs were placed in an incubator and the emerged workers were classified depending upon the genes they carried. In case the queens were heterozygous for some mutant genes, the number of progeny was calculated, as if the queens were homozygous.

Results

One insemination

The daily counts showed that the number of progeny originating from successive drones differs in the consecutive days. These data indicate, that the sperms from different drones ere in the spermatheca not completely mixed. But when the number of workers emerging in one day is not very low, than the progeny of every drone which inseminated the queen was found every day, no matter was it from the first or from the last one.

In the first experiment the first and the last drone was marked genetically. Concerning all the bees emerged from a comb, the progeny of the middle drones was the most numerous.

Few percentages more progeny originated also from the first drone than from the last one (Table 1). But the differences were not big.

To get more detailed data, in the next experiment, the middle drone was marked genetically in addition to the genetically marked first and last ones. The data presented in Table 2 did not show any advantage of the middle position. In fact the progeny of last drone was the most numerous in this series of insemination. The next numerous progeny was that of the first drone.

All the above presented data did not show any evidence of increasing or decreasing the number of progeny depending upon the successive position of semen in insemination. Therefore in agreement with our earlier investigation it must be assumed that an increase of injected dose decreased the number of each drone sperms, which entered into the queen's spermatheca. As a result, the queen possessed roughly equal number of sperms of every drone also after the insemination with bigger doses.

Two inseminations

In one insemination it was not possible to find any position of injected semen resulting in an overweight of progeny of a desirable drone. Our previous investigations (Woyke 1960) showed, that after two inseminations in two different days, the first dose was more effective than the next one in, increasing the number of sperms in the queen's spermatheca. Therefore in this experiment, queens were inseminated twice. The first time with one cu. mm. of semen and the other day second time with 8 cu. mm. of semen of genetically different drones.

The obtained results are presented in Table 3. In most cases the progeny of the one drone, which inseminated the queen during the first insemination, was the most numerous.

Thus this method makes possible to get more progeny of one desirable drone and the queen does not turn in drone layer due to lack of semen.

Summarizing, the obtained results allow to state, that every drone, which inseminates the queen during one process of insemination, contribute roughly in equal degree to the insemination of a queen. An overweight of progeny of a desirable drone can be obtained by double insemination - the first tine with semen of the desirable drone and the second time with semen of the other drones.

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Table 1

Percentages of progeny of successive drones (aver. for one drone)
Genetically marked the first and last drone

Successive drones	Queen and comb No.							
	162				157			
	1961		1962		1962		1962	
	1	2	3	4	1	2	3	4
1	5,6	6,9	12,2	9,3	11,7	11,2	9,4	9,6
2-7	15,2	14,9	13,0	14,6	13,2	13,8	13,8	13,9
8	2,9	4,0	9,8	2,8	8,9	6,0	8,1	6,7

Table 2

Percentages of progeny of successive drones (aver. *for* one drone).
Genetically marked the first, - the middle and the last drone

Successive drones	Queen and comb No.							
	460				446		427	
	1961		1962		1962		1962	
	1	2	3	4	1	2	1	2
1	12,8	12,1	9,0	14,5	16.5	16,7	10,7	10,8
2-4	10,1	9,6	8,4	10,1	10,2	10,2	11,1	8,0
5	8,4	10,5	7,3	11,5	11,8	12,1	8,0	5,6
6-8	10,1	9,6	8,4	10,1	10,2	10,2	11,1	8,0
9	18,4	19,5	33,0	13,4	10,5	9,9	14,5	35,7

Table 3

Percentage of progeny of successive drones (aver. for one drone)
Two inseminations

Successive drones	Queen and comb No							
	429				445			
	1961		1962		1961		1962	
	1	2	3	4	1	2	3	4
1-st insem. 1	15,4	20,5	12,5	17,6	12,5	10,1	20,3	12,4
2-nd insem.								
1	14,2	3,2	16,8	13,6	8,9	12,8	8,2	10,1
2-7	9,9	10,5	9,8	9,8	11,2	10,3	9,0	11,2
8	10,8	13,3	11,9	10,0	11,7	14,8	17,2	10,1

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Tom II