

# COMPARATIVE RESEARCH ON THE ACCEPTANCE OF EMERGED QUEENS AND QUEEN CELLS (*APIS MELLIFICA* L.) BY THE MATING NUCLEI

N. FOTI, Maria DRAGAN, Victoria CONSTANTIN, ROMANIA

In most specialized queen production enterprises, queens are introduced in the nuclei under the form of ripe queen cells some hours before their emerging (1, 3, 5, 6, 7), while in West Europe, where controlled mating stations are commonly used, queens are introduced only after they have emerged, and are sorted and marked (8).

The present study aims to establish the effectiveness of both procedures, the degree of acceptance of queens by the nuclei, and the influence of some factors on the losses recorded during the mating flight.

## METHOD AND MATERIAL

The experiments were conducted during the 1968 production season at the queen rearing section of the SCAS (Central Station of Apiculture and Sericulture) of Băneasa – Bucharest, with 1047 mating nuclei. SCAs-type nuclei were used in the experiments consisting of a box divided into 4 compartments – nuclei A, B, C, D, - each of them provided with space for 2 shallow Langstroth frames with combs. Each nucleus had an entrance on one of the side walls of the common box and a crown board with a wire screen, all of them being covered with a common cover.

The nuclei were placed in a rectangular orchard about 10 years old, with rows 7 m distant from one another and 5 m from one tree to another in the same row. The boxes with nuclei were located symmetrically, i.e. 2 between the trees of the same row at a distance of 2.5 m from one another and 7 m from one row to another. Thus each group of 4 nuclei of the common box had the entrances facing North (nucleus A), East (nucleus B), West (nucleus C) and South (nucleus D).

The nuclei were populated with bees and brood in the first weeks of May, each of them having, in the May-September period, about 150 to 250 bees. The first emerged queens (imago) or queen cells expected to emerge 12 to 24 hours later were introduced concurrently with the making up of nuclei and the other series, after removing the mated queens or after establishing their disappearance from the nuclei.

Table 1

EVOLUTION OF THE ACCEPTANCE AND OF LOSSES ON QUEENS DURING THEIR MATING FLIGHT IN THE 1968 SEASON

Month	Emerged queens (imago)					Queen cells				
	Intro-duced in nuclei (pieces)	Accepted (pieces)	%	Lost during their mating flight	%	Intro-duced in nuclei (pieces)	Accepted (pieces)	%	Lost during their mating flight	%
May	1170	908	77.60	159	17.51	122	92	75.40	23	25.00
June	1513	1260	83.27	245	19.44	867	732	84.42	93	12.70
July	1903	1594	83.76	506	31.74	363	295	81.26	71	24.06
August	636	558	87.73	214	38.35	806	715	88.70	233	32.58
September	285	240	84.21	89	37.08	3	2	66.66	1	50.00
Total	5507	4560	82.80	1213	26.60	2161	1836	84.96	421	22.93

The nuclei checked every 2 days when newly emerged marked queens or queen cells were introduced in the queen less nuclei or in those from which queens were removed after the egg laying had begun. Careful records on the introduction of queens or queen cells as well as on the mated queens removed were kept on individual record card for each nucleus fastened to the crown board. On the basis of the individual record cards, the total number of the emerged queens or queen cells introduced, the number of the accepted as well as of the mated queens centralized at the end of the rearing season for each nucleus and for the whole queen rearing farm.

## RESULTS AND DISCUSSIONS

### 1. The level of acceptance of queens and queen cells.

The data given in Table 1 on the evolution of the acceptance and losses during the mating flight of queens during the season show that of the total of 5,507 queens emerged (imago) and introduced in the

nuclei in May through September, 4,560 were accepted, i.e. a level of acceptance equal to 82.8% as against 2,161 queen cells introduced of which 1,836 were accepted, i.e. 84.96%. The difference of 2.16% in favor of the queen cell procedure is insignificant.

In the case of the emerged queens, the level of acceptance ranged from 77.6% to 87.73% and with the queen cells from 75.4% to 88.7%, the highest level being recorded for both sets of experiments in August (87.73% and 88.70 respectively) and the lowest level in May probably due to the variable weather conditions of this month (the level of 66.66% for the queen cells in September was not taken into consideration because of the very little number of cases).

Table 2

ACCEPTANCE OF QUEENS DEPENDENT ON THE POSITION OF NUCLEI IN THE BOX (1968)

Set of experiments	Emerged queens (imago)			Queen cells		
	Introduced in nuclei (pieces)	Accepted (pieces)	%	Introduced in nuclei (pieces)	Accepted (pieces)	%
Nuclei A	1370	1143	83.43	533	440	82.55
Nuclei B	1387	1146	82.62	548	471	85.94
Nuclei C	1392	1138	81.39	545	460	84.40
Nuclei D	1358	1138	83.79	535	465	86.91
Total:	5507	4560	82.80	2161	1836	84.96

Table 3

NUMBER OF THE QUEENS REJECTED BY THE NUCLEI DEPENDENT ON THEIR POSITION IN THE SHELTER

- Average data 1968 -			
Set of experiments	No. of nuclei	$\bar{X} \pm s \bar{X}$	Significance
Nuclei A	263	1.28±0.08	insignificant
Nuclei B	261	1.34±0.08	"
Nuclei C	261	1.34±0.07	"
Nuclei D	262	1.21±0.09	"

DL 5% = 0.29

As to the level of acceptance for both sets of experiments dependent upon the position of the nucleus in the shelter (box) the data presented in Table 2 indicate that with the set of experiments with emerged queens introduced in the peripheral nuclei A and D, the acceptance recorded was 83.43% and 83.79% respectively in comparison with the central nuclei B and C that showed an acceptance of 82.62% and 81.39% respectively. Likewise with the queens cells, insignificant differences were noted as to the acceptance of queens in the peripheral nuclei in comparison with the central ones (82.55%-86.91% against 85.94%-84.4%).

The results are also confirmed by the statistical analysis of the total number of non-accepted queens in the nuclei A, B, C, D. As illustrated in Table 3, in the central nuclei B and C a level of non-acceptance equal to 1.34±0.08% was recorded throughout the season in comparison to the peripheral nuclei A and D, where the level of the non-accepted queens was 1.28±0.08 and 1.21±0.09. The differences are insignificant (DL 0.29).

## 2. Losses recorded during the mating flight of accepted queens

The research aimed also at establishing the dynamics of losses of queens during their mating flight dependent on the season, position of the nuclei in the shelter (box), orientation of the entrances, and location of the nuclei in the field, the following results being obtained.

As it can be seen in Table 1, when the queens were introduced after their emergence, of 4,560 queens accepted 1,213 were lost during their mating flight accounting for 26.60%, whereas with the queens coming from queen cells of 1,836 accepted queens 421 were lost, i.e. 22.93%. The difference equal to 3.87% for the whole season in favor of the queen cells is insignificant and it could be due to the fact that with the set of experiments of "imago" queens were marked on the thorax, which enabled the birds of prey abounding in the area to hunt them more easily. The heaviest losses were recorded in July for both the emerged queens (31.74%-38.35%) and queen cells (24.06%-32.58%). (The losses with the set of experiments with "queen cells" of September were not taken into consideration because of the low number of cases). The lowest losses with both experiments were noted in May and June.

Table 4

NUMBER OF QUEENS LOST DURING THEIR MATING FLIGHT DEPENDENT ON THE ORIENTATION OF ENTRANCES

- Average data 1968 -			
Set of experiments	No. of nuclei	$\bar{X} \pm s \bar{X}$	Significance
Nuclei A – North	263	1.49±0.07	insignificant
Nuclei B – West	261	1.50±0.07	"
Nuclei C – East	261	1.70±0.07	"
Nuclei D – South	262	1.44±0.06	"

DL 5% = 0.27

Table 5

NUMBER OF QUEENS LOST DURING THEIR MATING FLIGHT BY PERIPHERAL AND CENTRAL NUCLEI

- Average data 1968 -			
Set of experiments	No. of nuclei	$\bar{X} \pm s \bar{X}$	Significance
Peripheral nuclei	99	1.30±0.12	control
Nuclei A – central	87	1.60±0.13	insignificant
Nuclei B – central	87	1.71±0.13	"
Nuclei C – central	87	1.93±0.14	+
Nuclei D - central	87	1.57±0.12	insignificant

DL 5% = 0.54

As to the dynamics of losses during the mating flight dependent on the orientation of entrances, the data given in Table 4 show that the highest values were noted with the nuclei entrances facing East (1.7±0.07 queens/nucleus) with insignificant differences as to the orientation of entrances.

Referring to the level of losses on queens dependent upon the location of nuclei in the field, from the data given in Table 5 it can be seen that the heaviest losses were recorded with nuclei placed in the central part of the area occupied by the nuclei ranging from 1.57±0.12 to 1.93±0.14 as against 1.30±0.12 with the peripheral nuclei, significant differences being noted only with the central nuclei C facing East.

## CONCLUSIONS

The data given in the paper show that:

- The procedure of introducing queens in nuclei under the form of emerged queens (imago) or queen cells give in general the same results as to the level of queen acceptance.

The level of losses on mated queens is influenced to a great extent by the environmental conditions, the presence of predators and the location of nuclei in the field;

- The orientation of entrances and the position of the nucleus in the shelter do not influence the loss of queens when mated.

## REFERENCES

1. FOTI N. – Date comparative privind împerecherea mătcilor în micronuclee și în nuclee normale. Lucrări științifice vol. V., Redacția Revistelor Agricole, București, 1965, p. 15-27
2. FOTI N. – Raport privind vizita la Stabilimentul de creșterea mătcilor „Apicoltora Piana” Castel San Pietro (Bologna) Italia, p. 1-40 (nepublicat)
3. LAIDLAW H.; ECKERT J.E. – Queen Rearing, University of California Press, 1962, p. 80-83
4. MĂRZA E., DRĂGAN N. - Randamentul la împerecherea mătcilor în nuclee mari și mici. Analele Stațiunii centrale de cercetări pentru apicultură și sericicultură, vol. VIII. Redacția revistelor agricole, București, 1967, p. 35-44
5. PIANA G.P. – Quelques problèmes de l'élevage des reines. R. *Française d'Apiculture* L. III, No. 149, Nov. 1958, Paris, p. 339-342
6. WEBER-SKLENAR – Die Wege 35 Nationen führten nach Rom. (2). Das Bienenmütterchen, 10, No. 12 Dez. 1958, p. 6-8
7. VINOGRADOV M.N. – Spetsializatiá a pcelovodstve, Rosselhozizdat M 1970, 109-116
8. ZANDER E. – Die Zucht der Biene 2 sufl. Wugen Ulmer Stuttgart 1941, p. 171-1977