

# Effect of honey flow on acceptance of bee eggs at different age in rearing colonies

JAKUB GĄBKA, BARBARA ZAJDEL, MARTYNA SKORUPKA,  
TERESA OSTASZEWSKA\*, MACIEJ KAMASZEWSKI\*

Apiculture Division, Warsaw University of Life Sciences, Nowoursynowska 166, 02-787 Warsaw, Poland

\*Department of Ichthyobiology and Fisheries, Warsaw University of Life Sciences, Ciszewskiego 8, 02-786 Warsaw, Poland

Received 15.05.2014

Accepted 11.09.2014

Gąbka J., Zajdel B., Skorupka M., Ostaszewska T., Kamaszewski M.

## Effect of honey flow on acceptance of bee eggs at different age in rearing colonies

### Summary

Quality of bee queens depends primarily on the age of the brood selected to initiate their rearing. The best queens are reared from eggs, although the acceptance of eggs in rearing colonies is reduced. The aim of the experiment was to investigate whether the honey flow affects the acceptance of eggs at different ages. Eggs aged 0-12, 24-36 and 48-60 hours were introduced into queen rearing colonies during the nectar flow and during the period without flow. The bees accepted 39.2% of the eggs introduced for queen rearing. No significant differences were noted between the total number of eggs accepted during the nectar flow (41.7%) and in the period without flow (36.8%). Significant differences were detected between the acceptance of eggs of different ages. Bees accepted significantly fewer of the youngest eggs (20.8%), compared with the oldest eggs (59.4%).

**Keywords:** honey bee, queen rearing, honey flow, bee eggs

The age of brood used for the rearing of queens has a major impact on their quality. The egg-laying rate of queens depends on the number of ovarioles, the volume of the spermatheca, and environmental conditions. Brood used for queen rearing should be as young as possible. Queens characterized by the highest weight, number of ovarioles and the volume of the spermatheca are obtained by queen rearing from eggs (6, 11), although the acceptance of eggs in rearing colonies is not high (8). Chuda-Mickiewicz and Prabucki (2) did not find any significant differences between the quality of queens reared from one-day-old larvae and three-day-old eggs. These authors obtained 56% of queens reared from larvae and 40% of queens reared from eggs. In the experiments of Gąbka et al. (3), bees from rearing colonies with open brood accepted 54% of eggs aged 48-66 hours and 72% of larvae aged less than 18 hours post hatch, and in colonies without open brood, 58% and 90%, respectively. According to Ostrowska (7), eggs used for rearing queens should be aged 2.5-3 days, and according to Pidek (8) not older than 2 days. The age of eggs has no significant effect on their acceptance in colonies with open brood, one day after the queen has been removed. However, the bees accept significantly fewer of the youngest eggs, and significantly more of the oldest eggs in colonies without open brood,

ten days after the queens has been removed (4). The Jenter method (5, 9) and the method of EZI Queen Technology (10) do not require the grafting of eggs or larvae to rear honeybee queens.

### Material and methods

The experiments were conducted in the Apiculture Division of the Warsaw University of Life Sciences in 2011. The first part of experiment was carried out at the beginning of July, during the main nectar flow from lime trees, and the second part, at the end of July, during the period without flow. Altogether, 288 bee eggs were introduced into 8 rearing colonies of *A. m. ligustica* bees. Each colony covered 18-20 combs.

The eggs originated from one Italian queen. The Jenter method was applied, which makes it possible to rear queens from eggs (5). The Jenter frame has removable cell bottoms, which are placed together with the eggs in special tubes. These tubes serve as queen cell cups, which can be introduced into rearing colonies. To obtain eggs of a specific age, the queen was isolated on three Jenter frames for three consecutive days from 8:00 to 20:00. In this way, eggs aged 0-12 hours, 24-36 hours and 48-60 hours were obtained after three days. The eggs were introduced during the nectar flow into four free-flying rearing colonies (1), from which queens were removed ten days earlier, and wild queen cells were cut off one day earlier. Into each colony, 36 eggs were introduced, 12 from each age group. The acceptance of eggs

was checked a few days later. The experiment was repeated in other four colonies during the period without flow. During the whole experiment, 96 eggs from each of the three age groups (0-12 hours, 24-36 hours, and 48-60 hours) were introduced – 144 during the nectar flow, and 144 during the period without flow.

Two-Way ANOVA was applied. Duncan's test was used to detect statistically significant differences between groups.

## Results and discussion

Two-Way ANOVA revealed a significant effect of the age of eggs on their acceptance ( $F_{2,23} = 5.334$ ,  $P = 0.015$ ), whereas the honey flow had no significant effect on egg acceptance ( $F_{1,23} = 0.253$ ,  $P = 0.621$ ). No significant interaction between these two factors was observed ( $F_{2,23} = 0.222$ ,  $P = 0.803$ ).

Out of a total of 288 eggs introduced into rearing colonies, 113 (39.2%) eggs were accepted. Bees accepted significantly fewer eggs aged 0-12 hours (20.8%) than those aged 48-60 hours (59.4%) (Tab. 1). These results are consistent with the observations of Ostrowska (7). Gąbka et al. (4) made similar findings. Chuda-Mickiewicz and Prabucki (2) obtained 40% of queens in the rearing from eggs. In a study by Gąbka et al. (3), bees accepted 56% of introduced eggs. According to Pidek (8), eggs should not be older than 2 days, but in the experiment presented here eggs older than 2 days were the best accepted.

Bees accepted 41.7% of eggs introduced during the nectar flow and 36.8% of eggs during the period without flow (Tab. 2). During the time when the nectar flow was available, rearing colonies accepted 25% of eggs aged 0-12 hours, 35.4% of those aged 24-36 hours and 64.6% of those aged 48-60 hours, whereas for the period without flow the respective figures were 16.7%, 39.6% and 54.2%.

No significant effect of nectar flow conditions on the acceptance of eggs introduced into rearing colonies was observed.

The age of eggs introduced into rearing colonies for queen rearing, significantly affects their acceptance. Older eggs are accepted at a higher rate than younger eggs.

Tab. 1. Acceptance of eggs of different age in rearing colonies

Age of eggs (hours)	Number of introduced eggs	Number of eggs introduced into one colony	Min-Max	Mean $\pm$ se	%
0-12	96	12	0-7	$2.50 \pm 0.78^a$	20.8
24-36	96	12	0-9	$4.50 \pm 1.03^{ab}$	37.5
48-60	96	12	4-12	$7.13 \pm 1.01^b$	59.4
Overall	288	36	0-12	$4.71 \pm 0.65$	39.2

Explanation: a, b – different letters indicate significant differences between the means

Tab. 2. Acceptance of eggs in rearing colonies

Period	Number of introduced eggs	Number of eggs introduced into one colony	Min-Max	Mean $\pm$ se	%
Flow	144	36	5-25	$15.00 \pm 2.95^*$	41.7
No flow	144	36	6-23	$13.25 \pm 2.70$	36.8
Overall	288	36	5-25	$14.13 \pm 1.96$	39.2

Explanation: \*Statistically significant differences between the means were not found

2. Chuda-Mickiewicz B., Prabucki J.: The effect of rearing queens from eggs and larvae. *Pszczeln. Zesz. Nauk.* 1998, 42(2), 27-28.
3. Gąbka J., Kamiński Z., Madras-Majewska B.: The influence of development stage of brood used for rearing honeybee queens on the number of obtained queen cells. *Roczniki Naukowe Polskiego Towarzystwa Zootechnicznego* 2010, 6(4), 241-245.
4. Gąbka J., Ochnio M., Kamiński Z., Madras-Majewska B.: Effect of age of eggs used for rearing honey bee queens on the number of received queen cells. *J. Apic. Sci.* 2011, 55(1), 47-52.
5. Jenter K.: Eine neue Königinnen-Zuchtmethod aus dem Ei oder der Eilarve im „Umsteckverfahren“. *Allgemeine Deutsche Imkerzeitung.* 1983, 4, 101-103.
6. Jordan R.: Die Zucht der Königin, ausgehend vom Ei. *Bienenvater.* 1960, 81(1), 3-7.
7. Ostrowska W.: *Gospodarka pasieczna.* PWRiL, Warszawa 1974.
8. Pidek A.: *Wychów matek pszczelich.* PWRiL, Warszawa 1987.
9. Sieger R.: Das Zuchtverfahren Jenter auf dem Prüfstand. *Allgemeine Deutsche Imkerzeitung.* 1983, 10, 312-317.
10. Wilde J.: Produkcja mleczka pszczelego bez przekładania larw. *Biuletyn Naukowy* 2002, 18(5), 107-112.
11. Woyke J.: Correlations between the age at which honeybee brood was grafted, characteristics of the resultant queens, and results of insemination. *J. Apic. Res.* 1971, 10(1), 45-55.

Corresponding author: dr inż. Jakub Gąbka, ul. Nowoursynowska 166, 02-787 Warszawa; e-mail: jakub\_gabka@sggw.pl

## References

1. Büchler R., Andonov S., Bienefeld K., Costa C., Hatjina F., Kezic N., Kryger P., Spivak M., Uzunov A., Wilde J.: Standard methods for rearing and selection of *Apis mellifera* queens; [in:] Dietemann V, Ellis J. D., Neumann P. (Eds): *The COLOSS BEEBOOK*, Volume I: standard methods for *Apis mellifera* research. *J. Apic. Res.* 51(5), 1-29.