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Growing honeybee queen from honeybee colonies located on the edges of cotton fields in Uzbekistan and artificially inseminating them

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Abstract. *The article presents information on the processes of artificially rearing queen bees in field conditions and their artificial insemination in bee colonies located on the outskirts of cotton fields in Uzbekistan.*

Keywords. *Honeybee queens, male bees, sexual fluid, paternal families, syringe, tube, carbon dioxide (CO₂), nucleus, larva, maternal families wax bowls, spatula, spatula, welding frame, educator.*

Аннотация. *В статье приведены сведения об искусственном выводе пчелиных маток и их искусственном осеменении в полевых условиях в пчелиных семьях, размещенных по краям хлопковых полей.*

Ключевые слова. *пчелиная матка, самец, половая жидкость, отцовской семьи, шприц, трубка, углекислый газ (CO₂), нуклеус, личинка, маточная семья, восковые мисочки, лопаточка, расплодная прививочная рамка, семья воспитательная.*

RELEVANCE OF THE TOPIC

The climatic conditions of the Republic of Uzbekistan are very favorable for the development of bee colonies. That is why our government pays great attention to the implementation of these works. In the climatic conditions of our republic, starting from early spring, it is possible to raise a large number of honeybee queens artificially in order to supply them to neighboring countries and to satisfy the needs of our republic.

After the queen honeybee reaches puberty, she naturally meets and fertilizes male bees only in the open air at an altitude of 500 meters. This feature makes it difficult to control and conduct selection and breeding work in beekeeping. For this purpose, we set out to study the feasibility of artificial insemination of queen honeybees in field conditions, in cotton growing areas, on an experimental basis.

The research work was carried out at the "Unumdor Zamin" beekeeping farm in the Andijan district of the Andijan region. The beekeeping farm has more than 800 bee colonies, mainly of the Carpathian bee breed. The main goal of the research is to develop a technology for breeding queen bees from bee colonies located on the outskirts of cotton fields in Uzbekistan and to inseminate them artificially.

Also, his tasks are:

-Cultivation of queen honeybees artificially in conditions of cotton growing areas;

-Cultivation of sexually mature male honeybees;
 Studying the health of male honeybees and how their sperm fluid changes with age;
 - The condition of the artificially inseminated queen honeybee, looking after laying eggs and studying the amount of her daily egg laying, were taken as a basis.

By making effective use of the empty areas on the edges of the cotton fields, honeybee colonies were selected from the colonies placed in them for artificially rearing queen honeybees, that is, colonies from which larvae were obtained in advance, and they were periodically fed with protein feed at a rate of 250-300 ml per day. During this period, all the necessary equipment for artificially rearing queen honeybees, wax cups, spatulas, combs, royal jelly, grafting frames, and clean water were prepared [1,2].

Also, from the best 10-12 closed brood colonies, strong honeybee colonies were selected and prepared. To orphan these colonies, their mother was removed one day in advance. When the bees in the foster bee colony felt orphaned during this period, the grafting frames with one-day-old larvae were placed in the middle of the hive. The foster bee colonies were fed 250-300 g of proteinaceous feed every other day [45].

In order to artificially inseminate queen honeybees, it is necessary to breed a sufficient number of queen honeybees in advance. For this purpose, queen honeybees were bred artificially in the required number. Information on this is provided in table 1.

Table 1. Incubation of larvae in queen bee breeding (pieces)

Days	The larva was given	Accepted	%
Day 1	84	71	84.5
Day 2	78	66	84.6
Day 3	86	69	80.2

Table 1. shows that in the artificial queen honeybee rearing experiment organized in empty areas on the edges of cotton fields, on the first day, 84 one-day-old bee larvae were given to the honeybee colonies. Of these, 71 were accepted, or 84.5%. Similarly, on the second day, 78 one-day-old bee larvae were given, or 66 were accepted, or 84.6%. On the third day, 86 one-day-old larvae were given, or 69 were accepted, or 80.2%.

After the queen honeybees, which were artificially reared using empty plots on the edges of cotton fields in the cotton-growing regions of Uzbekistan, were matured, the best of them were selected, and after they reached sexual maturity and puberty within 10-12 days, they were taken for artificial insemination.

During this period, paternal honeybee colonies were selected and sexually mature male bees were isolated from them. The information about this is presented in Table 2 below.

Table 2. Weight of male bees reared in experimental groups (mg)

Days	n	lime	$X \pm S_x$	$C_v, \%$
5-7 days	10	231-244	237.5 ± 31.4	31.4
9-10 days	10	239-248	243.0 ± 33.1	29.5
12-14 days	10	233-245	239.0 ± 30.4	30.4

The data in Table 2 show that the weight of male honeybees increased by 6 mg at 9-10 days compared to the initial 5-7 days of age, and by 15 mg at 12-14 days of age. This indicates that the increased weight of male bees also increases their reserves of sexual fluid.

Artificial insemination of queen bees in experimental groups

In March 2024, the best paternal honeybee colonies were selected to raise male bees, and these honeybee families were periodically fed with protein foods. Because when raising queen honeybees artificially, male honeybees must be raised before a month. At the end of April 2024, the artificial breeding of queen honeybees began. In the first days of May, a sufficient number of queen honeybees were artificially bred. They needed 10-14 days to reach adulthood. During this period, the queen bees were cared for and fed with protein feed.

You can also see data on the daily weight changes of male bees in Figure 1.

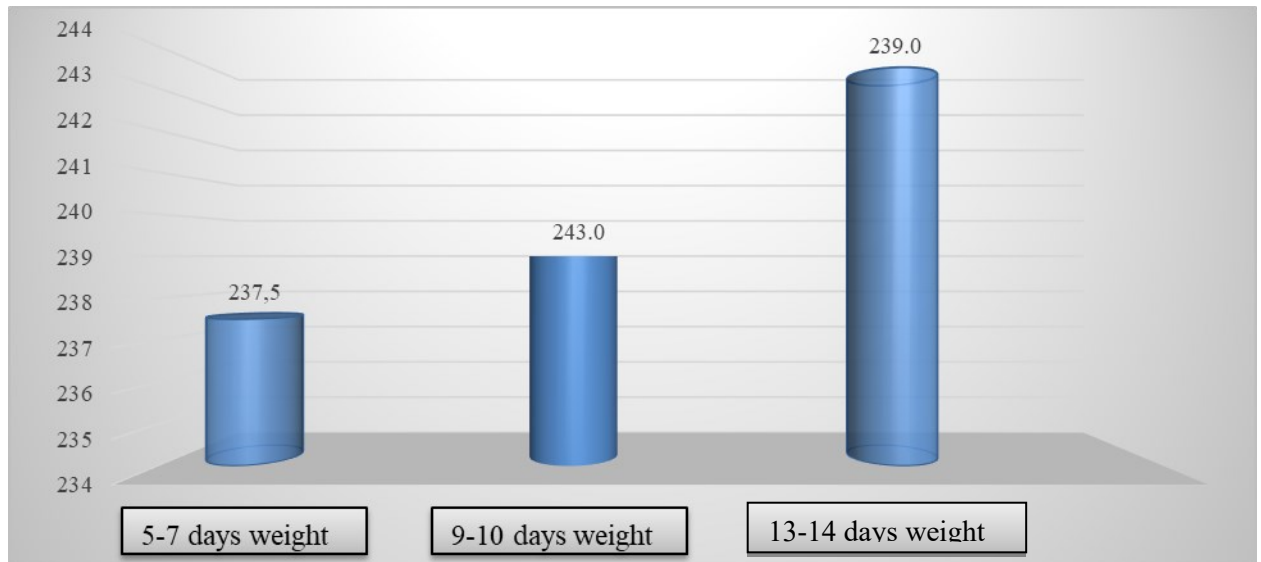


Figure 1. Daily changes in the weight of male bees

From the information in Figure 1, you can see that the weight of male honeybees growing up in their hives changed constantly until they reached adulthood, and after 12-14 days of adulthood, their weight reached 243.5 mg.

As the male bees gain weight, it is a major sign that all of his organs are developing well. It has been observed that these male bees have significantly more sperm than other lighter male honeybees, and queens have been prepared for artificial insemination.

For this purpose, in order to artificially inseminate queen honeybees, first of all, all parts of the artificial insemination apparatus were disinfected, using alcohol-based solutions and distilled water. Sexually mature male bees were selected to obtain sperm fluid from male bees.

During the experiments, the male honeybee’s abdomen was squeezed, the sperm sac on its posterior abdomen was slowly removed, and sperm fluid was extracted from it using a special syringe.

To artificially inseminate queen honeybees, special tubes were selected that matched the size of the queen honeybees and were mounted on a tripod. The queen bees were placed in the tube and anesthetized with carbonic anhydrite (CO₂) gas. The genitals of the queen honeybees placed on the tripod were opened with a hook and inseminated with the sperm of the male bees.

After fertilization, the queen honeybees were removed from the stand and kept in special cages in a warm room. Later, they were transferred to their small families (compartments) in the nucleus, and these small colonies accepted the queen honeybees well and quickly.

It was the first attempt of artificial insemination of queen honeybees by scientific staff of beekeeping department, and they achieved high-quality fertilization of queen honeybees.

Information on artificially inseminated queen honeybees is presented in Table 3 below.

Table 3. Artificially inseminated queen bees during the season (piece)

Days	n	lime	X±Sx	C _v , %
First day	83	60-98	83.0 ±15.1	22.4
Second day	92	86-99	92.5 ±17.1	28.5
Third day	92	72-112	92.0± 19.8	26,3

Table 3 shows that as of May 2024, 270 queen honeybees were prepared for artificial insemination. Of these, 3 queen bees were not inseminated due to their small size. On the first day 83, on the second day 92, and 92 on the third day, a total of 267 queen honeybees were qualitatively inseminated artificially.

After that, daily egg-laying of artificially inseminated queen bees was studied, and no egg-laying was observed from the first day. On the second day of the experiment, 29 queen bees laid 72,5 eggs, on the third day, queen bees laid 135,5 eggs, and in the following days, the number of queen bees increased to 765,5, and after that, the daily number of queen bees increased day by day.

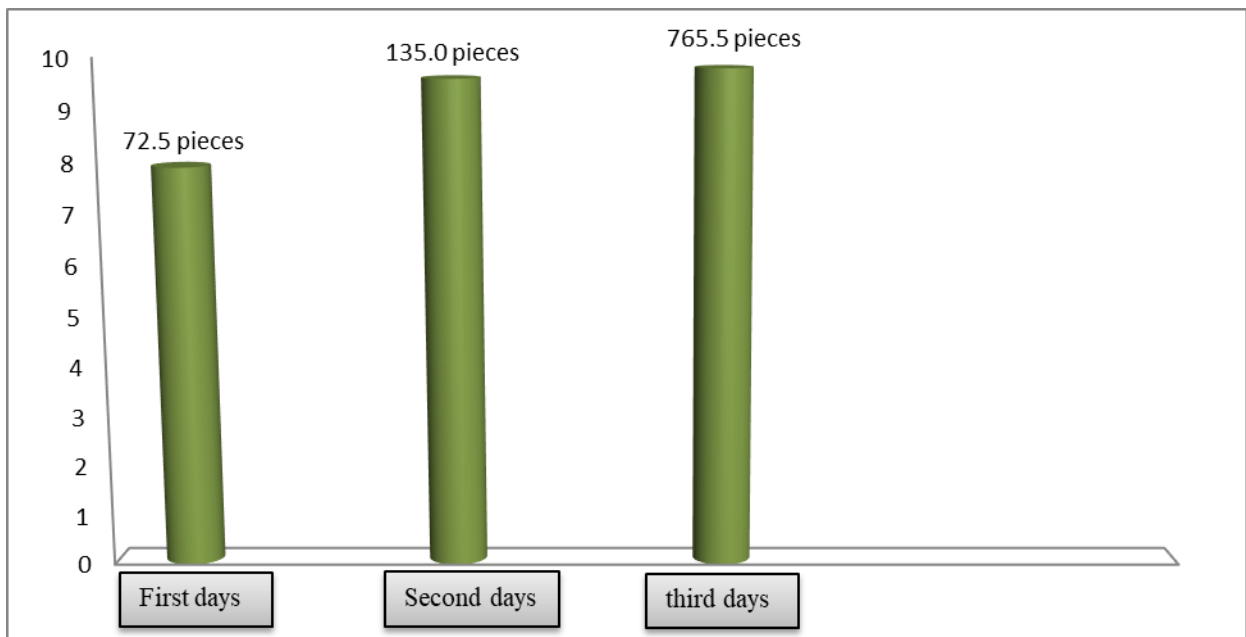
As a result, during the study period, after 267 queen honeybees were artificially inseminated, 258 of the 267 queen bees were successfully inseminated and began laying eggs after 2 days. 9 queen bees were not well inseminated due to poor quality and were rejected and destroyed. This is 3,48% of the total. You can also see the data on the daily egg laying of artificially inseminated queen bees in Table 4 below.

**Table 4. Daily priod of artificially inseminated queen bees
egg laying (piece)**

Days	Number of fertilized queen bees	Daily oviposition of fertilized queen bees		
		Lim	X±Sx	C _v %
Second day	29	67-78	72.5 ±2.71	21.4
Third day	58	120-150	135.0±2,80	25.5
Fifth day	62	581-950	765.5±2,82	28.4

Table 4 shows that artificially inseminated queen honeybees increased their daily egg laying. On the first day, they laid an average of 72,5 eggs per day, but on the third day this figure increased to 135,0 eggs, or 62,5 more than on the first day, or 180,0%. On the fifth day, egg laying increased significantly, reaching an average of 765.5 eggs. This figure increased by 630,5 eggs, or 566,6%, compared to the third day.

You can also see the daily egg-laying rate of artificially inseminated queen honeybees from the diagram in Figure 2 below.



2 pictures. Diagram of daily egg-laying of artificially inseminated queen bees

From the data in Figure 2, you can see that the artificially inseminated queen honeybees did not lay eggs on the first day, but on the second day, they laid an average of 72,5 eggs, and after that, you can see that the queen honeybees continuously increased their daily egg laying in the following days, reaching 765,5 on the fifth day.

CONCLUSION

It was determined that queen bees are sexually mature at 12-14 days after reaching puberty for artificial insemination, and sexually mature at 13-15 days.

It was found that artificially inseminated queen honeybees laid a small number of eggs from the second day and continuously increased their daily egg laying from the last days.

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