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THE QUALITY OF QUEEN BEES DEPENDING ON THE TERM AND METHOD OF THEIR HATCHING

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Abstract

The aim of the research was to identify the most favorable terms of breeding queens for commercial apiaries in the Vinnytsia region. One of the tasks of the research was to identify the most favorable conditions for breeding queens in the apiary of the Vinnytsia region. In accordance with the set goal, some factors influencing the quality of queen bees have been studied: honey collection conditions, terms of hatching, method of hatching queens. Reception by a bee family of breeding material, and also quality of the received queens is in many respects defined by a weather condition, a temperature mode, presence or absence in the nature of a honey harvest, a season and many other conditions. The weight of hatched queens under favorable conditions of honey collection corresponds to GOST 23127 "Uterus bee". Uterines bred in the third decade of May are the largest and exceed the breed standard by 9.2%. The weight of queens bred under adverse conditions, which occurred on May 23, less than 7.4%. swarming uteruses had the highest mass. They are larger than the fistulous uterus by 13% and 11.9%. Uteruses bred on May 18 were fertilized mainly on day 10 (50%), 10% of females flew around on day 11 and 35% of uteri were lost. The earlier the uterus reaches physiological maturity, the higher its further productivity. In the first 50 days of life, the uterus of earlier hatching lays 3.8% more eggs per day, compared with the uterus hatched a week later, and 15.3% superior to the uterus of the last period of the analyzed time.

Keywords: uterus, larvae, foster families, volume, queen cell, brood, development

Formulation of the problem. Beekeeping has long been one of the well-developed branches of agricultural production. Ukraine produces 4-5% of the world's honey. The main producers of honey in Ukraine are 11 regions, which provide production of up to 70-75% - Vinnytsia, Zhytomyr, Khmelnytsky, Mykolaiv, Dnipropetrovsk, Zaporizhia, Poltava and Kirovohrad, Sumy, Kharkiv and Donetsk regions. Vinnytsia region accounts for within 5.0% of commercial honey produced in Ukraine [14].

Beekeeping is characterized by rapid cost recovery and efficient production of products. As a rule, the payback period of one bee family is one year. The originality of beekeeping products lies in their plant and animal origin, high nutritional value, environmental friendliness and preventive and curative properties [5]. Therefore, their production is constantly growing, and scientists and practitioners are looking for ways to intensively use bee colonies.

The intensity of family development, its productivity and viability depend not only on the technology of care, honey harvest conditions, the condition of the nest, but also on the quality of the queen bee. The uterus primarily determines the quality of bee colonies and their productivity [10]. Beekeepers of Vinnytsia region, as a rule, use queens of their own breeding or borrow them from neighboring beekeepers. However, the conditions that determine the quality of queens during their breeding in the specified region have not been sufficiently studied.

In this regard, the study of methods of breeding queens and conditions that determine their quality, in modern conditions of beekeeping development has a certain scientific and practical interest.

The aim of the research was to identify the most favorable terms of breeding queens for commercial apiaries in the Vinnytsia region.

Review of recent research and publications. The quality of queen bees, in addition to breed, depends on a number of other factors, among which the most important are age, method of cultivation and fertilization.

Families with one-year-olds collect 42.4% more honey, and families with two-year-olds collect 20.8% more honey than three-year-olds. One-year-old uteruses lay the maximum number of eggs in spring and in the first half of summer, two-year-olds - in spring, but the intensity of egg-laying decreases in June. One of the prerequisites for intensive winter beekeeping is the presence of young queens in families. This year's uteri lay eggs in the fall for about 10 days longer and 7.3% more than two-year-olds, and 17 days longer and 2.9 times more than three-year-olds. In winter, old uteri die 50 times more often than young ones. The age of queens also affects the fertility of bee colonies. Thus, in families with old queens, bees swarm three times more often, go for a quiet replacement [8].

The weight of the uterus can be judged on its quality, but only if all the conditions necessary for its removal are met, as the fallopian tubes develop in the uterus in the last days and hours of stay in the uterus. If at this time it is incorrect to withstand the temperature, the uterus will have a high mass, but have poorly developed ovaries, and, as a result, have low egg production [9].

The weight of the queens is an indirect sign of their quality. As the weight of the uterus increases, the time of their puberty decreases. Infertile uteri weighing

120-180 mg were mated for an average of 17 days; weighing 211-220 mg - for 11 days; and even more difficult - for 10 days [1].

Feeding sugar syrup to the foster family has a positive effect on the quantity and quality of the resulting queens [11, 12]. The best reception of artificial bowls with larvae during the main bribe with constant bringing of pollen and nectar, in warm and humid weather. The presence and intensity of honey collection, as well as a large number of feed stocks in the nest of the foster family have a positive effect on the level of milk supply of larvae [4].

The presence of medical collection has a positive effect on the quality of queens [9]. It is established that the heaviest uteruses are removed during the main medical collection, and the lightest - with an uneven bribe.

The vital activity of a bee family directly depends on the season. Depending on the latitude, each country and region has its own optimal time for breeding queens. Uteruses bred in June have less weight compared to spring and obtained during the main honey harvest.

Materials and methods of research. One of the tasks of the research was to identify the most favorable conditions for breeding queens in the apiary of the Vinnytsia region. In accordance with the set goal, some factors influencing the quality of queen bees have been studied: honey collection conditions, terms of hatching, method of hatching queens.

In the formation of the compared groups used the method of analogues, taking into account the number of bees, brood, honey, perga, the origin of the queens. When studying the quality of queens of different hatching dates, larvae were taken from one maternal family. All bee families were in the same conditions.

The evaluation of the studied features and indicators was carried out according to the following criteria [3]:

- reception of larvae - was determined by calculating the percentage of larvae adopted for breeding, taking into account the bowls with larvae, in which bees laid portions of royal jelly three days after setting the nursery frame in the foster family;

- weight of queens - weighed on VT-500 scales. Infertile - on the first day after hatching, fertile - after laying the first eggs;

- volume of the queen cell - in the queen cells selected after the uterus came out with the help of a medical syringe with a volume of 2 ml, water was poured until it was filled and its volume was calculated;

- the height of the queen cell - was measured using a measuring stick and graph paper;

- the timing of the uterus - was determined visually by its behavior and the appearance of eggs in the cells, first on the 10th day after release and then daily;

- laying of queens - the average daily laying of queens was calculated by dividing the number of sealed cells of brood grown by bees by 12 accounting days;

- growth and development of bee families - every 12 days visually determined the number of bees in the families by the number of honeycombs occupied by them, in those hours when all the bees were in the hive;

- the number of sealed brood in families was determined every 12 days by measuring it with a grid frame with squares of 5x5 cm, each of which contains 100 cells. The last record of the brood was carried out in late August.

The process of hatching queens begins with the flowering of spring honeybees. In beekeeping, two methods are used to obtain queen bees, natural and artificial. Therefore, obtaining more high-quality queen bees by artificial method is relevant in both scientific and industrial terms. Derivation of queen bees by artificial means requires considerable attention to foster families. It is believed that the foster family should be strong, healthy, provided with sufficient honey (8-10 kg) and perga (2-3 honeycombs) and stand out with a tendency to intensive breeding. The highest quality queens are obtained during the period of stable honey harvest with weight gain of the control hive 1-1.5 kg [2].

To obtain quality queens, it is necessary to choose the most favorable terms of hatching, depending on the nature of the honey harvest, family status and climatic conditions.

To conduct research on the reception of larvae by foster families in the hatching of queens, we used an artificial method without transfer of larvae. In this method, a cell with larvae not older than 12 hours was selected. Next, a sharp hot knife at the bottom of the cell cut triangles so that their tops were directed to the upper bar. In the last row of cells left one larva, and two - selected. Then the edges of the cells with larvae were expanded with a stick. On cells with young larvae, bees laid queen cells during the first day [13].

At artificial removal of queens for education of larvae use foster families. Existing methods of obtaining uteri are based on the selection of the uterus. Bees, feeling its absence, began to breed new queens.

Research results. Admission to the rearing of larvae depends on a number of factors, which include the condition of the bee family, the quality of the wax raw material from which the bowls are made, the training of the foster family and many others. It is believed that the most influential are the honey harvest and weather conditions in the first week of growing larvae. Lack of honey collection does not prevent the receipt of high quality queens, but only worsens the reception of larvae that give birth.

In the course of the study, we monitored the intake of larvae by foster families during the hatching of queens in the spring for 2019-2020 (Table 1).

Table 1

Reception of larvae by foster families

Year	Date of registration								
	2.05			7.05			13.05		
	pledged	deduced	% method	pledged	deduced	% method	pledged	deduced	% method
2019	23	14	52,4	19	9	47,4	12	8	66,7
2020	21	11	60,9	18	11	61,2	14	10	83,4

The data in table 1 show that the reception of larvae for education increases with increasing calendar days. Admission of larvae laid at an earlier date (May 2) ranged from 52.4% in 2019 to 60.9% in 2020. The percentage of admission decreased from 52.4% to 47.4% on May 7, 2019. and on May 13 - the highest figure (66.7%). The results of bee colonies in 2020 differed compared to 2019 on the second date of registration, the number of larvae adopted for breeding increased from 60.9% to 61.2%, on the third date - to 83.4%.

Reception by a bee family of breeding material, and also quality of the received queens is in many respects defined by a weather condition, a temperature mode, presence or absence in the nature of a honey harvest, a season and many other conditions.

The reception of larvae by foster families differs significantly between the analyzed years (2019-2020) and depends on weather conditions. Adversely affect the low temperatures during the development of the uterus on its mass at the exit of the uterus. Bad weather, even during a bribe, has almost no effect on the reception and upbringing of queen cells. However, the deterioration of weather conditions, accompanied by a decrease in flight activity, negatively affects the formation of queens. The decrease in external temperature for two weeks, accompanied by rain, reduces the intake of larvae and slows down the growth of the uterine larva.

In 2019, there was a sharp decrease in the average daily air temperature on May 4-6 (Fig. 1) to 9-11 ° C against the background of lack of nectar, which led to a deterioration in larval intake.

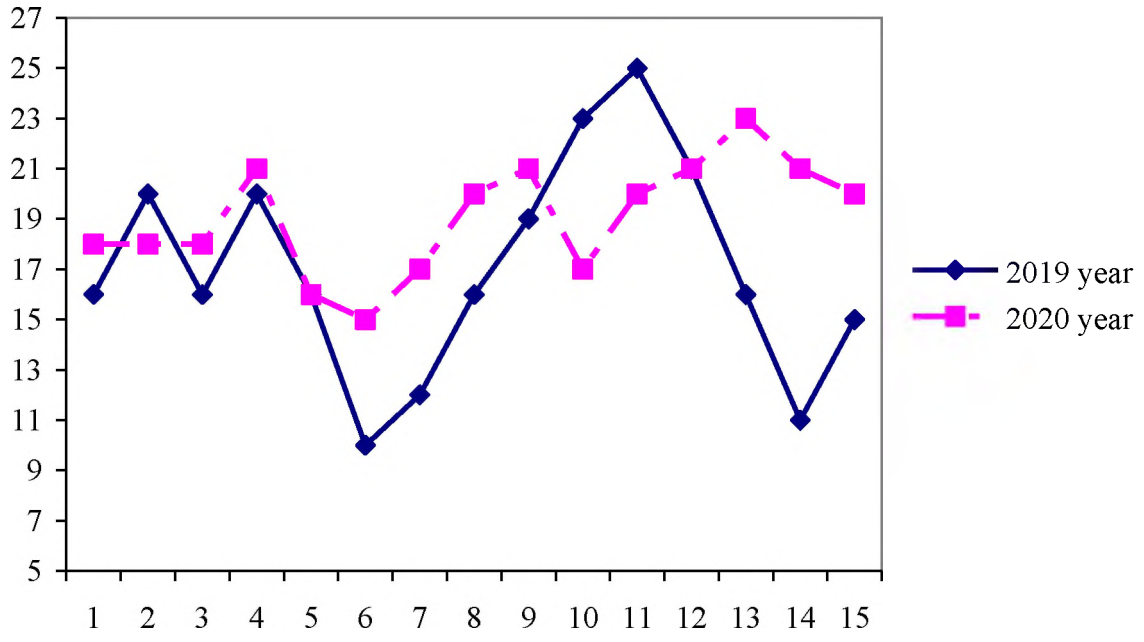

Fig.1. Air temperature for the period of larval rearing

The number of larvae adopted in 2019 for this period amounted to 47.4% and in 2020 - 61.2%, which is 13.8% more. In 2020, after laying the larvae on May 2 and in the following days, there was a gradual increase in air temperature to 23 ° C, which had a positive effect on the reception of larvae for education, and it during this period amounted to 61.2%. At a later date, there was an improvement in weather conditions. The air during the day warmed up to 23 ° C, which contributed to the successful use of nectar by bees. Reception of uterine larvae increased to 83.4%.

Thus, the reception of larvae by foster families depends on both weather and honey harvest conditions. With increasing air temperature, the percentage of larvae for rearing increases.

Even more important than the question of receiving bowls, is the question of the mass of queens, which are derived from queen cells of various kinds and sizes.

A number of scientists note the dependence of the quality of the uterus on the size of the queen cell. There is evidence in the literature that larger bees supply more royal jelly than smaller ones. It is recommended to lack small queen cells when breeding queens, as they will produce smaller individuals with fewer fallopian tubes [6].

In the course of research, we tracked the change in the size of queen cells during artificial hatching of queen bees (Table 2).

The volume of the swarm queen varies greatly, and its size is strongly influenced by the presence of food in nature. In the absence of bribes, especially in dry years, the size of the queen cells decreases; on the contrary, in a season with a good bribe bees rebuild many large queen cells. In the course of research, measurements of the volume of queen cells, which were laid by bee colonies that were in a swarm state, and during artificial hatching of queens were performed (Table 4).

Table 2

The volume of queen cells and the weight of queens depending on the method of their removal, ml

Way removal of queens	The length of the queen cell, mm	Uterine volume, ml	Mass infertile uterus, mg
Artificially bred	22,0±0,05	0,98± 0,014	195,7±0,38
Swarms	22,7±0,07	1,05± 0,031	199,4±0,27

The queen cells were evaluated on the 9-10th day after giving the larvae. The queen cell was selected by size, as it is associated with the weight of the uterus. In queen cells with a height of 16 mm develop mainly small uteruses weighing up to 180 mg, in queen cells with a height of 20 mm - satisfactory quality of the uterus weighing 180-200 mg, in queen cells with a height of more than 22 mm - large uteruses weighing more than 200 mg. For economic purposes, use queens weighing at least 200 mg, so all queen cells up to 20 mm in height should be missing.

In our studies, the volume of artificial queen cells is 6.7% less than swarms and is 0.98 ml, with a range of 0.8 to 1.10 ml. The volume of swarm queen cells is 1.05 ml, with a range of 0.91-1.15.

The swarms of uterine bees were 0.7 mm, or 7.1%, longer than those obtained in foster families.

One of the indicators of the quality of the uterus is its weight. It is the basis of GOST (GOST 23127-78 "Uterus") on queen bees and is for infertile uterus, depending on the breed of bees 180-190 mg and for fertile - 200-210 mg.

The length of the uterus and the volume affected the weight of the infertile uterus. Thus, in the swarming uterus, the average weight was dominated by artificially excreted 3.7 mg, or 1.9%.

Thus, our research confirmed the existence of a relationship between the size of the queen cells and the weight of infertile queens.

During 2019-2020, we tracked the mass of artificially bred infertile queens (Fig. 2).

In 2019, all obtained infertile uteri (due to adverse weather conditions) were of lower quality and their weight was 182.3 mg with a range of 178-219 mg. In 2020, their weight at the exit of the queen cell averaged 195.7 mg.

Therefore, with greater weight of the uterus is obtained under favorable honey harvest conditions.

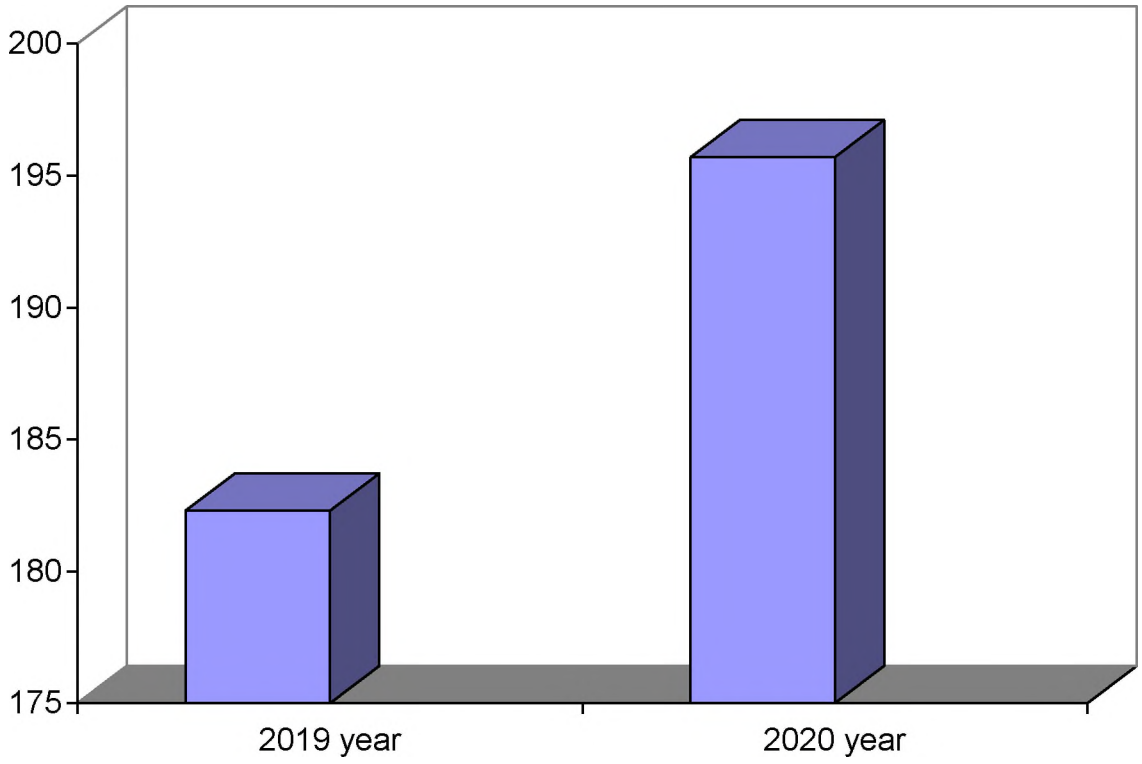

Fig. 2. The mass of infertile queens during artificial insemination in 2019-2020, m

In 2020, three batches of ewes were bred (Fig. 3) with the release dates of ewes on May 18, 23 and 29. The weight of infertile queens ranged significantly within the study groups (from 168 to 218 mg). The most severe were the uterus of the third group (202 mg) - May 29. They are 6.3% heavier than queens of group 1 (190 mg), released on May 18, and 8.0% heavier than queens of group 2 (187) - on May 23.

It should be noted the heterogeneity of the mass of the uterus within the study groups. Thus, in the first group, hatched in the earliest terms of the uterus, the difference between the maximum and minimum weight was 25 mg. It increased in group 2, with the release of the uterus in a week and reached 42 mg. The minimum difference was at later dates of hatching of the uterus in group 3 at 18 mg.

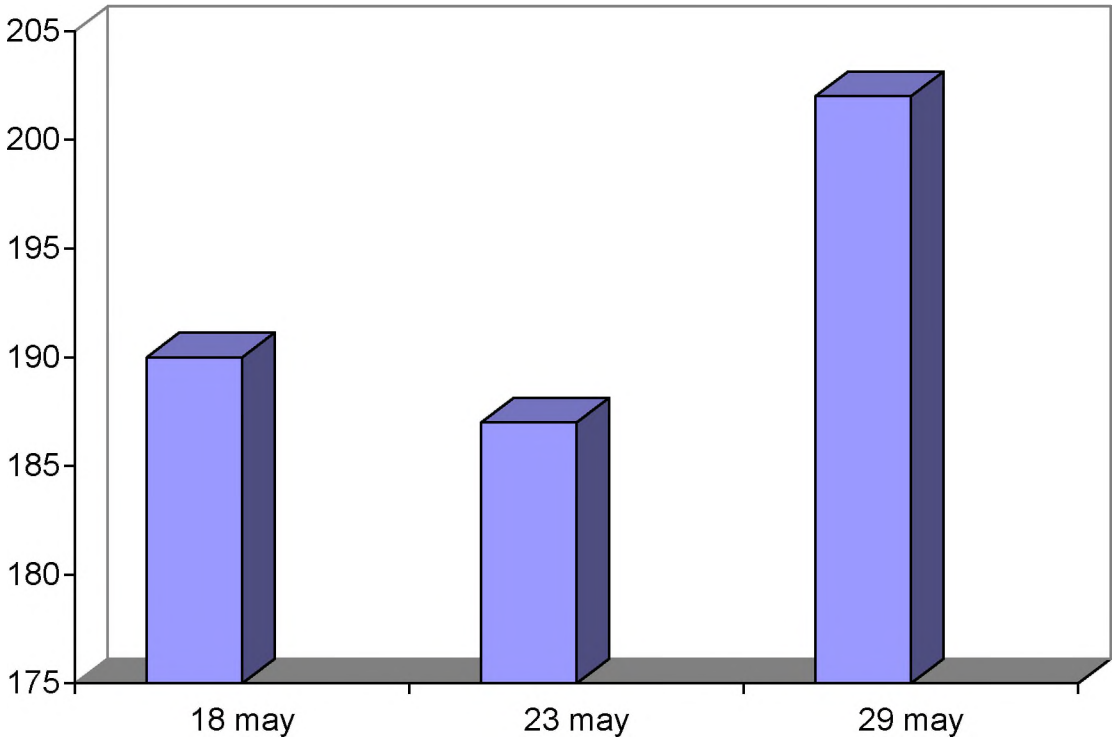

Fig. 3. Weight of infertile queens of different terms of derivation, mg

Thus, the mass of hatched queens under favorable conditions of honey collection corresponds to GOST 23127 "Bee uterus". Uteruses bred in the third decade of May are the largest and exceed the breed standard by 17 mg, or 9.2%. The weight of uteri bred under adverse conditions, which occurred on May 23, less than 15 mg, or 7.4%.

We conducted a study of comparative assessment of the quality of queens obtained by different methods of breeding: artificial and natural (swarm and fistulous) for 2019 and 2020 (Table 3).

During the study period, the highest mass had swarm uteruses 193.5 and 199.4 mg. They are larger than the fistulous uterus by 25.1 mg (13%) and 23.8 mg (11.9%) and obtained artificially by 11.2 and 3.7 mg.

Analyzing the mass of individual uteri within the group, it should be noted that more homogeneous uteri during artificial removal. Heterogeneous fistulous uterus. The difference in minimum (144 mg) and maximum (189 mg) weight is 45 mg.

Table 3

The mass of the uterus with different methods of hatching in 2019-2020 yaer

Спосіб виведення	2019 рік		2020 рік	
	мг	%	мг	%
Штучний	182,3	94,2	195,7	98,1
Свищевий	168,4	87	175,6	88,1
Роєвий	193,5	100	199,4	100

Swarming uteruses are the most heterogeneous, their minimum body weight is 145 mg and the maximum weight of infertile swarming uteruses reaches 212 mg and exceeds that in comparison with uteruses of artificial excretion by 14 mg, fistulous - by 22 mg.

The uterus after leaving the queen cell reaches physiological maturity for about 8-10 days. During this period, they end the formation of ovaries and they fly out to mate.

During the experiment, we tracked the timing of the flight of the uterus. Table 4 shows the time of flight of the uterus in 2020.

Table 4

Terms of flight of queens in 2020,%

Group	Flew for, days:			Died during the flight
	10	11	12	
1	50	10	5	35
2	40	30	10	20
3	30	20	15	35

Much of the uterus flew around during the first 10 days. Moreover, the uterus, bred on May 18, was fertilized mainly on day 10 (50%), 10% of the uterus flew around on day 11 and lost 35% of the uterus. The uterus of the second term of hatching also flew for mating mainly on the same days. On day 10, 40% of queens were fertilized, on day 11 - 30% and on day 12 - 10%. The number of queens that did not return to the hive has almost halved. The uteruses, bred on May 29, did not fly as well as in the previous groups. On day 10, 30% of queens were fertilized, on day 11 and 12 - 20 and 15% and 35% of queens were lost.

Weather conditions of the period of hatching of queens in 2020 promoted their timely departure for mating.

Some scientists believe that the uterus, which flies in the first days of departure, have a greater mass. We traced the relationship between the maturation of queens and their subsequent productivity (Table 5).

Uteri that mate for 10 days have 5.3% more weight, their egg production is higher by 8.2%. By the end of the active period, bee families with such queens were able to increase by 6.7% more bees than queens that matured for mating by 11-12 days from the date of release.

Table 5

The quality of queens that flew around at different times

Index	Flight time of queens, days	
	10	11-12
Uterine weight, mg	198	188
Oviposition, eggs per day	1065	984
The strength of the family on October 1, the streets	8,0	7,5

Thus, the timing of the flight of the uterus can be judged on their quality. The earlier the uterus reaches physiological maturity, the higher its further productivity.

The main indicator of the quality of the uterus is its egg production. The level of growth and development of a bee family largely depends on its level, and for a bee family the ability to accumulate the maximum number of bees before the main honey harvest. In turn, uterine egg production depends on a number of factors, among which should be noted the conditions of medical collection, the strength of the family, the season.

During 2019-2020, we tracked the dynamics of uterine egg production, which were bred artificially and naturally at different times.

In the layers, the laying of eggs began to be carried out 26 days after the uterus left the queen cell, which is a period consisting of 10-12 days before the flight and plus 14 days from the moment the uterus lays the first eggs.

For this purpose, three groups of layers with artificially derived uteruses were formed with the dates of hatching on May 18, 23 and 29. Laying hens in the first accounting period amounted to 517 eggs per day in the first group, 563 in the second and 382 in the third (Table 6, Fig. 4).

As bees accumulate in families, the intensity of uterine egg laying increases rapidly and after 12 days it increases by 66.5%. At the time of the third census, there was more than a twofold increase in this indicator, and before the main honey harvest, the laying of queens was 1240 eggs in the first group, which is 44.0% more than the previous date of registration.

Table 6

Laying of queen bees depending on the period of hatching, eggs per day

Accounting period	Дата виведення маток					
	18.05		23.05		29.05	
	Date of registration	Laying, pcs.	Date of registration	Laying, pcs.	Date of registration	Laying, pcs.
1	14.06	517	20.06	563	26.06	472
2	26.06	861	2.07	824	8.07	743
3	8.07	1240	14.07	1137	20.07	1056
Total for the accounting period		2618		2524		2271

In the second group on the second date of registration the productivity of queens increased by 46.3%, on the third date - by 37.9%, compared to the previous dates of registration.

On the third date of accounting, these indicators were higher by 57.4 and 42.1%, respectively.

The value of the average daily egg production of queens of groups 1 and 2 hatched at different times had

a difference when counting on day 26 from the beginning of egg laying in favor of queens hatched a week later (Fig. 5). Uterines of group 3 in terms of this indicator lagged behind group 1 by 8.7% and from group 2 - by 16.6%.

At day 38, in terms of the number of eggs laid by the uterus, hatched on May 23, they lag behind the previously received queens by 4.3%, and queens that hatched from queen cells on May 29 - by 9.8%. The same trend persists when accounting for the 50th day of life of the uterus. The uteruses of the families of the second group lay eggs by 8.3%, and the uterus of the third group - by 14.8% less than the queens of the first group.

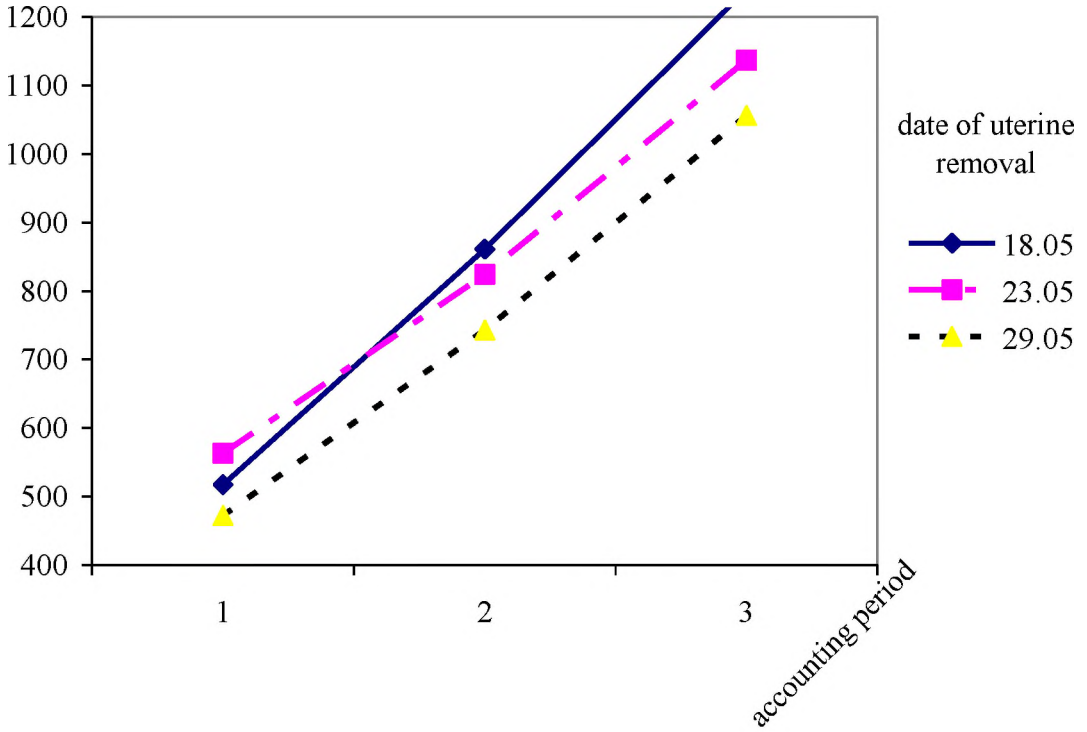

Fig.4. Dynamics of oviposition of queen bees in layers

In the first 50 days of life, the uterus of earlier hatching lays 3.8% more eggs per day, compared with the uterus hatched a week later, and 15.3% superior to the uterus of the last period of the analyzed time.

Conclusions.

1. Admission of larvae for uterine upbringing in foster families without selection of brood was 74.1%, with the formation with the selection of all frames with brood by 36.2%, with the selection of only closed brood - by 25.9%, with selection only open brood - 32.8% less.

2. The largest number of queens from the number of adopted larvae for education was obtained in the first group - 93.0%, the second - 90.9%, the third - 89.3%, the fourth - 91.6%.

3. In the group of foster families when using sugar syrup for feeding, the lowest percentage of larvae for uterine upbringing is 77.5%, honey sieve with stimovite - by 1.7%, honey sieve with apivite - by 8.7% and honey sieve with stimovit and apivit - 13.8% more.

4. The yield of conditioned queens in the fourth experimental group was higher compared to the same value of the control group by 13.3%, the second group - by 5.7%, the third - by 7.8%.

5. The weight of infertile queens corresponded to the breed standard and was equal to 180-186 mg, respectively.

6. The maximum yield of fertile queens was detected during the formation of nuclei on three store frames, with a force of 1.5 streets, four nuclei in the store extension, installed on the main family through a grid with holes 0.4x0.4 cm - 90%, which more than in the first group by 10% and the second - by 14%.

7. The weight of fertile queens in all three variants of nucleus types was higher than the breed standard - 202.5-207.9 mg.

8. The advantage of the families of bees of the fourth group in the number of printed brood at the end of the first peak (May 12) in relation to the first group was 1.36 times, to the second - 1.08 times, to the third - 1.06 times.

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EFFICIENCY OF USING SEXED SPERM IN THE FORMATION OF HIGHLY PRODUCTIVE HERD OF MILKING COWS

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Abstract

The aim of the study was to study the effectiveness of the use of sexed semen on the broodstock cattle of Holstein cattle. The subjects were cows, calves, heifers, sex and normal semen. The subject of the study is reproductive indicators, fertility, calf yield.

The tasks included the analysis of the main indicators in the dairy industry of the use of sexed semen; comparative evaluation of indicators in animal husbandry when using sexed and normal sperm.

It has been experimentally established that insemination with sexed sperm accounts for 82.95% and normal sperm for 17.21% of the total number of animals. The yield of calves from insemination with sexed sperm is 55.19%, normal - 44.81%. 159 heads, or 10.38% more calves, were obtained from mating livestock with sexed semen. The use of sexed semen reduces the ability to fertilize animals by an average of 25.0%. For 1 hryvnia invested in the purchase of semen, divided by sex, the company receives a profit of UAH 7.16, which convinces of the high profitability of its use.

Keywords: sexed semen, cattle, dairy cows, economic efficiency.

Formulation of the problem. Obtaining cheap high-quality livestock products ensures the profitability of production. Intensive technologies, advanced methods of selection and reproduction are used for this purpose, genetic resources of the best world breeds of cattle are used. In recent years, with the increase in milk productivity and reduced use of cows, the problem of lack of repair heifers has become more acute [1].

It is solved by mass production in the offspring of young animals of a given sex, which allows to increase the yield of high-value heifers, timely repair a herd of cows, increase the profitability of the industry. This innovative technology is still ingrained in Ukraine, so a few of farms use sperm, which allows you to get up to 90% of heifers in the offspring [2, 23].

The basis of the feasibility of using separated sperm is the percentage of fertilization and yield of heifers in the offspring, the intensity of their growth and development, the ability to reproduce and preserve genetic predispositions, milk productivity of first-borns compared to peers.

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