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Genetic reasons for the migration of the local population bees in Uzbekistan

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Abstract: The article presents the genetic reasons for the emergence of a large number of sources in Uzbekistan, information on the increase of macro- and microelements in the body of migratory bees. Key words: genetic, physiological, Carpathians, paired nucleotides, DNA, chromosome, macroelements, microelements, queen bee, picture.

1 Introduction

There were bees on the territory of Uzbekistan 3,000 years ago, and they have continued and strengthened their offspring through natural selection in the struggle for life, and have withstood the whims of any rapidly changing weather.

In beekeeping, not a single breed of bee has yet been created by man. Nevertheless, there are bee breeds adapted to the natural climatic conditions of each region. We used bees of the Carpathian breed along with bees from the local population in conducting experiments.

Fig. 1. The process of determining the external indicators of bees

During research, samples of worker bees of bee families in control and experimental groups were taken and their external indicators were studied.

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Information on the external characteristics of the local population and worker bees of the Carpathian breed is presented in Table 1 below

Table 1. External indicators of worker bees in the experiment (n-10)

Indicators	Control group X±Sx	Experimental group I X±Sx	Experimental group II X±Sx
Length of Khartoum	6,760±1,16	6,72±0,01	6,73±0,01
Head width	3,978±1,07	3,81±1,03	3,82±1,02
Head length	3,352±1,66	3,34±1,69	3,35±1,68
3rd tergite length	2,558±0,60	2,52±0,02	2,53±0,02
Width of tergite 3	4,211±0,46	2,21±0,02	4,83±0,02
4th tergite length	2,269±0,47	2,14±0,02	2,15±0.02
Width of tergite 4	9,280±0,96	9,44±0,95	9,45±0,96
The width of the wax windows	2,459±3,41	2,51±3,45	2,54±3,41
Wing length	9,197±0,45	9,23±0,44	9,25±0,44
Wingspan	3,143±1,26	3,154±1,31	3,16±1,34
Cubital index (%)	45,88±0,68	44,50±0,05	44,61±0,08
Weight of worker bees (mg)	99,06±0,05	110,5±0,08	110,8±0,08

2 Materials and methods

From the data in Table 1, it can be seen that although there was no change in the external characteristics of bees in the local population in the control group, there was a change in the length of their khartoum, and compared to the Carpathian bees in the experimental group, its length was 0.04 mm. ha or 100.3%, they fully meet the standard requirements for the creation of new generations of bees. Head width 3.97 mm or 104.1%, head length 3.35 mm or 100.3%, tergite 3 length 2.55 mm or 101.2% and width 8.21 mm or 104.1 to %; 4th tergite length 2.26 mm or 105.6% and width 9.28 mm or 104.1%; wax windows were found to be 2.45 mm wide, or 100.4%, with a wing length of 9.19 mm and a width of 3.14 mm. These indicators are much higher than other breeds of bees, i.e. the Carpathian breed, they stand out, and their 10-15% increase is statistically reliable. [R>0.999]

It was also found that the weight of Carpathian bees increased by 111.6% compared to local bees [1-11].

Similarly, the cubital index of the wings, which is of special importance in the selection work in the field of beekeeping, was 41.88%, while this indicator was 44.5% for the Carpathian breed, or 103.1% more, and the bees in the local population for centuries as a result of adaptation to any weather conditions in the republic, it indicates a positive effect on local bees and is statistically reliable (R>0.999). The coefficient of variation (Cv, %) of their main signs was found to be only 2%.

The mitochondrial intergenic locus of AT-polymorphic genes was investigated in the molecular-genetic studies conducted in bees in Russia. It is known that the number of loci in Central Russian bee breeds and their populations is on average 600 pairs of nucleotides, while in bees from the southern regions of Russia it is 300 pairs.


Fig. 2. A procedure for determining the number of pairs of nucleotides of migrating, non-migrating queen and worker bees

Also, the samples of the native and Carpathian bees in the control and experimental groups were taken from migrated, non-migrated mother and worker bees, and the genetic tendency to migration, i.e. the number of double nucleotides in DNA, was studied. We studied the DNA of bees in the conditions of the modern "Experimental Biology" laboratory at Gulistan State University.

Table 2 below shows the genetic characteristics of bees in the control and experimental groups, that is, the number of double nucleotides in their DNA.

Table 2. Changes in the number of pairs of nucleotides of single queen and worker bees in the control and experimental groups

Naming	Number of nucleotide pairs (units)		
	Control group Local	Experimental group I (Carpathian breed) artificial migration	II experimental group (Carpathian breed) natural migration
Migrating queen bees	608	612	612
Non-emigrating queen bees	606	608	608
Migrating worker bees	624	636	636
Non-migratory worker bees	616	618	618

Table 2 shows that the number of pairs of nucleotides in the genetic markers of bees was the same 612 pairs in both the migrated queen bees and artificially migrated bees in experimental group I. This figure is 4.0 more than the bees in the control group, or it is 100.6%.

Also, the same indicators were shown in the natural migratory bees in the II-experiment group. In the migrated queen bees, the number of pairs of nucleotides in the Carpathian queen bees of experimental group I was 608, which is 2.0 more than the control group or 101.1%. It was found that these indicators also make up 608 pairs of nucleotides in the natural migrant bees of experimental group II.

It was found that the number of nucleotide pairs was 636 in the worker bees of the experimental group I that migrated. This indicator is 12.0 more than the control group, or it is 101.9%. The same situation can be observed in experimental group II.

It was found that 618 pairs of nucleotides were present in experimental group I of the migrant worker bees. This indicator is 2 more than the control group, or it is 100.3%. The same result can be seen in experimental group II. (R>0.999).

Thus, our research has shown that one of the reasons for the tendency of bee families to migrate or to migrate is due to an increase in the number of protein-paired nucleotides in the DNA of genetic information storage in the hive of the mother and worker bees before migration.

We also studied the physiological changes in the body of bees prone to migration.

Relevance of the topic: Krivtsov N.I., et al. (2010) observed that out of every 10 worker bees prone to migration, 6 of them had physiological changes in the oviducts. Also, in order to prevent migration separation in families of bees prone to migration, in order to increase the size of the hive and increase the activity of worker bees in the hive, it is necessary to take measures to encourage them to collect flowers and involve them in building new frames. During the period of preparations for migration, the number of unemployed bees in the bee colony increases slightly. As a result, a large amount of food reserves is created in the body of such unemployed bees. Because this supply of food will greatly help bees to fly long distances, move to a new place and build new nests, feed family members, and work intensively in the future.

If the separation of colonies in a bee family is not prevented, it is possible for such colonies to separate several times, which lasts 10-15 days and continues until there are no queens left in the family, until one of them becomes the ruler of the family, until the last queen bee cuts them off. In order to prevent the separation of the bee colony, it is necessary to use many measures. Among these, it is necessary to always provide young mother bees in the bee family, to create a wider and more space for the mother bees to lay eggs in the bee family, to expand the size of the beehive, to provide the hive with fresh air and to ventilate it.

All the measures mentioned above cannot guarantee the complete prevention of bee colony migration in the conditions of industrialized beekeeping.

The productivity of the bee family is directly related to the amount of seral plants around it and the strength of the family. Nevertheless, it was observed that some bee families tend to migrate in spring and summer. As soon as worker bees appear in the hive, they stop working and take care of the brood.

During this period, bees completely stop making wax in the hive, collection of flowers and pollen from the field slows down, and worker bees stop feeding the queen bees. As a result, the queen bee loses weight, the size of the egg tubes in the ovary decreases, and the air sac in the abdomen flattens out, fills with air, and they are able to fly.

In addition, as a result of the reduction in the size of the ovaries in the queen bees, the ability to produce various "voices" was restored. This made the migration of bees in the family even stronger. During this period, as the egg-laying of queen bees decreased, the size and weight of the eggs they laid increased.

It is also important to study and determine the physiological state of bees throughout the year before they move. For this purpose, we also studied the influence of microelements on the release of microelements in the body of bees.

The productivity of the bee family depends on its strength and the surrounding serous vegetation. However, in the spring and summer months, strong bee families tend to divide and try to separate colonies. In such families, the number of unemployed bees increases until the appearance of migrant queens and the period when the queen bees lay eggs for them.

A month before the migration of the bees, we checked and monitored about 300 bee families one by one at the "GULOMHO'JA ASALCHILIGI" farm in Tashkent district. As a result, we formed experimental and control groups of 10 susceptible to migration. In families of bees prone to migration, experimental groups of bees with migratory queens (n-10), and control groups of bees without migratory queens (n-10) were formed. The bee families in the control and experimental groups were kept in 20-frame beehives and they had the same strength. The queen bees in the hive were of the same age and had the same amount of food.

We took several different samples from bee families prone to migration, about changes in the amount of micro and macro elements in their organism. We studied the samples in the laboratory of experimental biology at Gulistan State University. We also studied and analyzed the amount of fat in the body of bees prone to migration and the weight of worker bees based on periods.

3 Result and Discussion

We studied various physiological changes in the body of bees prone to migration 30 days before the migration. We have studied the condition of worker bees, the changes in the amount of fat in their body, before they leave the colony in laboratory conditions.

Data on changes in weight and body fat of migratory bees are presented in Table 3 below.

Table 3. Fluctuations in weight and fat content of migratory worker bees (mg)

Indicators	Groups	n	lim	$X \pm S_x$	Cv, %
Worker bees change their weight					
Migrant worker weight of bees	Control group	10	104-115	109,5±1,07	4,4
	Experimental group I (artificial displacement)	10	105-116	111,1±1,08*	4,5
	Experimental group II (natural displacement)	10	106-117	112,0±1,09*	4,6
Not prone to migration weight of worker bees	Control group	10	95-108	102,5±1,44	3,4
	Experimental group I (artificial displacement)	10	94-107	100,3±1,45	3,4
	Experimental group II (natural displacement)	10	95-109	102,0±1,44	3,4
Changes in the amount of fat in the body of bees					
Fat content in the body of non-migratory bees, %	Control group	10	0,18-0,130	0,240±0,12	0,24
	Experimental group I (artificial displacement)	10	0,16-0,39	0,250±0,07	0,24
	Experimental group II (natural displacement)	10	0,15-0,32	0,235±0,072	0,24
The amount of fat in the body of bees prone to migration, %	Control group	10	0,36-0,31	0,370±0,07	0,025
	Experimental group I (artificial displacement)	10	0,37-0,32	0,350±0,07	0,026
	Experimental group II (natural displacement)	10	0,38-0,33	0,16±0,07	0,026

Note: R>0.95

As can be seen from the data in Table 3, the amount of fat in the body of worker bees prone to migration in the control group was 0.10 mg higher than that of worker bees in the non-migration group, or this indicator is 141.6%. Similarly, the amount of fat in the body of worker bees in experimental group I, which is not prone to migration, is 0.10 mg compared to the control group. increased by 145.8%. Also, it is noteworthy that the amount of fat in the body of worker bees in experimental group II, which is not prone to migration, increased proportionately.

Similarly, it was observed that the body weight of migrant bees increases with the increase of body fat of worker bees. 7.0 mg in the body of susceptible worker bees in the control group compared to the body weight of non-susceptible worker bees. increased to (R>0.999)

In particular, the weight of worker bees in experimental group I of migratory worker bees is 111.1 mg. was 112.0 mg. has been 0.9 mg compared to experimental group I. increased by 100.8%. Also, in experimental group I of non-migratory worker bees, the weight of worker bees is 100.3 mg. was 102.5 mg. was found to be 1.7 mg more or 101.7%. (R>0.999)

Thus, before the migration of the bee family, physiological changes appeared in the organism of the worker bees. During this period, the body (volume) of worker bees increased by 101.7% compared to the control group, and the amount of fat in their body increased by 145.8%. Data on changes in body fat content and bee weight in migratory bees are presented in Figure 3.

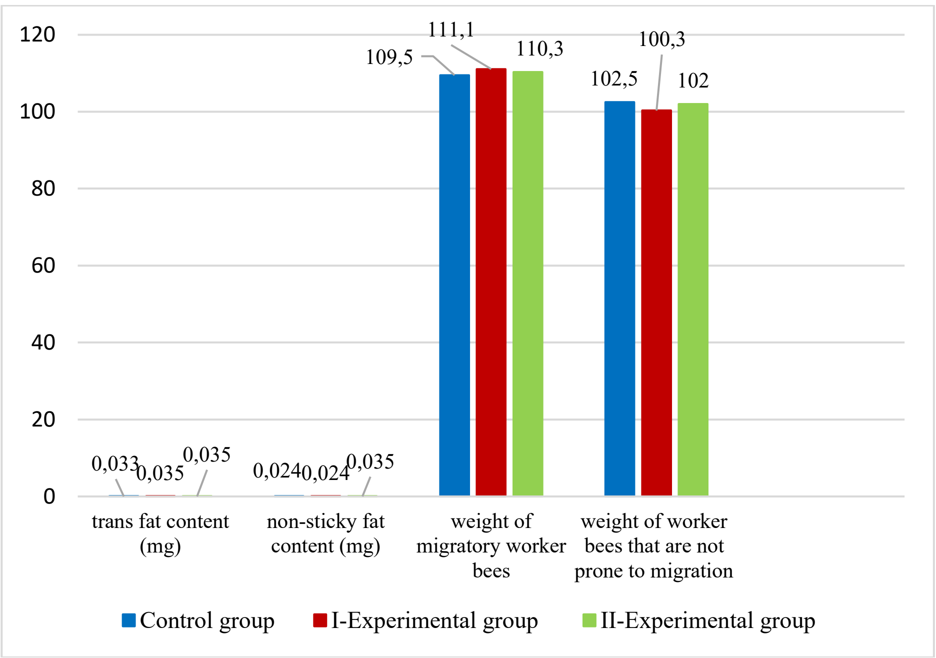

Fig. 3. A diagram of changes in fat content in the body of migratory bees and the weight of worker bees

Figure 3 shows that we can see that the body fat of the migrating bees and the weight of the worker bees change. It was observed that the fat content in the body of bees in the control group susceptible to migration increased by 0.130 mg or 154.5% compared to bees in the control group that was not susceptible to migration.

Similarly, the weight of the bees prone to migration also increased and this figure was 102.5 mg in non-migration bees. was 111.1 mg in bees prone to migration. established The mean difference is 8.6 mg, and this indicator has increased by 108.3%.

Also, in order to find out the reasons for the separation of bees from the colony, we took various samples from bees that are prone to migration and those that do not migrate, and studied the amount of macro and microelements in the body of bees, and indicators such as their influence on migration. Information on this is presented in Table 4 below.

Table 4. The abundance of macro and micro elements in the body of migrating bees mg

Name of macro and micro elements	The control group is not susceptible to migration	I-Experimental groupartificial migration			II experimental group natural migration		
		Tends to move	A large amount	As a % relative to control	Tends to move	A large amount	As a % relative to control
Magnesium (Mg)	3331,7721	352,8011	21,029	106,3	364,1100	36,411	109,3
Sodium (Na)	348,5841	487,5352	201,9511	142,3	477,6415	129,5841	137,0
Calcium (Ka)	383,445	441,3512	57,9	115,1	451,4112	68,445	117,7
Zinc (Zn)	22,203	30,643	8,44	138,0	32,688	10,203	145,4
Silver (Ag)	0,0121	0,0282	0,0211	23,1	0,0480	0,1359	122,2
Chromium (Cr)	0,0465	0,0903	0,0438	194,1	0,0913	0,0468	196,3
Uranus (U)	0,0008	0,0017	0,0009	21,2	0,0017	0,0009	21,2
Molybdenum (Molybdenum)	0,0021	0,0023	0,0002	2,3	0,0029	0,0020	108,6

From the data in Table 4, it can be seen that the micro-organisms for migration are more extended to some macro and elements control group in artificial migration bee organism in experimental group I. For example, chromium element exceeded the control group by 0.04 mg/kg, or it is 194.1%. Sodium increased by 102.9 mg/kg, or 142.3% of the element. Similarly, zinc element increased by 138.0% and magnesium element by 106.3%

Also, compared to the control group in the organism of natural migratory bees in experimental group II. It was observed that the amount of chromium element increased by 196.3%, sodium element by 137.0%, calcium element by 117.2%, and silver element by 122.2%. It was also found that the elements of Silver, Uranium, and Molybdenum increased to 23.1, 21.2, and 2.3%. This indicates that there is a very high probability of causing a migration from the bee family.

In the course of our research, we studied the drastic reduction of macro- and micronutrients in the organism of bees prone to migration, which is one of the reasons affecting the migration of bees. Table 5 below shows the difference in the amount of macro and micronutrients in the body of bees prone to migration compared to non-migrating bees.

Table 5. Decreasing the amount of macro and microelements in the body of bees, (mg)

The name of the elements	The control group did not tend to migrate	I-Experimental groupartificial migration			II experimental group natural migration		
		Tends to move	Reduced amount	As a % relative to control	Tends to move	Reduced amount	As a % relative to control
Potassium (K)	3377,5271	3116,5901	261,0	92,0	3110,5900	267,5901	92,1
Phosphorus (R)	3002,9721	2935,7551	74,2	97,5	2930,7560	72,7551	97,6
Sulfur (S)	231,0081	216,0732	15,0	93,5	215,0732	15,0732	93,1
Aluminum (Al)	23,8475	20,2384	3,60	84,8	20,2380	3,2384	84,8
Barium (Ba)	2,4457	1,6214	0,83	66,3	1,6215	0,8200	66,3
Bismuth (B)	0,0042	0,0031	0,11	73,8	0,0030	0,0012	74,4
Cobalt (Co)	0,0096	0,0061	0,35	63,5	0,0060	0,0036	62,5

Iron (Fe)	82,6701	68,3132	14,32	82,6	69,3130	13,3570	83,8
Lithium (Li)	0,0941	0,0754	187,0	80,1	0,0755	0,0186	80,2
Manganese (Mn)	32,1125	18,2612	13,9	56,6	18,2612	12,8513	56,8
Selenium (Se)	0,1712	0,1596	116,0	93,2	0,1590	0,0122	92,8
Silicon (Si)	124,9754	106,2001	18,7	85,0	106,200	18,9754	84,9
Boron (B)	1,5841	0,9429	0,56	62,6	0,9129	0,6712	57,6

It can be seen from the data of Table 5 that the body of bees in experimental group I, which is susceptible to migration, has some macro and microelements, and does not secrete migration. Compared to the control group, it was significantly reduced. For example, the element Phosphorus is reduced to 74.2 mg/kg, or it is 97.5%. It was found that potassium element decreased by 92.0%, Sulfur by 93.5%, Selenium element by 93.2%, Aluminum element by 84.4%, Iron element by 82.6%, Silicon element by 85.0%. Similarly Boron, Cobalt, Barium, Manganese elements are 62.6; 56.6; It was observed that it decreased by 63.5 and 66.3%. It indicates that the main reason for the separation of the bee family was the excessive decrease in the amount of certain microelements in the bees' body.

4 Conclusion

It was also found that the amount of microelements such as boron, lithium, potassium, cobalt, barium, bismuth decreased from 66.3% to 56.6%. The migration of the bee family was caused by excessive reduction of some micronutrients in the bees' body

Our research has many similarities with the research works of authors such as M. Yu. Syromatnikov and others (2016), V. G. Nikolenko (2009). In their research, information is given about the increase in the amount of many heavy metals in the body of migrating bees.

It is worth noting that in studies, it was observed that the amount of fat in the body of bees prone to migration and the weight of worker bees increased proportionally before migration. Also, it was found that the amount of some macro- and micronutrients in the body of bees prone to migration increases, while the amount of some macro- and micronutrients decreases.

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