Таблица 2

Зависимость изменения физико-химических свойств растворов от состава в системе {72,0%[41,53%∑$Ca(NO_3)_2$+$Mg(NO_3)_2$+58,47%H_2O]+20%NH_4NO_3+ 8,0%KNO_3}- $NH_2C_2H_4OH$

№	Содержание компонентов, %		$t_{кр}$, °C	d, г/см^3	η, мм^2/с	pH
	{72,0%[41,53%∑$Ca(NO_3)_2$+ $Mg(NO_3)_2$+ 58,47%H_2O]+ 20%NH_4NO_3+8,0%KNO_3}	$NH_2C_2H_4OH$				
1	100	-	-8,0	1,4550	3,65	1,22
2	99,78	0,22	-10,0	1,4580	3,68	1,24
3	99,45	0,55	-12,0	1,4542	3,69	1,60
4	90,04	0,96	-10.0	1,4536	3,70	2,03
5	98,33	1,67	-7,2	1,4520	3,72	2,97
6	97,7	2,30	-7,0	1,4508	3,78	4,10
7	96,97	3,03	-6,0	1,4484	4,08	6,13
8	96,75	3,25	-6,0	1,4478	4,28	7,0
9	96,46	3,54	-6,0	1,4468	4,41	7,23
10	96,24	3,76	-6,0	1,4459	4,46	7,30

Раствор, полученный после нейтрализации моноэтаноламином имеет температуру кристаллизации -6,0°С, плотность 1,4478 г/см^3 и вязкость 4,2800 мм^2/с, pH=7 и содержит (масс. %): N=13,14, Са=3,99, Mg=1,97, K_2O=3,64.

Данный раствор может быть рекомендован в качестве жидкого удобрения комплексного действия, содержащего одновременно такие питательные элементы как N, Са, Mg и K_2O.

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GENETIC POTENTIAL AND PROSPECTS FOR USING OF SILKWORM BREEDS, MARKED BY SEX AT THE EGG STAGE

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ABSTRACT.

To obtain the maximum effect from the heterosis of the silkworm, it is necessary to achieve an accurate separation of breeding material into females and males in order to obtain pure hybrids. This is facilitated by the breed of silkworm, stored in the world collection of the Science research Institute of Sericulture, labeled by sex at the egg stage and accurate separation of the eggs by their color into females and males.

Keywords: mulberry silkworm, world collection, breed, eggs of silkworm, color, heterosis, hybrid, females, males.

Introduction

Sericulture around the world is based on the production of only first-generation hybrids for the manifestation of heterosis.

Heterosis effect is manifested mainly on the signs of two categories - viability and quantitative characteristics. High viability leads to increased resistance to diseases and extreme conditions, accelerated growth and development, fertility, as well as an increase in many quantitative indicators, including those of economic importance. This is facilitated by a favorable combination of hybridization of polymer-active genes that control quantitative traits.

Unfortunately, on the way to obtain the maximum effect from the heterosis of the silkworm there are serious obstacles, in particular, the inability to obtain pure hybrids that are not clogged with parent material. The fact that the butterflies of the silkworm mate immediately after departure from the cocoons and thus produce pure-bred eggs of silkworm. To avoid mating within each breed, it is necessary to separate its females and males in advance, even before leaving the cocoons, to then cross the females of one breed with the males of another. Tens of millions of individuals are divided by sex. Meanwhile, the methods of separating breeding material by sex with pupose of hybridization are inaccurate or time consuming. For example, in Uzbekistan, the method of dividing cocoons by sex, based on the weight differences between the opposite sexes, due to the overlapping of the mass of females and males, makes it possible to distinguish less than half of the separated females and males from the batch of cocoons, and then with a large error in the group of each sex.

The analysis of industrial silkworm egg showed that it contains only 45-50% of hybrid eggs, while the rest of the eggs are the parent source breed [1].

Clogging of the hybrid silkworm egg with the original parent breeds so reduces the yield that further introduction of new hybrids becomes meaningless. However, the development and improvement of sericulture is unthinkable without the precise preparation of hybrid silkworm egg for industrial use. This can only be achieved if the precise separation of elite material into groups of females and males. The problem can be solved by genetic methods, namely, the use of genetically modified, so-called, sex-labeled silkworm breeds in hybridization

In these breeds of silkworm, obtained in the Scientific Research Institute of Sericulture (SRIS), radiation method [2,3], was able artificially to mark genetic methods females and males of different well-distinguishable morphological features manifested in the early adult stage. Thanks to this, it is possible to separate the females from the males before the butterflies depart. Marking by sex was achieved by TRANS location on the sex chromosome plots of autosomes genes controlling the color of the silkworm eggs. In such breeds a butterfly lays eggs of two colors: dark and light. From dark eggs develop in the females, light males. Due to this, the sex is unmistakably recognized on the 2nd day after laying. Depending on which genome – W_2, W_3, W_5, the breed is marked, the color of the eggs (males) can be light yellow (W_2), brown (W_5), dark brown (W_3). An example of the use of such breeds can serve as a hybrid of Sovetskaya-13×Sovetskaya-14, a Sovetskaya-14× Sovetskaya-13, zoned in some regions of Uzbekistan.

Meanwhile, the presence in the world collection of silkworm SRIS (124 breeds) 12 ready-made determined by sex (labeled on by sex at the egg stage) breeds, provides the conditions for the creation of hybrids with 100% purity of the preparation of the silkworm eggs [4]. Their biological indicators are given in table 1.

Table 1

Biological indicators of the silkworm breeds genetically modified by sex at a stage of a eggs

№	Name of breeds	Viability,%		Average weight		silk-bearing,%
		eggs	cater-pillars	cocoon, g.	shell, mg.	
1	Sovetskaya-5 (W_2 W_2)	95,7	84,4	1,64	392	23,9
2	Sovetskaya-5 (W_2 W_2) transparent caterpillars	93,9	80,4	1,69	352	21,3
3	Sovetskaya-10 (W_3 W_3)	93,5	82,6	1,43	329	23,0
4	Sovetskaya-12 (W_5 W_5)	96,1	88,5	1,53	362	23,7
5	Sovetskaya-13 (W_2 W_2)	94,6	88,0	1,44	328	22,8
6	Sovetskaya-14 (W_3 W_3)	93,7	88,2	1,46	341	23,4
7	Belococoonaya-1 (W_2 W_2)	92,6	86,0	1,71	333	19,5
8	Belococoonaya-1 (W_3 W_3)	90,5	87.2	1,69	340	20,1
9	Belococoonaya-2 (W_5 W_5)	85,0	86,6	1,69	343	20,3
10	SANIISH-8 (W_3 W_3)	90,2	89,4	1,64	300	18,7
11	SANIISH-9 (W_2 W_2)	85,2	87,8	1,66	333	20,1
12	Sovetskaya-6 (W_3 W_3)	85,6	83,8	1,76	373	21,2
13	Ipakchi-1 (control)	97,9	93,0	1,80	392	22,2

In table 1, together with the name of the silkworm breeds, the symbols of genes controlling a particular color of the serous shell of eggs are shown: W_2 – light yellow, W_3-dark brown, W_5 – brown.

As a control, the indicators of non-deterministic color of the classical breed Ipakchi-1 is one of the components of widely implemented in the Republic of industrial hybrid Ipakchi-1×Ipakchi-2

Materials and methods

Every year, the materials of the world collection of silkworm SRIS are reproduced by the traditional method of feeding white-window breeds [5] using the method of selection by motor activity [6] and the method of early revival of the silkworm eggs [7].

Despite the serious genetic changes in the genomes of the species under consideration, their main biological indicators are quite high (table.1): revival of eggs – from 85,0% to 96,1%, viability of caterpillars –

from 80,4% to 89,4%, silk-bearing of cocoons – from 18,7% to 23,0%. Noteworthy high silk-bearing breeds Sovetskaya-5 (23,9%), the Sovetskaya-10 (34,0%), the Sovetskaya-12 (23,7%), the Sovetskaya-13 (22,8%), the Sovetskaya-14 (23,4%).

These breeds can serve as a material for creating pure hybrids. The creation and implementation of such hybrids can bring tangible income to the sericulture of Uzbekistan due to the maximum use of the effect of heterosis in 100% pure high - silk-bearing hybrids of the first generation.

For this purpose, work was carried out on the evaluation of the breeds marked by sex at the stage eggs of the world collection of silkworm SRIS on the biological characteristics for use in hybridization. Search and selection of breeds for hybridization was carried out by ranking method [8]. The ranking method consists in the possibility to establish a relationship between the features that are expressed by the order of the occupied place by each member of the population, i.e. the place of rank in the variational series. In this case, the processing includes not the absolute values of the varying features, but the ordinal places or ranks occupied by the members of the population for each of the correlating features. The best performance characteristics occupy the first place, and then drop-down the values of the indicators. Then minimum sum of points of the considered characteristics, the list of breeds (or one breed) of high rank with the best rates.

Research result

The results of the evaluation of biological indicators marked by sex at the stage of silkworm eggs are shown in table 2

Table 2

Ranks marked by sex at the egg stage silkworm with the assessment of biological indicators

№	Name of breeds	Viability of caterpillars, %		weight of cocoon, g.		silk-bearing, %		sum of points
		abs. un	rank	abs. un	rank	abs. un	rank	
1	SANIISH-8 (W_3 W_3)	90,8	1	1,41	10	15,8	10	21
2	SANIISH-9 (W_2 W_2)	79,5	10	1,59	4	20,1	8	22
3	Belococoonaya-1 (W_2 W_2)	89,2	2	1,51	6	20,0	9	17
4	Belococoonaya-2 (W_5 W_5)	83,8	8	1,62	2	20,6	3	18
5	Sovetskaya-6 (W_3 W_3)	86,9	6	1,63	2	20,3	7	16
6	Sovetskaya-5 (W_2 W_2)	84,4	7	1,64	1	23,9	1	10
7	Sovetskaya-10 (W_3 W_3)	88,6	3	1,43	9	23,0	5	17
8	Sovetskaya-12 (W_5 W_5)	88,5	4	1,53	5	23,7	2	11
9	Sovetskaya-13 (W_2 W_2)	88,6	3	1,44	8	22,8	4	15
10	Sovetskaya-14 (W_3 W_3)	88,2	5	1,46	7	23,4	3	15

From table 2 it is seen that the highest viability of caterpillars is a breed SANIISH-8 (W_3 W_3), Belococoonaya-1 (W_2 W_2), the Sovetskaya-10 (W_3 W_3), the Sovetskaya-13 (W_2 W_2). The high mass of the cocoon occurs in breeds of the Sovetskaya-5 (W_5 W_5), Belococoonaya-2 (W_5 W_5). The best silk-bearing of cocoons were breeds Sovetskaya-5 (W_2 W_2), Sovetskaya-12 (W_5 W_5), Sovetskaya-14 (W_3 W_3). The lowest amount of points and, accordingly, high ranks are gaining breeds Sovetskaya-12 (W_5 W_5), Sovetskaya-13 (W_2 W_2), Sovetskaya-14 (W_3 W_3). These breeds are promising in terms of their use for hybridization in obtaining 100% pure hybrids.

After ranking, i.e. determination of the occupied places of collection breeds on the main biological signs and selection of the best breeds, it is necessary to carry out selection work for the purpose of improvement of economic and valuable properties [9]. The fact is that with the collection breeds for a long time only mass selection was carried out only possible when working with the collection in the existing conditions. This inevitably had an impact on key biological indicators. To raise the productive characteristics of the selected species should be carried out seed feeding with a rigid selection at all stages of development of silkworm.

Summary

As part of the world collection of silkworm SRIS there are breeds, marked by sex at the stage of eggs and characterized by high biological indicators. Such breeds can be used to obtain 100% pure hybrids with the maximum manifestation of heterosis.

However, the use of such hybrids in the industrial silkworm production of the Republic is impossible, due to the lack of currently devices for the separation of the silkworm eggs by color. Currently, we are working to develop a "Devices and software technologies for distribution of silkworm eggs labeled by sex of the breeds of the silkworm" according to the grant “FA-2018-015” from Ministry of Innovative Development of the Republic of Uzbekistan

It is expected that in the near future the device will be ready for operation and put into production. Therefore, hybrids of mulberry silkworm with 100% purity of preparation, created using genetically modified gender-marked eggs breeds, prepared for implementation in the next 5 years, will be in demand and successful in production.

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ВЫЩЕЛАЧИВАНИЯ ШЛАМОВ ДИСТИЛЛИРОВАННОЙ ВОДОЙ ДЛЯ ИЗУЧЕНИЯ МИГРАЦИИ ТЯЖЕЛЫХ МЕТАЛЛОВ И МЫШЬЯКА

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SLUDGE LEACHING WITH DISTILLED WATER FOR THE STUDY OF MIGRATION OF HEAVY METALS AND ARSENIC

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АННОТАЦИЯ.

Из-за размыва отвалов ГОК «Тувакобальт» сезонными и дождевыми потоками представляется большая экологическая проблем, поэтому для ликвидации техногенных отходов исследовались выщелачивание шламов, извлечения вредных компонентов. Предлагается экономическое обоснование по утилизации отходов и использование его в качестве добавки в изготовлении композитных материалв.

ABSTRACT.

Because of erosion of mine dumps "Touchball" seasonal and rain-is a vast environmental problems, therefore, to eliminate industrial wastes was investigated in leaching slimes, extracting harmful components. The economic justification for waste disposal and its use as an additive in the manufacture of composite materials is proposed.

Ключевые слова: отход, шлам, дистиллированная вода, отвал, мышьяк, аммиачно-карбонатный раствор, выщелачивание.

Key words: waste, sludge, distilled water, dump, arsenic, ammonia-carbonate solution, leaching.

В последнее время техногенные системы стали объектами пристального внимания и изучения как серьезный источник загрязнения окружающей среды и техногенные месторождения одновременно. Одними из таких объектов в Республике Тыва являются мышьяксодержащие отходы от гидрометаллургического передела бывшего комбината «Тувакобальт». Рассматривая отходы как ценное техногенное месторождение, решение экологической проблемы мышьяковых отвалов видится в их комплексной переработке с применением экологобезопасных технологий обогащения с одновременной их ликвидацией как очага загрязнения окружающей среды региона. В связи с этим были проведены исследования по выщелачиванию шламов дистиллированной водой для изучения миграции тяжелых металлов и мышьяка, а также аммиачными и аммиачно-карбонатными растворами для изучения оптимальных условий извлечения никеля, меди, кобальта.

Для изучения химического состава растворов выщелачивания шламов были отобраны пробы с разных уровней из карты №1, которая рекультивирована с поверхности. Номера проб соответствуют определенной глубине: проба №1 – верхний горизонтальный уровень, 0 м, проба №2 – 0,5-1,2 м, пробы №№ 3, 4, 5 – 2,4-3 м. На первом этапе исследований в качестве растворов выщелачивания использовали гидрокарбонат аммония 0,1%, гидроксид аммония 10%, а также дистиллированную воду. Растворы обозначены римскими цифрами: I – дистиллированная вода, II – гидрокарбонат аммония 0,1%, III – гидроксид аммония 10%. Соотношения твердой и жидкой фаз были взяты: 1:5, 1: 50. В растворах выщелачивания были определены мышьяк фотометрическим методом по образованию мышьяковомолибденовой сини на спектрофотометре СФ-46, а кобальт, никель, медь - на атомно-абсорбционном спектрометре AAS 5FL. В карбонатных и водных растворах выщелачивания с соотношением Т:Ж=1:50 определялись содержания карбонат - и гидрокарбонат-ионов, хлорид-ионов, кальция, магния.