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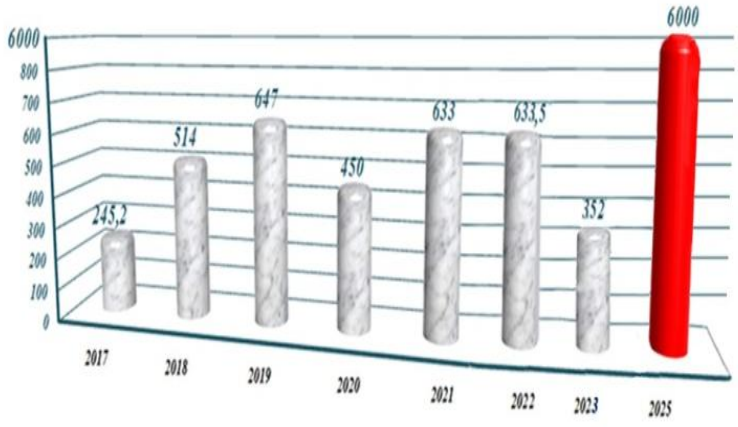
The Feeding and Development of Heat-Resistant Hybrids of Silkworms Under Adverse Conditions

Abstract

Decree of the President of the Republic of Azerbaijan dated November 27, 2017 on the approval of the "State Proqram for the development of cocooning and sericulture in the Respublic of Azerbaijan for 2018-2025"



For the further development of sericulture in the future, mechanization of all work in mulberry silkworm feeding and cocoon collection, creation of higher silky and productive breeds and hybrids, heavy varieties, etc. such directions have been taken into account.

In recent years, climate change is one of the global problems affecting the world. As it is known industrialization has had great negative effects on the Earth`s climate system along with other atmospheric wastes there has been a rapid increase in the scale of greenhouse effect gases.

In the lowland regions of our republic the fifth age of mulberry silkworm feeding falls on the temperature period of 28-30-32^{0}C.

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Due to the effect of such high temperature at least 45-50% of the worms get sick and die due to the effect of heat. In addition, the weight of the cocoons is low. Taking into account all this the creation and testing of hybrids with high cocoon weight and resistance to disease and heat is especially relevant. That is if the heat tolerance of the newly created hybrids is high it is possible to increase the production of cocoons and raw silk by 1,5-2,0 times without incurring additional costs.

Keydwords: *breed, hybrid, heat, productivity, selection*

Introduction

Azerbaijan has been not remained unaffected by global climate change. Observations indicate that the agricultural sector is among the most climate-sensitive areas (Akhmedov, Murodov 1998). Therefore, taking preventive measures is crucial. In this regard, scientific research has been conducted to preserve the existing locally adapted silkworm breeds and to develop new heat-resistant hybrids.

Therefore, the development of new heat-resistant silkworm hybrids is a crucial issue of great practical and economic value for national agriculture (Abbasov 2010).

In the modern era, one of the primary tasks facing breeders and geneticists is the development of breeds, varieties, and hybrids that can better adapt to wide environmental fluctuations and ensure relatively high and stable productivity under various ecological conditions. Such breeds, varieties, and hybrids are highly valued by agricultural producers and are considered more economically viable (Khalilov, Gulubayova, Huseynova, 2012). Therefore, in recent years, the creation of highly ecologically resilient plant varieties and animal breeds has been regarded as a priority direction in selection breeding (Huseynov, Eminbayli, 1973). This issue is also relevant for sericulture. During the experimental testing of new hybrids created through crossbreeding of intensive silkworm breeds under optimal conditions, cocoon productivity per box reaches 90-100 kg, with a raw silk yield of 43-45%. However, in production conditions, these figures drop to 40-45 kg and 30-35%, respectively, which is well known to specialists (Mammadov, 2018). New Technology in Sericulture. As a result, more than half of the potential cocoon and raw silk yield is lost, reducing farmers' interest in sericulture and slowing down the development of both sericulture and the silk industry (Huseynova, Musayeva, 2020).

Research

The creation of new heat-resistant silkworm hybrids is an important issue of great practical and economic value with significant national economic importance (Huseynov, Eminbeyli, 1973).

For the implementation of the work, silkworms from the selection laboratory, including the Ughur, Ordubad-1, Ordubad-2, Mughan-1 and Mughan-2 breeds, as well as the Mizuri-1 and Mizuri-5 varieties introduced from the Georgian Sericulture Research Institute (GSRI), and the control varieties Mayak-2 and Mayak-3, were used. The following hybrid combinations were created: 1) Ordubad-1×Mughan-1; 2) Ordubad-1×Mughan-2; 3) Ordubad-1×Mizuri-1; 4) Ordubad-1×Mizuri-5; 5) Ordubad-1×Ughur; 6) Ordubad-2×Muğan-1; 7) Ordubad-2×Mughan-2; 8) Ordubad-2×Mizuri-1; 9) Ordubad-2×Mizuri-5; 10) Ordubad-2×Ughur; 11) Mayak-2×Mayak-3 (control variant). The Mayak-2×Mayak-3 hybrid was used for comparison. The experiments were conducted in two different environments (optimal and suboptimal).

Typically, in the lowland regions of our republic, the feeding periods of silkworms at the fourth and fifth instars coincide with hot and dry periods. Due to the high temperature and low humidity, the leaves wilt quickly and lose their quality. Considering these factors, a suboptimal environment was created for the fourth and fifth instar stages .

The crossbreeding of breeds was conducted in a suboptimal environment (Huseynova, Musaeva, 2024). The feeding of silkworms (hybrids) began in April. The feeding duration lasted for 27-28 days. The survival rate of the hybrids' larvae and the feeding duration are presented in the table below:

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Table 1
The survival rate of the hybrids' larvae and feeding duration.

№	Hybrid Name	Start Date		Survival Rate	Feeding Duration
		Incubation	Feeding		
1	Ordubad-1×Mughan-1	18.04	27.04	98.5%	28.0
2	Ordubad-1×Mughan-2	18.04	27.04	96.5%	28.0
3	Ordubad-1×Mizuri-1	18.04	27.04	96.0%	28.0
4	Ordubad-1×Mizuri-5	18.04	27.04	97.0%	28.0
5	Ordubad-1×Mayak-2	18.04	27.04	97.5%	27.0
6	Ordubad-1×Mayak-3	18.04	27.04	95.5%	27.0
7	Ordubad-1×Ughur	18.04	27.04	99.0%	27.0
8	Ordubad-2×Mughan-1	18.04	27.04	97.5%	28.0
9	Ordubad-2×Mughan-2	18.04	27.04	98.0%	28.0
10	Ordubad-2×Mizuri-1	18.04	27.04	96.5%	28.0
11	Ordubad-2×Mizuri-5	18.04	27.04	96.0%	28.0
12	Ordubad-2×Mayak-2	18.04	27.04	96.5%	28.0
13	Ordubad-2×Mayak-3	18.04	27.04	95.5%	28.0
14	Ordubad-2×Ughur	18.04	27.04	96.5%	28.0
15	Mayak-2×Mayak-3	18.04	27.04	98.5%	28.0

As seen in the table, the hybrid with the highest survival rate of larvae was Ordubad-1×Uğur, with a rate of 99.0% (Huseynova, Musaeva,

The biological indicators of the silkworm hybrids that were fed are presented in Table 2.

Table 2
The biological indicators of the hybrids are as follows.

№	**Hybrid Name**	**Average mass**		**Silkiness, %**
		Cocoon, g	**Silk thread, mg**	
1	Ordubad-1×Mugan-1	1,78	357	20,1
2	Ordubad-1×Mugan-2	1,67	328	19,4
3	Ordubad-1×Mizuri-1	1,78	384	21,5
4	Ordubad-1×Mizuri-5	1,75	331	18,7
5	Ordubad-1×Mayak-2	1,72	373	21,6
6	Ordubad-1×Mayak-3	1,62	340	21,0
7	Ordubad-1×Ughur	1,80	372	20,6
8	Ordubad-2×Mughan-1	1,66	362	21,9
9	Ordubad-2×Mughan-2	1,68	276	16,6
10	Ordubad-2×Mizuri-1	1,56	272	17,3
11	Ordubad-2×Mizuru-5	1,55	320	20,5
12	Ordubad-2×Mayak-2	1,66	319	19,1
13	Ordubad-2×Mayak-3	1,60	330	20,8
14	Ordubad-2×Ughur	1,66	314	18,9
15	Mayak-2×Mayak-3 (control)	1,79	369	20,6

As shown in Table 2, the average weight of the live cocoons in the hybrids ranges between 1.55g and 1.80g. The highest average weight of the live cocoon is observed in the Ordubad-1×Uğhur hybrid (1.80g), while the lowest is in the Ordubad-2×Mizuri-5 hybrid (1.55g). The average weight of the silk ranges between 272mg and 384mg across the hybrids. The best result is again observed in the Ordubad-

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1×Mizuri-1 hybrid (384mg), while the lowest result is in the Ordubad-2×Mizuri-1 hybrid (272mg). The silkiness of the hybrids fluctuates between 16.6% and 21.9%. The highest silkiness is found in the Ordubad-2×Muğan-1 hybrid (21.9%) (Huseynova, Musaeva, 2023; Huseynova, Bakirov, Shukurlu, Kuluntay, Rustamova, Yusifova, Mamadov, 2024).

Conclusion

1. The highest survival rate of larvae among the hybrids was observed in Ordubad-1×Ughur (99.0%).
2. The highest average weight of the live cocoon among the hybrids was in Ordubad-1×Ughur (1.80g).
3. The best result in terms of the average weight of the silk filament was in the Ordubad-1×Mizuri-1 hybrid (384mg).
4. Feeding was conducted in a suboptimal environment for 15 hybrids.

In the future, two hybrids selected for heat tolerance will be submitted to the Azerbaijan Patent Office (AXA) for getting patent. It is also recommended that these hybrids be fed in the lowland regions of our republic.

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