

AGRICULTURE

CHARACTERIZATION OF NEW GEORGIAN MULBERRY SILKWORM BREEDS RELATIVELY RESISTANT TO THE DISEASE «NUCLEAR POLYHEDROSIS»¹*Nargiz Baramidze, doctor of agrarian sciences*²*Shorena Kharatishvili, doctoral candidate*³*Lia Mdzaluri, doctoral candidate*⁴*Maia Khutsishvili, candidate of agrarian sciences*⁵*Zoia Tskaruashvili.**Georgia, Tbilisi, Scientific-Research Center of Agriculture;**Georgia, Tbilisi, Agrarian University.*¹*Senior specialist of the Scientific-Research Center of Agriculture;*²*Consultant at the Scientific-Research Center of Agriculture;*³*Consultant at the Scientific-Research Center of Agriculture;*⁴*Researcher at the Agrarian University;*⁵*Researcher at the Agrarian University.*DOI: [https://doi.org/ 10.31435/rsglobal_ws/30112018/6232](https://doi.org/10.31435/rsglobal_ws/30112018/6232)

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ABSTRACT

The paper considers biotechnological characteristics of new breeds of mulberry silkworm „V-1“ and „V-2“, which are relatively resistant to the worm disease „nuclear polyhedrosis“. The hybrids were obtained from mulberry silkworm breeds „Dighmuri“ and „Iveria“. Breed „Iveria“ is characterized by short period of feeding; it was created for the west Georgia zone, while the cocoon thread length of the breed „Dighmuri“ is 1800-2000 meter, silk capacity of live cocoon is 25-26%, but these breeds are characterized by relatively low viability [1,2,3]. Our research aimed to improve namely this flaw. As a result of complex selection works carried out for the improvement of the above stated viability and other major indices we received new highly productive breeds, which by their indices equal or exceed initial breeds.

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Introduction. From the beginning of selection works (1930 y.) more than 50 local selection breeds of mulberry silkworm were obtained. Selected breeds obtained in the first period of works were characterized by short thread length and thinness (800-900 meter, metric number 2000-2200). Because of it, to receive complex silk thread (№429) it was sufficient to wind only 6-7 cocoons jointly, and correspondingly its cocoon thread length, thinness and other indices were rather low. In the following years, biotechnological characteristics of selective breeds were improved and the

cocoon thread length of the breed “Dighmuri” that was selected in 1985-1989 years reached 1800-200 meter, but this breed is characterized by low viability. Because of it, selection was continued for heighten worm viability and its resistance to diseases.

Material and methodology. As starting material we gave preference to local origin breeds (Dighmuri and Iveria) [4,5]. For the study and evaluation of initial breeds and starting populations obtained from those breeds we used a method of preliminary prognosis –by determination of form elements in hemolymph [6,7]. In some cases a method of injection of blood was also used.

To improve viability and to elevate resistance of a disease “nuclear polyhedrosis“ in silkworm, we used method of artificial infestation (induction) of mulberry sulkworm. Besides, method of feeding on the provocative background (high temperature, 28-32°C, humidity more than 90%, rough feed) was also used.

To achieve 100% infestation of mulberry silkworm by polyhedrosis is factually impossible, only relatively weak worms are infected. This is why hemolymph was collected from diseased worms, as much as possible. Purification of polyhedrons was made by centrifugation at 3000 rev./min, at 4 °C, in 60, 40 and 29 saccharose linear gradient.

Polyhedrons were counted in Gorjaev’s chamber and various titers of polyhedron suspensions were prepared: 500mm³, 1000mm³, 5000mm³, 10000mm³, 50000mm³, which were used for artificial infestation of silkworms.

When the 4th skin was changed, silkworm was counted in 100-100 pcs in 7 variants and 5 variants were given leaf that was sprayed with polyhedron suspensions; the 6th variant was used as a dry control and the 7th variant – as a wet control.

Polyhedron suspensions were tested by carrying out annual reiterated feeding, till the concentration was established, at which a worm would be infested to the level, when it would be able to undergo metamorphosis into a moth and to lay grain.

Results. Mulberry silkworm disease “polyhedrosis” was observed in the 5th instar, at 6-7 day, before cocoon spinning.

Table 1. Number of silkworm infected by polyhedron suspension.

V instar day	Variant													
	500 mm ³		1000 mm ³		50000 mm ³		10000 mm ³		50000 mm ³		Dry control		Wet control	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	1	-	-	1	1	2	-	-	-	-	-	1	1
3	1	1	1	1	3	3	3	2	2	2	2	2	2	2
4	1	1	1	1	-	3	1	3	3	1	1	2	2	2
5	-	-	1	1	2	2	5	2	2	2	2	2	2	2
6	1	2	3	3	7	7	-	-	-	-	-	2	2	2
7	1	2	3	3	7	7	-	-	-	-	-	4	4	4
total	q-ty	%	q-ty	%	q-ty	%	q-ty	%	q-ty	%	q-ty	%	q-ty	%
	5	5	7	7	9	9	12	12	27	27	5	5	13	13

The first table offers quantity of individuals, which died as a result of infestation by various concentration polyhedron suspensions, according to days. 78 worms of 700 - died, many died in the process of metamorphosis and relatively healthy moths came out only from 69 cocoons.

According to the above given table, the greatest number of worms died in the version with 50000mm³ polyhedron suspension, the smaller number died in 500 mm³ variant.

The rescued worms span cocoon and from those cocoons the grain was prepared, which was tested for disease at the next feeding.

The concentrations of polyhedron suspensions when the biggest number of mulberry silkworm died as a result of experiments (50000mm³, 10000mm³, 5000 mm³ and 1000 mm³) were discarded from the test. Finally only one concentration of polyhedron suspension was prepared (500 mm³), when small number of worms were infected, and the rescued silkworm reached the moth stage and as a result of papillonage grain was obtained. Experimental results are given in Table 2.

Table 2. Number of worms infested by polyhedral suspension.

Vinstar day	500 mm ³		Dry control		Wet control	
1	-		-		-	
2	-		-		-	
3	-		-		-	
4	1		-		1	
5	-		-		1	
6	1		-		1	
7	1		1		1	
8	1		1		1	
total	q-ty	%	q-ty	%	q-ty	%
	4	4	2	2	5	5

Table 2 offers number of individuals who died at infestation by various concentration polyhedron suspensions and the percentage of lethal end according to days.

According to this table, 4% of worms was diseased in the first variant, while in the 7th variant (wet control) 5 worms were diseased; in the process of metamorphosis 7% of worms died while the remaining worms span cocoon and from those cocoons grain was prepared.

From the worms rescued after every experiment the F₁... F₇ generation was obtained by the method of sampling, and from that generation by long-term selection and sampling the improved lines were obtained [8,9,10]. After each feeding moth microanalysis was carried out and grain laid by diseased moth was discarded.

Simultaneously works were carried out by analytical and synthetic selection methods and sampling from generations [11,12]. Works which aimed to preserve significant technological indices and to improve worm viability in those lines were continued, in particular, by strict rejection and on the basis of non inbred crossing by propagation in generations; sampling of families and individuals with high indices was performed and on its base breed "V-1" was obtained from "Dighmuri" and "V-2" from "Iveria". The obtained breeds are distinguished by high biotechnological indices, especially – by high viability.

The main goal of our research, that is elevation of mulberry silkworm viability in starting breeds from 88,7-91.5 %- to 95.6-97.3% was achieved, which is a great achievement in mulberry silkworm selection breeding work.

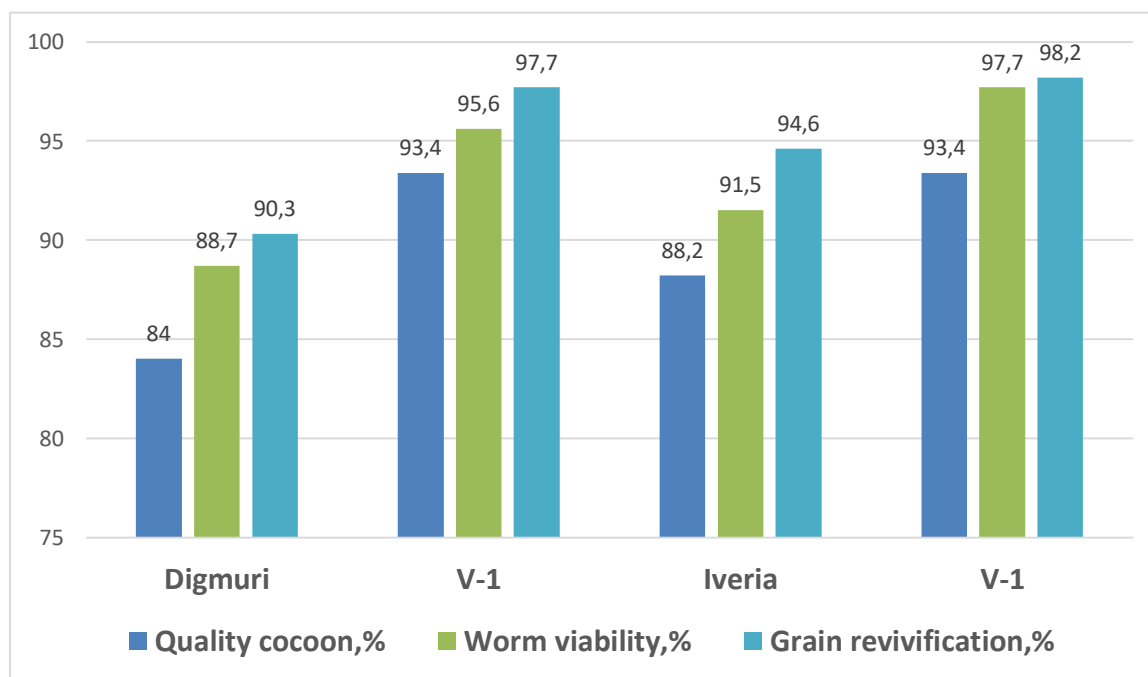


Fig. 1. Diagram 1. Comparison of the main indices of the starting and new breeds of mulberry silkworm

As to other biotechnological indices, they are significantly improved in the tested breeds and they fully conform to normative demands. Besides, according to the leading signs for sampling (quality cocoon quantity and improvement of viability) these breeds fully justify our preliminary task and it is logical since elevated viability is the prerequisite for obtaining high quality cocoon yield. Irrespective of it, works are continued towards still more improvement of these signs and for stabilization, since both starting and tested breeds possess great potential.

Conclusions.

1. Optimal polyherdal suspension concentration titer was developed (500 mm³).
2. Breeds V-1 and V-2, relatively resistant to the silkworm disease “nuclear polyhedrosis” were obtained by the method of sampling of F₁... F₇ generations of healthy worm after artificial infestation of mulberry silkworm, which as a result of analytical and synthetic selection and strict selection/sampling in generations were formulated into the breeds of high biotechnological indices.
3. New breeds are the precious starting materials for selection to receive more highly productive breeds.

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