

The Impact of Aminoacids on the Silk Productivity of Mulberry Silkworms in the Re-Feeding

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Abstract: *In recent two years re-feeding implementations of the mulberry silkworm have been practiced widely in the Republic of Uzbekistan. This article presents the results of the research on analysis of some amino acids at the process of re-feeding breeds and strains in summer time. It was ascertained that amino acids lysine and methionine affected favorably on silk productivity indications. In the control variant where the mulberry leaves were processed with amino acid solution of 0,5%, increase in cocoon mass varied from 1,9% to 21,1% over the control. The effect of amino acid application also occurred in silkworm moth out. Silkworm moth out was in considerable higher rate in all breeds and strains of experimental variants compared to re-feeding of other usual caterpillars.*

Keywords: mulberry silkworm, cocoon, cocoon shell, moth, lysine, methionine, breeds, strain

1. Introduction

The sericulture branch in the Republic of Uzbekistan produces and realizes raw-silk, silk yarn, silk wool, silk materials and miscellaneous silk goods to world silk market that can meet the demand of world light industry. The actual task of today is to increase the export potential of aforementioned silk products gradually.

In order to fulfil the tasks set on rearing silk cocoons production, industrial and elite grains in pedigree sericulture stations and grain plants, it is necessary to organize proper silkworm re-feeding, that is, to establish pedigree feeding in summer and autumn periods. And for this, there exists adequate infrastructure in the republic for grain implementations of mulberry silkworm.

In view of the above mentioned it is required to create favourable feeding conditions during re-feeding process similar to spring worm-feeding. In silkworm nursery it is possible to establish optimal hygrothermal (temperature and air humidity) regime and normal perflation. But, the main silkworm feed – mulberry becomes dehydrated and stiffer in summer period that may lead to inadequate assimilation of mulberry.

In the conditions of Central Asia due to sharp continental climate a number of questions are required to be solved at the re-feeding period. Particularly, it is needed to neutralize shortage of humidity, proteins, vitamins and various microelements in mulberry leaves. Scarcity of the very organic and inorganic matters can cause to inefficient digestion and assimilation of feed, delay in growth and development of larva. In result, these worms curl small cocoons and accordingly low yield of cocoon is obtained per box of worm.

Considering aforementioned cases our research aims to study the impact levels of some amino acids at the re-feeding in breeds and strain population of mulberry silkworm.

2. Materials and methods of research

For the implementation of assigned tasks we used in the experiments large-sized cocoon breeds of silkworm Guzal, Marvarid, medium-sized breeds Gulshan, Nafis, Line 27, Line 28 and Asaka. These breeds and strains are the components of regionized industrial hybrids “Oltinvodiy 1”, “Oltinvodiy 2”, “Gulshan x Nafis”, “Nafis x Gulshan” and “Musaffo tola 1”, “Musaffo tola 2” that are under state testing.

In order to conduct re-feeding in the grain in summer, by the method of processing with hydrochloric acid (HCl) with density 1, 12 within 8 minutes at 30°C temperature we prevented embryo diapausing that was delayed artificially in the first day.

The experiments were carried out in summer (June-July) of 2016 in a special silkworm nursery of scientific research institute of sericulture. The mulberry leaves were processed with 0,5 % aqueous amino acid (lysine and methionine). The worms were fed with processed leaves once in the third time, twice in the fourth time and three times in the fifth growth time. At all feeding courses optimal hygrothermal regime was maintained and all breeds and strains of worms under the experiment were kept in identical conditions. For the control variants we used the leaves processed with simple water and dry mulberry leaves.

At the experiments of J.Tuychiev, N. Akhmedov, U.Nasirillaev in 1999; U.Nasirillaev, S.Lejenko in 2001; A.Mirzakhodjaev, B.Mirzakhodjaev in 2012; B.U.Nasirillaev, M.K.Juraeva in 2015 was defined grain efficacy, that was put aside at the first day, and also the convoluted cocoons at the first day from the moment of mass cocoon rolling in pedigree feeding of mulberry silkworm.

Furthermore, in native researchers' investigations was identified scientifically based application of some biologically active matters, microelements and organic compounds of different origin, such as, in the works of I.A.Elmuurodova, N.A.Akhmedov in 1988; I.A.Elmuurodova in 1992; J.B.Khamidov, B.A.Parpiev, G.Ya.Lamm in 1990;

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B.U.Nasirillaev, U.K.Najimov, N.K.Khidirova, A.M.Rashkes, U.A.Abdullaev, Ya.V. Rashkes, Kh.M.Shokhidoyatov in 1993; D.Tuychiev, B.Nasirillaev in 2001; U.N.Nasirillaev, S.S.Lejenko, B.S. Azizov, Sh.R.Umarov, B.U.Nasirillaev in 2002; Sh.R. Umarov in 2011.

3. Results and Discussion

Worm viability, cocoon mass and shell is regarded as the main attributes for evaluation of cocoon prolificness per worm box. Therefore, in our experiments amino acids lysine and methionine were used for feeding the worms in order to replenish with deficient organic matter and to increase nutrient value of the feed. At the same time some other breeds and strains were fed with dry leaves and processed with simple water without any solution.

Changing rate of silk productivity attribute of breeds and strains under the experiment has been outlined in Table 1.

Table 1: Cocoon mass in experiment and control variants under feeding (June-July 2016)

No	Breeds and strains	Average mass of cocoon, gr		
		Experiment variant (amino acid)	Control variant	Superiority of experiment variant over the control, %
Dry control				
1	Guzal	1,54±0,004	1,34±0,028	114,9
2	Marvarid	2,00±0,006	1,77±0,029	113,0

Table 2: Cocoon shell mass and silkiness in experimental and control variants (June-July 2016)

No.	Breeds and strains	Cocoon shell mass, mg			Silkiness, %		
		Experimental variants (amino acid)	Control variants	Superiority of experimental variant over the control, %	Experimental variants (amino acid)	Control variants	Superiority of experimental variant over the control, %
		Dry control			Dry control		
1	Guzal	317 ± 1,7	245 ± 7,7	129,4	20,5 ± 0,07	18,3 ± 0,19	112,0
2	Marvarid	421 ± 3,9	359 ± 7,4	117,3	21,1 ± 0,13	20,3 ± 0,12	103,9
3	Gulshan	299 ± 4,2	270 ± 3,8	110,7	20,1 ± 0,12	19,4 ± 0,24	103,6
4	Nafis	343 ± 5,2	316 ± 4,9	108,5	20,9 ± 0,09	19,6 ± 0,17	106,6
5	L-27	251 ± 3,0	224 ± 2,0	112,1	21,1 ± 0,15	20,2 ± 0,12	104,5
6	L-28	267 ± 5,8	237 ± 9,7	112,7	21,9 ± 0,13	20,7 ± 0,28	105,8
7	Asaka	293 ± 4,7	237 ± 5,8	123,6	19,7 ± 0,20	18,4 ± 0,48	107,1
		Hydrologic control			Hydrologic control		
1	L-27	251 ± 3,0	232 ± 3,9	108,2	21,1 ± 0,15	19,7 ± 0,28	107,1
2	L-28	267 ± 5,8	245 ± 2,9	109,0	21,9 ± 0,13	20,9 ± 0,20	104,8
3	Asaka	293 ± 4,7	211 ± 1,0	138,9	19,7 ± 0,20	17,1 ± 0,10	115,2

The data of table 2 absolutely confirms the fact that cocoon shell mass of breeds and strains in experimental variant is higher than the control variant. By applying amino acids shell mass increased by 8,5%, 29,4%, in dry control of experimental variant, while in hydrologic control it made 8,2-38,9%. These data indicate decrease in protein content level in the leaves of summer mulberry and efficacy of processing leaves with amino acids for summer feeding.

3	Gulshan	1,49±0,015	1,39±0,006	107,2
4	Nafis	1,64±0,020	1,61±0,014	101,9
5	Line-27	1,19±0,006	1,11±0,010	107,2
6	Line-28	1,22±0,020	1,14±0,030	107,0
7	Asaka	1,49±0,009	1,29±0,010	115,5
Hydrologic control				
1	Line-27	1,19±0,006	1,18±0,004	100,8
2	Line-28	1,22±0,020	1,17±0,004	104,3
3	Asaka	1,49±0,009	1,23±0,007	121,1

In table 1 numerical data indicates higher cocoon mass in experiment variant comparing to the control. Increase in cocoon mass makes 13,0-15,5% in Guzal, Marvarid and Asaka breeds under dry control. In experiment variant of hydrologic control cocoon mass increased by 21,1% in Asaka breed, in Line 27 – 0,08% and in Line 28 – 4,3%. The above-mentioned indicators reveal that different breeds and strains hold different reaction rate on endogenous feed processing of mulberry silkworms.

Cocoon shell mass has a particular role among farm-valuable traits of mulberry silkworm. The main raw silk is produced from cocoon shell and that's why it is a topical issue that how endogenous presence is affected by amino acids lysine and methionine. Besides, there exists applied relevance of cocoon shell mass increasing of brood cocoons on efficacy of prepared grains.

Table 2 exhibits indicators of cocoon shell mass under experimental and control variants.

Table 3: Cocoon moth out in experimental and control variants

Breed and strain	Variants	Total quantity of cocoon, pcs	Quantity of cocoon-out moth, pcs	Quantity of cocoon-in moth, pcs	Cocoon moth out, %
Guzal	experimental	255	237	18	92,9
	control	254	219	35	86,2
Marvarid	experimental	265	232	33	87,5
	control	266	192	74	72,2
Gulshan	experimental	314	291	23	92,7
	control	217	200	17	92,3
Nafis	experimental	301	264	37	87,7

	control	165	136	29	82,4
Asaka	experimental	191	184	7	96,3
	Simple control	217	200	17	92,2
	Hydrologic control	160	151	9	94,4
Line-27	experimental	191	146	45	76,4
	Simple control	192	154	38	80,2
	Hydrologic control	134	94	40	70,1
Line-28	experimental	255	249	6	97,6
	Simple control	231	204	27	88,3
	Hydrologic control	188	170	18	90,4

According to numerical data of cocoon mass and shell, we calculated silkiness of materials under experiment. Under the usual spring feeding cocoon silkiness of breeds becomes comparatively higher because of natural nutrient enrichment of mulberry leaves. So, in view of achieving maximal genetic potential of brood strains and breeds we investigated influence of amino acids on cocoon silkiness. At the data of table 2 it is obvious that silkiness of Guzal breed is 12,0% higher compared to the control, while in Asaka breed it makes 7,1%. In other breeds and strains of experimental variant silkiness is shown 3,6-6,6% higher than the control, and all this proves efficacy of amino acid application in brood re-feeding of mulberry silkworms.

Besides silk productivity trait, cocoon moth out has a particular significance in grain production. For the yield of the grain of full value and good quality after the moth crossing, it is required to gain maximal cocoon moth out. In summer time this indicator is likely to present not less than 90,0%. The data in table 3 presents how the processed leaves of mulberry with amino acids may influence on moth out phase.

Coming out of the indicated data we can say that moth out in all experimental variants of breeds and strains is higher compared to control variant. In Line 28 (97,6%), Asaka (96,3%), Guzal (92,9%) and Gulshan (92,7%) breeds this indicator is similar to the level of spring feeding and absolutely proves received data of silk productivity attribute. Endogenous amino acids lead not only to increase in cocoon and shell mass, but also affect on moth viability. The analysis on moth out shows that tendency of increasing moth out is observed in all experimental variants of breeds where the amino acids are used.

4. Conclusions

Considering the results of conducted experiments, the potential of application of endogenous amino acids in re-feeding has been proven with a view to increase mass of cocoon and shell, cocoon silkiness, and also achieve genetic potential of parent breeds and strains of mulberry silkworm.

Furthermore, it has been approved firstly that application of endogenous amino acids favourably influenced on moth out of brood cocoons, i.e. the processing mulberry leaves with lysine and methionine increased considerably moth out level. The received data for summer feeding affords us ground to conclude as endogenous amino acids cause to intensification of metabolic process of worm organism and

strengthen viability in less favorable worm feeding in summer and autumn periods.

Introduction of the results of this research on grain-producing brings a huge effect to industrial and elite silkworm grain yield of best quality in re-feeding in the republic of Uzbekistan.

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