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Research Concerning the Influence of Some Supplements (Spirulina and Spirulina with Sea Buckthorn Extract) on Sericigene Glands Weight of Silkworm (*Bombyx mori* L.)

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Abstract

The goal of our research is to organize an experiment with 3 variants of silkworms. The biological material was represented by a single silkworm breed: Baneasa 75 (B75), in order to obtain the best genetic uniformity. Only environmental conditions (feeding) were different. This research present the influence OF 2 supplements on serigene glands weight at Vth age of larva. Spirulina and Spirulina with Sea Buckthorn extract capsules provided from S.C Hofigal Export-Import S.A. Spirulina is a rich source of proteins, contains a wide range of aminoacids, fatty acids, vitamins (biotin, tocopherol, thiamine, riboflavin, niacin, folic acid, pyrodozoic acid, beta-carotene and vitamin B12), vegetal hormones, enzymes, microelements, biological pigments. Sea Buckthorn extract is a very rich source of vitamins (vitamins A, E, C, P, carotenoids and B complex), microelemnts (phosporus, calcium, magnesium, potasium) and fatty acids. Regarding the sericigene gland weight we can observe that the mean values of the variant treated with Spirulina (S) and the variant treated with Spirulina with Sea Buckthorn extract (S+SB) are higher than the control.

Keywords: silkworm, spirulina, sea buckthorn, mulberry leaf, genotype x environment interaction

1. Introduction

The purpose of this paper is to study the influence of some supplements used in larva feed (aqueous extract of Spirulina 500 ppm and aqueous extract of Spirulina with Sea Buckthorn extract 500 ppm) on sericigene glands weight as aspects of the interaction genotype x environment (reaction of the same genotype - individuals of the same breed and different environment conditions - feed).

Mulberry (*Morus* species) leaf is the solo food and source of nutrition for the silkworm, *Bombyx mori* L. due to the presence of morin [2, 6]. The growth and development of larva, and subsequent cocoon production are greatly influenced by nutritional quality of mulberry leaves. Supplement in silkworm nutrition like protein substitute fortified with food stuff are needed for nutritional requirement among several insects [6].

Mulberry leaf supplemented with spirulina as a feed to *Bombyx mori* L. oraly found to be effective in enhancing the larval and cocoon characters [1, 4, 5].

In 2007 Venkatesh Kumar et al. used in larva feeding aqueous extract of Spirulina in various concentrations (100 ppm, 200 ppm şi 300 ppm).

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Differences between the treatments were found significant in all the quantitative cocoon characters except shell percentage. Single cocoon weight, single shell weight, cocoon weight and silk filament length are significantly higher at 300 ppm concentration compared to control [5].

Nicula A. et al. in 2007 fed the larvae on mulberry leaves, sprayed with different biostimulatory extracts: Netin, Sea buckthorn juice, Vitis, Citriseed, and Yeast hidrolysate solutions. They report changes in larva weights, serigene glands protein content and water retention during the IV and V age. The results showed that some biostimulatory extracts, especially Yeast hydrolisates induced the increase of larva and serigene glands weight [3].

Our research reveals the influence of two supplements (S and S+SB) on larva weight in the V^{th} age, sericigen glands weight and quantitative parameters of cocoon.

In this paper we present the influence of supplements (S and S+SB) in serigene gland weight.

2. Material and Method

The experiment was developed within the Laboratory of Sericulture of the Department of the Technologies of Apicultural and Sericulture Products of the Faculty of Animal Science, USAMV Cluj-Napoca, in May - June 2011.

The 3 experimental silkworm groups (variants) were feed with mulberry leaves from the intensive mulberry tree plantation from USAMV Cluj-Napoca.

The plantation is made up of Ukraine 107 mulberry trees very well adapted to the pedoclimatic conditions from Transylvania.

The first silkworm group is the control where the larvas were fed only with mulberry leaves (CONTROL).

The second group was fed with mulberry leaves treated with Spirulina aqueous solution 500 ppm (S).

The third group was fed with mulberry leaves treated with Spirulina with Sea Buckthorn aqueous solution 500 ppm (S+SB).

Supplements administration started on V^{th} age (during 8 days) 3-4 times/day.

Sericigene glands weight was recorded before larval spining.

Fresh mulberry leaves were soaked with aqueous extract of S and S+SB, and then leaves were dried under fan before feeding to the silkworms till end of the fifth instar.

Statistical processing of data and the signification of differences between variants mean values was performed by multiple comparisons test Student-Newman-Keuls.

10 serigene glands of each variant were weighted.

3. Results and Discussions

Because the variance (mean square) between treatments is very significant (table 1) we proceed to the multiple comparison test Student-Newman-Keuls for testing the signification of differences between means value.

Table 1.Analysis of variance regarding sericigene glands

Source of variation	Degrees of freedom	Sum of squares	Mean square	F	Signification
Treatment	2	0.809	0.404	47.957	***
Individual	9	0.091	0.010	1.209	ns
Error	18	0.152	0.008	-	-
Total	29	1.054	-	-	-

Mean value, standard deviation, standard error of mean, variability coeficient, confidence interval and relative value are shown in table 2.

The mean value of sericigene glands weight from silkworms were fed with mulberry leafs treated with S are about 1.118 g.

The mean value of sericigene gland weight of silkworm fed with mulberry leafs treated with S+SB was around 1.233 g.

The mean values recorded by treatments (S and S+SB) are higher than control (0.841 g).

Variability coefficient (V%) at the variants treated with S (5.73) and S+SB (8.60), was lower than control (12.85).

Confidence interval signifies the limits of theoretical mean between the ranges with a 95% probability.

Multiple comparisons test (table 3) show very significant diferences between the group fed with mulberry leafs treated with S (0.276 g) and control and between group fed with mulberry leafs treated with S+SB (0.391 g) and the control.

Table 2. Mean values and variability estimates of sericigene glands weight

Variant/Parameters	S	S+SB	Control
n	10	10	10
Minimal weight	1.044	1.109	0.651
Maximal weight	1.283	1.489	1.084
$x \pm s_x$	1.118 ± 0.020	1.233 ± 0.033	0.841 ± 0.034
Standard deviation (s)	0.064	0.106	0.108
Variability coefficient , (V%)	5.73	8.60	12.85
Relative value (%)	132.83	146.49	100
Confidence interval (95%)	1.072 - 1.164	1.158 - 1.309	0.764 - 0.919

Table 3. Multiple comparisons test on sericigene glands

Compared variants	Difference (g)	q	P value
S VS. CONTROL	0.276	13.474	p < 0.0001***
S+SB VS. CONTROL	0.391	9.513	p < 0.001***
S VS.S + SB	- 0.115	3.962	p < 0.05*

Between treatments (S and S+SB) diferences are statisticaly significant (-0.115 g) for the variant feded with S+SB.

4.Conclusions

Regarding sericigene gland weight we can afirm that the leafs treated with Spirulina and Spirulina with Sea Buckthorn extract have positive influence on the increase of the weight of serigene gland.

The increase of the weight of serigene gland can be correlated with a very rich cocoon production beside the improvement of quantitative and qualitative cocoon parameters (cocoon weight, shell weight, cocoon weight, silk filament length).

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