SILKWORM FEEDING TRIALS FOR EVALUATING THE VARIETAL EFFECT OF THREE MULBERRY LEAVES ON THE SILKWORM GROWTH AND COCOON YIELD QUALITY

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(Manuscript received 25 October 2005)

Abstract

Silkworm larvae were reared on the leaves of three different mulberry varieties; *Morus alba* var. *kokuso*-27, *M. alba* var. *morittiana* and *M. alba* var. *rosa* to study the varietal effect on the silkworm growth and cocoon yield. The nutritional composition of the leaves of the mulberry varieties was also determined.

The study of biochemical analysis and feeding trials revealed that there were a significant increase in crude protein, soluble sugar and starch in the leaf of *M. alba* var. *kokuso*-27 mulberry variety as compared to *M. alba* var. *morritiana* and *M. alba* var. *rosa* and it was found to be superior to others. The chlorophyll content in the basic-leaves was higher than in the apexial and middle leaves.

Key words: Silkworm, mulberry varieties; *Morus alba* var. *kokuso*-27, *M. alba* var. *morittiana* and *M. alba* var. *rosa, and* varietal effect.

INTRODUCTION

Mulberry is an important tree in Seri cultural industry. Quality of mulberry leaves play an important role in success of sericulture industry and directs its economics (Choudhury *et al.*, 1991). Leaf nutrition of mulberry is the most important factor influencing the growth and productivity of silkworm. Protein play critical roles in virtually all biological process. Sugar contents in the leaves presents an important factor in feeding of larva. Starch is the nutritional reservoir in plants. It is a polysaccharides that can be rapidly mobilized to yield glucose, a prime fuel for generation of energy.

Different varieties of mulberry may have compositional differences and might lead to varying effects on growth and silk production (Krishnaswami *et al.*, 1971 and Minko and Mircheva, 1979).

The silkworm; *Bombyx mori* L. is a highly specialized phyto-phagous insect, as it feeds only on mulberry leaves. Nearly 70 percent of the silk proteins produced by silkworm are directly derived from the proteins of the mulberry leaves.

The present study was carried out to determine the nutrients composition of three mulberry varieties leaves and their effect on larval growth and silk production.

MATERIALS AND METHODS

The imported varieties of mulberry selected for the experiment were *M. alba* var. *kokuzo*-27 and *M. alba* var. *morittiana* with the local variety *Morus alba* var. *rosa* as a control.

The biochemical analysis of crude protein, total soluble sugar, total starch as well as chlorophyll content of mulberry leaves of the different varieties were carried out.

The protein were extracted following (Lowery *et al.*, 1951), the soluble carbohydrates following (Willis and Yem, 1957). The extract was directly used to estimate sugar following the phenol sulphuric acid method as suggested by Dubios *et al.*, (1956). The estimation of chlorophyll amount was applied using the Minolta SPAD-502 Chlorophyll Meter.

The feeding trials was conducted in Faculty of Agriculture, Cairo University in April 2005.

The silkworm hybrid 9F7X was used for the present study and rearing of disease free laying was carried out at 25 $\pm$ 1°C and R.H. 75 $\pm$ 5%.

Data were also recorded in respect of average grown larval weights, cocoon and shell weights, silk ratio and yield of cocoons. Statistical analysis using F test were carried out.

RESULTS

It is known that the leaves on which the silkworms feed could strongly affect silkworm survival and health. Also the cocoons economic characters are mainly

influenced by the nutritional content of mulberry leaves, better the quality of the leaves, greater are the possibilities of obtaining good cocoon crops.

The biochemical composition of mulberry leaves is given in Table (1).

The present study revealed that *M. alba* var. *kokuso*-27 contained comparatively more crude protein (233.15 mg/g) than *M. alba* var. *morittiana* (164.20 mg/g) and *M. alba* var. *rosa* (156.92 mg/g) which might have improved the physical property of food and thus increase the food consumption and consequently accelerated the growth. The same trend was noticed in soluble sugar (123.14, 103.90 and 99.82 mg/g) for *M. alba* var. *Kokuso*-27 *Morittiana* and *rosa*, respectively. Also, maximum starch content was observed in *M. alba* var. *Kokuso*-27 (70.40 mg/g) following by (50.20 mg/g) in *M. alba* var. *rosa* then (54.60 mg/g) in *M. alba* var. *morittiana.*

Differences occurred among the different varieties regarding total chlorophyll in leaves. The higher quantities of chlorophyll are advantageous since chlorophyll is the most important pigment.

Leaves chlorophyll amount was varied from variety to other, also depended on the leaf position on the branch (Table 2). Results indicates that chlorophyll amount in the basic leaves was higher than those in apexial or middle leaves.

Also, the differences between highest and lowest values in the basic and middle leaves was not high as in the apexial leaves except in *M. alba* var. *kokuzo*-27. These could be due to the uncomplete development of chlorophyll in apexial leaves since these leaves are the youngest ones.

Feeding trials with silkworm leaves were also conducted. Table (3) presents the feeding effect of three different mulberry leaves varieties. The analysis of variance show that significant differences exist for the four characters; larval, cocoon, cocoon shell weight and silk ratio. This suggest that they present a variability and that a selection can be successfully carried out. Also, cocoon yield shows that *kokuso*-27 has the highest effect on the silkworm rearing.

From the biochemical analysis of mulberry leaves of the different varieties, it is discernable that is no single variety all the nutrients are present in the highest value. But Table (1) shows that the variety *kokuso*-27 is consider superior over the others.

These results were confirmed by the findings of Thangamani and Vivekanandan (1984), Bari *et al.*, (1985). Also, Puttaramaniak *et al.*, (2000) who reported that there are large amount of variation in total chlorophyll and crude protein contents among twelve mulberry *M. alba* varieties.

Feeding trials with silkworm larvae were also conducted by several workers to maximize the concoon yield, Sironmani *et al.*, (1983), Tayade and Jawale (1984) and Fonesca *et al.*, (1990).

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Table 1. Biochemical Analysis of Various Components Presented in Three Different Mulberry Leaf Varieties.

Component/dry weight	Mulberry Varieties		
	M. alba var. kokuso-27	*M. alba* var. morittiana	*M. alba* var. *rosa*
Crude Protein (mg/g.)	233.15	164.20	156.92
Soluble sugar (mg/g.)	123.14	103.90	99.82
Starch (mg/g.)	70.40	54.60	50.20

Table 2. Chlorophyll Content of Three Different Mulberry Varieties and Different Leaves Position.

Variety	Basic-leaves		Middle-leaves		Apexial-leaves	
	Lowest	Highest	Lowest	Highest	Lowest	Highest
M. alba var kokuso-27	36.93	42.70	36.10	39.10	28.15	40.98
. *M. alba* var marittiana	39.90	42.38	36.53	40.35	30.40	35.38
M. alba var *rosa.*	35.15	37.33	33.68	36.93	27.60	30.88

Table 3. Feeding Effect of Different Mulberry Varieties on Silkworm *Bombyx mori* L.

Parameters	Mulberry Varieties			L.S.D.
	M. alba var. kokuso-27	*M. alba* var. morittiana	*M. alba* var. *rosa*	
4th larval instar weight (gm)	0.550	0.380	0.358	0.038
5th larval instar weight (gm)	1.954	1.709	1.318	0.145
Cocoon Weight (gm) □	1.524	1.163	1.093	0.070
□	1.301	0.742	0.891	0.081
Cocoon shell weight (gm) □	0.294	0.210	0.214	0.016
□	0.296	0.149	0.150	0.021
Cocoon shell ratio(%) □	19.229	18.05	16.84	0.559
□	21.35	20.08	19.57	0.814
Yield of Cocoons/ gm eggs (Kg)	2.89	2.00	1.50	-

دراسة تأثير تغذية ديدان الحرير على ثلاث أصناف من أوراق التوت على نمو اليرقات ومحصول الحرير

عزة توفيق عاشور

** قسم الحشرات الاقتصاديه والمبيدات – كليه الزراعة – جامعة القاهرة*

تم تربية يرقات ديدان الحرير على أوراق ثلاث أصناف مختلفة من التوت (الياباني، الرومي ، البلدي) وذلك لدراسة تأثير الصنف على كل من النمو ومحصول الشرانق. أيضا تم تقدير المكونـــات الغذائية تبعاً لموقع الأوراق للأصناف المختلفة.

أوضحت دراسة التحليل الكيماوي وتجربة التغذية أن هناك زيادة معنوية في البروتين والسكر الذائب والنشا في أوراق الصنف الياباني مقارنه بالصنف الرومي والبلدي وكان متفوقا على الأصناف الأخرى.

وجد أن محتوى الكلوروفيل فى الأوراق القاعدية كان أعلى من الأوراق الطرفية والوسطية.