

## EFFECT OF SOME LACTIC ACID BACTERIA ON SOME PARAMETERS OF THE SILKWORM , *BOMBYX MORI* L.

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### ABSTRACT

Effect of lactic acid bacteria (*Lactobacillus rhamnosus*, *Lactobacillus paracasei* and *Lactobacillus acidophilus*) as food additives on some parameters of *Bombyx mori* L. was carried out . Experimental product of Lactic acid bacteria was dissolved in distilled water to prepare one concentration (5mg/ml.) from bacteria in addition to yoghurt and milk. The obtained results showed that, *Lactobacillus acidophilus* occupied the first category for improving the most studied parameters of *B. mori* when comparing to control. Where the 5th instar larval weights were 2.159g compared to 2.002 g in control , effective rate of rearing recorded 82.00% compared to 78.00% in control and total haemolymph protein recorded 64.00mg/ml. compared to 60.99mg/ml. in control. Cocoon indices registered 1.101 g, 0.209 g and 18.98% for cocoon weight, cocoon shell weight and cocoon shell ratio comparing to 1.005 g, 0.177 g and 17.61% for the control respectively.

### INTRODUCTION

The silkworm is the larva or caterpillar of the domesticated silk moth, *Bombyx mori* belonging to the Family Bombycidae. It is an important economic insect since it is the producer of silk. Sericulture or silk farming is the rearing of silkworms for the production of raw silk although there are several commercial species of silkworms, *Bombyx mori* is the most widely used and intensively studied.

Probiotics are organisms and substances which contribute to intestinal microbial balance (Parker, 1974). Lactic acid bacteria (LAB) are a group of Gram-positive, non-sporulating bacteria that includes species of *Lactobacillus*, *Leuconostoc*, *Pediococcus* and *Streptococcus*. Dietary LAB refers to those species and strains that are used in food and feed fermentation processes. The term LAB does not reflect a phyletic class, but rather a group of organisms that are defined by their ability to produce a common end product lactic acid from the fermentation of sugars. LAB have limited biosynthetic abilities, and require pre-formed amino acids, B vitamins, purines, pyrimidines and, usually a sugar as a carbon and energy source. These nutritional requirements restrict their habitats to those in which the required compounds are abundant (Oh *et al.*, 2000). The gut probiotics are involved in the digestive utilization of feeds and detoxification of metabolite, stimulation of non-specific immune system.

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They also promote the production of vitamins and increase host resistance and compete with pathogenic bacteria by producing organic and antibiotic substance. The lactobacillus plantarum is a probiotic which improves the cocoon production of mulberry silkworm *B. mori* (Singh *et al.*, 2005). The present study highlights the effect of some lactic acid bacteria on some the economical parameters of the silkworm *B. mori*.

#### MATERIALS AND METHODS

The effect of some lactic acid bacteria (*Lactobacillus rhamnoses*, *Lactobacillus paracasei* and *Lactobacillus acidophilus*) on rearing performance of silkworm, *Bombyx mori* L., were studied at Plant Protec. Dept. Fac. of Agric., Fayoum Univ. during spring season (12-4 /2-6) of 2016. Egg box of silkworm, *B. mori* L. (local hybrid) was obtained from the Seric. Res. Dept., Plant Protec. Res. Inst, Agric. Res. Center. Dokki, Giza. Lyophilized strains, *Lb. paracasei* NRRL-B-4560 and *Lb. rhamnoses* NRRL-B-442, were obtained from Dairy Microbiology Laboratory National Research Center (NRC), Dokki, Cairo, Egypt. , *Lb. acidophilus* (type La 5) was obtained from Chr. Hansen's Laboratories, Copenhagen, Denmark. 5 mg of the above mentioned bacteria in addition to yoghurt and milk /ml of distilled water were prepared. Larvae of *B. mori* L. were reared on fresh mulberry leaves (*Morus alba* var. *indicia*) grown in the farm of faculty of Agriculture at Fayoum (at Dar El Ramd region ) under laboratory conditions (26±2°C, 70±5% RH). At the beginning of the 4<sup>th</sup> instar, larvae were divided into five groups (in addition to the control). Each group contained five replicates (each of twenty larvae). Each replicate was reared in carton tray(30×15×4 cm). larvae were fed on one of the five experimental products day after day during 4<sup>th</sup> & 5<sup>th</sup> larval instars.

Mulberry leaves were sprayed with one of the experimental products after drying on ambient air temperature for one minute, while the control was fed on mulberry leaves sprayed with distilled water. The tested parameters were recorded for all replications of treatments and control i.e: 5th instar larval weights, effective rate of rearing, cocoon weights, cocoon shell weights and cocoon shell ratio were calculated and total haemolymph protein were recorded. was calculated. Data was analyzed by ANOVA through statistical package for social science (SPSS) according to Berkowitz and Allaway, 1998 to find out the significance between treated and control. Means were separated by (L.S.D at 0.05%).

#### RESULTS AND DISCUSSION

##### 5th instar larval weights:

According to data in table (1) the means of the 5th instar larval weights were ranged between 2.000 g for milk and 2.159 g for *Lactobacillus acidophilus* treatments. The obtained results are in general agreement with

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**Sekar et al.( 2011) and Rahul et al.(2017)** whom found improving in larval weight of *B. mori* when using mulberry leaves treated with Probiotic bacteria (*Lactobacillus rhamnosus* ATCC 9595, *Lactobacillus acidophilus* ATCC) and *Lactobacillus sporogenes*, *Lactobacillus acidophilus*, *Bacillus licheniformis*, *Bacillus subtilis* & *Saccharomyces cerevisiae*,.

**Effective rate of rearing:**

Data presented in **table (1)** showed no significant change in the treated groups with Lactic acid bacteria when compared to control one for the effective rate of rearing. The highest rate (82.00%) has been obtained in *Lactobacillus acidophilus* treatment. Similar observation was reported by **Rahul et al.(2017)** as effective rate of rearing of *B. mori* larvae was improved when mulberry leaves were treated with Probiotic bacteria (*Lactobacillus rhamnosus* ATCC 9595 and *Lactobacillus acidophilus* ATCC 4356).

**Total haemolymph protein:**

According to data in **table (1)** total haemolymph protein was increased in the treated groups with Lactic acid bacteria comparing to the control, it recorded 64.00 mg/ml when larvae treated with *Lactobacillus acidophilus* comparing to 60.99 mg/ml in control. The obtained results are supported by **Rexin and Vasantha (2017)** when used mulberry leaves treated with 1, 3 and 5% concentration of Lactic acid bacillus.

**TABLE (1):Effect of feeding *Bombyx mori* L. larvae on mulberry leaves treated with Experimental products of bacteria on some parameters.**

Experimental products (5 mg/ml of water).	Parameters		
	Means of 5th instar larval weights (g) ±SE	Means of effective rate of rearing (%)	Total haemolymph protein (mg/ml.).
<i>Lactobacillus rhamnosus</i>	2.020±0.0030b	80.00±1.4500	63.54±2.789 ab
<i>Lactobacillus acidophilus</i>	2.159±0.0021a	82.00±1.4378	64.00±2.008 a
<i>Lactobacillus Paracasei</i>	2.005±0.0087b	80.00±1.4553	62.90±2.545 ab
yoghurt	2.011±0.0012b	79.00±1.6009	62.78±2.776 ab
milk	2.000±0.0066b	78.00±1.8990	60.03±2.770 b
Control	2.002±0.0025b	78.00±1.2344	60.99±2.009 b
F test	**	---	*
LSD at 0.05%	0.101	---	3.000

**Cocoon weights , cocoon shell weights and cocoon shell ratio:**

Data in **table (2)** represent the means of cocoon, cocoon shell weights and cocoon shell ratio as follow:

**Cocoon weights:**

The mean weight of the cocoon was maximum (1.101 g) in *Lactobacillus acidophilus* treatment with significant difference compering to

control. The obtained results in accordance with Sekar *et al.*( 2011) who found, increase in cocoon weight of *B. mori* when using mulberry leaves treated with Probiotic bacteria (*Lactobacillus rhamnosus* ATCC 9595 and *Lactobacillus acidophilus* ATCC 4356, Rahul *et al.*( 2017) when using mulberry leaves treated with *Lactobacillus sporogenes*, *Lactobacillus acidophilus*, *Bacillus licheniformis*, *Bacillus subtilis* & *Saccharomyces cerevisiae*.

#### Cocoon shell weights:

The cocoon shell weights were 0.209g in *Lactobacillus acidophilus* treatment compering to 0.177g in control. In these experiment shell weight of larvae treated with *Lactobacillus acidophilus* was significantly increased compered with control. The obtained results agreement with Sekar *et al.*(2011) when using mulberry leaves treated with *Lactobacillus sporogenes*, *Lactobacillus acidophilus*, *Bacillus licheniformis*, *Bacillus subtilis* & *Saccharomyces cerevisiae*.

#### Cocoon shell ratio:

Cocoon shell ratio was 18.78% and 17.61% of *Lactobacillus acidophilus* treatment and control respectively. In these experiment cocoon shell ratio of larvae treated with *Lactobacillus acidophilus* was in significantly increased compered with control. The obtained results are in general agreement with the findings of Rahul *et al.*(2017) who found that, increasing the cocoon shell ratio of *B. mori* when using mulberry leaves treated with Probiotic bacteria (*Lactobacillus rhamnosus* ATCC 9595 and *Lactobacillus acidophilus* ATCC 4356).

**TABLE (2):Effect of feeding *Bombyx mori* L. larvae on mulberry leaves treated with Experimental products of bacteria on cocoon parameters.**

Experimental products (5 mg/ml of water).	Parameters		
	The means of cocoon weights (g).	The means of cocoon shell weights (g).	The means of cocoon shell ratio (%).
<i>Lactobacillus rhamnosus</i>	1.009±0.001 b	0.187±0.033 ab	18.53±1.024
<i>Lactobacillus acidophilus</i>	1.101±0.001a	0.209±0.032 a	18.98±1.011
<i>Lactobacillus Paracasei</i>	1.022±0.003 b	0.190±0.045 ab	18.59±1.009
yoghurt	1.010±0.022 b	0.180±0.014 b	17.82±1.088
milk	1.003±0.004 b	0.175±0.018 b	17.44±1.090
Control	1.005±0.000 b	0.177±0.022 b	17.61±1.088
F test	**	*	---
LSD at 0.05%	0.076	0.023	---

**REFERENCES**

- Berkowitz D. and Allaway A. (1998).** Statistical package for social sciences (SPSS), Version 7.5 for Windows NT/Windows 95:130-132.
- Oh, S.; Kim, S. H. and Worobo, R. W. (2000).** Characterization and purification of a bacteriocin produced by a potential probiotic culture, *Lactobacillus acidophilus* 30SC. *J. Dairy Sci.*, 83: 2747-2752.
- Parker, R. B. (1974).** Probiotics the other half of the antibiotic story. *Animal Nutrition and Health*, 29: 4-8.
- Rahul, K. ; Roy, G. ; Hossain, Z. and Trivedy, K.(2017).** Impact of probiotics *Lactobacillus rhamnosus* ATCC 9595 and *Lactobacillus acidophilus* ATCC 4356 on the economic traits of silkworm *Bombyx mori* L. *Imperial Journal of Interdisciplinary Research*,3(3):1115-1117.
- Rexin, A. and Vasantha, R. (2017).** Effect of sporlac on protein content of silkworm *Bombyx mori* L. *International Journal of Emerging Trends in Science and Technology*, 4(2): 4994-4997.
- Sekar, P.; Balasundaram, A. and George, J. (2011).** A study on immunomodulation and health enhancement in *Bombyx mori* subjected to supplementary feeding with a probiotic consortium . *International Journal of Current Research*, 33( 2) :006-016.
- Singh, K.K; Chauhan,R.M.; Pande,A.B.; Gokhale S.B. and Hegde,N.G. (2005).** Effect of use of *Lactobacillus plantarum* as a probiotics to improve cocoon production of mulberry silkworm, *Bombyx mori* (L.).*J. Basic Appl.Sci.* 1:1-8.

دراسة تأثير بكتريا حمض اللاكتك على بعض صفات دودة الحرير التوتية.

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**الملخص**

تم دراسة تأثير بكتريا حمض اللاكتك كإضافة غذائية إلى ورق التوت المستخدم في تغذية دودة الحرير التوتية في قسم الوقاية بكلية الزراعة جامعة الفيوم خلال فصل الربيع لعام ٢٠١٦. حيث تم الحصول على هجين محلى من قسم بحوث الحرير بمركز البحوث الزراعية بالجيزة. تم تربية اليرقات على ورق توت هندي خلال الخمس أعمار اليرقية. بعد الإنسلاخ الثالث تم تقسيم اليرقات إلى خمس مجموعات بالإضافة للكنترول. كل مجموعة قسمت إلى خمس مكررات وكذلك الكنترول. تم الحصول على المنتج واذابته في الماء المقطر لتحضير تركيز ٥مجم/ملتر من بكتريا حمض اللاكتك وهي لاكتوباسلس رامينوسيس ولاكتوباسلس باراكيسى ثم لاكتوباسلس اسيدوفيلس بالإضافة إلى الزبادى العادى واللبن. حيث تم تغذية هذه اليرقات على ورق التوت المعامل بهذه التركيزات يوم بعد يوم خلال العمر اليرقى الرابع والخامس. وكانت النتائج كالتالى: أفضل نوع هو لاكتوباسلس اسيدوفيلس. حيث وصل متوسط وزن اليرقة في نهاية العمر اليرقى الخامس ل ٢,١٥٩ جم مقارنة ب ٢,٠٠٢ جم فى الكنترول بينما وصلت كفاءة التربية ل ٨٢ % مقارنة ب ٧٨ % فى الكنترول. بلغ متوسط البروتين الكلى فى الدم ٦٤,٠٠ ملجم/ملتر مقارنة ب ٦٠,٩٩ مجم/ملتر فى الكنترول كذلك كان متوسط وزن الشرقة ١,١٠١ جم مقارنة ب ١,٠٠٥ فى الكنترول و متوسط وزن قشرة الشرقة ٠,٢٠٩ جم مقارنة ب ٠,١٧٧ فى الكنترول و متوسط نسبة الحرير ١٨,٩٨ % جم مقارنة ب ١٧,٦١ فى الكنترول.