

EFFECT OF *HIBISCUS SABDARIFFA* ON REARING PERFORMANCE OF SILKWORM, *BOMBYX MORI* L.

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ABSTRACT

Effect of *Hibiscus sabdariffa* as food additives on rearing performance of silkworm, *Bombyx mori* L. was studied. Dried flowers of *H. sabdariffa* were crushed and soaked in distilled water to prepare different concentrations (20, 40, 60, 80 and 100 mg/ml.). The obtained results showed that, the concentration 60 mg/ml. of *H. sabdariffa* occupied the first category. Where effective rate of rearing recorded 84.00% compared to 76.00% in control, total haemolymph protein mg/ml. recorded 70.54mg/ml. compared to 64.52mg/ml. in control and number of eggs / female recorded 284.00 compared to 262.00 in control. Cocoon indices were 1.165 g, 0.229 g and 19.66% for cocoon, cocoon shell weights and cocoon shell ratio comparing to 1.067 g, 0.169 g and 17.71% for the control, respectively.

INTRODUCTION

The mulberry silkworm, *Bombyx mori* L is monophagous, feeding only on mulberry leaves, there are about 1000 varieties of silkworm (**Barnet, 1963**), among them bivoltine and multivoltine races are used for rearing in our country (**Krishnaswami et al., 1973**). Plant derived medicines have been part of our traditional health care in most parts of the world and there has now been an increasing interest in using plants as the sources of agents to fight microbial diseases (**Sandhya et al.,2006**). *Hibiscus sabdariffa* is very important medicinal plant , the chemical analysis of calyx revealed that, it contained protein, fat, carbohydrate, fiber, calcium, phosphorus, iron, vitamin A and ascorbic acid (**Adegunloye et al.,1996**). Various antioxidant constituents are found in the calyx and flower petals of roselle, such as anthocyanins, quercetin, ascorbic acid, β -sitosteroid glycoside and protocatechuic acid (**Salah et al.,2002**). The present study has been planned to determine the effect of *H. sabdariffa* as food additives on rearing performance of silkworm , *B. mori*, L.

MATERIALS AND METHODS

During spring season of 2015 at Plant Protection Dept. Fac. of Agric., El Fayoum Univ. The effect of *Hibiscus sabdariffa* on rearing performance of silkworm, *Bombyx mori* L., was studied. Egg box of silkworm, *B. mori* L. (Egyptian hybrid) was obtained from the Seric. Res. Dept., Plant Protec. Res. Inst, Agric. Res. Center. Dokki, Giza. Dried flowers of *H. sabdariffa* was obtained from pharmacy and were crushed and soaked in distilled water to prepare different concentrations. 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 ($28\pm 2^{\circ}\text{C}$, $70\pm 5\%$ RH). At the beginning of the 5th 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 of *B. mori* L. were fed on mulberry leaves sprayed with each concentration of (20, 40, 60, 80 and 100 mg/ml.) of *H. sabdariffa* daily during the 5th instar after drying on ambient air temperature for one minute. While the control was fed on mulberry leaves sprayed with distilled water. Tested parameters (Effective rate of rearing, number of eggs / female, cocoon & cocoon shell weights and cocoon shell ratio) were recorded. Total protein of haemolymph was analyzed according to **Bradford, 1976**. 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

Effective rate of rearing:

Data presented in **Table (I)** showed a significant change in the treated groups with *H. sabdariffa* when compared to control ones for the effective rate of rearing. Where the best result (84.00%) has been obtained by using 60 mg/ml concentration of *H. sabdariffa*. This increase might be due to the effect of gossypetin component of *H. sabdariffa* as anti-bacterial which might decrease the mortality percentages as reported by **Mounnissamy et al., 2002**. The obtained results are in general agreement with the findings of many authors whom found that, effective rate of rearing of *B. mori* larvae was improved when using mulberry leaves treated with *Parthenium hysterophorus*, *Tridax procumbens* and *Tribulus terrestris*, (**Muruges and Bhaskar, 2007**), mulberry leaves treated with aqueous extract of *Phyllanthus niruri*, (**Kumari et al., 2010**).

Total haemolymph protein:

According to data in **Table (I)** Total haemolymph protein was significantly increased in the treated groups with *H. sabdariffa* when compared to control. It was 70.54 mg/ml when larvae treated with 60 mg/ml of *H. sabdariffa* comparing to 66.82 mg/ml in control. This increase may be due to the effect of *H. sabdariffa* antioxidant (**Guyton & Kensler, 1993 and Crawford et al., 1998**). Similar results was obtained by **Raju et al., 2012** when using mulberry leaves treated with turmeric on *B. mori* larvae.

Number of eggs / female:

Number of eggs / female was significantly increased in the treated groups of *H. sabdariffa* when compared to control as presented in **Table (I)**. The obtained results agreement with **Shubha et al., 2006** when using mulberry leaves treated with aqueous extract of *Psoralea corylifolia*,

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Phyllanthus niruri, *Tribulus terrestris*, *Withania somnifera* and *Adathoda vasica* and **Sumathi, 2008** when using mulberry leaves treated with aqueous extract of *Lantana camera* and *Ocimum sanctum* on *B. mori* larvae.

TABLE(I):Effect of feeding *Bombyx mori* L. larvae on mulberry leaves treated with different concentrations of *Hibiscus sabdariffa* on some parameters.

Concentrations of <i>H. sabdariffa</i> by mg/ml of water.	Parameters		
	Effective rate of rearing(%).	Total haemolymph protein (mg/ml).	Number of eggs / female.
20	79.00±1.5802 b	68.54±2.478 ab	273.54±11.5803 ab
40	81.00±2.5538 ab	68.90±1.147 ab	264.89±9.5008 ab
60	84.00±2.9455 a	70.54±1.851 a	284.00±8.1455 a
80	78.00±3.5971 b	67.98±2.488 ab	272.03±8.5973 ab
100	78.00±2.2626 b	67.69±1.408 ab	260.00±12.2626 b
Control	79.00±2.4221 b	66.82±2.335 b	262.00±10.4221 ab
F test	*	*	*
LSD at 0.05%	3.445	3.009	23.65

Cocoon weights, cocoon shell weights and cocoon shell ratio:

Data in Table (II) represent cocoon, cocoon shell weights means and cocoon shell ratio which were increased especially when larvae treated with 60 mg/ml of *H. sabdariffa*. Where the obtained results were 1.165 g, 0.229 g and 19.66% for cocoon, cocoon shell weights and cocoon shell ratio comparing to 1.067 g, 0.169 g and 17.71% for the control, respectively. This increasing may be due to the effect of *H. sabdariffa* which increased total haemolymph protein. The obtained results are in general agreement with the findings of many authors whom found that, cocoon, cocoon shell weights and cocoon shell ratio of *B. mori* were increased when using mulberry leaves treated with aqueous extract of *Murraya koenigii*, (**Ganesan and Isaiarasu, 2007**), with aqueous extract of *Lantana camera* and *Ocimum sanctum*, (**Sumathi, 2008**) and with aqueous extract of *Andrographis paniculata* and *Plumbago zeylanica*, (**Takhliq, 2011**).

TABLE (II):Effect of feeding *Bombyx mori* L. larvae on mulberry leaves treated with different concentrations of *Hibiscus sabdariffa* on cocoon parameters.

Concentrations of <i>H. sabdariffa</i> by mg/ml of water.	Parameters		
	Cocoon weights (g).	Cocoon shell weights (g).	Cocoon shell ratio (%).
20	1.105±0.003ab	0.189±0.005	17.10±1.007
40	1.082±0.022 bc	0.205±0.026	18.94±1.306
60	1.165±0.013 a	0.229±0.017	19.66±0.0320
80	1.026±0.005 bc	0.165±0.007 b	16.08±0.1141
100	1.011±0.003 c	0.167±0.009 b	16.51±0.1833
Control	1.067±0.012 bc	0.179±0.003 b	17.71±0.4008
F test	*	-	-
LSD at 0.05%	0.082	-	-

REFERENCES

- Adegunloye, B. J.; Omoniyi, J. O. and Ajabonna O.P.(1996). Mechanism of blood pressure lowering effects of the calyx extract of *Hibiscus sabdariffa* in rats. *Journal of Science*, 5: 235-238.
- Barnet, L. (1963). *The wonders of life and earth parentic and hall*. Landon, pp: 48.
- Berkowitz, D. and Allaway, A. (1998). Statistical package for social sciences (SPSS), Version 7.5 for Windows NT/Windows 95:130-132.
- Bradford, M. M. (1976). A rapid and sensitive method for quantities of microgram quantities of protein-dye binding. *Anal. Biochemical*,72: 248-254.
- Crawford, R. S.; Chait, A. ; Malvis, D. and Peter, M. (1998). Physicochemical characteristics of roselle (*Hibiscus sabdariffa*). *Nutritional Food Science*, 32: 68-73.
- Ganesan, R. and Isaiarasu, G. (2007). Effect of the curry leaf extract on growth and cocoon characteristics of *Bombyx mori* L. *Journal of Ecotoxicology & Environmental Monitoring*. 17(3): 281-284.
- Guyton, K. Z. and Kensler, T. W. (1993).The effect of sour tea (*Hibiscus sabdariffa*) on essential hypertension. *Ethnopharmacology*, 65:231-236.
- Krishnaswami, S. ; Vijayraghavan, S. and Krishnaswami, S. (1973). Studies on fortification of mulberry leaves for feeding silkworm. *Int. J. Seri.*, 11(1):68 -72.
- Kumari, S. S.; Bhaskar, R. N.; Peter, A.; Narayanaswamy, K. C. and Fatima S. (2010). Deterioration of rearing parameters of PMxCSR₂ due to *Aspergillus* infection. *Bulletin of Indian Academy of Sericulture*, 14(2): 7-12.

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- Mounnissamy, V. M.; Kavimani, S. and Gunasegaran, R. (2002).** Antibacterial activity of gossypetin isolated from *Hibiscus sabdariffa*. *The Antiseptic*, 99(3):81-82.
- Muruges, K. A. and Bhaskar, R. N. (2007).** Efficacy of botanicals on larval growth of silkworm, *Bombyx mori* L. and its impact on silk productivity. *Bulletin of Indian Academy of Sericulture*,1(1): 11-15.
- Raju, H. A. ; Mamatha, D. M. ; Rao, M. R. and Kanji, V.K. (2012).** Impact of turmeric on the protein and lipid metabolic profiles of silkworm, *Bombyx mori* L. and cocoon production. *Current Biotica*, 6(2): 208-226.
- Salah, A. M.; Gathumbi, J. and Verling, W. (2002).** Inhibition of Intestinal motility by methanolic extracts of *Hibiscus sabdariffa* in rats'. *Phytochemical Resources* , 16:283-285.
- Sandhya, B. ; Thomas, S.; Isabel, W. and Shenbagarathai, R. (2006).** Ethno medicinal plants used by the Valaian community of Piranmalai hille, India. *African Journal of Traditional, Complementary and Alternative Medicines*, 3 (1):101-114.
- Shubha, K.; Bhaskar, R. and Chikkalingaiah, N. (2006).** Role of medicinal botanical extracts on grainage parameters of PM x CSR₂. *Environment and Ecology*, 24S: Special 3: 662-664.
- Sumathi, S. (2008).** Supplementation of plant extracts on economic parameters of silkworm *Bombyx mori* L. *Journal of Ecotoxicology & Environmental Monitoring*, 18(5) : 445-450.
- Takhlique, M. (2011).** Medicinal plant extracts a great determinant to economic potency of silkworm: *Bombyx mori* L. *Journal of Entomological Research*, 35(3): 231-233.

دراسة تأثير الكركديه على كفاءة التربية في دودة الحرير التوتية نجات حامد سليمان

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المخلص

خلال فصل الربيع لعام ٢٠١٥ تمت هذه الدراسة في قسم وقاية النبات بكلية الزراعة جامعة الفيوم لدراسة تأثير الكركديه كإضافة غذائية على ورق التوت المستخدم في تغذية دودة الحرير التوتية. حيث تم الحصول على هجين محلي من قسم بحوث الحرير بمركز البحوث الزراعية بالجيزة. تم تربية اليرقات على ورق توت هندي تم الحصول عليه من مزرعة الكلية بدار الرماد خلال الخمس أعمار اليرقية. بعد الإنسلاخ الرابع تم تقسيم اليرقات إلى خمس مجموعات بالإضافة للكنترول. كل مجموعة قسمت إلى خمس مكررات وكذلك الكنترول. تم طحن أزهار الكركديه التي تم الحصول عليها من الصيدلية ونقعها في الماء المقطر لتحضير التركيزات المختلفة (٢٠، ٤٠، ٦٠، ٨٠، ١٠٠ مجم/ملتر). حيث تم تغذية هذه اليرقات على ورق التوت المعامل بهذه التركيزات يوميا خلال العمر اليرقي الخامس. وكانت النتائج كالتالي: أفضل تركيز هو ٦٠مجم/ملتر. حيث وصلت كفاءة التربية ل ٨٤% مقارنة ب ٧٣% في الكنترول. بلغ متوسط البروتين الكلي في الدم ٧٠,٥٤مجم/ملتر مقارنة ب ٦٤,٥٢مجم/ملتر في الكنترول. بينما وصل عدد البيض لكل أنثى ٢٨٤ بيضة مقارنة ب ٢٦٢ بيضة في الكنترول. كذلك كان متوسط وزن الشرقة ١,١٦٥ جم و متوسط وزن قشرة الشرقة ٠,٢٢٩ جم و متوسط نسبة الحرير ١٩,٦٦% مقارنة ب ١,٠٦٧ جم و ٠,١٦٩ جم و ١٧,٧١% في الكنترول بالنسبة للصفات السابقة على التوالي.