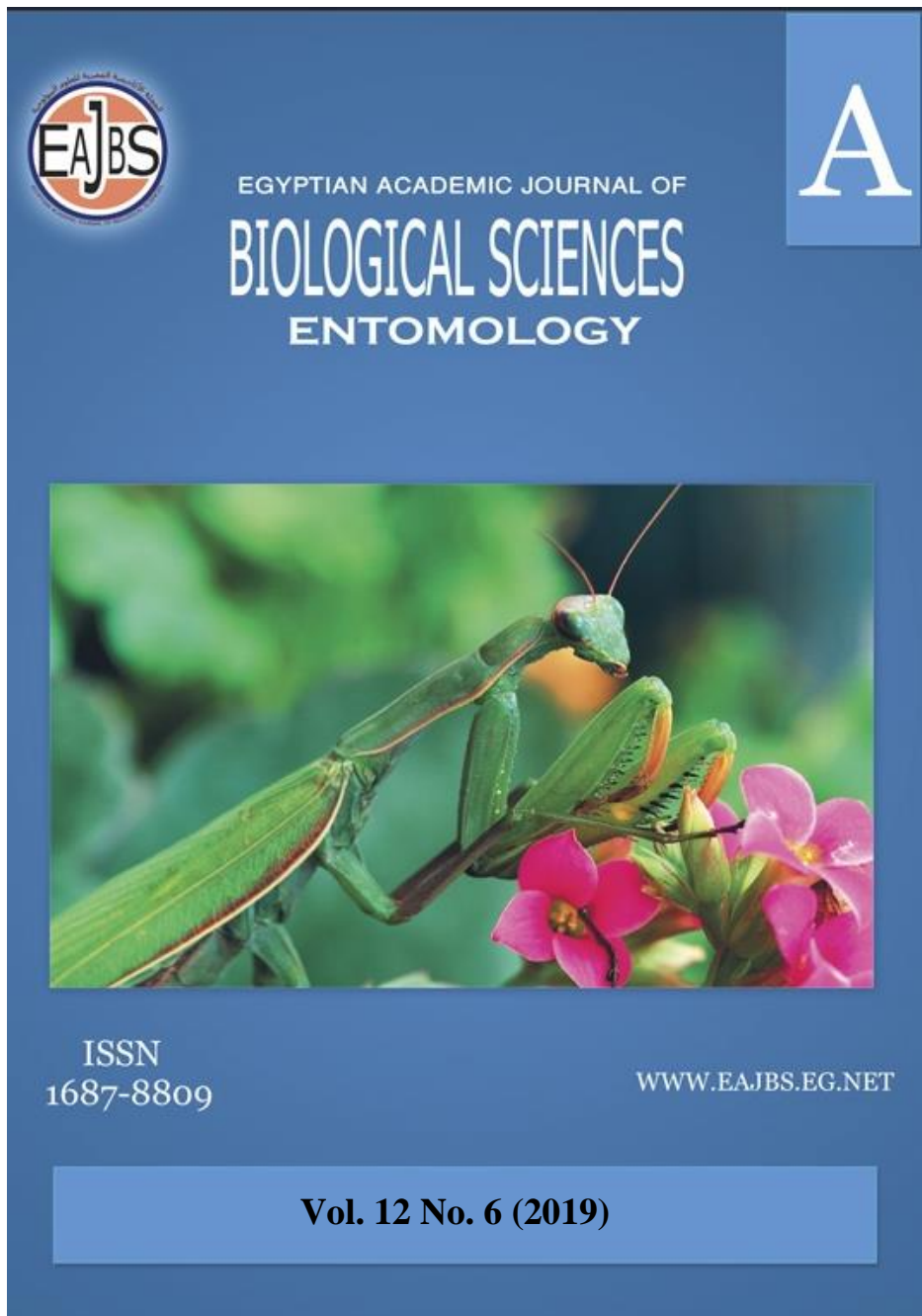
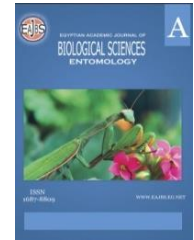


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Effect of *Majorana hortensis* L. as Food Additives on Rearing Performance of Silkworm , *Bombyx mori* L.

Nagat H. Soliman

Plant Protection Department, Faculty of Agriculture, El Fayoum University, Egypt.

Email: nha01@fayoum.edu.eg

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ABSTRACT

Effect of *Majorana hortensis* as food additives on rearing performance of silkworm, *Bombyx mori* L. was studied. Dried shoots of *M. hortensis* were soaked in heated water (60 °C) for ten minutes to prepare different concentrations (0.1, 0.3 and 0.5 mg/ml.). The obtained results showed that, the concentration 0.5mg/ml. of *M. hortensis* occupied the first category. Where 5th larval instar weight recorded 2.039 g comparing to 2.003 g in control, pupal weight recorded 0.739g comparing to 0.692g in control, 5th instar mortality percentages were 5.00% comparing to 7.00% in control, 5th instar larval durations were 9.33 day comparing to 9.54 day in control, cocooning percentages were 96.79% compared to 94.00% in control, silk productivity were 2.658 cg/day comparing to 1.866 cg/day in control, Cocoon indices were 1.255 g, 0.238 g and 18.96% for cocoon, cocoon shell weights and cocoon shell ratio comparing to 1.000 g, 0.178 g and 17.80% for the control, respectively.

INTRODUCTION

The mulberry silkworm (*Bombyx mori* L.) is of great economic importance as a foreign exchange earner for many silk-producing countries. It is a beneficial insect reared for the valuable commodity silk. The nutritive value of mulberry leaves depends on various agro-climatic factors and any deficiency of nutrients in leaves affects silk synthesis by the silkworm. Nutritional management directly influences the quality and quantity of silk production (Murugan *et al.*,1998). Pharmacological studies have acknowledged the value of medicinal plants as potential source of bioactive compounds (Prusti *et al.*, 2008). *Majorana hortensis* is aromatic and medicinal plant .The composition of essential oil of *M. hortensis* was monoterpenoids (α-pinene 1.5%, β-pinene 0.2-2.5%, sabinene 2.5-10%, myrcene 1-9%, α-terpinene 6-8%, γ-terpinene 14-20%, paracymene 5.5%, terpinolene 1-7%, α-phellandrene, β-phellandrene 4%) ,sesquiterpenoids(β-caryophyllene 2.5-3%, α-humulene 0,1%),monoterpenols(linalool 2-5%, terpine-1-ol-4 14-22%, terpine-1-ol-3 0.3%, α-terpineol 3-6%, cisthuyanol-4 4-13%, trans-thuyanol-4 1-5%),terpenic esters(linalyl-acetate 0.1-3%, terpenyl-acetate, geranyl-acetate 1,2%),phenol-methyl-ethers(trans-anethol -0,5%) (Karwowska &Kostrzewa, 1991).The present study has been planned to determine the effect of *M. hortensis* as food additives on rearing performance of silkworm , *B. mori*.

MATERIALS AND METHODS

During spring season of 2019 effect of *Majorana hortensis* on rearing performance of silkworm, *Bombyx mori* was studied at Plant Protec. Dept. Fac. of Agric., El Fayoum Univ. Egg box of silkworm, *B. mori* (Egyptian hybrid) were obtained from the Seric. Res. Dept., Plant Protec. Res. Inst, Agric. Res. Center. Dokki, Giza. Dried shoots of *M. hortensis* were soaked in heated water (60 °C) for ten minutes to prepare different concentrations. Larvae of *B. mori* were reared on fresh mulberry leaves (*Morus alba* var. *indicia*) under laboratory conditions (27±2°C, 76% ±5RH). At the beginning of the 5th instar, larvae were divided into three concentrations (in addition to the control). Each concentration was divided into five replicates (each of twenty larvae). Each replicate was reared in carton tray (30×15×4 cm).

Larvae of *B. mori* were fed on mulberry leaves sprayed with concentrations (0.1, 0.3 and 0.5 mg/ml.) of *M. hortensis* after drying on ambient air temperature for one minute in addition to the control fed on mulberry leaves sprayed with distilled water. 5th instar larval weights, pupal weights, mortality percentages, cocooning percentages, silk productivity, cocoon weights, cocoon shell weights, and cocoon shell ratio were recorded for all the replications of treatments and control. Data were analyzed by ANOVA through statistical package for social science (SPSS) to find out the significance between treated and control (Berkowitz and Allaway 1998). Means were separated by (L.S.D at 0.05%).

RESULTS AND DISCUSSION

Larval Weights:

According to data in Table (I) statistical analysis proved that there were significant differences between means of larval weights, Where the best result (2.039g) has been obtained when larvae treated with 0.5 mg/ml of *M. hortensis*.

Pupal weights:

The means of the pupal weights ranged between 0.692 g/pupa for control and 0.739 g/pupa for 0.5 mg/ml of *M. hortensis*. According to data in Table (I), statistical analysis proved that there were significant differences between means of pupal weights.

5th Instar Mortality Percentages:

Table (I) show a significant change in the treated groups of *M. hortensis*. when compared to control for the 5th instar mortality percentages. Where the best result (5.00%) has been obtained when used with concentration of 10 mg/ml of *M. hortensis*.

The obtained results in Table (1) are in general agreement with the findings of many authors whom found that, improving in weights of *B. mori* larvae and Agreement with the findings of many authors whom found that, increasing in pupal weights of *B. mori* when using mulberry leaves treated with *Coffea Arabica*, (Jeyapaul *et al.*, 2003), Agreement with Kuntamalla and Rao, (2005) when using mulberry leaves treated with *Azadirachta indica*. Muruges and Bhaskar, (2007) when using mulberry leaves treated with aqueous extract of *Parthenium hysterophorus*, *Tridax procumbens* and *Tribulus terrestris* on 5th instar mortality percentages of *B. mori*. mulberry leaves treated with aqueous extract of *Nephrolepis auriculata*, *Christella parasitica*, *Dicranopteris linearis* and *Pityrogramma calomelanos* (Padmalatha *et al.*, 2005), mulberry leaves treated with aqueous extract of *Murraya koenigii* (Ganesan and Isaiarasu, 2007) and Samba, *et al.*, (2016) when using aqueous extract of *Azadirachta indica*, *Parthenium hysterophorus*, *Osimum sanctum* and *Pongamia pinnata*.

Table 1: Effect of feeding *Bombyx mori* L. larvae on mulberry leaves treated with different concentrations of *Majorana hortensis* on some parameters.

Concentrations of royal jelly (mg/ml)	Parameters		
	Mean of weight (g) ±SE		Means of 5 th instar mortality percentages (%) ±SE
	5 th larval instar	Pupal stage	
0.1	2.011±0.0034	0.700±0.0033	6.00±1.200
0.3	2.020±0.0021	0.713±0.0051	5.00±0.432
0.5	2.039±0.0011	0.739±0.0022	5.00±1.232
Control	2.003±0.0010	0.692±0.0051	7.00±1.202
F test	**	**	*
LSD at 0.05%	0.018	0.019	1.65

5th Instar Larval Durations & Cocooning Percentages:

The means of the larval durations & Cocooning percentages were varied but not show any significant change in the treated groups of *M. hortensis* when compared to control (Table 2)). The obtained results in Table (2) are in general agreement with the findings of many authors who found that, improving in larval duration when using mulberry leaves treated with *amlaki rasayan* (Madhuri and Jitendra, 2002) and mulberry leaves treated with aqueous extract of *Withania somnifera* (Sridevi *et al.*, 2004).

Silk Productivity:

The means of silk productivity were significantly increased in the treated groups of *M. hortensis* when compared to control (Table 2). Where the best treatment was 2.658 cg/day when larvae treated with 0.5 mg/ml of *P. anisum* compared to 1.866 cg/day in control.

Table 2: Effect of treated mulberry leaves with concentrations of *Majorana hortensis* on some parameters of silkworm, *Bombyx mori* L.

Concentrations (mg/ml.)	Parameters		
	Means of 5 th instar larval durations (day).	Means of cocooning percentages (%).	Means of silk productivity (cg/day).
0.1	9.76±0.135	94.00±1.890	1.926±0.0890
0.3	9.08±0.141	95.00±1.550	2.202±0.0330
0.5	9.33±0.149	96.79±1.550	2.658±0.0121
control	9.54±0.101	94.00±1.000	1.866±0.0111
F value	**
LSD at 0.05%	0.376

Data in Table (3) show that the means of the cocoon weights ranged between 1.000 g/cocoon for control and 1.255g/cocoon for 0.5 mg/ml of *M. hortensis*. The means of the cocoon shell weights ranged between 0.178g/cocoon for control and 0.238 g/cocoon for 0.5 mg/ml of *M. hortensis*. The means of the cocoon shell ratio ranged between 17.09 % for 0.1 mg/ml and 18.96 % for 0.5 mg/ml of *M. hortensis*.

Statistical analysis proved that there were significant differences between different concentrations of cocoon weights, cocoon shell weights and cocoon shell ratio.

Data in Table (3) agreement with the findings of many authors whom found that, increasing in cocoon weights, cocoon shell weights and cocoon shell ratio of *B. mori* when using mulberry leaves treated with *amlaki rasayan* (Madhuri and Jitendra, 2002), mulberry leaves treated with aqueous extract of *Coffea Arabica*, (Jeyapaul *et al.*, 2003), mulberry leaves treated with aqueous extract of *Azadirachta indica*, (Kuntamalla and Rao, 2005),

mulberry leaves treated with aqueous extract of *Murraya koenigii*, (Ganesan and Isaiarasu, 2007), mulberry leaves treated with aqueous extract of *Lantana camera* and *Ocimum sanctum*, (Sumathi, 2008) and mulberry leaves treated with aqueous extract of *Andrographis paniculata* and *Plumbago zeylanica*, (Takhliq, 2011).

Table 3: Effect of treated mulberry leaves with concentrations of *Majorana hortensis* on cocoon indices of silkworm, *Bombyx mori* L.

Concentrations (mg/ml.)	Parameters		
	Cocoon weights (g)	Cocoon shell weights (g)	Cocoon shell ratio (%)
0.1	1.100±0.0120	0.188±0.0200	17.09±0.1323
0.3	1.153±0.0450	0.200±0.0102	17.35±0.1000
0.5	1.255±0.0331	0.238±0.0100	18.96±0.1800
control	1.000±0.0209	0.178±0.0210	17.80±0.1511
F value	**	**	*
LSD at 0.05%	0.090	0.041	0.899

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ARABIC SUMMARY

تأثير البردقوش كإضافة غذائية علي كفاءة التربيه في دودة الحرير التوتية

نجاه حامد سليمان

قسم وقاية النبات – كلية الزراعة – جامعة الفيوم – مصر

تمت هذه الدراسة في قسم وقاية النبات بكلية الزراعة جامعة الفيوم خلال فصل الربيع لعام 2019 لدراسة تأثير البردقوش كإضافة غذائية علي كفاءة التربية في دودة الحرير التوتية. حيث تم الحصول علي هجين محلي من قسم بحوث الحرير بمركز البحوث الزراعية بالجيزة. تم تربية اليرقات علي ورق توت هندي خلال الخمس أعمار اليرقية. بعد الإنسلاخ الرابع تم تقسيم اليرقات إلى ثلاث مجموعات بالإضافة للكنترول. كل مجموعة قسمت إلى خمس مكررات وكذلك الكنترول. تم نقع الأفرع الجافه في الماء لتحضير التركيزات المختلفة (0,1, 0,3, 0,5 مجم/مللتر) . حيث تم تغذية هذه اليرقات علي ورق التوت المعامل بهذه التركيزات خلال العمر اليرقي الخامس. وكانت النتائج كالتالي: أفضل تركيز هو 0,5 مجم/مللتر. حيث ادى الى انخفاض كل من نسب الموت ومدة العمر اليرقي الخامس مقارنة بالكنترول. بينما ادى الى زيادة وزن اليرقات والعداى ووزن الشرنقة وقشرة الشرنقة ونسبة الحرير ونسبة التشرنق ونتاجية الحرير مقارنة بالكنترول.