

Impact of Chemical Fertilizer Treatments on Cocoon Quality of Silkworm *Bombyx mori* L.

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ABSTRACT

The present investigation aimed to study the effect of the chemical fertilizer [N P K] on traits of larval weight , fresh cocoon weight , cocoon shell weight , pupae weight , silk ratio, 5th larval duration , number of egg / female , egg fertility and hatchability. This investigation was carried out at Department of Plant Protection, Faculty of Agriculture, Mansoura University. The treatments with chemical fertilizer at recommended dose resulted significant increase for all traits comparing control. Also results showed that reared during spring was better than autumn. Interaction between chemical fertilizer and season reported is better.

INTRODUCTION

Silkworm, *Bombyx mori* L is a monophagous insect need for growth and development mulberry leaf. The production of high quality and quantity of cocoon depends on larval feeding mulberry leaf are rich in components (Vijaya *et al* 2009) , good environmental condition and protection from diseases (Saha *et al* ., 1995 and Dechuet *et al* 1997). The nutritional components of the mulberry leaf can be increased by adding fertilizer (Nasreen *et al* ., 1999) . In the developing countries like Egypt , the alternative diets of the mulberry silkworm have not yet been applied due to the high costs of the economically cheaper technique which improves the cocoon and egg production is needed (EL Hattab ,1985; El-Karakasy, 1989 and El-Sayed ,1999). Temperature and humidity plays a vary vital role in silkworm growth and quality of the cocoon (Khan .,2014) and affects the quality of the mulberry leaf change due to climatic condition (Rajabiet *et al* ., 2007) in rearing increase of humidity induces diseases (Ganga and Chetty, 1994); maintenance of optimum temperature (27- 28 °C) and humidity (75±5%) are ideal.

This is experiment aimed to study the effect of chemical fertilizers on mulberry silkworm traits.

MATERIALS AND METHODS

The present work was carried out during Spring and Autumn 2015. This investigation was carried out at Department of Plant Protection, Faculty of Agriculture, Mansoura University

1-Materials :

Silkworm eggs were obtained from Sericulture Research Department – Plant Protection Research Institute – Agricultural Research center-Giza, Egypt. Local mulberry trees treated with chemical fertilizer (Phosphorus in the form of super phosphate 16% P₂O₅, Nitrogen in the form of Urea 46% N and Potassium in the form of potassium sulfate 48% K₂O). Recommended dose (400g N +300g P+250g) were applied.

2-Rearing room:

1-Stands and rearing equipment were disinfected using formalin solution with concentration of 3%.

3-Rearing technique

Silkworm rearing was carried out under laboratory condition. Where mean of room temperature were 28± 2 °C and average of relative humidity were 70 % ± 5%.

4- Experimental design:

The newly hatched *B mori* L. larvae were divided into two groups. First group fed on mulberry leaves with chemical fertilizers. While the second group fed on mulberry leaves without fertilizers. Each group divided into three replicates. Each replicate contains one hundred larvae.

5- Silkworm Characters

Durations of fifth instars larvae (day), larval weight (g), fresh cocoon weight (g), cocoon shell weight (g), pupal weight (g) cocoon shell ratio, fecundity, fertility, Hatchability. Data were analyzed SAS 1985

RESULTS AND DISCUSSION

1-Effect of chemical fertilizer N PK on silkworm characters.

Fifth larval duration:

Fifth instar larval duration were decreased when larvae fed on mulberry leaves treat with chemical fertilizers as shown in Table 1. So the fifth larval duration were improved by about 7 %. These results are in agreement with Fang Chnet *et al.*, (2009) and Ramkrishna *et al.*, (2011) who indicated that silkworm growth were improved by potassium application .

Larval weight:

Data given in Table 1 clarified that using chemical fertilizers increased larval weight by about 8%. These results are in agreement with Ramkrishna *et al* ., (2011) who found that reared silkworm larvae in mulberry leaves raised by chemical fertilizer gave higher average of larval weight . Furthermore, Gad *et al* . (2003) recorded that treatments the 3th instar larvae with potassium iodide improved the silkworm parameters.

Cocoon weight:

Cocoon weight character showed increment 13 % when fed larvae on mulberry leaves treated with chemical fertilizers (Table1). Similar results were obtained by Muhammed *et al.*,(2010) and Wagihaet *al.*(2008) who found that using chemical fertilizer have maximum cocoon weight.

Cocoon shell weight:

Using chemical fertilizer gave higher cocoon shell weight with about 14.5 % (Table 1).These results are according with Bqualet *al.* , (2006) and Waktole and Bhaskar (2012)noticed that cocoon shell weight of *Bombyxmori*L. reared on mulberry leaf treated with chemical fertilizer are significantly better effective rate of rearing cocoon shell.

Pupal weight :

The results in Table 1 showed that mulberry leaf treated with chemical fertilize gave pupal weight are better (12.7 %) than without chemical fertilizer. These results are in accordance with those found by Muhammed *et al.* ,(2010) and Wagihaet *al.*(2008) who found that using chemical fertilizer have better pupae weight .

Cocoon shell ratio :

Data given in Table 1 clarified that cocoon shell ratio of larvae fed on leaves from mulberry trees treated

with chemical fertilizers are better than control (1%). These results are in agreement with Ramakrishna *et al.* ,(2011) who found that reared silkworm larvae in mulberry leaves raised by chemical fertilizer gave higher average of silk ratio Fecundity:

Using chemical fertilizers with mulberry trees and fed the silkworm larvae with its leaves increasing fecundity (1%) (Table1). These data are in according with the finding of El – Khayat,*et al.* (2013) who provided that the chemical fertilizer increased no of egg / female .

Fertility:

Data recorded in Table 1 demonstrated that using chemical fertilizer with mulberry trees lead to significant increase infertility. These data are in according with the finding of El – Khayat *et al.*, (2013) who found that the chemical fertilizer gave significant increase egg fertility.

Hatchability:

Table 1 represented the effect of chemical fertilizer with mulberry trees lead to significant increase of hatchability. These data are in accordance with the finding of El – Khayat., (2013) who provided that the chemical fertilizer increased hatchability

Table 1:Effect of chemical fertilizer on silkworm characters

	5th Larval duration	Larval weight (g)	Cocoon weight(g)	Cocoon shell weight (g)	Silk ratio %	Pupae weight (g)	No egg /female	Egg Fertility %	Hatch %
Chemical fertilizer	9.17 a	4.19 a	1.77 a	0.435 a	24.53a	1.33 a	558.64 a	98.24 a	98.88 a
Without fertilizer	9.86 b	3.87 b	1.57 b	0.380 b	24.3 0 b	1.18 b	531.32 b	97.38 b	98.66 b

2-Effect of seasons on silkworm characters:

Results in Table 2 demonstrated that all characters acquired highly significant differences between seasons. Spring season recorded a high value for larval weight, cocoon weight, cocoon shell weight, pupal weight, silk ratio, fifth larvae duration fecundity, fertility and hatchability than that obtained during Autumn . Similar results were obtained by Ghzy (2005) and Maryam *et al.*, (2012) who found that data reported of Spring season was better than Autumn for all characters

3-Effect of interaction between chemical fertilizer and seasons:

Highly significant differences were obtained for all characters when silkworm larva fed on mulberry leaf treated with chemical fertilizer in Spring was better than those of Autumn , these results are in agreement with Ghazy (2005) Maryamet *al.* , (2012) who found that results showed that Spring season was better than Autumn for all characters of *Bombyxmori* L . Also El-Khayetet *al* (2013) who found that chemical fertilizer was better in all characters than without fertilizer.

Table (2) Effect of seasons on silkworm characters

	5th Larval duration	Larval weight (g)	Cocoon weight(g)	Cocoon shell weight (g)	Silk ratio %	Pupae weight (g)	No egg /female	Egg Fertility %	Hatch %
Spring	8.94 a	4.38 a	1.79 a	0.440 a	24.60 a	1.34 a	577.49 a	98.69 a	99.34 a
Autumn	10.13 b	3.59 b	1.54 b	0.369 b	23.64 b	1.18 b	512.32 b	96.84 b	97.67 b

Table (3) Effect of interaction between chemical fertilizer and seasons

	5th Larval duration	Larval weight (g)	Cocoon weigh (g)	Cocoon shell weight (g)	Silk ratio %	Pupae weight (g)	No egg	Egg fertility %	Hatch%
Chemic fertilizer x Spring	9.25a	4.05 a	1.86a	0.460 a	24.62a	1.25 a	565.26 a	98.4 a	99.28a
Chemic fertilizer x Autumn	10.55 b	3.55 b	1.64 b	0.390 b	24.28 b	1.12 b	498.70 b	96.32 b	98.07 b

In conclusion, the results generally indicated that adding chemical fertilizer during Spring and Autumn season improve all economic characters for silk worm

Spring season have better value in all characters than Autumn.

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تاثير التسميد الكيماوي علي انتاجية الشرائق لديدان الحرير التوتية
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** قسم بحوث الحرير- معهد بحوث وقاية النبات -مركز البحوث الزراعيه- الجيزة

يهدف هذا البحث إلي دراسة تأثير استخدام التسميد الكيماوي N P K خلال موسم الربيع والخريف ٢٠١٥ علي كفاءة إنتاجيه الشرائق وطول العمر الخامس. أظهرت النتائج ان التغذية علي أوراق التوت المعاملة بالتسميد الكيماوي N P K يؤدي إلي ارتفاع وزن اليرقات وكفاءة إنتاج الشرائق و وزن العذراء وقصر فترة العمر الخامس كما أظهرت النتائج زيادة في عدد وضع البيض ونسبة الفقس مقارنة بالكنترول . كما أظهرت النتائج ان التربية أثناء موسم الربيع أفضل من موسم الخريف علي جميع الخصائص الاقتصادية وإنتاج الشرائق .