

Impact of Thiadiazole as *Bombyx Mori* Growth Enhancer

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Abstract- Sericulture or silk farming is the rearing of silkworms for the production of raw silk. The mulberry silkworm, *Bombyx mori* is a domesticated and monophagous insect which feeds only on the leaves of mulberry for its nutrition. In this study we investigated the growth and economic parameters of Silkworm, *Bombyx mori* (Lepidoptera: Bombycidae) by dietary supplementation of thiadiazole. Thiadiazoles are heterocyclic compounds containing oxygen and nitrogen. 1, 3, 4, thiadiazoles are extensively studied and are known to play diverse biological activities. Diamines or polyamines are found in various biological fluids and are necessary for optimal growth, replication and metabolism of every cell in the body. This report describes the synthesis of diamino substituted thiadiazole and its effect on the growth parameters of *Bombyx mori* silkworm. Results show that the thiadiazole resulted in increased worm weight, silk gland weight and cocoon weight. We conclude that the thiadiazole can be fed to *Bombyx mori* silk worms for improving their economic parameters.

Keywords: Diamines, Thiadiazoles, *Bombyx mori*, sericulture, Economic parameter.

I. INTRODUCTION

Sericulture is one of the agro based industries in India. India occupies second place of Mulberry raw silk production in the world. Mulberry silk comes from the cocoons of *Bombyx mori* (L). The fact that the Silkworm, *Bombyx mori* is domesticated for nearly four thousand years ago is well established. It is well documented that all insects require proper environmental conditions for normal life [1]. The environment influences the activities of the organism directly or indirectly. This is true for domesticated insects like *Bombyx mori*. Due to continuous domestication for many years, the silkworm has lost many of its natural activities as sense of smell, flight etc. and it is completely under the protection of the silkworm growers [2]. Though the number of generations in a year is controlled genetically in the silkworm, environmental conditions like photoperiod, temperature, humidity etc., are known to influence during the entire life cycle of the silkworm [3]. Thiadiazoles are heterocyclic compounds containing oxygen and nitrogen. 1, 3, 4, thiadiazoles are extensively studied and are known to play diverse biological activities [4-5]. Diamines or polyamines are found in various biological fluids and are necessary for optimal growth, replication and metabolism of every cell in the body. This research work describes the synthesis of diamino substituted thiadiazole and its effect on the growth parameters of *Bombyx mori* silkworm [6-8]. Diamine incorporated thiadiazoles proves as growth enhancers of *B. mori* larval weights, silk gland weights, cocoon weights in comparison with the control worms.

Therefore, the present study was taken to determine the effects of thiadiazole on the larval development and silk production of CSR2 × CSR4 silkworm larvae at constant temperature (25°C) and humidity (75-80%).

II. MATERIAL AND METHODS

Study Area

Present work was carried out at Government Resham Kendra, Indore region (Mhow and Sonkatch) (M.P.)

Experimental Species

Productive bivoltine silkworm hybrid (CSR2 × CSR4) is obtained from Central Sericulture Research and Training Institute (Mysore, India) was used as a study material. This hybrid is suitable to rear during favourable season (August–February).

Rearing method

Bombyx mori larvae (CSR2 × CSR4 strain) were reared in laboratory conditions under constant temperature (25°C) and relative humidity (75-80%).

Dietary supplementation of the silkworm with the thiaziazole

Bombyx mori larvae were grown on normal mulberry leaves till the end of the 4th instar larval stage. Feeding was given from day one of the 5th instar stage as silk glands develop from 5th instar stage. Larvae were divided into two groups, each group consisting of 50 worms, one group is experimental and other is control. 1mg/ml of the compound is dissolved in 1ml of ethanol. Fresh mulberry leaves were treated with the synthesized compound by swab method. These treated leaves are fed to larvae three times per day. This treatment was carried out on all the days of fifth instar. The larvae fed with plain mulberry leaves were maintained as a control group.

III. RESULTS

(i) Estimation of growth parameters:

Weight analysis of drug treated worms and control at 5th instar larval stage: In the present investigation the result analysis of the effect of thiaziazole on larval weights showed positive effect. Maximum larval weight of **2.8 gms** was observed with thiaziazole treated mulberry leaf on the 6th day of 5th instar larval stage and larval weight of **2.3 gms** was observed with control (fresh mulberry leaf) on the 6th day of 5th instar larval stage. Thiaziazole treated larvae entered spinning stage prior to control larvae. It is summarized in table 1 and figure 1.

Table-1: Weight analysis of drug treated worms and control at 5th instar larval stage:

Larvae	Temperature (°C)	Humidity (RH %)	Treatment	Day's of 5 th instar	Weight of larvae (grams)
50	25°C	75-80%	Thiaziazole Treated	1	0.7 ±0.40
				2	1.2 ±2.510
				3	1.6 ±1.502
				4	2.2 ±0.20
				5	2.3 ±1.324
				6	2.8 ±0.201
50	25°C	75-80%	Control	1	0.8 ±1.409
				2	1.2 ±1.4
				3	1.6 ±0.11
				4	2.0 ±0.209
				5	2.1 ±0.3
				6	2.3 ±0.01

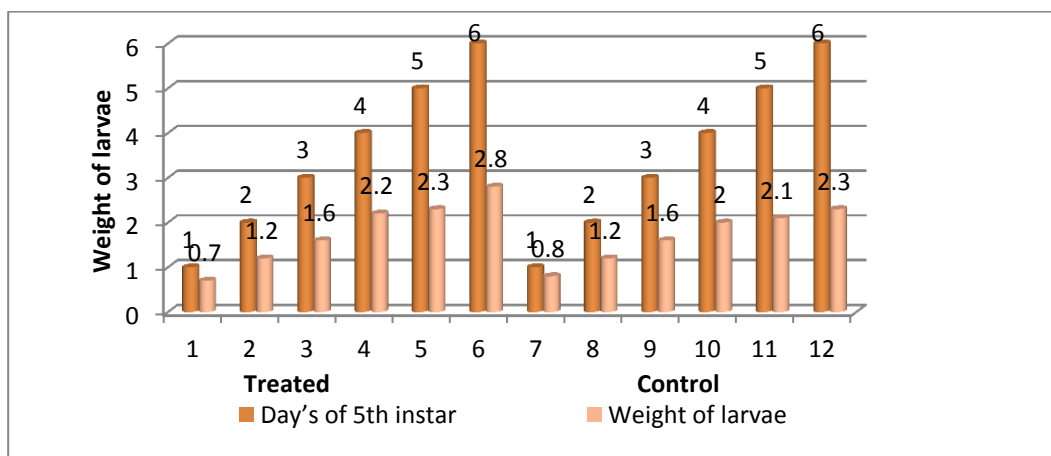


Figure-1: Weight analysis of drug treated worms and control at 5th instar larval stage.

Length analysis of thiadiazole treated worms and control at 5th instar larval stage:

Effect of thiadiazole on length of worms is summarized in table 2 and figure 2. Treatment with thiadiazole resulted in the maximum larval length was **6.03 cms** on 6th day of 5th instar larval stage and minimum larval weight of **4.00 cms** on 1th day of 5th instar larval stage at optimum temperature and relative humidity i.e. 25°C and 75-80% whereas **5.02 cms** on 6th day of 5th instar larval stage and minimum larval weight of **3.8 cms** on 1th day of 5th instar larval stage at optimum temperature and relative humidity (25°C and 75-80%) in control condition.

Table-2: Length analysis of thiadiazole treated worms and control at 5th instar larval stage:

Larvae	Temperature (°C)	Humidity (RH %)	Treatments	Day's of 5 th instar	Length of larvae (cm)
50	25°C	75-80%	Thiadiazole Treated	1	4.00 ±0.31
				2	4.9 ±1.01
				3	5.3 ±0.782
				4	5.5 ±0.40
				5	6.00 ±0.371
				6	6.03 ±0.230
50	25°C	75-80%	Control	1	3.8 ±0.929
				2	4.00 ±1.43
				3	4.8 ±1.329
				4	4.9 ±0.498
				5	5.00 ±2.01
				6	5.02 ±1.528

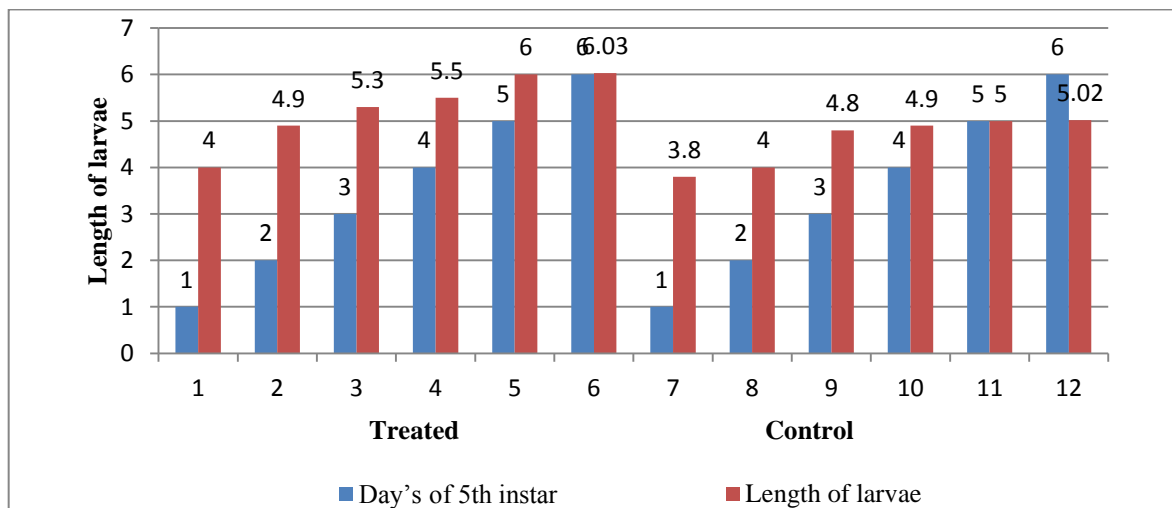


Figure-2: Length analysis of thiadiazole treated worms and control at 5th instar larval stage.

Analysis of silk gland weights in thiadiazole treated worms and control at 5th instar silkworms:

Effect of thiadiazole on silk glands weight is summarized in table 3 and figure 3. Larvae treated with the thiadiazole showed better gland weight. Maximum weight gain of the silk glands was observed on the 6th day with thiadiazole treated mulberry leaf of **0.8 gms** and minimum silk gland weight of **0.1 gms** on 2nd day of the 5th instar larvae with thiadiazole treated mulberry leaf

at optimum temperature and humidity. In control group **0.5 gms** as maximum silk gland weight and **0.0 gms** as minimum silk gland weight was at optimum temperature and humidity.

Table-3: Analysis of silk gland weights in thiadiazole treated worms and control at 5th instar silkworms:

Larvae	Temperature (°C)	Humidity (RH %)	Treatment	Day's of 5 th instar	Silk Gland Weight (grams)
50	25°C	75-80%	Thiadiazole Treated	2	0.1 ±0.581
				4	0.5 ±0.542
				6	0.8 ±0.21
50	25°C	75-80%	Control	2	0.0 ±1.89
				4	0.2 ±1.30
				6	0.5 ±0.520

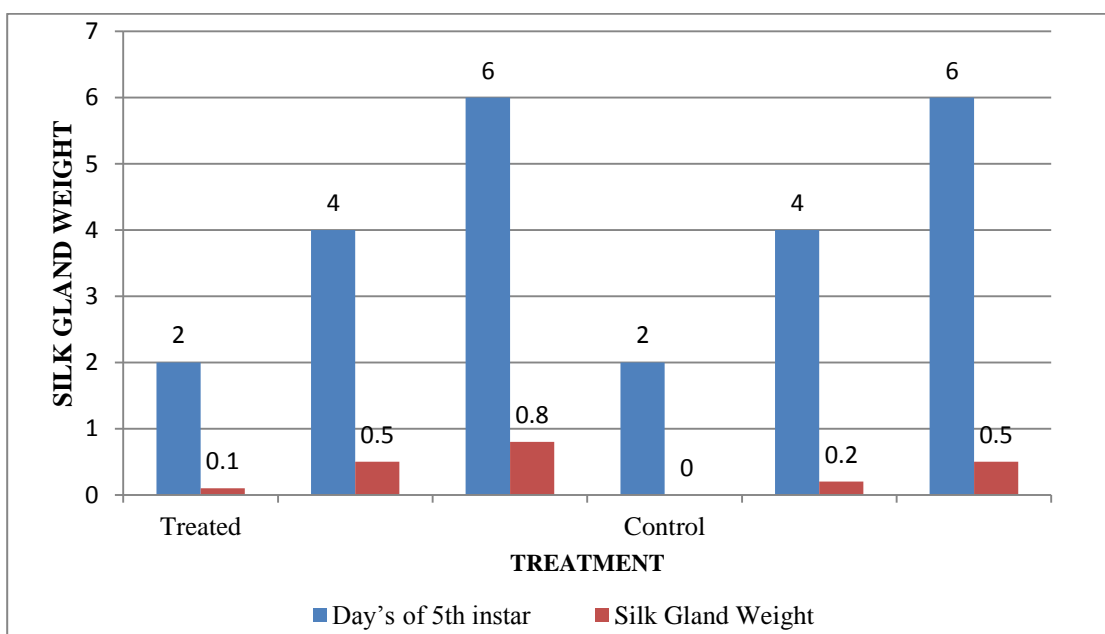


Figure-3: Analysis of silk gland weights in thiadiazole treated worms and control in 5th instar silkworms.

(ii) Evaluation of Economic parameters in thiadiazole treated worms and control:

Cocoon weight:

Effect of thiadiazole on Cocoon weights is summarized in table 4 and figure 4. The maximum cocoon weight was found to be **3.5 gms** with thiadiazole treated mulberry leaf at optimum temperature and humidity. Cocoon weight of control was **2.5 gms** at optimum temperature and humidity.

Table-4: Evaluation of cocoon weight in thiadiazole treated worms and control:

Larvae	Temperature	Humidity	Treatment	Cocoon weight (grams)
50	25°C	75-80%	Thiadiazole Treated	3.5 ±0.59
50	25°C	75-80%	Control	2.5 ±0.300

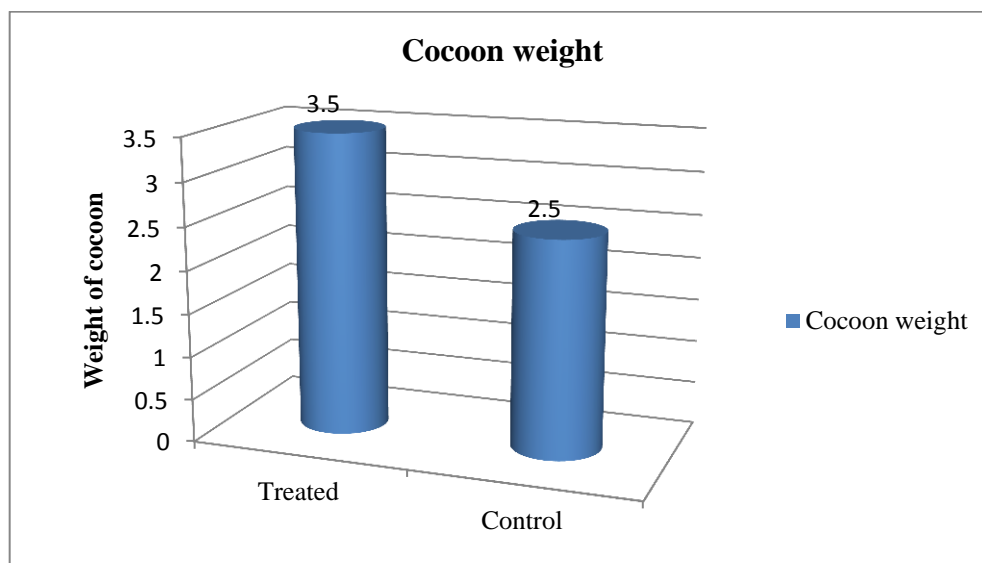


Figure-4: Evaluation of cocoon weight in thiadiazole treated worms and control.

Length of silk produced:

Effect of thiadiazole on silk production is summarized in table 5 and figure 5. The maximum amount of silk produced was **1100 meters** with thiadiazole treated mulberry leaf at optimum temperature (25°C) and relative humidity (75-80%) and **702.5 meters** with fresh mulberry leaf respectively at optimum temperature (25°C) and relative humidity (75-80%).

Table-5: Effect of thiadiazole on productivity of silk (at temperature 25°C and humidity 75-80%):

Larvae	Treatment	Length of silk produced (meters)
50	Thiadiazole Treated	1100 ±0.592
50	Control	702.5±1.320

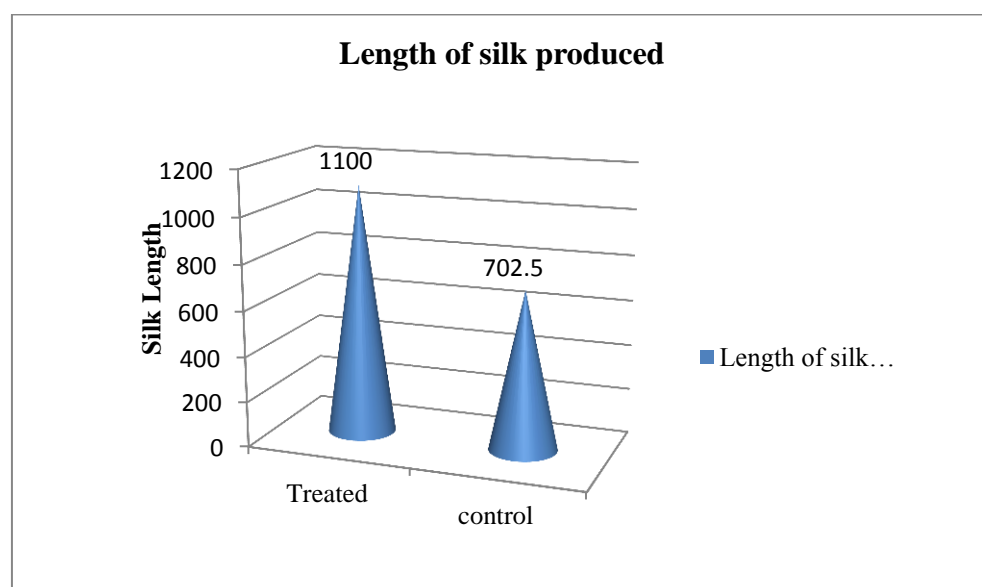


Figure-5: Effect of thiadiazole on productivity of silk (at temperature 25°C and humidity 75-80%).

IV. DISCUSSION

The rearing of mulberry silkworm *B. mori*, which produces mulberry silk, is of great economic importance. Numerous efforts have been made to enhance its growth by several biotechnological methods. Although thiaziazole is known to have a positive effect on the growth of various organisms [9], its effect on the growth of the economically important mulberry silkworm *B. mori* was not ascertained.

In the present investigation effect of thiaziazole on the larval weight, larval length, silk gland weight, cocoon weight and length of silk produced is determine. Treatment with thiaziazole resulted in the maximum larval weight, larval length, silk gland weight, cocoon weight and length of silk produced i.e. 2.8 gm, 6.03 cm, 0.8 gm, 3.5 gm and 1100 meters on 6th day of 5th instar larval stage. The present study results show a positive effect of thiaziazole treatment on the growth and economic parameters of mulberry silkworm.

[10] Synthesized diamino substituted thiaziazole compound and studied its effect on the various growth parameters of *Bombyx mori* silkworms. [11] Determined the effect of food supplementation with thiaziazole on feed efficacy of *Bombyx mori*. This aspect is supported by our results which show that the thiaziazole treated larvae recorded higher larval weight, larval length, silk gland weight, cocoon weight and silk length in silkworm.

From the present study, it can be interpreted that thiaziazole can be given as an extra supplement for the better growth of silkworms. The present study shows the effect of thiaziazole on the growth parameters of mulberry silkworm *B. mori*.

Present study shows the effect of diamino substituted thiaziazole on the growth of *Bombyx mori* silkworms. We observed an increase in the growth of *B.mori* silkworm when their diet is supplemented with amino substituted thiaziazole. Diamine incorporated thiaziazoles proved as growth enhancers of *B. mori* larval weights, silk gland weights, cocoon weights and viability with thiaziazole in comparison with the control worms.

V. CONCLUSION

In this experiment we have feeded the silkworm larvae with thiaziazole treated mulberry leaves. Through this experiment we have seen the significant changes in the efficiency of the larvae and cocoon of the silkworm *Bombyx mori*. The results of our study suggest to feed silkworm larvae with mulberry leaves treated with thiaziazole at fifth instar for better larval weight and reeling performances.

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