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# Effect of Ascorbic Acid on the Growth of Silkworm, *Bombyx mori*, and Its Influence on Economic Traits of Sericulture

Jeethumol Kuruvila <sup>1</sup>, Sajani Jose <sup>2</sup>

P.G. Student, Department of Zoology, Nirmala College for Women, Coimbatore, Tamilnadu, India <sup>1</sup>

Assistant Professor, Department of Zoology, Nirmala College for Women, Coimbatore, Tamilnadu, India <sup>2</sup>

**ABSTRACT:** Sericulture is the production of silk using domestic silkworms. Silkworm (*Bombyx mori*) larvae are used for silk production. The process begins with the thousands of silk moth eggs that are prepared by feeding them mulberry leaves. As the larvae molts, a stick is placed on it to weave silk on and becomes a cocoon that later envelops the larvae in two to three days. The cocoons are then boiled killing the pupae silkworm. The cocoons are taken and unwound on a reel. Nutrition place an important role in improving the growth and development of silkworm, *Bombyx mori*. The effect of Ascorbic acid as a food additive, was tested on mulberry silkworm, *Bombyx mori*.

**KEYWORDS:** Silkworm, Ascorbic acid, Growth.

## I. INTRODUCTION

Sericulture depends on rearing of silkworm on mulberry leaves; for this reason, silk production has direct relationship with larval growth on mulberry leaves change due to climatic conditions and field practices. One of the alternative way of improvement of larval feeding is enrichment of mulberry leaves with supplementary nutrients such as vitamins. Nutrition place an important role in improving the growth and development of the silkworm, *Bombyx mori*.

The effect of ascorbic acid as a food additive, was tested on mulberry silkworm *Bombyx mori*. That is the study deals with the effect of ascorbic acid on growth, metamorphosis and protein synthesis in the silkworm, *Bombyx mori* and its influence on economic traits of sericulture. The experiment were conducted in triplicate with 20 larvae in each group and larvae from third to fifth instar was fed with mulberry leaves with different concentrations of ascorbic acid i.e. (0.5%, 1.0%, 1.5%, 2.0% concentrations). The supplementation was continued till fifth and on fifth day of fifth instar the silkworms were collected and weighed. The present study shows that ascorbic acid supplementation to the mulberry leaves at different concentrations increased significantly the body length and weight of both larvae and pupae. Fifth instar larvae of *B. mori* fed on mulberry leaves treated with ascorbic acid produced heavier fresh cocoons. The data showed that 2 % ascorbic acid produced the heaviest cocoon. The recent study showed that vitamin C supplementation could increase the growth and survival rate of *Bombyx mori*.

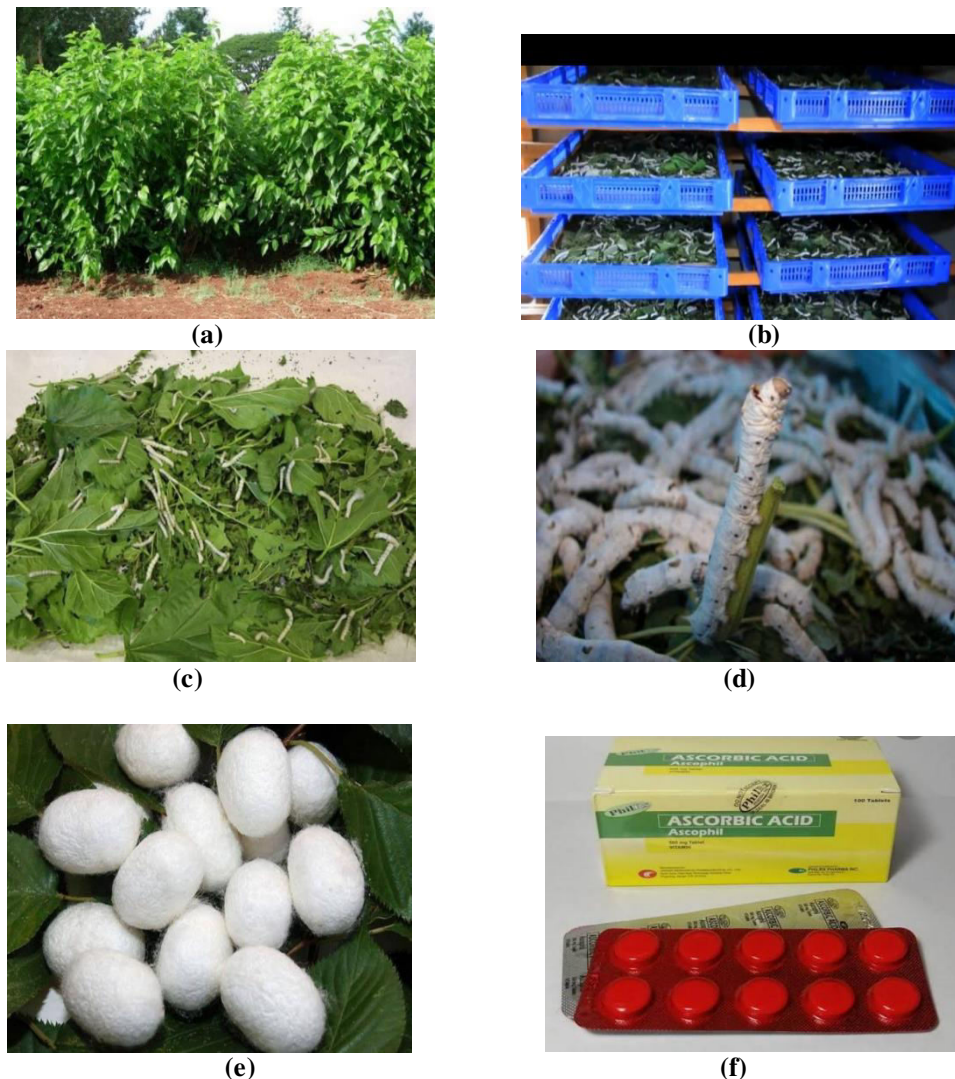
## II. RELATED WORK

The absence of ascorbic acid in the diet of first and second instar *B. mori* larvae resulted in poor growth and development from third instar onwards was reported by Ito and Arai [3]. Thulasi *et al.*, (2013) [investigated the effect of ascorbic acid and lemon juice on the silkworm, *Bombyx mori* has been studied with reference to larval growth, protein synthesis and silk production. Both these exogenous factors, when supplemented with mulberry diet, showed positive impact on larval growth during the fourth and fifth instar developmental stages. Ascorbic acid yielded significant gains in economic parameters such as the cocoon weight, pupal weight, raw silk weight and denier and the lemon juice in shell weight, shell protein and denier. Synergistically, they caused an elevation in floss protein content, which is sericulture wastage. Thulasi and Sivaprasad *et al.*, (2013), studied on the effect of ascorbic acid and lemon juice on the silkworm, *Bombyx mori* with reference to larval growth, protein synthesis and silk production.

The output in the sericulture industry i.e., silk production, depends on the quality and nutritional status of the mulberry leaf. Of late, the enrichment of mulberry leaf with a multitude of exogenous factors, such as vitamins, minerals, antibiotics, hormones and study their impact on silk production, has become the order of traditional research in sericulture (Sannapa *et al.*, Etebari *et al.*, Bhattacharya *et al.*, Chakrabarty and Kaliwal.)

### III. METHODOLOGY

The larvae of *Bombyx mori*, bivoltine race, variety SK7 were obtained from a sericulture farmer, vandithavalam, palakkad and were reared in the laboratory. Optimum temperature and humidity were provided. The experiment were conducted in triplicate with 20 larvae in each group and the larvae from third to fifth instar was fed with ad libitum mulberry leaves with different concentrations of synthetic vitamin C i.e.(0.5%, 1.0%, 1.5%. and 2% concentrations) at 26+2°C and relative humidity 80+10%. The larvae of experimental group were fed with mulberry leaves treated with different vitamin C concentrations three times at 8.a.m, 1.p.m, 5.p.m. The bed was regularly cleaned for collecting the excreta and unused leaves, which were weighed for studying the metabolic status of the insects under the different groups, during the study period.



**Fig. 1.** (a) Mulberry plant (b) Rearing tray (c) V-Instar larvae of *Bombyx mori*(d) V- Instar larvae of *Bombyx mori* (e) Cocoon of *Bombyx mori* (f) Ascorbic acid tablet.

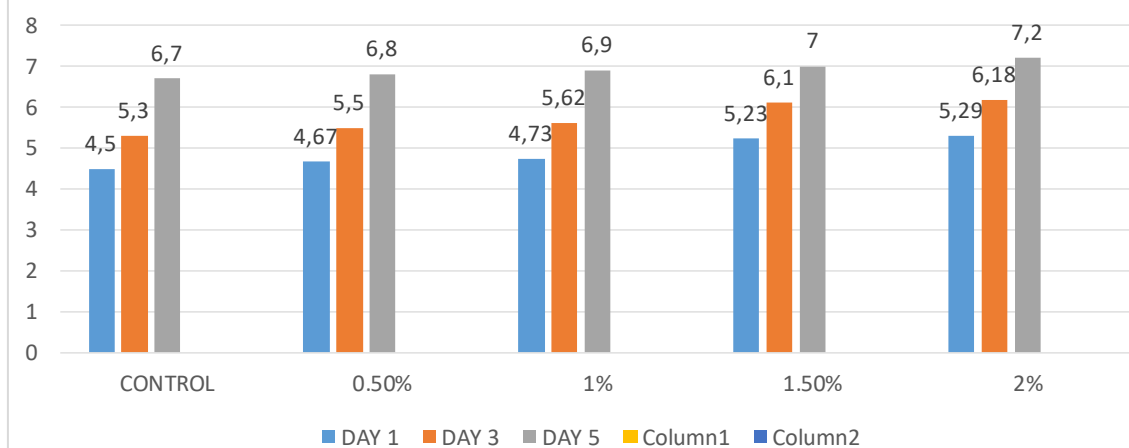


## IV. EXPERIMENTAL RESULTS

THE BODY LENGTH OF FIFTH INSTAR LARVAE OF *Bombyx mori* ON 1<sup>st</sup>, 3<sup>rd</sup> AND 5<sup>th</sup> DAY OF TREATMENT.

Growth of silkworm larvae in length(cm)	control	0.5% concentration of ascorbic acid	1% concentration of ascorbic acid	1.5%concentration of ascorbic acid	2% concentration of ascorbic acid
Day 1	4.5	4.67	4.73	5.23	5.29
Day 3	5.3	5.5	5.62	6.1	6.18
Day 5	6.7	6.8	6.9	7	7.2

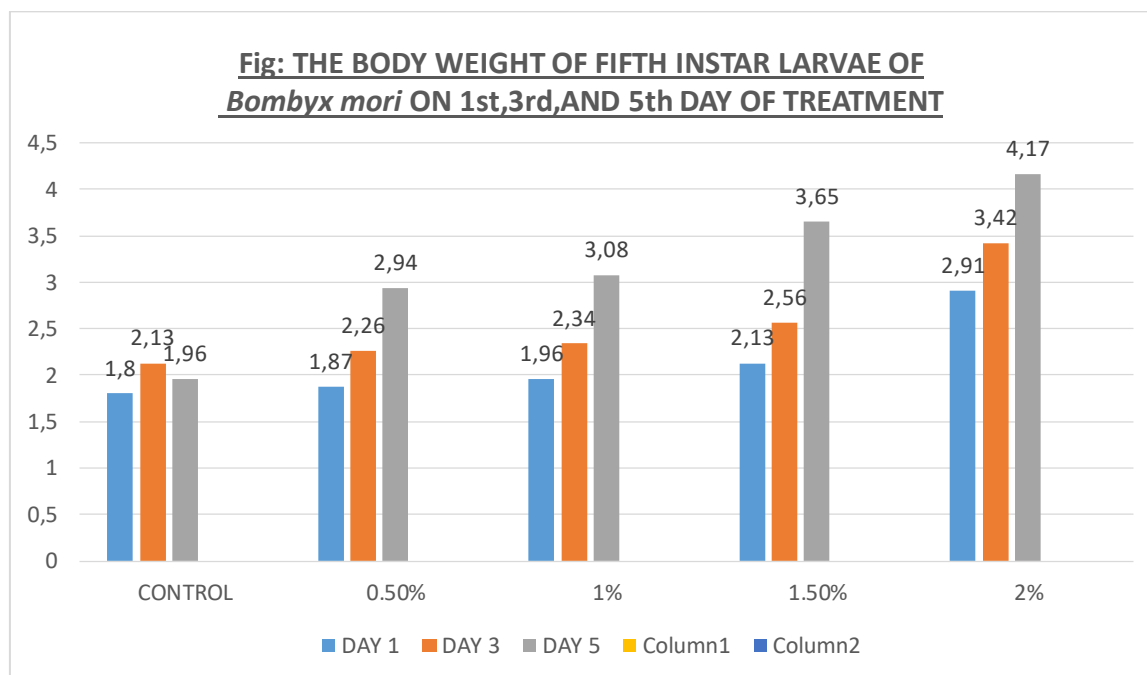
**Fig 1:THE BODY LENGTH OF FIFTH INSTAR LARVAE OF *Bombyx mori* ON 1<sup>st</sup>,3<sup>rd</sup>,AND 5<sup>th</sup> DAY OF TREATMENT**



Different concentrations of ascorbic acid showed positive impact of larval growth during 1<sup>st</sup>, 3<sup>rd</sup> and 5<sup>th</sup> days. From day 1 onwards the larval body length of treated larvae increased. 0.17 cm of length increased were noted at 0.5%concentration of ascorbic acid. 0.6 cm were increased at 1% of ascorbic acid. 0.5 cm increased at 1.5% concentration and 0.6cm length were increased at 2% concentration of ascorbic acid. The maximum length is 7.2 cm at 2% concentration of ascorbic acid on day 5.

THE BODY WEIGHT OF FIFTH INSTAR LARVAE OF *Bombyx mori* ON 1<sup>st</sup>, 3<sup>rd</sup> AND 5<sup>th</sup> DAY OF TREATMENT.

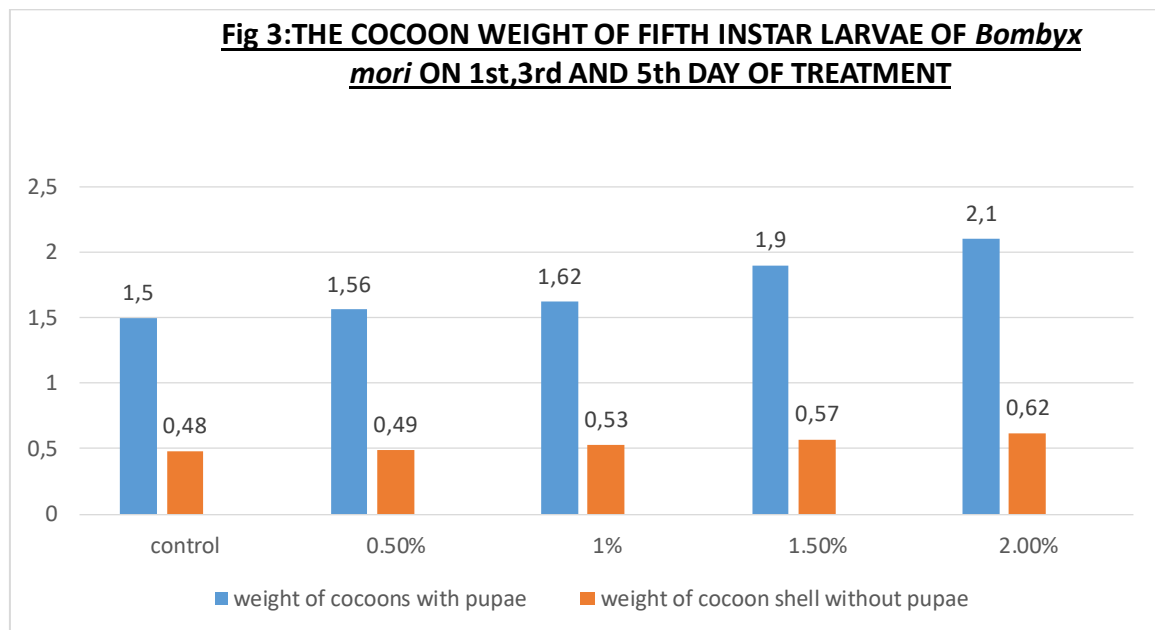
Growth of silkworm larvae in weight (g m)	Control	0.5% concentration of ascorbic acid	1% concentration of ascorbic acid	1.5% Concentration Of ascorbic acid	2% concentration of ascorbic acid
Day 1	1.80	1.87	1.96	2.13	2.91
Day 3	2.13	2.26	2.34	2.56	3.42
Day 5	2.79	2.94	3.08	3.65	4.17



From day 1 onwards the larval body weight of treated larvae increased. 0.07 g m of weight at 0.5% concentration of ascorbic acid, 0.09 g m weight increased at 1% of ascorbic acid, 0.17 gm weight gain at 1.5% concentration and 0.78 gm weight gain at 2% concentration of ascorbic acid treated. The highest weight is 4.17 g m at 2% concentration of ascorbic acid on day 5.

**THE COCOON WEIGHT OF FIFTH INSTAR LARVAE OF *Bombyx mori* ON 1<sup>st</sup>, 3<sup>rd</sup>, AND 5<sup>th</sup> DAY OF TREATMENT**

Concentrations	Weight of cocoon with pupae	Weight of cocoon shell without pupae
Control	1.5	0.48
0.5% Ascorbic acid	1.56	0.49
1% Ascorbic acid	1.62	0.53
1.5% Ascorbic acid	1.9	0.57
2% Ascorbic acid	2.1	0.62



An increase in the weight of cocoon with pupae treated with ascorbic acid were noted an increase of weight 0.06 g m were noted at 0.5%, 0.06 g m at 1% concentration, 0.28 g m at 1.5%, and 0.2 g m at 2% concentration of ascorbic acid. On all 5 days the growth of the silkworm *Bombyx mori* were maximum at 2% concentration of ascorbic acid.

## VI. CONCLUSION

Present study reveals that the optimum concentration of ascorbic acid for the growth of silkworm larvae is 2% and it can also enhance the silk production qualitatively and quantitatively.

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