

Research Article

EFFECT OF FOLIC ACID AND ZINC CHLORIDE ON GROWTH AND ECONOMIC TRAITS OF MULBERRY SILKWORM *BOMBYX MORI* L.

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ABSTRACT

Fortification of mulberry leaves with dietary supplements is found to be a scientific method of rearing silkworms. In order to investigate the effects of supplementary nutrients to silkworm, *Bombyx mori* L an experiment was conducted with Folic Acid and Zinc Chloride treatments. The dietary supplements of Folic Acid 100 ppm (T₁) and Zinc Chloride 100 ppm (T₂) treated mulberry leaves of V1 variety were fed to silkworm larvae from third day of fifth instar larvae till spinning. These treatments results in a significant increase in biological parameters such as larval weight and economical parameters such as cocoon weight, pupal weight, shell weight and shell ratio %. But, the most important economical parameter shell ratio % of Zinc Chloride treated leaves was not found significant. The Folic Acid treated leaves showed the maximum shell ratio percentage of 20.99% which was found to be the effective treatment. In the present study, it has been concluded that the Folic Acid 100 ppm treated leaves exhibits higher performance over the Zinc Chloride 100 ppm treated leaves.

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INTRODUCTION

Sericulture is both an art and science of raising silkworms for silk production. It is an agro based popular cottage industry and plays a vital role in the improvement of rural economy of India. It is well known for its low investment and quick and high returns which makes it an ideal industry fitting well into the socio-economic frame of India. India is the second largest producer in the world after China. Germany is the largest consumer of Indian silk (Pardeshi *et al.*, 2014). The silkworm *Bombyx mori* is a phytophagous insect and a typical monophagous feeder on mulberry leaves (*Morus alba*). Nutrition of silkworm is a sole factor which almost individually augments quantity and quality of silk. It plays an important role in improving the growth and development of the silkworm and the silk production is dependent on larval nutrition and nutritive value of mulberry leaves and finally in producing good quality cocoons. In order to make the silkworm rearing a profitable enterprise and owing to the monophagous feeding habit of the silkworm; different vitamins, minerals, plant extracts, amino acids, milk, royal jelly were tried as food supplements. (Lakshmi Devi *et al.*, 2013).

Zinc is the only heavy metal that shows amphoteric properties and is freely soluble in water and alkalis to form Zincates. It has multiple biological functions such as an

integral constituent of over 20 different enzymes including DNA and RNA polymerases; confer protection against the actions of a number of toxins; helps in structural and functional maturation of neurons; homeostasis under different conditions (Willott *et al.*, 2002). Folic Acid causes a significant increase in economical parameters such as female and male cocoon weight, shell weight and egg production. Also the dietary supplementation with B – complex to silk worm larvae resulted in significant increase of female fecundity and improved cocoon yield and filament length of the silk (Sarker *et al.*, 1995). In the current study, we made a comparative analysis of the impact of folic acid and zinc chloride on growth and economic traits of cocoons like larval weight, cocoon weight, pupal weight, shell weight and shell ratio were investigated.

MATERIALS AND METHODS

After the fourth moult, the third day of the fifth instar larvae were divided into three treatments with seven replications each consisting of thirty larvae. From the stock solution prepared, 100 ml of the solution is measured and added in one litre of distilled water to make 100 ppm solution. The first group was given with normal mulberry leaves four

times a day as the control (T_3). The second group was considered as the experimental group which is feed with the mulberry leaves fortified with 100 ppm Folic Acid (T_1) and 100 ppm Zinc Chloride (T_2) respectively. The fortified mulberry leaves are shade dried for few minutes to drain the excess water and feed to the worms.

The growth rate pattern such as larval weight from each treatments and replications was observed from the subsequent day of treatment onward till spinning. The mature larvae on sixth day were mounted in Netrica separately by treatment and replication wise. The cocoons are harvested after five days from spinning and subsequently cocoon parameters such as cocoon weight, shell weight, pupal weight and shell ratio percentage were estimated.

$$\text{Shell ratio \%} = \frac{\text{single shell weight}}{\text{single cocoon weight}} \times 100$$

The important cocoon characters viz weight of cocoon (with pupa), weight of cocoon shell (without pupa) was recorded and the shell ratios were calculated following Kumararaj *et al.* (1972). The most important commercial character of cocoon is weight which indicates approximate quantity of silk that can be spun from it. More important than the cocoon weight is the weight of cocoon shell weight on it is the shell that yields silk. Higher the shell weight, greater the silk yield from it. The shell ratio indicates the quantity of silk that can be spun from a lot of fresh cocoons. The experiment was laid out in Completely Randomised Design (CRD) for various estimations of nutrition growth and cocoon characters. The determination of the various experiments has been subjected to ANOVA in order to separate out all possible errors.

RESULTS AND DISCUSSION

The growth rate pattern of fifth and sixth day of fifth instar larvae was studied under the influence of Folic Acid and Zinc Chloride. The maximum larval weight was observed in Zinc Chloride treated silkworm (3.58 g). Both Folic Acid and Zinc Chloride treated silkworms gained more weight when compared with control. There was no subsequent difference of larval duration in between treatments and control. Analyzing the data recorded, it can be seen that all the experimental groups had superior performances compared to control groups. The difference observed being significant (Table 1).

The maximum cocoon weight was observed in Folic Acid treated leaves (1.83 g) which is followed by Zinc Chloride treated leaves (1.77 g). The single cocoon weight was significantly higher in all the treatment groups when compared with control groups. After taking weight of cocoon the pupae were removed outside and weighed. The pupal weight has also showed significant increase in treatment groups with maximum of 1.45 g in Zinc Chloride treated leaves (Table 1). This is in proximity that enrichment of mulberry leaves by nutrient supplementation

is one of the strategies by which cocoon and silk productivity can be increased and quality can be enhanced (Sengupta *et al.*, 1972).

Table 1. Comparison of folic acid and zinc chloride on growth and economic parameters

Particulars	T ₁ (Folic Acid 100ppm)	T ₂ (Zinc Chloride 100ppm)	T ₃ (Control)
Larval weight On 5 th day(in g)	3.15	3.16	2.34
Larval weight On 6 th day(in g)	3.38	3.51	2.84
Cocoon weight (in g)	1.83	1.77	1.48
Pupal weight (in g)	1.44	1.45	1.18
Shell weight (in g)	0.39	0.31	0.30
Shell ratio (%)	20.99	17.28	19.36

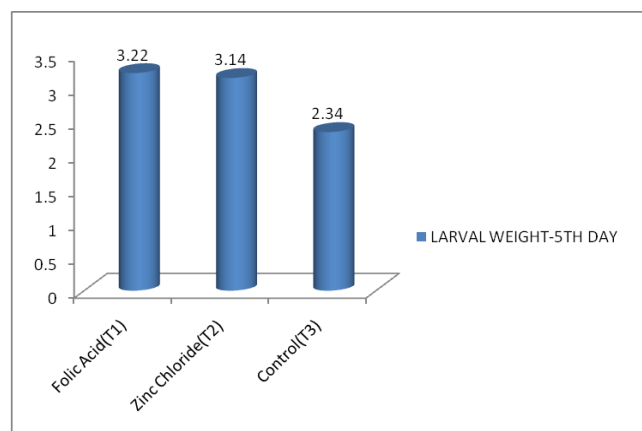


Fig. 1. Larval weight (g) on fifth day of fifth instar

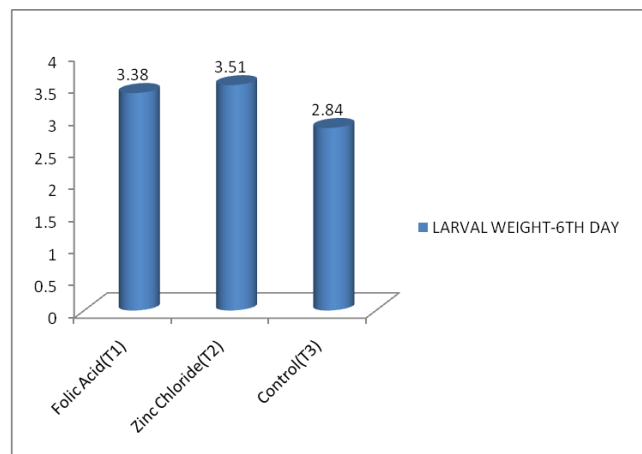


Fig. 2. Larval weight (g) on sixth day of fifth instar

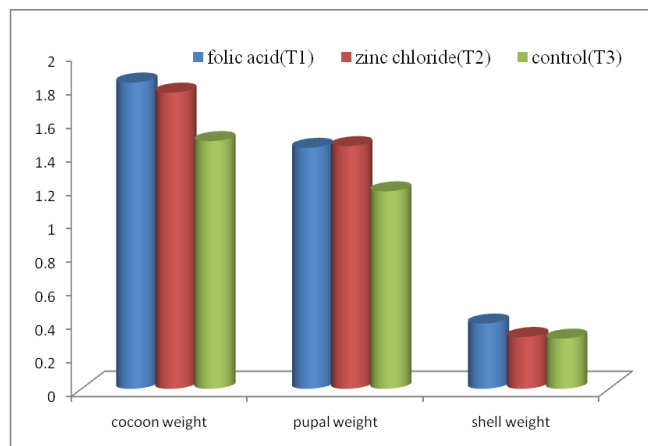


Fig. 3. Cocoon weight, pupal weight and shell weight

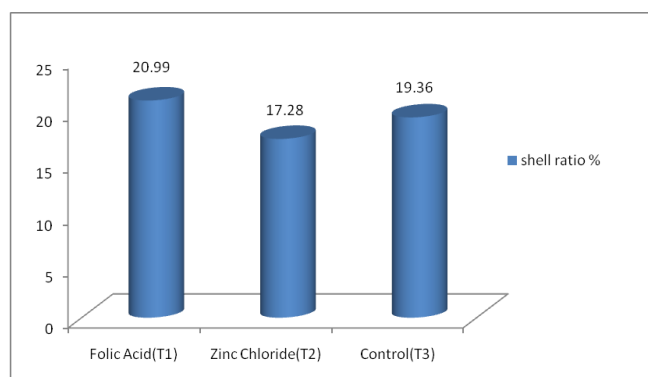


Fig. 4. Shell ratio per cent.

Among the two treatments, the maximum shell weight was recorded in the Folic Acid treated leaves of .48 g. The minimum shell weight was observed in control group of 0.39 g. From the data's analyzed, all the experimental groups showed improved shell weight. Results showed that Shell Ratio per cent was recorded highest on Folic Acid treated leaves of 20.99 per cent. This is followed by 19.36 per cent in control group. The effect of Zinc Chloride treated leaves has no significant impact on shell ratio per cent (Table 1). This higher growth and development also influences the economic characters like cocoon weight,

shell weight and shell ratio and subsequently quality of silk. This is in conformity with the findings of Rahmathulla *et al.* (2007) who also have reported similar results.

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