Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8111

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2020) *8*(3), 545-548

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Research Article

Effect of 1% N with Various Combinations of Ascorbic Acid on Growth of Eri Silkworm (*Samia cynthia ricini*)

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Received: 17.04.2020 | Revised: 23.05.2020 | Accepted: 27.05.2020

ABSTRACT

The study was conducted to determine the effect of 1% N with different doses (0.025, 0.05, 0.075, 0.1, 0.125 and.0.150%) of ascorbic acid on growth and silk production of larvae. Larvae were fed on mulberry leaves treated with 1% N and ascorbic acid in various combinations. Data was recorded on food consumption, co-efficient of utilization, body weight, body length and cocoon shell ratio and analyzed statistically. It was revealed that T5 (0.2%N +0.05% vitamin C) proved as the best treatment, which yield better results than all other test treatments about all the parameters under study. In conclusion, the higher doses of vitamin C, lowered the silk yield and caused decline in growth of silkworm larvae

Keywords: *Samia cynthia ricini, ascorbic acids, feed efficiency, growth rate*

INTRODUCTION

Sericulture is one of the most important cottage industries, which involves the utilization of Castor leaves and rearing of silkworm to produce new silk. In Assam, ericulture is widely distributed and according to an estimate some 12400 families are engaged in rearing of silkworm in different areas (Hussain & Javed, 2002). Various authors have tried alternative hosts for the rearing of silkworm and many of them using mineral elements as food supplements and have found positive impact of supplements on the silkworm growth and silk production as Balasundaram et al. (2013) found that different combinations of mineral nutrients gave better larval growth and silk production.

These studies helped in the improvement of the diet of silkworm. The present studies were in continuous with the work of the earlier workers who have tried different mineral elements and alternate hosts to increase silk yield qualitatively and quantitatively.

The aim of the present study was to determine the effect of 1% N, combinations with different doses of ascorbic acid on larval growth, silk production, coefficient of food utilization and cocoon shell ratio.

Cite this article: Deka, J., & Deka, M.B. (2020). Effect of 1% N with Various Combinations of Ascorbic Acid on Growth of Eri Silkworm (*Samia cynthia ricini*), *Ind. J. Pure App. Biosci. 8*(3), 545-548. doi: http://dx.doi.org/10.18782/2582-2845.8111

MATERIALS AND METHODS

The study was conducted in Biotech HUB, DBT GoI, Pragjyotish College, Guwahati, Assam during March to November, 2019. The experiment was carried out to determine the effect of 1% N used in different combinations with ascorbic acid (vitamin C) on the larval growth and silk production of silkworm (*Samia Cynthia ricini*).

The eggs of *ricini* were obtained from Central Silk Board Mirza. The eggs were placed at ambient temperature of 25 ± 2°C and relative humidity of 70-80% in an incubator for hatching.

After hatching, larvae were isolated from stock culture and divided into 27 groups of 50 larvae each. The larvae were reared in cardboard boxes measuring 22 x 15 x 5 cm^3 covered with polythene sheet turned over cardboards to prevent the moisture loss. The larvae were subjected to following treatments. There were 9 treatments used in the experiment.

Treatment	Description
T1	Simple castor leaves
T2	Castor leaves dipped in water
T3	Castor leaves dipped in 1% N Solution
T4	Castor leaves dipped in 1% N Solution + 0.025% Vitamin C
T5	Castor leaves dipped in 1% N Solution + 0.05% Vitamin C
T6	Castor leaves dipped in 1% N Solution + 0.075% Vitamin C
T7	Castor leaves dipped in 1% N Solution + 0.10% Vitamin C
T8	Castor leaves dipped in 1% N Solution + 0.125% Vitamin C
T9	Castor leaves dipped in 1% N Solution + 0.150 Vitamin C

Different combinations were prepared from urea and ascorbic acid (vitamin C) except T_1 and T_2 (simple leaves and leaves dipped in water). First three larval instars were fed on tender castor leaves of *Ricinus communis* and last two were offered full grown leaves, thrice a day. Before feeding, the leaves were dipped in treatment solutions and dried in shade. At the start of 4th instar, 40 larvae with best vigor and uniform size were maintained in each replication of each treatment and the rest were discarded.

Experiment was carried out in completely randomized design. The larval length and weight were recorded on the last day of each instar using scale and electronic balance, respectively.

The data recorded on:

Food consumed during each instar, cumulative food consumption of all instars, coefficient of utilization for each instar, cumulative coefficient of utilization of all instars, larval weight in each instar, larval length in each instar, weight with pupa, cocoon weight without pupa, cocoon shell ratio and mortality was analyzed statistically. Duncan's multiple range test was applied to test the significance of results (Steel & Torrie, 1985).

The residual leaves and feces were collected separately and dried in an oven at 100°C for 24 h and food consumption was measured as:

Food Consumption = Dry weight of leaves offered - Dry weight of residual leaves

The coefficient of utilization (CU) of food was calculated as per Rajanna and Puttaraju (2000):

$$\mathbf{CU} = \frac{\textbf{Dry weight of food consumed - Dry weight of faces}}{\textbf{Dry weight of food consumed}} \times \mathbf{100}$$

Cocoon shell ratio (CSR) was obtained by the formula:

$$\textbf{CSR} = \frac{\textbf{Weight of the Shell}}{\textbf{Weight of Cocoon}} \textbf{ x 100}$$

RESULTS AND DISCUSSION

Cumulative food consumption: The data (Table 1) on cumulative food consumption showed significant ($P<0.05$) differences among various treatments during the entire larval period. The maximum food consumption was observed in T_5 (54.20 ± 1.06) where as the second best treatment was T_4 (52.74 ± 1.65), which was followed by T_3 (51.65 ± 0.45). It was observed that T_1 (simple castor leaves) and T_8 (1% N + 0.1 vitamin C) showed statistical similarity. T_9 (40.60 ± 1.88) showed minimum cumulative food consumption (Table 1). The food consumption during all larval instars was maximum in T_5 and minimum in T_1. These results are in conformity with those of Hussain and Javed (2002), Balasundaram et al. (2013), who reported that larvae fed with supplemented with optimum doses of N gave good food consumption as compared to simple castor leaves.

It may be due to that T_5 showed greater mean value of food consumption as compared to other treatments as 1% N used in different combinations with vitamin C. These findings are also in agreement with Hussain and Javed (2002) who found that silkworm larvae ingest and digest more food when supplemented with ascorbic acid.

Cumulative coefficient of utilization: Data (Table 1) on cumulative coefficient of utilization, showed significant ($P<0.05$) differences among test treatments. Maximum and minimum values of cumulative coefficient of utilization were recorded in T_5 (70.11 ± 0.19.) and T_9 (51.74 ± 0.86), respectively. Treatment T_1 (55.96 ± 0.45), T_7 (58.68 ± 0.76), T_3 (65.39 ± 0.66) and T_4 (65.84 ± 0.57) were statistically similar while all other treatments vary significantly ($P<0.05$) with each other. It can be concluded that maximum food was converted into body matter in supplemented treatments. It was also found that higher doses of ascorbic acid were unable to provide proper food to silkworm for best larval.

Body weight during fifth instar: Data (Table 1) recorded on body weight during first instar showed that great statistical difference among various treatments. Maximum mean value of body weight was in T_5 (52.72 ± 0.52) followed by T_6 (48.53 ± 1.08) and T_4 (47.19 ± 0.93) (Table 1). Data further indicated that T_1, T_2 and T_7 were statistical similar. It was also found that T_8 and T_9 were statistically alike. These results depicted that (1% N +0.05% vitamin C) was the best treatment. It was also observed that T_9 showed mean body weight lower than control (T_1). It can be concluded that this behaviour may be due to higher doses of vitamin C. Higher doses of micronutrients and other fatty acids may have negative impact on growth of silkworm larvae (Thangapandiyan and Dharanipriya (2019).

Body length during fifth instar: Maximum larval body length was observed in T_5 (6.90±0.98) and the second best treatment was T_6 (6.62±0.83) followed by T_4 (6.49±0.89) and T_7 (6.32±0.15) (Table 1). Data further indicated that T_3 (5.77±0.17) and T_8 (5.82 ±0.54) were statistically alike. All other treatments were found significantly different. From these results it can be concluded that food supplementation greatly influenced the body length of silkworm larvae. T_5 showed maximum body length while T_9 (5.25 ± 0.77) gave minimum. Thus, it was obvious that larvae subjected to different treatments of ascorbic acid and nitrogen gave better larval length. Hussain and Javed (2002) reported that ascorbic acid ameliorates the growth of silkworm larvae.

Cocoon shell ratio: Maximum mean value of cocoon shell ratio had been observed in T_5 (23.32 ± 1.09). The second best treatment was T_4 (22.56 ± 1.21) followed by T_3 (22.24 ± 1.38) and T_6 (21.17 ± 1.35) respectively. It was seen that except T_8 (18.56 ± 0.65) and T_9 (18.41 ± 0.68) all other treatments were statistically different from each other (Table 1).

Data revealed that silkworm larvae fed on supplemented mulberry leaves, T_5 showed good cocoon shell ratio as compared to all other treatments. It is clear from data that 1% N + 0.05% vitamin C (T_5) proved as best treatment. Thus, it can be concluded that greater cocoon shell ratio may be due to better combination of 1% N + 0.05% vitamin C.

These findings are in accordance with (Thangapandiyan & Dharanipriya (2019) who investigated that when silkworm larvae were fed on 1% N treated mulberry leaves, increased the cocoon weight. Heaviest cocoon shell ratio can be obtained by supplementing mulberry leaves with minerals and other nutrients (Mahmood, 1989).

Table 1: Effect of 1% N with various combinations of ascorbic acid on growth parameters of *Eri Silkworm* (with standard deviation)

Treatment	Food Consumption g/10 larvae	Coefficient of Utilization (%)	5th Larval body weight/10 larvae	Body length 5th Instar cm/larvae	Cocoon Shell Ratio
T1	43.55 ±1.02	55.96 ±0.45	39.49± 0.45	5.33 ±0.78	18.71± 0.98
T2	47.93 ±0.78	62.50 ±0.51	40.98± 0.98	5.44 ±0.29	19.95± 0.75
T3	51.65 ±0.45	65.39 ±0.66	42.71± 0.79	5.77 ±0.17	22.24± 1.52
T4	52.74 ±1.65	65.84 ±0.57	47.19± 0.93	6.49 ±0.89	22.56± 1.35
T5	54.20 ±1.06	70.11 ±0.19	52.72± 0.52	6.90 ±0.98	23.32± 1.09
T6	47.47 ±1.76	61.13 ±0.98	48.53± 1.08	6.62 ±0.83	21.17± 0.98
T7	44.81 ±1.09	58.68 ±0.76	41.56± 1.07	6.32 ±0.15	20.52± 0.56
T8	42.27 ±1.57	54.68 ±0.89	40.35± 0.89	5.82 ±0.54	18.59± 0.65
T9	40.60 ±1.88	51.74 ±0.86	38.93± 0.68	5.25 ±0.77	18.41± 0.68

CONCLUSION

In the present study, the treatment of Vitamin C at the concentration of 1% N Solution + 0.05% Vitamin C may have beneficial effects on the feed efficacy, growth of the silkworm larval, pupal and cocoon length, width and weight and also increased the quantity of silk production by enhancing the feed efficacy than control. So, this supplementation could be prescribed to the farmers to get more quantity of silk.

Acknowledgement

The authors greatly acknowledge the authorities of Pragjyotish College as well as the Faculty members of Zoology Department. The authors would like to offer their thanks to all the Staff of Mirza CSB.

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