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Growth rate pattern and economic traits of silkworm, (*Bombyx mori* L.) under the influence of inorganic and organic supplementation diet

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Abstract
The growth and development of silkworm larvae and subsequently cocoon productions are greatly influenced by the mulberry leaf quality. Nearly 70 percent of the silk produced is directly derived from mulberry leaf proteins. Hence, silkworm should be fed abundantly with good quality mulberry leaves for the successful cocoon production and high yield of silk. Silkworm is a monophagous insect which feeds only on mulberry leaves. Nutrition improves the growth, development, health, feed consumption and conversion of silkworm thereby improving the economic traits. The present study deals with the supplementation of Inorganic and Organic diet for the growth and development of double strains ($FC_1 \times FC_2$). Oral supplementation of inorganic tissue salt and organic nutrients. The economic performance of double strains ($FC_1 \times FC_2$) evaluated based on larval, cocoon, pupa shell weights and avg. shell ratio % relationship of food consumption to larval weight, cocoon weight shell weight, avg. Shell ratio %, etc. The observed parameters showed improvement in inorganic and organic when compared to the respective control.

Keywords: Silkworm (*Bombyx mori* L), supplementation, larval weight, cocoon weight, pupa weight, shell weight

Introduction
Salts may represent a limiting factor for the growth of insects, principally true for all types of diet composition (Wiggleswarth, 1972). The salt significantly improved the growth of the developmental stages, increased the cocoon characters, elicited early cocoon production and increased the reproductive potential of the silkworms. Nutritional supplementation of zinc sulphide, sodium sulphide, potassium, sodium, calcium and calcium increased the economic parameters of the silkworm. It is reported that many salts considerably increased the growth of silkworm larvae, pupae, and adults and subsequently cocoon production, but higher salt concentrations produced terminal effects on these parameters. For silk productivity of silkworms, the most important physiological factor is nutrition. It is well known fact that growth and development of the silkworm and the economic characters of their cocoons are influenced to a great extent by the nutritional content of the leaves as food for silkworm. The supplementation fulfils the nutrition required to promote better growth and development with elevate economic characters. The organic component like carbohydrates, proteins, vitamins, lipids etc. play a vital role in the overall growth of silkworm. Nutrition is always a concern in silkworm rearing as the silkworm is not fed with health and nutritive leaves. It has also been that the supplementation with salt increases the biochemical content in the silkworm, *B. mori* (Etebari and Fazilati, 2003) [5]. Ahmed (1993) [1] has found that the combination of different nutrient gives better larval weight and silk productivity. The objective of the present study is to determine the growth rate pattern and economic traits of Silkworm, (Bombyx *mori* L) under the influence of Inorganic and Organic Supplementation Diet.

Materials and Methods
Rearing techniques: The mulberry silkworm disease free laying (dfls) of double hybrid ($FC_1 \times FC_2$), eggs was obtained from the Government Sericulture farm, Poonch. It was established in the PG, Department of Sericulture, Poonch Campus, and University of Jammu during one successive spring season (April –May 2015) by providing requisite environmental conditions. Sizes which enhancing the probability of extinction directly and indirectly causes the reduction.

Nutrition methods and Food intake

The native mulberry (*Morus alba*) leaves are used to feed the mulberry silkworm larvae. The worms were divided into three separate batches; Organic, Inorganic and Control. The inorganic batch was fed by treating the leaves with salts like zinc sulphide, sodium sulphide, potassium, sodium and calcium @0. 04 gm concentrate. While the organic batch was fed by treating the leaves with a solution prepared from jam, multivitamins tablets and soya bean extract. Whereas the control batch was fed with normal leaves. Treated leaves were given from beginning of the first day of first instars till it begins to spin the cocoon. The solution was sprayed 30 minutes earlier than feeding on the leaves. After the 3rd instar only 250 larvae were retained by maintaining 3 replications in each batch. The temperature in the rearing room was maintained at 28±2 °C and the RH was 73±5%. All the rearing operations were carried out according to Krishna swami *et al*. (1973) [8].

Statistical Analysis

The statistical analysis was carried out using ANOVA with two factors under significance level of 0.05 for the whole results using SPSS and complete randomized design were used according to (Steel *et al*. 1997). Multiple comparisons were carried out applying LSD.

Results and Discussion

Usage of a combination of organic and inorganic supplements, increasing the carbohydrate and crude protein percentage of the mulberry leaves significantly increased the silkworm larval body weight, silk gland weight and ultimately the cocoon yield etc (Jadhav *et al*., 2000). The results of the present investigations on leaf supplementation with inorganic and organic nutrient to silkworm larva considering the following economical traits such as pupation rate, cocoon weight, cocoon shell weight and cocoon shell percentage were calculated and are presented in Table no. 1. Many researchers have found that the larval characters of *B. mori* was improved by different nutrients such as ascorbic acid, folic acid, thiamin, vitamin B complex, etc. (Saha and Khan 1996; Nirwani and Kaliwal 1996; Etebari *et al*. 2004; Rahmathulla *et al*. 2007; ElKaraksy and Idris 2009) [5]. Healthiness of any biological system is directly correlated with the natural balance of inorganic tissue salt in the organism; any disturbance in the equilibrium of molecular motion of the inorganic salts can cause disease conditions in living tissue metabolism. It has been reported that thyroxin and vitamin B. It was observed that vitamin supplementation slightly reduced the larval periods in *B. mori* at lower concentrations as compared to the controls. The presence of vitamin is appropriate for growth of larvae and the reproduction in many insects (Ishii, 1971; Yazan 1972; Baker 1975; Ritter and Johnson, 1991; Levison, 1992; Ozalp and Emer 1992; Chang and Li, 2004). The dietary supplements like; protein, vitamins, lipids, etc. evincing their specificity at specific doses for various metabolic activities of silkworm (Horie, 1980). Nutritional study on silkworm is an essential prerequisite for its proper commercial exploitation. Nutrition of silkworms in sole factors which almost individually augment the quality and quantity of silk (Laskar and Datta, 2000). Bose *et al*. (1995) studied the bioassay of foliar application of micronutrients to mulberry on rearing performance of silkworm, NB_{18} and NB_7. Maximum reduction in larval duration of 15-70 hr. was observed with the application of Boron (2.5 and 5.0 kg/ha/yr) over control. The maximum increase in cocoon weight, larval weight, yield, ERR, shell weight and shell percentage were observed with the application of Iron (2.5 and 5.0 kg/ha/year), Zinc (5.0 and 10 kg/ha/year), Copper (2.5 and 5.0 kg/ha/year) which showed 11.08, 10.55, 30.28, 16.15, 18.24 per cent and 11.86 per cent increase, respectively over control.

Nutritional study on silkworm is an essential prerequisite for its proper commercial exploitation. Supplemented mulberry leaves significantly increased the body weight of silkworm larvae (Majumder and Medda 1975) [4]. Saha and Khan (1997) reported that the growth *B. mori* larvae were significantly influenced at lower doses when the worms were reared on a Sinafort supplemented diet. The oral supplementation of riboflavin resulted. With a significant increase in larval and silkgland weight (Nirwani *et al*. 1996). The silkworm, PM x NB_4D_2 fed with 0.5 per cent 'Green leaf' foliarly sprayed leaves gave better cocoon weight (1.679 g), shell weight (0.319 g), pupal weight (1.336 g) and filament length (1054.58 m) (Chikkaswamy *et al.*, 1999a).

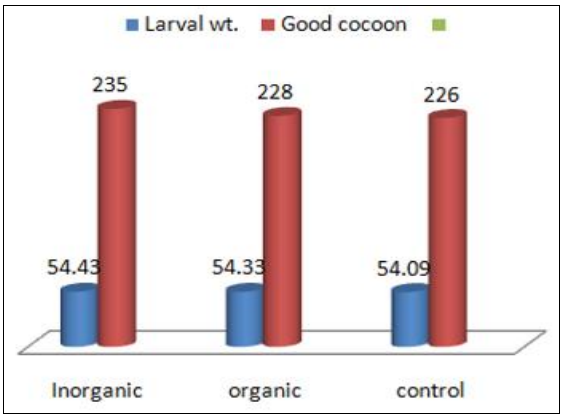

Fig 1: Supplementation effect of inorganic tissue salts on Good cocoon and larval weight

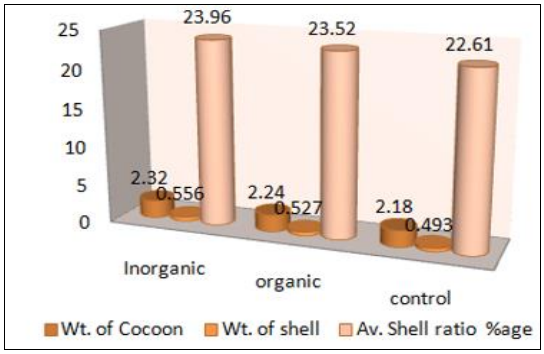

Fig 2: Supplementation effect of inorganic tissue salts on Cocoon weight, shell and Av. Shell ratio percentage

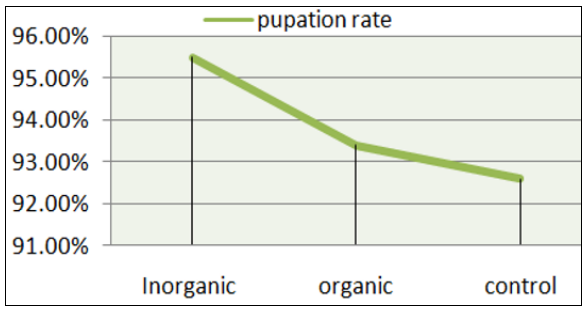

Fig 3: Supplementation effect of inorganic tissue salts on Pupation rate

Table 1: Performance of double hybrid (fc $_1$ × fc $_2$) for economical characters

S. No.	Batch	Larval wt.	Good cocoons	Pupation rate	Wt. of Cocoon	Wt. of shell	Av. Shell ratio %
1.	Inorganic	54.43	235	95.5%	2.32	0.556	23.96
2.	organic	54.33	228	93.4%	2.24	0.527	23.52
3.	control	54.09	226	92.6%	2.18	0.493	22.61

Conclusion

It was generally considered that supplemented diets could not be used for silkworm rearing throughout the whole instars for silk production, due to the cost of the diet. However, with the breeding of polyphagous silkworms and the development of low cost diets this practice may become possible. Both theoretical and applied studies are currently in progress, including breeding of silkworms, improvement of artificial diets, development of rearing system and economical evaluation of the silkworm rearing system on supplemented diets throughout the instars and the effective production of silkworm eggs. The new method of rearing of the silkworm on supplemented diets is a renovated technique and its rapid expansion is expected in sericulture. To improve the quality of supplementation diet, the quality of mulberry leaf must be improved first. Since, the primary purpose of mulberry cultivation in most of the Asian countries is to feed the silkworm with its leaf, the impact of the salt that accumulated in leaf of mulberry on silkworm growth and development need to be investigated in details.

References

1. Ahmed S. Effect of phosphorus and potassium treated mulberry leaves on larval development and silk yield of *Bombyx mori L* M.Sc. (Hons.) Thesis Deptt. Agric. Entomol., Univ. Agric, Faisalabad, Pakistan 1993.
2. Bhattacharya Kaliwal A. The biochemical effects of potassium chloride on silkworm (*B. mori*). Insect Science 2005;12:95-100.
3. Bhattacharya A, Kaliwal BB. Synergetic Effects of Potassium and Magnesium Chloride on Biochemical Contents of the Silkworm, *Bombyx mori* L. CJES Caspian Journal of Environmental Sciences Caspian J. Env. Sci 2005;3(1):15-21.
4. Dasmahapatra AK, Chakraborthi MK, Medda AK. Effect of potassium iodide, cobalt chloride, calcium chloride and potassium nitrate on protein, DNA and RNA content of silk gland of silkworm (*Bombyx mori* L) Nistarirace. Sericologia 1989;29:355-359.
5. Etebari K, Fazilati M. Effect of feeding ofmulberry's supplementary leaves with NP and K in some biological and biochemical characteristics of silkworm, *Bombyx mori*. J Sci Technol Agric. and Natur. Resour 2003;**7:**233-244.
6. House HC. The role of nutritional principles in biological control,‘ Can. Entamol 1996;98:1121-1134.
7. Islam R, Ali AO, Paul DK, Sultana S, Banu NA, Islam R. Effect of salt, nickel chloride supplementation on the growth of silkworm *Bombyx mori* L. (Lepidoptera: Bombycidae). J Biol Sci 2004;4:170-172.
8. Subburathinum KM, Krishna M. Role of Soya bean protein in silkworm nutrition,‘ Indian silk 1998,9-10.
9. Kumar MD, A Michael AS. Effect of Seri feed a feed supplement enriched feed of silkworm *Bombyx mori* L. on its nutritional and economic parameters. International Journal of Scientific & Engineering 2011;2:9.
10. Legay JM. Recent advances in silkworm nutrition. Ann. Rev. Entomol 1958;3:75-86.
11. Murphy TA, Wyatt GR. The enzymes of glycogen and trehalose synthesis in silk moth fat body. J Bio. Chem 1965;240:1500-1508.
12. Azam M, Riaz M, Tayal MK, Singh A, Bhagat CH, Kapoor S. “supplementation of inorganic tissue salts to evaluate enhancement of Tolerance against adversity and diseases in silkworm, *Bombyx mori* L. Bionano Frontier 2015;8(1):327:330.
13. Chamundeshwari P, Radhakrishnaih KK. Effect of zinc and nickel on the larval and cocoon characters of silkworms, *Bombyx mori*. L. Sericologia 1994;34(2):327-330.
14. Schussler WH. Referredin The twelve tissue remedies of Schussler by Boericke and Dewey, published by B. Jain Publisher (P) Ltd, New Delhi, India 1873.
15. Steinbrecht RA, Gnatzy W. Pheromone receptors in *Bombyx mori* and *Antheraea pernyi* I. Reconstruction of the cellular organization of the Sensilla Trichodea. Cell Tissue Res 1984;235:25-34.
16. Steinbrecht RA. An anomalous *Sensillum chaeticum* with a double set of cilia and outer dendritic segments in *Bombyx mori* L. (Lepidoptera: Bombycidae). Int J Insect Morphol Embryol 1988;17:83-87.
17. White PR, Chapman RF. Tarsal chemoreception in the Polyphagous grasshopper *Schistocerca americana*. Behavioral assays, sensilla distributions and electrophysiology. Physiol. Entomol 1990;15:105-121.
18. Ziesmann J, Valterova I, Haberkorn K, de Brito Sanchez MG, Kaissling KE. Chemicals in laboratory room air stimulate olfactory neurons of female *Bombyx mori*. Chem. Senses 2000;25:31-37.