Short Communication

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EFFECT OF GA_3 ON LEAF CONSTITUENTS OF *QUERCUS SERRATA* AND ITS IMPACT ON REARING PERFORMANCE OF SILKWORM (*ANTHERAEA PROYLET* J.)

M. GHOSH AND *R.C. SRIVASTAVA

Central Sericultural Research & Training Institute, Berhampore-742 101, West Bengal, India

**Life Science Department, Tripura University, Tripura*

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Chlorophyll, total sugar, protein level and total free amino acids were found higher in treated *Quercus serrata* as compared to the control ones but in case of crude fibre the levels were markedly decreased. The body weight of larvae and fecundity of silkworms fed on GA_3 treated leaves were higher than the control.

Key Words : *Antheraea proylei, Quercus serrata,* gibberellic acid, leaf constituents.

The commercial characteristic of silkworm is entirely dependent on quality of oak (*Quercus serrata*) leaves in respect of its chemical constituents such as protein, total free amino acids, total sugars and crude fibre levels which play important role in silk production. It has been reported that gibberellic acid improves the commercial characteristics of silkworms, *Bombyx mori* (Santa Kumari *et al.,* 1989). Fletcher and Osborne (1965, 1966) found that gibberellins regulate protein and RNA synthesis during senescence in leaf cells of *Taraxacum officinale.* It has also been found that GA_3 delays leaf senescence in mulberry (Boraiah *et al.,* 1987).

The present paper deals with the growth and commercial characteristics of *A. prolei* by feeding their larvae on leaves (*Q. serrata*) sprayed with the optimum concentration of GA_3 (5.0 ppm).

7 year-old *Q. serrata* with 120 cm x 120 cm spacing were selected. Foliar spray of optimum concentration of GA_3 (5.0 ppm) as established by Ghosh and Srivastava (1993) for this plant, was given to each plant with the help of a Maruti foot sprayer (200 ml/plant) after 15 days of sprouting. Out of them 110 plants, 10 were used for biochemical estima-tions and the remaining were used for rearing experiments. Control were treated similarly but with distilled water. Medium aged leaves were collected after 30 days of spray, oven dried at 60°C for 24 h, then finally powdered and stored in air tight bottes until used for analysis.

Total chlorophyll content of dry leaves was determined by the method of Arnon (1949), level of total free amino acids by the method of Yemm and Cocking (1955). Crude protein content of the leaves was estimated by Micro-kjeldahl's method (Lang, 1958) and total sugar by Anthrone reagent (Plumer 1982). Crude fibres were estimated by A.O.A.C. (1984) method.

Table 1 indicates significant increase in the leaf components such as total chlorophylls, total sugars, total free amino acids and crude protein in GA_3 treated plants as compared to control. But in case of crude fibre, the level was significantly higher in the leaves of control plants than in the treated ones. The mortality percentage of the silkworm larvae reared on the leaves of control plants was two times higher than those of fed with GA_3 treated leaves, where the body weight of the larvae was also higher by 33% than control (Table 2). The months of insects which were fed with the GA_3 treated leaves laid more eggs per female (fecundity), thereby yielding more silkworms for further rearing. There was an appreciable decrease in the larval period for the worms reared on GA_3 treated plants as compared to untreated plants. The cocoon weight, shell weight and SR% were found significantly higher for cocoons samples harvested from GA_3 treated plants. GA_3 improved several of the commercial characteristics essential for the silk industry. The major factors that influenced production of silk are cocoon and shell weight and silk per cent, all of which have been found to be significantly improved by GA_3 treatment. The

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Table 1. Influence of GA_3 on leaf constituents of *Quercus serrata* on day 30 after spray (average of 3 replicates).

Parameters	Control	GA_3 treated	CD at 5%
Chlorophyll level (mg/g DW)	0.74	0.84	0.0325
Total sugar level (mg/g DW)	10.50	12.25	0.728
Crude protein (% DW)	20.12	22.54	0.816
Total free amino acids (mg/g DW)	26.42	30.06	1.028
Crude fibre (% DW)	17.20	14.16	0.943

Table 2. Influence of GA_3 on rearing performance of silkworm (*Antheraea proylei*). The larvae were mounted on the leaves 15 days after GA_3 spray (average of 10 replicates).

Parameters	Control	GA_3 treated	CD at 5%
Mortality of larvae (%)	40	20	7.216
Larval length (mm)	75.2	105.4	16.727
Larval width (mm)	12.5	14.8	1.027
Larval body weight (mg/g DW)	478.15	640.42	24.167
Larval period (days)	38	33	2.573
Pupal weight(g)	3.66	5.15	1.823
Fecndity (no.)	95	128	5.729
Cocoon weight (g)	4.02	5.75	0.316
Shell weight (g)	4.02	5.75	0.316
Silk weight (g)	0.36	0.60	0.052
Silk ratio (SR %)	8.95	10.43	

DW - weight

observed effects of GA_3 on the silkworm could be mediated either by a direct effect of the plant hormone on the metamorphosis of the insect or indirectly by its influence on the leaves, the addition of GA_3 to detached leaves delays senescence of certain species (Thimann, 1980). Retardation of senescence by GA_3 in *Taraxacum officinale* was associated with a stimulation of C^{14} leucine incorporation into protein indicating enhanced protein synthesis (Fletcher and Osborne, 1965, 1966) in detached mulberry leaves. GA_3 has been reported to delay senescence (Boraiah *et al.*, 1987) and its effect on enhancement in levels of total sugars, total free amino acids and crude protein could be the factors that contribute to the improvement of silk production. Moreover, the fibre content was also significantly less in treated plants as compared to control and the less fibre-containing leaves are preferred by larvae. However, irrespective of whether the effects of the hormone on silkworm are direct or indirect, the conclusion of the study is that application of GA_3 to the leaves of *Quercus serrata* plants and use of these leaves to the silkworm diet is beneficial for the Sericlture Industry.

REFERENCES

A O A C 1984 *Official Methods of Analysis*, 14th ed, Arlington, VA.

Arnon DI 1949 Copper enzymes in isolated chloroplasts polyphenoloxidase in *Betavulgaris*. *Plant Physiol* **24** 1-15.

Boraiah G, M Santa Kumari & V M Sreedhara 1987 Reversal of leaf senescence in different varieties of mulberry by GA_3 and Kinetin. *Sericologia* **27** 177-182.

Fletcher R A & D J Osborne 1965 Regulation of protein and nucleic acid synthesis by gibberellins during leaf senescence. *Nature* **207** 1176-1177.

Fletcher R A & D J Osborne 1966 Gibberellin, as a regulator of protein and ribonucleic acid synthesis during senescence of leaf cells of *Taraxacum officinale*. *Can J Botany* **44** 739-745.

Ghosh M K & R C Srivastava 1993 Foliar treatment with optimum doses of agrochemicals can improve quality of Oak-tasar cocoons. *Curr Sci* **65** 714-718.

Lang C A 1958 Simple micro-determination of Kjeldahl nitrogen in biological materials. *Anal Chem* **30** 1692-1694.

Plumer D T 1982 *An Introduction to Practical Biochemistry*, II Ed. McGraw Hill Book Co, England, p 183-184.

Santakumari M, V M Sreedhara & R A Fletcher 1989 Gibberellic acid improves the commercial characteristics of silkworms. *Sericologia* **29** 347-351.

Thimann K V 1980 The senescence of leaves In *Senescence in Plants* (Thimann K V ed) CRS Press Boca Ratan, Florida p 85-115.

Yemm E W & E C Cocking 1955 The determination of amino acids with ninhydrin. *Analyst* **80**109-213.