

PABA INDUCED REDUCTION OF FITNESS CHARACTERS IN TWO RACES OF MULBERRY SILKWORM, *BOMBYX MORI* L.

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ABSTRACT: Larvae of economically important, mulberry silkworm, *Bombyx mori*, were subjected to growth regulator PABA treatment and its effects on the fitness characters were analyzed. The results indicated that though PABA increased the silk yield, it hampered fitness characters. Thus the experiment cautions sericulturists, who use PABA to improve cocoon characters that they should not make use of such cocoons for seed purpose.

KEY WORDS: Growth regulators, PABA, Mulberry silkworm, *Bombyx mori*, Fitness characters,

Sericulture is an agro-based rural oriented industry, where 'biological machine' silkworm converts plant protein 'Morin' into animal protein 'Silk' during their larval-pupal metamorphosis. To increase the silk yield, as in other agricultural crops (NANDI and CHATTERJEE, 1978; RAZA, 1978), though the farmers use various methods, as the chemical methods are the quick ones to give results, in sericulture also, they use several growth regulators including Para-aminobenzoic acid (PABA) (AKAI and KOBAYASHI 1971; NIHMURA *et al.*, 1972; MUROKOSHI *et al.*, 1972; KOBARI and AKAI 1978). Some of these growth regulators like IAA have proved to be negative too (PAI *et al.*, 1991). In spite of the above, the sericulturists have paid almost no attention. We studied the effects of PABA (growth regulator) on fitness characters such as fecundity, fertility, hatchability, larval duration etc.,

Bivoltine, Kalimpong-A and multivoltine, Pure Mysore races of silkworm, *Bombyx mori* L. reared by following standard methods as described by KRISHNASWAMI (1978) up to 2nd instar, were selected for the experiments. Once these larvae completed their 2nd moult and entered 3rd instar, five batches of 100 worms each were made as Batch-1, Batch-2, Batch-3, Batch-4 and Batch-5. These worms were fed with normal mulberry leaves soaked in distilled water and which were later air dried, mulberry leaves soaked in distilled water containing 50 ppm of PABA and later air dried, mulberry leaves soaked in distilled water containing 100 ppm of PABA and later air dried, mulberry leaves soaked in distilled water containing 200 ppm of PABA and later air dried for all feedings up to spinning. Such reared worms were allowed for spinning and the cocoons obtained thereby, were further allowed for emergence. The freshly emerged males and female moths were inbred and the laying was prepared. These layings along with mother moth were analyzed for fecundity and fertility. These layings were further allowed to continue their life cycle to hatch and % hatching was calculated.

All characters analyzed in Kalimpong-A race showed significant reduction in all the concentrations (Table). While Pure Mysore, the Concentration-1 brought significant

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reduction in hatching percentage, while at concentration-2; Pure Mysore exhibited reduction in fecundity, fertility and hatching percentage. PABA at 200ppm concentration showed significant reduction in all the four traits analyzed. Fecundity, fertility, hatchability, larval duration etc., are some of the important parameters to evaluate toxicity of any chemical or physical agent in animal tests system (LUNING, 1966, PAI et al., 1986, 1991), as they have direct bearing on evolutionary success/ failure of any species. The reduction in fecundity might be due to changes brought in by PABA on hormonal system of silkworms as proposed by GRUWEZ et al., 1971, which in turn affected the ovarioles. While the reduction in hatchability could be attributed to the effect of PABA on growing embryos as earlier recorded *Drosophila* (LUNING, 1966; SANKARANARAYANAN, 1969). The lengthening of larval duration was due to the physiological changes in silkworms by their hormone, as reported by earlier workers (AKAI et al., 1978; KUWANA et al., 1984). The present results indicated that though PABA increased some of the economic traits as reported earlier workers, significantly reduced the fitness characters. Thus it could be concluded that cocoons obtained by PABA treated batches should not be used for seed purposes.

Table: PABA induced reduction of fitness characters in two races of *Bombyx mori* L.

Race	Treatment	Larval duration (h)	Fecundity (%)	Fertility (%)	Hatching (%)
Kalimpong-A	Control-1	552 ± 06	490 ± 16	87.0 ± 3.2	86.4 ± 1.8
	Control-2	552 ± 06	496 ± 09	88.2 ± 1.6	85.3 ± 2.0
	Conc.-1	600 ± 12*	140 ± 19*	77.2 ± 2.0*	74.8 ± 3.0*
	Conc.-2	612 ± 12*	402 ± 13*	73.9 ± 3.6*	71.6 ± 4.8*
	Conc.-3	624 ± 12*	370 ± 20*	65.0 ± 4.8*	62.8 ± 1.1*
Pure Mysore	Control-1	624 ± 24	360 ± 20	94.0 ± 2.3	97.0 ± 1.0
	Control-2	624 ± 24	351 ± 16	93.8 ± 1.9	97.3 ± 0.9
	Conc.-1	648 ± 24	343 ± 13	88.0 ± 1.1	86.0 ± 1.0*
	Conc.-2	648 ± 24	340 ± 16*	82.6 ± 2.0*	80.3 ± 1.6*
	Conc.-3	660 ± 12*	320 ± 19*	80.7 ± 1.8*	76.4 ± 0.9*

*Statistically significant by ANOVA AT 0.05 level

REFERENCES:

- AKAI, H. and T. KOBAYASHI, 1971. Induction of prolonged larval duration by JH in *Bombyx mori* (Lepidoptera: Bombycidae), *Appl. Ent. Zool.* 6: 138-139.
- AKAI, H., KIGUCHI, K., KOBARI, Y. and A. SHIBUKAWA. 1978. Practical utilization of Juvenoids for increasing silk production. *Sci. Paper of the Inst. of Org. and Phy. Chem. Wroclaw Tech. Univ.* No.22, Conf. 7: 781-792
- GRUWEZ, G., HOSTE, C., LINTS, C.V. and F.A. LINTS. 1971. Oviposition rhythm in *Drosophila melanogaster* and its alterations by a change in Photoperiodicity, *Experientia* 27: 1414-1416.
- KOBARI, Y and H. AKAI. 1978. utilization of Manta (synthetic compound with JH activity) for silkworm rearing. *J. Seri. Sci. Japan*, 47: 315-319
- KRISHNASWAMI, S. 1978. New technology of silkworm rearing, *Bull. No.2, CSR&TI, Mysore*: 1-36
- KUWANA, E., TAKEYA, R. and M. ETO 1984. synthesis and antijuvenile activity of 1-citronellyl-5 substituted imadazoles. *Agri. Biol. Chem.* 48(12): 3115-3119
- LUNING, K.G. 1966. *Drosophila* tests in Pharmacology, *Nature*, 209: 84-86.
- MUROKOSHI, S. CHANG C.F. and S.TAMURA. 1972. Increase in silk production by silkworm *Bombyx mori* due to oral administration of JH analog. *Agri. Biol. Chem.* 36:: 695-696

- NANDI, P. S. and S. K. CHATTERJEE. 1978. Effect of Ethyl Gibberellic acid a Pot. Thiocyanate on growth, development and diosgenin formation in different species of *Dioscorea* rearing. *Indian J. Exp. Biol.* 25(4): 523-252.
- NIHMURA, M., AMORI, R., MORI, K. and M. MATSUI. 1972. Utilization of synthetic compound with JH activity in silkworm rearing. *Agri. Biol. Chem* 36: 89-892.
- PAI, I. K., HEGDE, S.N. and N.B. KRISHNAMURTHY. 1986. Effect of Paraaminobenzoic acid on hatchability in silkworm *Bombyx mori*. *Indian Zool.* 10(1&2): -13.
- PAI, I.K., HEGDE, S.N. and N. B. KRISHNAMURTHY. 1991. Toxicity of Paraaminobenzoic acid in Pure Mysore and Kalimpong-A races of silkworm *Bombyx mori* L. *Sericologia, France*, 31(2): 311-318
- RAZA, S.H. 1978. Effect of some growth regulators on seed germination of *Kalyanasona* wheat. *Indian J. Agri. Res.* 12(3): 201-202.
- SANKARANARAYANAN, K. 1969. The effect of nitrogen and oxygen frequency of x-ray induced dominant lethals and the physiology of the sperm in *Drosophila melanogaster*. *Mut. Res.* 4: 641-661