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Lipid and other nutrients metabolism in *Bombyx mori* during gowth and metabolism

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ABSTRACT

Bombyx mori mainly feeds upon the tender leaves of *Morus alba*. The leaf contains such as fats, lipids, proteins minerals and water which may in influence the growth and metamorphosis of the larvae. if the diet does not contain all the mineral nutrients, the growth and metabolisms is affected adversely which may lead deformation in cocoon formations as well as the quality of the silk. The paper reports the lipid profile of mulberry leaves and its effects on growth and metabolism of the larve.

Key words: *Morus alba*, *Bombyx mori*, growth metabolism, moisture content.

INTRODUCTION

Silk moth is an insect of order Lepidoptera which needs exogenous source of lipid compound for growth and development. Steroids have several vital functions including larval growth and development. the silk moth which is monophagous insect, feeds upon mulberry leaves. The quality of mulberry leaf is very essential for the proper growth and metabolism of *Bombyx mori*, Lipid which contains phospholipid and triglyceroids are found to be present either in the fat body or larval lymph glands. Smith et.al. (1980) have reported the role of plant lipid in embryonic development of *Bombyx mori*. Similarly, jackson (1980) have reviewed the location of lipid and its biosynthesis in insect body. Chino and Gilbert (1965) have also reported the role of lipid in the transport of haemolymph.

The present paper was aimed to report the utilization of plant lipid for growth and metamorphosis of *Bombyx mori*.

MATERIAL AND METHODS

1. Mulberry plants that is *Morus alba* leaves were collected from Johad Sericulture Form Govt. of M.P. the Tender leaves were fad to the different in star silkworm according to their need. Bivoltine variety of silk worm was used for the presently study.
2. Rearing and feeding of larvae of *Bombyx mori*.: *Bombyx mori* have four stages of growth and development. In the first stage. The embryo grows and develops in to a larva. The second is a vegetative stage, in which the larva takes nutrients i.e. mulberry leaves. Mulberry leaves are the sole food for larvae in commercial sericulture and of silkworm crop. Hence choice of mulberry leaves suitable for healthy growth of silkworm is one of the most important factors in sericulture. The third is a metamorphic stage in which the larva becomes pupa and then into the adult. The fourth stage of cycle is known as reproductive stage in which moth mates and the female moth lays eggs producing next

generation.

3 Feeding of silkworm :- For the proper growth and metamorphosis of larvae, proper feeding was giving as per standard method (Saxena 2000).

RESULTS

Mulberry leaves are the sole food for silkworm. The mulberry leaves were collected and chemical analysis was carried out as giving in table 1,2,3, and figure 1.

Utilization of mulberry leaves constituents by silk moth

The lipid fraction of Soxlahet extracted plant material was applied through dietery material. it has been noticed that the cholestrol of plant was feeding stimulate which showed nutritional and behavioural effect of silk moth, *Bombyx mori*.

The result have been shown in tables 4,5, and fig. 2.

Table 1: Showing loss in weight in mulbery leaves (100gms) tender leaves

Weight of leaves (Tender)	Dry weight of leaves	Loss in weight and %	Ash contends 2.5%	
			Acid soluble	water soluble
50gms	12gms	38gms=76%	1.6gms	40gms

Table 2: Mineral composition of the ash of mulberry leaves

S. No.	Main Constituents	Percentage
1.	K_2O	35.46
2.	Na0	22.00
3.	Cao	16.96
4.	SIO_2	12.00
5.	P_2O_5	10.01
6.	SO_3	05.33
7.	Mgo	03.70

Lipid metabolism

After the feeding of mulberry leaves there is decrease in neutral and phospholipid during the embryonic development of silkworm. The steroid

Table 3: Comparative contents of Sugar, Strach and water in Mulberry leaves

S. No.	Contents	Time	
		8.00	18.00
1.	Water	82.11	74.901

Table 4: Showing rearing schedule of young larvae instars of *Bombyx mori*

Age of silkworm		Temp.	RH%	Size of leaf square (cm) (kgm)	Quality of leaf	No.of feeds/day	No.of cleanig
Multivoltine strain	IINSTAR	27	80-90	0.5-2.0	2-2..5	3-4	1
of *B.mori*	IIINSTAR	27	80-90	2.0-4.0	6-7	3-4	2
	IIIINSTAR	26	75-80	4.0-6.0	25-30	4-5	3
Bivoltine strain	IINSTAR	27	80-90	0.5-2.0	2-5..5	3-4	1
of *B.mori*	IIINSTAR	27	80-90	2.0-4.5	8-10	3-4	2
	IIIINSTAR	26	75-80	4.5-6.2	35-45	4-5	3

For 100 disease free laying .

Table 5 : Average of ingestion, egestion, assimilation, tissue grwoth in different instars of *B. mori*

Larval Instar	Ingestion Leaf Consumption	Fresh wight in grams Egestion	Assimilation	Tissue Growth
I - INSTAR	0.400 ± 0.002 (0.2 9)	0.1000 ± 0.001	0.3 00 ± 0.002 (0. 3 8)	0.048 ± 0.002 (0.20)
II - INSTAR	2.197 ± 0.001 (0.61)	0.580 ± 0.001 (2.04)	1.617 ± 0.001 (2.05)	0.480 ± 0.002
III - INSTAR	6.327 ± 0.003 (4.6 5)	1.740 ± 0.001	4.587 ± 0.002 (5. 7 8)	1.850 ± 0.017 (7. 66)
IV - INSTAR	17.200 ± 0.047 (12. 6 3)	5.6 00 ± 0.69	11.600 ± 0.100 (14.62)	5.600 ± 0.079 (23. 17)
V - INSTAR	110.060 ± 0.021 (8 0.8 2)	48.8 10 ± 0.028	61.250 ± 0.047 (77. 19)	16.200 ± 0.094 (67.03)

± Values indicate Standard Error (SE): instar wise percentage of ingestion, assimilation and tissue growth are given in parenthesis.

Table 6: Mean efficiency of food utilization by *Bombyx mori* larvae

Instar	Approximate Digestibility (AD%)	Efficiency	
		Ingested Food (ECI %)	Digested Food (EC D%)
I - INSTAR	74.998 ± 0.106	11.998 ± 0.248	15. 99 3 ± 0.456
II - INSTAR	76.600 ± 0.025	22.2 3 8 ± 0.25	30.67 5 ± 0.024
III - INSTAR	72.44 8 ± 0.018	29. 2 3 8 ± 0.2 25	40.330 ± 0.348
IV - INSTAR	67. 4 3 8 ± 0.048	32 552 ± 0.379	46.26 5 ± 0.315
V - INSTAR	55.65 3 ± 0.032	14.72 0 ± 0.081	26.45 0 ± 0.134

± Values indicate standard error (SE).

remains at same lebel throughout the embryonegenesis, The fat body of the moth exhibit sexual dimarphism in lipid contents. (Fig - 2).

DISCUSSION

In the present study detail observations on utilization of host plant and its interaction with the larvae of *Bombyx mori* have been recorded which have been mentioned in table 4. It has been noticed that due to shortening. of feeding period, the larval period got extended in comparison to continuously fed larvae. During fourth instar, it was less pronounced, however, during Vth instar, there was difference of about one day between 0 and 6 hrs/day of food deprivation. No remarkable difference was noticed between 0 and 3 hrs/day as shown in table (5). The pupal period did not show any difference between the treatment. Increasing level of food deprivation showed increase adverse effect of the survival percentage of the larvae.

Data, on food deprivation effect on the quantity of food ingested, faecal matter produced, food digestion and gain in body weight have been shown in table (6). Which showed an increasing trend with advancement in larval stage. These findings are in agreement with those reported by Kogan and Cope (1974), Ramdev (1978) on Achoea janata, Mehrotra et.al. (1972) an Locusts and Nath *et al.,* (1990) on Diacrasia.

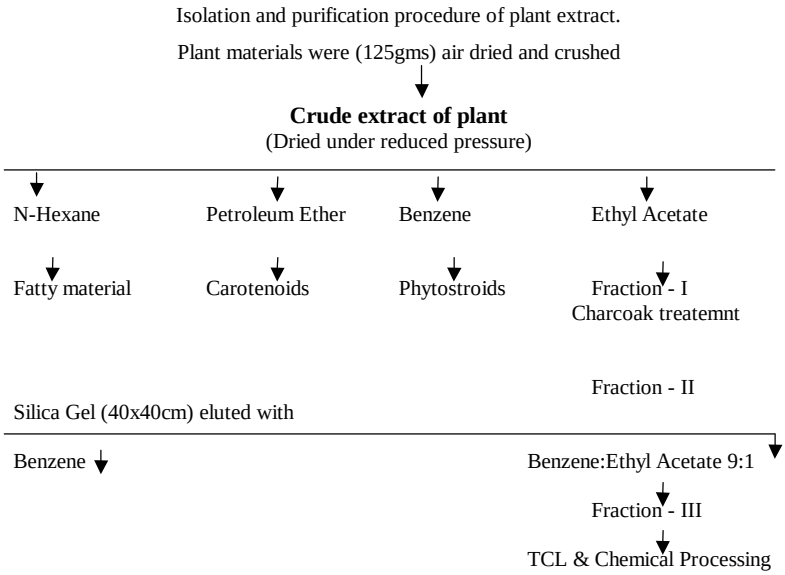

Fig. 1: Singh et, al. method (1989).

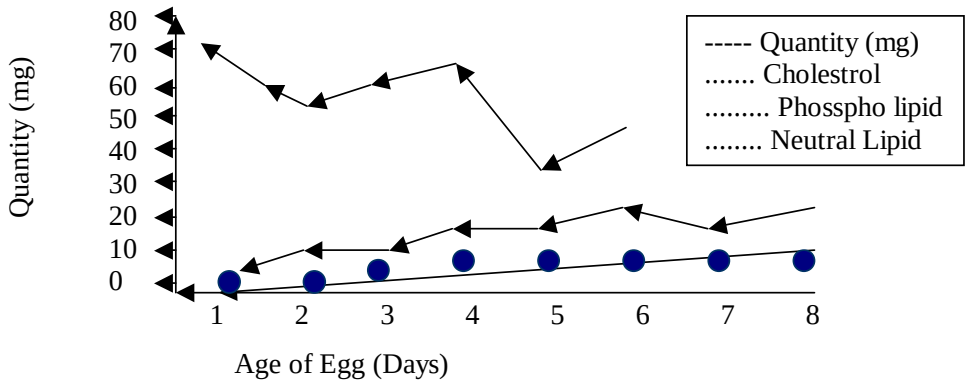

Fig. 2: Showing lipid contents of *Bombyx mori* during the embryonic development

REFERENCES

1. Chino H. and Gilbert, L.I., Lipid release and transport in Insects. *Bioche. Biophysiol*. A CTA; **98**: 94-110 (1965).
2. Jackson L.L., Cuticular lipids of insects. *Lipids*; **5**: 38-41 (1980).
3. Kogan M and Cope, D, Feeding and nutrition of insects associated with soyabean. *Ann - Entomol. Soc., Am*: **67**: 66- 72 (1974).
4. Mehrotra, K.N. Rao, P.J. and Faruqui, T.N.A., The consumption. digestion and Utilization of by Locust *Ent. Exp. Appl.*, **15**: 90- 96 (1972).
5. Nath T.N.:Shivnath and G.Subbarao., Effect of food deprivation of dry matter Utilization shell and cocoon weigth and fecundity of multivoltine silkworm, *Bombyx mori* Linn. race Nistani. *Ind. J. Seri*; **29**(2): 174-181 (1990).
6. Ramdev, Y.P., Studies on the consumption and utilization of caster Ricinus communis

Linn. by the cestar semilooper, Achola janota M.Sc thesis, I.A.R.I., New Delhi (1978).

7. Saxena H.K., Studies on the utilization of Lipid in Bombyx mori. Ph.D. Thesis, BarkatUllah University, Bhopal. 180 (2000).
8. Smith, S.L. Walker, E., Lawarance, B and Gilbert, I., Studies of biosynthesis of Ecdyosone and 20 - hydroxy - ecdyosone in the tabacoo. hornworm, Manduca sexia, progress in Ecd.Res. Edt. Hoffmann. Elsvier Bio - Medical Press: 139 - 162 (1980).