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Effect of a Nuclear Polyhedrosis on Carbohydrate, Glycogon and Fat Content of *Spodoptera litura* F*

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ABSTRACT

Sequential changes in total carbohydrates, glycogen and fat content in the larvae of *Spodoptera litura*, following infection with a nuclear polyhedrosis virus were studied. There was no marked difference between the healthy and virus infected larvae in their total carbohydrates, glycogen and fat content up to an intermediate stage of infection (i. e., 3 to 4 days after inoculation). But a substantial decrease in the levels of total carbohydrates and glycogen occurred on the fifth day and a similar reduction in the amount of fat on the fourth and fifth days following infection.

INTRODUCTION

Many factors such as diet, starvation and age of an insect may influence its carbohydrate and fat content (Wigglesworth, 1953). Morris, (1962) observed that nuclear polyhedrosis infection caused a marked reduction of glycogen in the larvae of *Lambdina fiscellaria somniaria* and Mamedniyazor *et al.* (1966) reported a similar decrease in the total lipid level of the silkworm, *Bombyx mori*. The present paper reports the effect of a nuclear polyhedrosis infection on the total carbohydrates, glycogen and fat content in the larvae of *Spodoptera litura*.

MATERIALS AND METHODS

The larvae used in these studies were drawn from stocks reared in the laboratory on castor *(Ricinus communis* L.) leaves. A purified suspension of freshly isolated polyhedra from diseased larvae of *S. litura* was used as the infective material. Early fourth instar larvae were incoulated with 1,00,000 polyhedra each by a spot feeding technique. Larvae treated similarly but without the virus inoculum served as control. The inoculated and control larvae were reared individually in small plastic containers and virus free castor leaves were provided as food.

Samples of larvae for analyses were drawn at intervals of 1, 2, 3, 4 and 5 days after inoculation. Three samples of each stage were selected and the number of larvae per sample varied depending on the weight. The analyses were done on fresh whole body homogenates. Carbohydrates were extracted as outlined by Crompton and Birt (1967) and glycogen was precipitated from this extract following the technique of Roe *et al.* (1961). Total carbohydrates and

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glycogen were estimated by the anthrone method (Fairbairn 1953). Fat determinations were done according to the procedure described by Orr (1964) on separate samples collected as described above.

RESULTS AND DISCUSSION

The results of analyses of total carbohydrates, glycogen and fat content in healthy and virus-infected larvae are given in Table 1.

There were no significant difference between the healthy and virus-infected larvae in their total carbohydrates and glycogen content until the fourth day after inoculation. But on the fifth day the infected larvae had markedly lower levels of these compounds than in healthy ones. One of the symptoms of virus infection in Lepidoptera is cessation of feeding several days prior to death. In the present experiment, the infected larvae

TABLE 1. Total carbohydrates, glycogen and fat content (expressed as mg/g body weight) in healthy and virus-infected larvae of *S. litura*

Post inoculation period in days	Total carbohydrates		Glycogen		Total fat	
	Healthy	Virus infected	Healthy	Virus infected	Healthy	Virus infected
1	3.57	3.42	2.28	2.02	33.63	33.22
2	3.55	3.68	0.83	0.88	28.89	26.84
3	6.25	5.24	3.11	2.74	30.16	35.81
4	5.27	5.05	1.82	1.65	36.26	24.31
5	7.06	3.43	3.40	1.41	43.56	22.46
C. D. (P = 0.05)	1.62		—		10.43	

fed very little on the fourth day and did not feed on the fifth day. It is known that the starvation could cause a depletion of carbohydrates in many insects (Mellanby 1932; Steinhaus, 1949; Baude, 1967). Thus starvation induced by the virus infection could be a reason for the observed loss of total carbohydrates and glycogen in the present instance. It is also possible that the glycogen depletion results, at least in part, from an interference with enzyme activity by the virus as observed by Bergold (1959).

The fat content in virus-infected larvae did not show significant variation from that of the healthy ones during the three days following inoculation. But it was significantly lower on fourth and fifth days. The data further show that the fat content in diseased larvae declined after three days recording the minimum amount on the fifth day. This indicates a depletion of stored up fat. But in healthy larvae there was a conspicuous accumulation of fat during this period. As in the case of carbohydrates,

starvation could cause depletion of stored fat also, since it is known that a considerable number of insects utilize fat as a source of energy during starvation (Fast, 1964). Jacob (1972) observed that the adipose tissues of *S. litura* were heavily infected by the virus. This results in a marked weakening of the adipose tissue system and consequent dislocation of its normal functions of synthesis and storage of fat. Hence it is possible that decreased food intake and weakening of the adipose tissue system resulting from virus infection force the larvae to live upon the reserve fat.

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