Uric Acid of Pine Moth, Dendrolimus spectabilis Butler

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松蟲의 尿酸에 關하여

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摘 要

1. 松虫(*Dendrolimus spectabilis*)의 尿酸을 成長과 變態에 따라 測定하였다.
2. 初期幼虫體의 尿酸濃度는 比較的 낮으나 前蛹期에서 增加, 3日된 蛹에서 最高度에 達하고 後期蛹에서는 減少, 後期의 成虫에서 最少値를 보이고 있다.
3. 一般的으로 male은 female보다 높은 濃度의 尿酸을 가지고 있다.
4. Haemolymph에 있어서 尿酸濃度의 變化는 不規則的이나, feces에 있어서는 上昇하는 경향을 보이고 있다.

INTRODUCTION

In general, insects are uricotelic, and uric acid is the main end product of nitrogenous metabolism. It is a well known fact that uric acid usually acounts for over 80% of the nitrogen of the excreta. Studies on the uric acid of insects have been made by many workers (Florkin, 1937; Taira and Nawa, 1957, 1958; Srivastava and Gupta, 1960; Eguchi 1961; Bernard and Fixter, 1963; and Barrett and Friend, 1966). Florkin (1937) carried out the first complete studies on the changes in the uric acid concentration in the haemolymph of a metamorphosing insect. He found that over the 19 day period between spinning and emergence, uric acid concentration in the haemolymph of the silkworm, *Bombyx mori*, varied from 6.8 mg/100 ml to 14.8 mg/100 ml plasma. Srivastava and Gupta (1960) have also studied the excretion of uric acid in *Periplaneta american* L. Eguchi (1961) reported the relation between uric acid content and xanthine dehydrogenase activity in several translucent and normal silkworms, Bernard and Fixter (1963) the uric acid content of *Drosophila* during and after metamorphosis, and Barrett and Friend (1966) the uric acid concentration in the haemolymph of *Rhodnius prolixus* (STÅL) during growth and metamorphosis.

The present study was undertaken with a view to measure the uric acid of pine moth, *Dendrolimus spectabilis* during growth and metamorphosis.

MATERIALS AND METHODS

The larvae of fifth-instar were collected from the vicinity of Seoul city and maintained at 26°C in rearing box containing pine needles. The pine needles were changed daily and at the desired age the samples were obtained from the box. The haemolymph was collected in a micropipette, and the tissue of body and feces were prepared according to the method of Eguchi (1961).

The uric acid was determined according to the method of Brown adopted by Eguchi (1961) with the following minor modifications. To 1 ml of the haemoylmph sample 7 ml of distilled water, 1 ml of 10% sodium tungustate and

1 ml of 2/3 N sulfuric acid were added and centrifuged.

After 1 ml of the supernatant was diluted with 1 ml of distilled water, 2 ml of sodium cyanide, 2 ml of urea solution and 1 ml of uric acid were mixed. And the resulting colour was measured at 660 mμ using a Beckman spectrophotometer.

RESULTS AND DISCUSSION

Uric acid concentration is presented in Table 1.

As shown in Table 1, uric acid concentration in body of the early larva is relatively low. Following prepupation, however, it increases to a maximum at 72 hours (pupa, 3 days), decreasing in the late pupa, and showing minimum values in the late adult. This result generally is similar to that of Bernard and Fixter (1963). They reported that the concentration of uric acid was maximum at 36 hours following pupation. But in the present study it reached its maximum values at 72 hours. Both adults, male and female, contain small amount of uric acid in comparison with the pupa.

Table 1. The uric acid of pine moth, *Dendrolimus spectabilis* Butler during growth and metamorphosis.

Stages		Uric acid (mol./ml)		
		Body	Haemolymph	Feces
6 th instar larva		40.7	3.04	7.3
7 th instar larva		43.2	2.72	7.7
8 th instar larva		48.6	2.70	8.2
Prepupa, 1 day		67.9	5.25	
Pupa, 1 day	male	87.8		
	female	66.7		
Pupa, 3 days	male	109.3		
	female	69.8		
Pupa, 6 days	male	104.1		
	female	68.6		
Pupa, 8 days	male	90.2		
	female	68.1		
Adult, 1 day	male	42.9		
	female	31.2		
Adult, 5 days	male	24.6		
	female	12.5		

And male represents higher values than female in uric acid concentration throughout the stages. This is not in conformity with the result of Bernard and Fixter (1963). They reported four-day-old adult females of the strains $\begin{matrix} y \\ y \end{matrix}\rangle$, wt, and bwst contained more uric acid than their male counterparts, but by 8 days all but $\begin{matrix} y \\ y \end{matrix}\rangle$ showed no difference. This may depend on species and on the differences of uric acid-producing systems of insects.

An accumulation of uric acid by insect pupae had been reported by many investigators (Brown, 1938; Anderson, 1948; Ludwig, 1954). The same has also been observed for the pine moth. In general, the changes were irregular of uric acid concentration in haemolymph, while feces showed increasing tendency with the growth of larvae. Haemolymph volumes vary considerably during molting and after metamorphosis of insect. Accordingly, Barrett and Friend (1966) noted that an increase of uric acid concentration in the haemolymph was due to a decrease of haemolymph volume. However, in the present experiment this is uncertain because haemolymph volume per individual was not measured throughout the stages.

SUMMARY

1. The uric acid of pine moth, *Dendrolimus spectabilis* Butler during growth and metamorphosis was measured at stages of larva, prepupa, pupa and adult.

2. The concentration of uric acid in body of the early larva is relatively low. Following prepupation, however, it increases to a maximum at 72 hours (pupa, 3 days), decreasing in the late pupa, and showing minimum values in the late adult (5 days).

3. The male generally has higher concentration than female in uric acid.

4. The changes in the uric acid concentration in haemolymph are irregular, while feces is showing increasing tendency.

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