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SHORT COMMUNICATION

THE FATTY ACID COMPOSITION OF THE LADYBIRD BEETLE, *COLEOMEGILLA MACULATA* (DEGEER) DURING HIBERNATION

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Abstract—1. A natural population of ladybird beetles, *Coleomegilla maculata*, was sampled at eight intervals during hibernation.

2. Oleic acid (18:1) accounted for more than 60 per cent of the total fatty acids of the beetles.

3. The fatty acid composition of the beetles remained fairly constant throughout hibernation, except for a great increase in the proportion of arachidonic acid (20:4) toward the coldest part of the winter, and its subsequent decline toward spring.

INTRODUCTION

THE FATTY acid composition of many insect lipids has been determined (Fast, 1964; Young, 1967), but the relations which have been sought between hibernating insect lipid composition and ambient temperature generally have involved animals in the laboratory, and little is known of seasonal changes in fatty acid composition. A recent report on mosquitoes (Buffington & Zar, 1968) indicates that more investigations of natural populations are needed, and this paper presents preliminary data on a ladybird beetle, emphasizing this view.

MATERIALS AND METHODS

Specimens of the beetle, *Coleomegilla maculata* (Coleoptera: Coccinellidae), were collected in Trelease Woods, a deciduous forest about 10 miles north-east of Urbana, Illinois. The animals were found in the woods only during the hibernating period of October (1966) through May (1967). While some individuals could be found on the herbaceous foliage in October and May, the beetles were all located in large groups beneath the leaf litter during the other months of collection. On collection, the beetles were killed immediately with chloroform vapor and were frozen within 2 hr. After freeze-drying, the ether extraction, transmethylation and gas–liquid chromatography of the fatty acids were performed as previously described (Buffington & Zar, 1968). Chromatograms were run as long as the known retention time for methyl docosahexaenoate. Determinations of the caloric value of pulverized beetles were performed using a Parr 1411 oxygen bomb calorimeter.

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RESULTS AND DISCUSSION

Compared to other members of the order Coleoptera (Fast, 1964; Young, 1967), *C. maculata* possesses small proportions of palmitic acid (16:0) and linoleic acid (18:2), and a large proportion of oleic acid (18:1) (Table 1). Arachidonic acid (20:4), not commonly reported in insects, was found in this species to increase from a negligible amount in the autumn to a high peak in January and February, after which it decreased greatly toward spring. These changes in arachidonic acid content were reflected in the iodine values of the total fatty acids, as was the increase in linoleic acid in May.

TABLE 1—LIPID ANALYSIS OF *C. maculata* AT INTERVALS DURING HIBERNATION

	1966			1967				
	22–23 Oct.	15 Nov.	14 Dec.	22 Jan.	14 Feb.	19 Mar.	16 Apr.	16 May
Fatty acids* (%):								
12:0	0·3	0·1	0·2	0·1	0·2	0·3	0·2	T†
12:1	0·2	0·5	0·3	0·2	0·2	0·3	0·2	T
14:0	3·9	2·0	3·8	2·4	2·7	2·6	3·0	1·8
14:1	0·5	0·5	0·4	0·2	0·2	0·2	0·4	0·4
16:0	8·0	3·1	6·0	6·2	5·5	5·3	4·0	4·2
16:1	5·6	3·2	5·1	4·9	4·5	5·2	4·9	0·1
18:0	3·5	3·4	3·4	3·6	2·2	2·7	2·1	1·3
18:1	69·1	77·1	69·7	62·1	67·9	71·4	71·7	73·1
18:2	7·0	8·4	8·4	11·1	9·3	9·2	11·2	17·6
18:3	1·9	1·5	2·0	2·0	1·4	1·8	1·5	1·2
20:4	T	0·2	0·8	7·2	6·1	0·9	0·7	0·3
Iodine value of fatty acids	86·4	93·6	91·9	110·7	107·0	94·8	96·7	102·4
Body lipids (% of dry wt.)	33·4	25·9	28·3	20·9	28·0	25·2	27·8	17·1
Body wt, mg (mean, dry)	9·8	11·8	10·2	4·4	5·3	5·0	—	4·0
Caloric content (g-cal/mg)	6·2	5·9	6·1	5·6	6·2	6·1	5·8	5·9

* Carbon chain length: number of double bonds.
† T = "trace", meaning less than 0·1 per cent.

Van Handel (1967) has contested the report of Harwood & Takata (1965) that mosquitoes which overwinter as adults are induced by winter temperature and photoperiod to deposit lipids with increased unsaturation. Preliminary observations on a wild population of such a mosquito seem to support his contention (Buffington & Zar, 1968). However, the finding in the present study of a striking mid-winter increase in lipid unsaturation suggests that more extensive studies of this kind are needed.

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