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FLIGHT MUSCLE-GLYCOGEN OF SOME BUTTERFLIES (LEPIDOPTERA)

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GLYCOGEN has been shown to be present in the insect muscles by some workers in the past[1-7]. But all these workers have estimated this energy-yielding compound from the flight muscles as a whole, irrespective of their type. Because of this lacuna, the present study has been undertaken on 8 species of butterflies to ascertain the differences if any for glycogen storage in the longitudinal dorsal muscles (LDM) and tergosternal muscles (TSM).

Various species of butterflies were collected in the early hours of the day from the Botanical Garden of the Punjabi University. The butterflies were rested for an hour in a spacious cage, where flower pots were kept. The specimens were then dissected under stereoscopic binocular in physiological saline, so as to obtain the longitudinal dorsal and tergosternal muscles. The terminology used is based on the work of Snodgrass[8]. The muscle samples were blotted dry, weighed and proceeded with, to extract and estimate glycogen. For this purpose, the method of Heatly[9] was used while the estimations were done according to Montgomery[10].

The estimated amount of glycogen in the two different types of the flight muscles *i.e.* LDM and TSM of 8 species of butterflies is given in table 1, which reveals no uniform pattern of glycogen deposition. Glycogen in TSM ranges from 1.55 to 5.58 mg/g wet wt and in LDM from 1.48 to 5.32 mg/g wet wt in the different species used in the present study.

Sacktor[4] while studying the flight fuel of insects has commented in general that the species belonging to order Diptera and Hymenoptera, use carbohydrates as the main substrate for energy, but Zebe[11] has expressed that in other insects including Lepidoptera and Orthoptera, fats are used, even though glucose is available. The present findings on the 8 species of butterflies reflect that though the contents of glycogen are not very high in comparison to certain other groups of insects, yet the reserves are available in the flight muscles of these insects fairly in good amount, and this observation provides a good reason to believe that the lepidopterns (butterflies) use this compound also for energy production. This observation also strengthens and supports the views expressed by van Handel and Nayar[12], who have recently questioned the exclusive use of fat in Lepidoptera. These workers have de-

monstrated the direct use of carbohydrates during flight of the moth, *Spodoptera frugiperda*. The use of carbohydrates during flight of some other lepidopterns is also indicated by the findings of Gussin and Wyatt[13], and Stevenson[14].

Another significant deduction that can be made from the data presented in table 1, is that the ratio of LDM to TSM is above unity in all the species of butterflies indicating a uniformly higher rate of glycogen deposition in the tergosternal muscles than in the longitudinal dorsal muscles. It is well known from the work of Snodgrass[8] that tergosternal muscles are responsible for the upstroke of the wings while the longitudinal dorsal muscles help in the down stroke. Hence the quantum of mechanical work done in the two cases is different, the TSM being under greater stress than the LDM and hence requires more fuel reserves.

Table 1 *Glycogen content of longitudinal dorsal muscles (LDM) and tergosternal muscles (TSM) of butterflies (Lepidoptera).*

Sr. No.	Species	mg/Glycogen/g wet wt. ± SD LDM	TSM	Ratio LDM : TSM
A. Fami-Papillionidae:				
1.	*Papilio polytes*	4.65 ± 0.06	5.58 ± 0.03	1 : 1.25
2.	*Papilio demoleus*	2.40 ± 0.08	4.19 ± 0.02	1 : 2.29
B. Fami.-Pieridae:				
3.	*Irias marianne*	5.32 ± 0 42	5.42 ± 0.25	1 : 1.02
4.	*Eurema hecabao*	3.13 ± 0.04	4.88 ± 0.21	1 : 1.82
5.	*Catopsilia pyranth*	1.90 ± 0.07	2.32 ± 0.02	1 : 1.50
6.	*Catopsilia pomona*	1.66 ± 0.08	2.22 ± 0.01	1 : 1.85
7.	*Ixias pyrene*	1.65 ± 0.04	3.40 ± 0.08	1 : 3.68
C. Fami.-Danaidae				
8.	*Danaus chrysippus*	1.48 ± 0.01	1.54 ± 0.02	1 : 1.12

Each value is an average of atleast four determinations. SD = standard deviation. Ratios of LDM : TSM were calculated from their respective average values.

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A NEW AVIAN CESTODE *PROFIMBRIARIA BACZYNSKAE* N. SP. FROM AN INDIAN SURKHAB

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THE paper presents the first Indian report on genus *Profimbriaria*[1], subfamily Fimbriariinae[2] of family Hymenolepididae[3]. The study was based on 24 worms collected from 3 surkhab, *Tadorna ferruginea* (Pallas) examined at Fatehpur and Pauri, U.P. The lone previous report on type species, *P. multicanalis*[4] from *Scolopax gallinago* was from Russia. Yamaguti[5] also considered this to be the only known species of the genus whose description was based only on the study of mature proglottides. However, the details of pseudoscolex, scolex (figure 1) and strobila of the present specimens revealed 33–108 × 3.54 mm. worm