Studies on glycogen profile avian cestodes

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ABSTRACT
The present investigation deals with the content of glycogen in avian Cestodes viz., Cotugnia orientalis Sp. Nov., Raillietina microscolenia Fuhrmann, 1908, Davenia yamaguti Sp. Nov., Vampirolepis indica Sp. Nov. and its host tissue i.e. infected and normal intestinal tissue. The present study indicates that the amount of glycogen was lower in the body of parasites that infected and normal intestinal tissue of the host. As well as the amount of glycogen present in all cestode parasites are some variable due to its size and its habitat.

Key words : Avian cestodes, Glycogen profile

Carbohydrates are the chief energy source in parasitic cestodes. In view of the importance of carbohydrates in helminthes any difference in their carbohydrate metabolism and that of their hosts might be usefully exploited in helminth control. The cestode parasites utilize the food from the intestinal guts of hosts. The metabolism depends on the feeding habits and the rich nourishment available in the guts of the hosts. The parasites use this nourishment for their normal development and growth. A major part of energy source utilized by the parasite is from carbohydrates, the percentage and location of carbohydrates in the host, where the environment is rich for nourishment and normal development and reproduction of the parasite is accounted in the host diet. The host carbohydrate also has an effect of growth; worms grow better in a host, feed on protein free diet containing carbohydrates.

Glucose is very important energy source for many helminthes in habiting the gut of vertebrates. It is generally belived that helminthes absorb glucose against a concentration gradient and use their endogenous carbohydrates as an energy source only when it is unobtainable from outside. Similarly, glycogen in most of the cestodes provides a significant reserve store of energy, particularly in forms which are parasitic in animals and which exist in environments of low oxygen tension.

Some workers have previously experimented on the carbohydrate metabolism of Oochoristica, Moniezia expansa, Moniezia benedinia, Taenia saginata, H.nana, H. utelii, H. diminuta Phylobothrium foliatiut, Echinococcus, Diphylidium canium, Taenia pisiformis, Taenia crosseps and Bothriocephalus gowkongensis. The quantitative values found in previous and of many the recent literature viz., Woodland (1923) Read et al. (1956), Read and Rothman (1958), Read and Simmons (1967), Von Brand (1950, 1966) and others have been obtained by rather unspecific chemical method, there often given higher values than those obtained by means of an enzymatic procedure (Glucose oxidize); Daughtry and Taylor (1956) studied regional distribution of glycogen in cestode of rat, Goodchild (1961) studied carbohydrate content of cestode H. diminuta from rat, Cheng and Dyckman (1964) described glycogen deposition in H. diminuta, Chopra (1981) studied glycogen contents and its distribution in cyclophyllidean cestode of sheep, Singh et al. (1987) described total carbohydrates and glycogen in Cestodes, Hiware and Jadhav (1994) studied quantitative studies of glycogen in some Cestodes, Pappas et al. (1999) studied glucose and glycogen gradient in H. diminuta and Ramalingam et al. (2004) studied Carbohydrate profile in relation to growth and differentiaation of proglottids in Avitellina lahorea.

MATERIALS AND METHODS

Some avian hosts and their intestine (Six hundred and forty eight intestines) were brought and these intestines were dissected for the collection of parasites. Three hundred seventy intestines were heavily infected with cestode parasites. The identical parasites are sorted, few of them fixed in 4% formalin for identification. The taxonomic observation turns then to a species of the genus Cotugnia orientalis Sp. Nov., Raillietina microscolcina

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Small pieces of infected, non-infected intestine and parasites viz., Cotugnia orientalis Sp. Nov., Raillietina microscolecina Fuhrmann, 1908, Davainea yamagutii Sp. Nov. and Vampirolepis indica Sp. Nov., were collected and washed thoroughly in distilled water and the glycogen content was determined by the method of Kemp et al., 1954.

The amounts of glycogen in the worms were calculated by the formula:

\[
\text{Percentage of glycogen} = \frac{100 \times U}{1.11 \times S}
\]

where,

\[U = \text{O.D. of unknown solution.}\]
\[S = \text{O.D. of the 100 mg of glucose standard.}\]
\[1.11 = \text{Conversion factor of glucose to glycogen}\]

\[S = 2\]

**RESULTS AND DISCUSSION**

The result obtained in the present study indicates that the glycogen content showed differential values in parasite, normal and infected intestine as the cestode parasites contain low glycogen as compared to its host intestine. This was true for all the worms and are summarized in Table 1.

Jadhav et al. (2008) reported such type of variation in glycogen content i.e. content of glycogen or carbohydrates is present in Davainea shindei is lower (15.17 mg/100 ml) where as in host intestine it contains high amount (17.56 mg/100 ml).

Graff and Allen (1963) determined glycogen content of Moniliformis dubis from male rat. The glycogen content of the male worms, when expressed as mg glycogen/gm wet weight of tissue, was over twice them the amount found worms i.e. 16.81 (I4.3) in male while 7.87 (11.76) in female.

Hopkins (1950) described artificial infection of Schistocephalus to pigeon from fish body. He determined the amount of glycogen in parasites body i.e. 11.9% (after infection of 24 hours) 10.8% (after 48 hours) and 10.0% (after 72 hours).

Odlang (1955) determined the amount of glycogen in trematode and cestode. This result indicates that lung flukes Haematoloechus complexus and H. medioplexus have significantly smaller amount of glycogen than frog tapeworm, crepidobothrium saphena Axmonn (1947) explained size of the parasite was on factor and that large flukes such as Fasciola, Fascioloides and Alassostoma stored greater quantities of glycogen then smaller worms, Habitat also very important factors which play important role in amount of glycogen present in parasites body.

The glycogen content of cestodes depends to some extent on the stage in the life cycle in few cestodes developmental history changes the growth and parasite is rapid at the first 18-24 hours and then slows down even if the concentration is high as it was in the early phase. It has been observed the same in Hymenlepis diminuta increases from 15% of the dry substance in 5 to 7 days old worms to 37% of the dry substance in 13 to 16 days old specimens (Mettric and Cannon, 1970). It has also been observed that the uptake of glucose is very much effective when CO\(_2\) is present in the surrounding than when it is absent.

The glycogen level in normal and post helminth infected tissue a Catla catla and Labeo rohita was determined by Anilkumar and Rajlingam (2009). They

| Table 1: Comparative chart of glycogen contents in normal host intestinal tissue, infected intestinal tissue and their parasites |
|-----------------|-----------------|-----------------|-----------------|
| Sr. No.         | Name of parasites | Normal intestinal tissue (mg/100 ml) | Infected intestinal tissue (mg/100 ml) | Parasites (mg/100 ml) |
| 2.              | Raillietina (R) microscolecina Fuhrmann, 1908 | 23.42             | 19.81             | 15.76             |
| 3.              | Davainea yamagutii Sp. Nov. | 22.52             | 20.27             | 16.21             |
summarized the content of glycogen is high in infected intestine and liver of *Catla catla* and *Labeo rohita* as compared to normal tissue of both fishes.

But in the present investigation, there is marked variation in glycogen content as lower glycogen level is noticed in parasite than infected and normal intestine of its host.

**Conclusion:**

The present study indicates that the amount of glycogen was lower in the body of parasites than infected and normal intestinal tissue of host. As well as the amount of glycogen present in all cestode parasites varied due to its size and its habitat.


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**LITERATURE CITED**


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