Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2022; 10(2): 107-109

Received: 04-01-2022
Accepted: 08-02-2022

P Raju
Assistant Professor, Department of Zoology, SRRGASC, Karimnagar, Telangana, India

Ch. Thirupathi
Assistant Professor, Department of Zoology, SRRGASC, Karimnagar, Telangana, India

B Suresh Kumar
Assistant Professor, Department of Zoology, SRRGASC, Karimnagar, Telangana, India

Achaiah N
Department of Zoology, University Arts and Science College (Autonomous), Kakatiya University, Warangal, Telangana, India

Corresponding Author:
Achaiah N
Department of Zoology, University Arts and Science College (Autonomous), Kakatiya University, Warangal, Telangana, India

A study on the carbohydrates profiles of *Raillietina cesticillus* (Molin, 1858) infecting domestic chick *Gallus domesticus*

P Raju, Ch. Thirupathi, B Suresh Kumar and Achaiah N

DOI: https://doi.org/10.22271/j.ento.2022.v10.i2b.8971

Abstract
In the present investigation, *Raillietina cesticillus* a cestodes parasite infecting domestic chick (*Gallus domesticus*) has been investigated to study the differential distribution of metabolites. It exhibits immature, mature and gravid regions that differ in morphology, anatomy, and physiology. Glycogen content is 27.81±1.79, 34.71±0.78 and 24.05±3.02 and the total carbohydrates are 36.23±2.94, 41.32±3.05 and 34.53±1.58 mg glucose/g fresh weight of the tissue respectively whereas pyruvate levels are 4.78±0.30, 4.86±0.40 and 4.60±0.10 µg of pyruvate /gm fresh weight of the parasite tissue. The data obtained revealed that higher levels of activities were associated with mature and immature regions, whereas the gravid segment with low levels of all these metabolites. They respire by anaerobic and semi aerobic modes therefore, the yield is lesser, and they store higher levels of glycogen.

Keywords: *Raillietina cesticillus*, glycogen, total carbohydrates and pyruvate

Introduction
Tapeworm infections are of considerable importance due to the lesions they produce in carcasses of meat animals, and some affect the health of human beings too. The cestodes exhibit a unique phenomenon in development. Proglottids formation continuously occurs in the neck region and newly formed segments are present at the anterior and the oldest proglottids are gravid present at the end of the tapeworm. In cestodes, a continuous gradient of metabolites and anatomical structures occurs representing development and even degeneration of reproductive organs. During this metabolic transition, morphological changes are accompanied by physiological and biochemical changes.
Although substantial advances have been made in our understanding of the epidemiology of infection with these parasites and in methods of their control and treatment, most experimental work on cestodes has been carried out on those species which are comparatively easily maintained in the laboratory i.e., Hymenolepis spp. Taenia spp. Moniezia spp. *Echinococcus granulosus*, Pseudophyllidea like Mansonides and *Ligula intestinalis*, and *Diphyllobothrium lotus*. The physiology of the remaining cestodes with a few exceptions has not been investigated. In the present study, biochemical aspects of carbohydrates have been investigated in the worm representing immature, mature and gravid regions.

Collection of parasites
Raillietina cesticillus, a poultry parasite commonly parasitizing the Indian fowl (*Gallus domesticus*) has been taken up for the present investigation. The intestine of the country fowls was obtained from the local poultry markets. As the birds were sacrificed, the intestines were collected in 0.9% normal saline from the Warangal region of Telangana and brought to the laboratory. The parasites were collected from the teased intestines and washed with 0.9% normal saline and washed in several changes to remove debris, mucus and sticky food material. Each parasite with scolex and other distinct parts was carefully picked up and placed into a separate petri dish for the identification. The mature worms approximately of the same size, length were selected for biochemical estimation.
In cestodes proglottids formation occurs in neck region, newly formed proglottids are present at the anterior and the oldest proglottids are present at the end of the tape worm, in between

mature one are present, the last gravid proglottids were filled with eggs. There occurs a continuous gradient of difference in metabolite as the worm exhibits transition in terms of Morphology, anatomy and metabolism. These are accompanied by physiological and biochemical changes [1]. Helminths contain large reserves of glycogen as respiratory substrate. Helminths are not capable of complete oxidation of glucose regardless of their habitat [2]. The parasitic helminths entirely depend for these requirements on the host. Glycogen is the energy source in helminth worms [3]. Many workers have studied the physiological and biochemical aspects of tapeworms.

The investigations of the biochemical aspects of parasites not only help in understanding the fundamental aspects of the biological phenomenon, but it also helps in recognizing metabolic pathways and reactions which are of greater physiological significance to the parasite than to the host as well [4, 5, 6, 7] studied the carbohydrate metabolism in worms.

It was proved that they store a huge amount of stored carbohydrates [8]. Glycogen is the principal carbohydrate stored [9] and was studied [10].

Material and Methods

Parasites were collected from small intestines of a naturally infected domestic chick from the Warangal region of Telangana, India. Some of the worms were processed for identification by following standard methods. Identification was made based on morphology, a number of scolices seen and the site of infection in the host. Identification was carried out with the help of Systema Helminthium volume-II [11] and Helminths, arthropods and protozoa of domesticated animals [12]. Immature proglottids with scolex, neck and anterior region, a mature region with reproductively active segments and a gravid region with eggs separated and biochemical investigations were conducted.

Pyruvate [13] total carbohydrates and glycogen content was estimated [14] ANOVA statistically evaluated the values obtained. The values are presented in table no.1

Results

Glycogen content is more in the mature region followed by immature and gravid segments. Total carbohydrates and Pyruvate also exhibited the same pattern. Pyruvate levels were more in metabolically active mature and immature regions than in the gravid region.

Table1 shows the levels of different carbohydrate metabolites. (Each value is a mean of six values with ±SE)

Table 1: Shows the levels of different carbohydrate metabolites

Content	Immature	Mature	Gravid
Glycogen	27.81±1.79	34.71±0.78	24.05±3.02
Total carbohydrates	36.23±2.94	41.32±3.05	34.53±1.58
Pyruvate	4.78±0.30	4.86±0.40	4.60±0.10

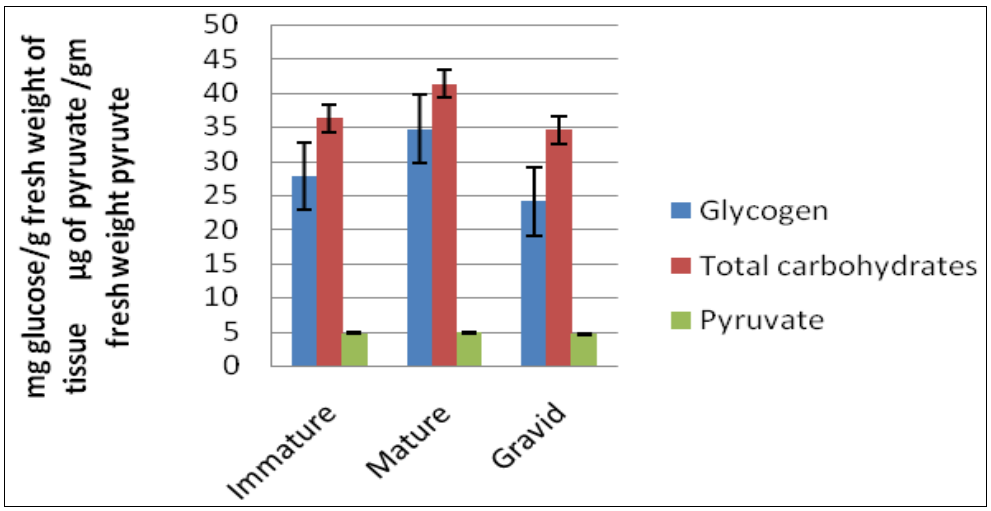

Fig 1: Showing the levels of different carbohydrate metabolites

Glycogen content is 27.81±1.79, 34.71±0.78 and 24.05±3.02 mg glucose/g fresh weight of tissue in immature, mature and gravid proglottids respectively. The total carbohydrates in immature, mature and gravid regions are 36.23±2.94, 41.32±3.05 and 34.53±1.58 mg glucose/g fresh weight of the tissue respectively whereas pyruvate levels are 4.78±0.30, 4.86±0.40 and 4.60±0.10 µg of pyruvate /gm fresh weight of the parasite tissue in immature, mature and gravid proglottids respectively and it was represented in the histogram. No.1. Glycogen content is more in the mature region followed by immature and gravid segments. Total carbohydrates and Pyruvate also exhibited the same pattern. The glycogen content in the present study reveals the gradient of distribution in immature, mature and gravid regions. The obtained values are comparable with those of *Hymenolepis citelli* [15, 16]. Higher pyruvate levels in the mature area may represent reactions of glycolysis at the PEP level to OAA and then to malate. Pyruvate is converted into lactate by LDH and excreted out. The present findings agree with the earlier reports

i, e more in mature followed by immature and gravid region [17, 18]. The differences may be due to differential environmental influence on different regions of worms and differences in permeability along the regions [19].

Conclusions

The present study revealedthe graded distribution of total carbohydrates, pyruvate and glycogen. *Raillietina cesticillus*

living in anaerobic and semi-aerobic environment store more amount of glycogen and it was conformed. The decrease in carbohydrate level in the gravid segment may be due to utilization in growth and differentiation. The mature region with higher carbohydrate content may be due to metabolic activities like reproduction.

References

1. Pappas PW, Barley AJ, Werdrop SM. *Hymenolepis diminuta* Glucose and glycogen gradients in adult tapeworm. Exptl. Parasitol. 1999, 46. 315-326.
2. Brand T Von. Metabolism of carbohydrates in the biochemistry of parasites. IInd Ed. Acad. Press, New York and London, 1973, 90.
3. Read CP, Simmons JE Jr. Carbohydrate metabolism in Hymenolepis (Cestoda). J Parasit. 1973;53;1023-1029.
4. McManus DP, Smyth JD. The physiology and biochemistry of Cestodes. Cambridge University Press, 1989.
5. Barrett Ward, Fairbairn. In biochemistry of parasites by Von Brand 1973: Academic Press. New York, 1971.
6. Srivastava CB. Quantitative studies on Glycogen in some cestodes collected from different hosts and localities of Western Maharashtra. Ind. Jr. Helminthology, Comm, 1994, 219-222.
7. Fioravanti, *et al*. Metabolic transition in the development of Hymenolepis diminuta. Parasitol Res. 1998;84:777-782.
8. Fairbairn DG, Werthim, Harpur RP, Schiller EL. Biochemistry of normal and irradiated strains of *Hymenolepis diminuta*. Exp. Parasitol. 1961;11:248-263.
9. Read CP. Fluctuation in the glycogen content in the cestode, *Hymenolepis diminuta*. J Parasitol. 1949b;35(8):46- 50.
10. Humbe A, Jadhav S, Borde SN. Biochemical studies of gastrointestinal cestode parasites in *Capra hircus* (L.) and *Ovis bharal* (L.) from Marathwada region. Int Multidiscip Res J. 2011;1(12):08-10.
11. Yamaguti S, Systema Helminthium. Cestodes of Vertebrates. Interscience Publishers Inc. New York, 1959, 2.
12. Soulsby EJL, Helmnths. Arthropods and protozoa of domesticated animals, 7th ed. London: Bailliere and Tindall, 1986, 809.
13. Griedman, Haughen. In Hawk's physiological chemistry edited by Oser 1954, Mc Grawhill, New York, 1943.
14. Carroll NV, Longley RW, Roe JH. The determination of glycogen in liver and muscle by use of anthrone reagent. J biol Chem. 1956;220(2):583-593.
15. Read CP. Carbohydrate metabolism of *Hymenolepis diminuta*, Expt. Parasitol. 1957;5:325-344.
16. Read CP, Rothman AH. The role of carbohydrates in the biology of cestodes. The effect of starvation on glycogenesis and glucose consumption in Hymenolepis. Exp. Parasitol. 1957b;6:280-387.
17. Ramalingam K, Vijayalakshmi V, Satyaprema VA. Carbohydrate profile in relation to growth and differentiation of proglottids in *Avitellina lahorea* (Woodland, 1927), anoplocephalid cestodes, Uttar Pradesh J Zool. 2004;24(3).
18. N Achaiah, Vijaya kumar, Raju Thirupathi, Suresh. Carbohydrate profile in relation to growth and differentiation of proglottids of cyclophyllidean cestode, *Raillietina tetragona* (Molin, 1858) infecting domestic chick, *Gallus gallus*. Uttar Pradesh Journal of Zoology. 2022;43(2):38-42. ISSN: 0256-971x (p).
19. Daugherty JW. The effect of host castration and fasting on the rate of glycogen sis in *Hymenolepis diminuta*. J Parasitol. 1956;42:17-20.