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Taxonomic and Biochemical Studies of Piscean Nematode *Camallanus Jadhavii* (Jadhav and Khadap, 2013) Parasitic in *Wallago Attu* (Bleeker, 1857)

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ABSTRACT

Present study deals with taxonomical and biochemical studies of nematode parasite *Camallanus jadhavii* (Jadhav and Khadap, 2003) Pathan et.al., 2011 parasitic in *Wallago attu* (Bleeker, 1857). The normal intestinal tissue contains more glycogen (31.54 mg / 100 mg), protein (29.28 mg / 100 mg) and lipids (22.40 mg / 100 mg) as compared to infected intestinal tissue (29.12 mg / 100 mg, 28.02 mg / 100mg and 20.16 mg / 100 mg), whereas low biochemical content in nematode parasite *Camallanus jadhavii* (27.38 mg / 100 mg, 24.80 mg / 100 mg and 18.46 mg / 100 mg. Intestinal parasites were capable of extracting nutritious materials from their host and thus represented a high level in glycogen, protein and lipid.

***Keywords*:** *Camallanus jadhavii* (Jadhav and Khadap, 2003) Pathan et. al., 2011; Taxonomical and Biochemical Content; *Wallago attu* (Bleeker, 1857)

1. INTRODUCTION

Parasitic biochemistry has great practical importance through chemotherapy and vaccine production and in understanding of the complex association involved in the host parasite relationship However; information in parasite biochemistry is patchy. It is a field growing in parallel with the new surge of interest in tropical diseases. Whereas previously parasitologists have been required to adopt biochemical methodology in order to stay abreast of development. All parasites still require a supply of energy for biosynthesis of macromolecules, growth, mechanical activity, reproduction etc. A major part of energy source utilized by the parasite is from carbohydrates. Carbohydrates are chiefly energy source in all parasites. Proteins are the most abundant organic molecules in cells constituting 50 percent or more of their dry body weight. The main significance of the proteins is their role in structural make up of the body rather than in the yield of the energy. Proteins serve a physiological system in many ways with their ubiquitous nature. They build up new tissue and maintain the structure of every cell/ tissue including its content of protein-containing enzyme systems. Lipids are of great importance to the body of parasites as the chief concentrated storage form of energy, besides their role in cellular structure and various other biochemical functions.

Helminths when live in the intestine of hosts, they utilize food from the gastrointestinal tract. The metabolism of these parasites depends on the feeding habits and the rich nourishment available in the gut of the host. These worms use this nourishment for their normal development and growth. Metabolic studies suggest that a complex nutritional relationship occurs between a parasite and its host. It has been observed in some Helminths that they are capable of fixing CO_2. Thus, it is clear that the parasites use the waste metabolic materials from the hosts intestinal mucosa very efficiently, where as, there are another to be capable of taking the nutritional material by direct contact with the mucosal wall. Von Brand et.al., 1964 and Von Brand, 1970, Weinland, 1901 a, b worked metabolic activity of tapeworms. The metabolic and in vitro studies suggest that cestodes need proteins from the predigested food from the hosts's intestine for various metabolic activities. Estimations of amino acids in cestodes by Good Child, C.G. et.al. (1966), Mishra, et.al. (1988).

The genus *Camallanus* was established by Railliet and Henry (1915) to include *C. lacustris* (Zoega, 1776). Species of the genus are widely distributed over the world. It has been studied that many species of this group of nematode are described from stomach or intestine of frog, turtle and most frequently from numerous fish species (Gupta, 1959; Yamaguti, 1961; Agrawal, 1967; Sood, 1989; Kuzmin *et al*., 2009). To date, there are generally few data is available on morphology and systemic evaluation of *Camallanus* sp. in India.

The present study describes a new species of camallanid nematode found in the swim bladder during a parasitological fauna survey of cat fish, *Wallago attu* (Bleeker, 1857) from Nanded Region, M.S. India.

Genus *Camallanus* is an intestinal tapeworm of freshwater fishes and have a serious impact on health productivity and quality of life, in addition gastro-intestinal disorders and lack of vital nutrients. Economically fishes are useful to man as a food, fish oil, leathers, medicines and disease control, fish meal and fish manure. Fishes are suffering from cestode infection, which leads to anemia and reduces the food value. The cestode parasites utilize the food from the intestinal gut of host. The metabolism depends on the feeding habits and the rich nourishment available in the gut of the host. The parasites use this nourishment for their

normal development and growth. Investigations into the biochemical profiles are revealing new facts, which would be very useful in developing a rational approach to design the anti helminthic therapeutics. Freshwater teleost *Wallago attu* (Bleeker, 1851) is in great demand due to its good taste, flavour, invigorating effect and still its market price is quite affordable. Keeping the view in mind the nutritional, economical and medicinal value of fishes the present work is done.

2. MATERIAL AND METHODS

Study area

Study was conducted in different collection sites of Nanded district. Nanded is situated in south eastern part of Maharashtra State. The Nanded district lies between 18.15 to 19.55 North latitudes and 97.07 to 98.15 East longitude. It covers an area of 10,528 sq.km.

Freshwater fish *Wallago attu* (Bleeker, 1857) (Fig. 1) were examined for nematode infection. Nematodes were collected, identical parasites were sorted out with the help of microscope, preserved in glycerol and morphological observations turned out to be Nematode *Camallanus jadhavii* (Jadhav and Khadap, 2003) Pathan et.al., 2011 (Fig. 2). Collected normal, infected intestinal tissue (small pieces) and nematode parasite were kept on blotting paper to remove excess amount of water. Material transferred in previously weighed watch glass and weight on sensitive balance.

Fig.1. *Wallago attu*

Biochemical content were estimated by following standard methods.

1) Glycogen was estimated by Kemp et. al., method (1954)

2) Protein was estimated by Gornall et. al., method (1949)

3) Lipid content was estimated by Folch et.al., method (1957)

3. RESULTS AND DISCUSSION

Taxonomy of *Camallanus jadhavii* Sp.

Body mediam, thin, transparent, wide anteriorly and tapering posteriorly. Cuticle thin, delicates, bears thin striations. Mouth opening dorso-ventrally slit like. Buccal capsule chitinous, consist of two valves, each with 10-14 longitudinal ridges of varying size in both

sexes. Buccal capsule forms a chitinous ring with the junction of oesophagus. Tridents present. Oesophagus consists of muscular and glandular parts. Posterior part of oesophagus joins to intestine. Intestine leads into short rectum that opens directly to exterior at the anus in female and in male into the cloaca.

Male Characters

Fig.2. Microphotoplate of *Camallanus jadhavii* sp.

Males are smaller than females and measures 8.22 mm in length and 0.98 mm in width. Buccal capsule long and measures 0.066 mm in length and 0.063 mm in width. Tridents present. Nerve ring surrounding the muscular portion of oesophagus and lies at 0.42 mm from anterior extremity.

Excretory pore lies at 0.52 mm from anterior extremity. Oesophagus consisting muscular and glandular parts and measures 1.29 mm in length. Total ten pairs of caudal papillae are present, out of them five pairs are pre-anal and five pairs are post-anal in position. Spicules are unequal and dissimilar in shape. Right spicule is long and measures 0. 258 mm in length while left spicule is short and measures 0.190 mm in length. Tail is curved and measures 0.118 mm in length.

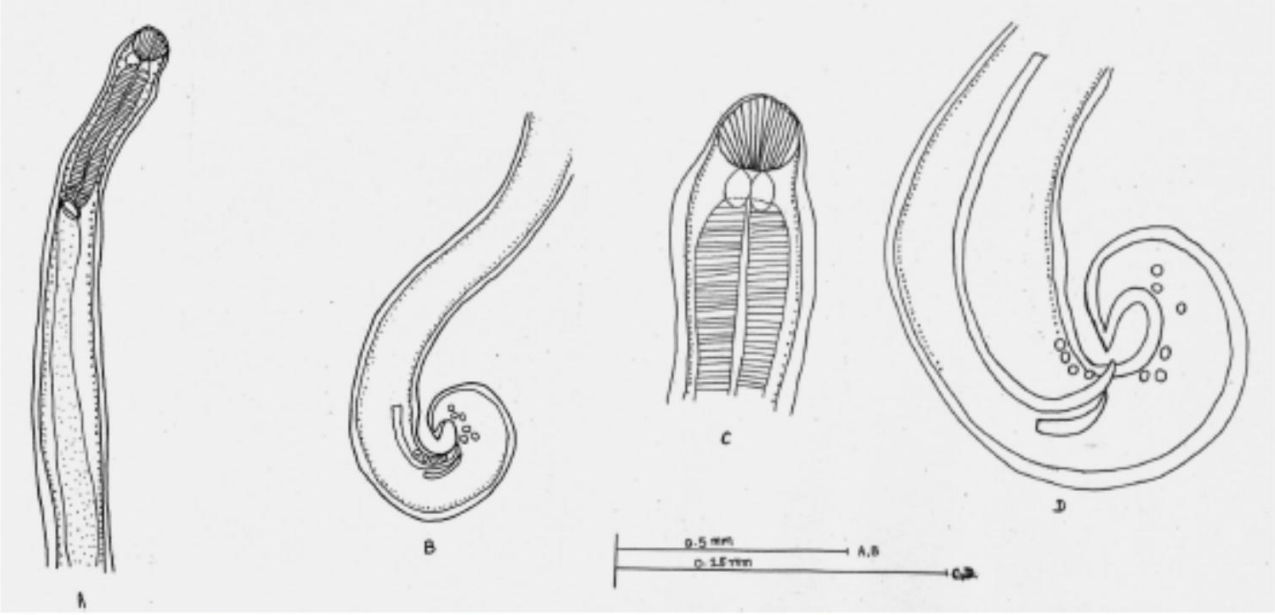


Fig.3. Camera Lucida Diagram of Male *Camallanus jadhavii* sp. A– Anterior Region ; B-Posterior Region ; C– Enlarged anterior Region and D– Enlarged Posterior Region

Female Characters

Females are longer than males and measures 9.42 mm in length and 1.12 mm in width. Buccal capsule long and measures 0.076 mm in length and 0.084 mm in width. Nerve ring surrounding the muscular portion of oesophagus and lies at 0.48 mm from anterior extremity. Excrecory pore lies at 0.56 mm from anterior extremity.

Oesophagus consisting muscular and glandular parts and measures 1.34 mm in length. Vulva is pre-equatorial, lies at 3.2 mm from anterior extremity. Vulval opening is an oval slit at mid-dorsal side of the worm. Muscular vagina runs posteriorly. Vagina gives of two opposed, distended uterine tubes.

Posterior uterine tube ends blindly, there is no ovary. Anterior uterine tube ends in a single anterior ovary. Eggs are oval to rounded in shape and measures 0.048 mm in diameter. Tail is pointed and measures 0.126 mm in length.

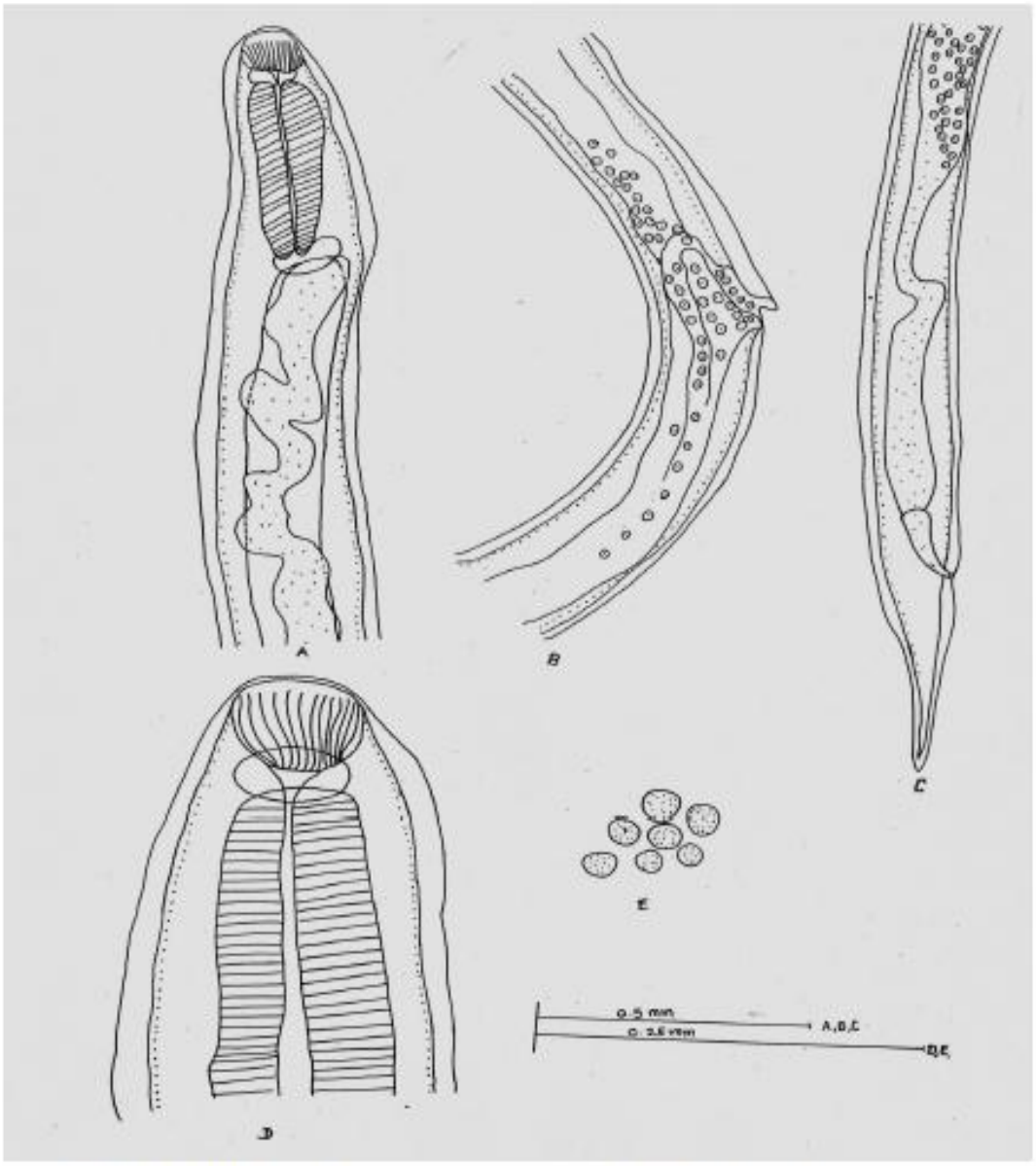


Fig 4. Camera Lucida Diagram of Female *Camallanus jadhavii* sp. A– Anterior Region; B-Middle Region ; C– Posterior Region and D– Enlarged Anterior Region E– Eggs

Biochemical Study

Glycogen, protein and lipid contents in the infected, non-infected intestinal tissue of *Wallago attu* and intestinal nematode *Camallanus jadhavii* (Jadhav and Khadap, 2003) Pathan et.al., 2011 are shown in Table 1 & Graph 1.

Biochemical contents (glycogen, Protein and lipid) in normal intestinal tissue of *Wallago attu* (Bleeker, 1857) is (31.54 mg/100 mg, 29.28 mg/100 mg and 22.40 mg / 100 mg); in infected intestinal tissue is (29.12 mg / 100 mg, 28.02 mg / 100 mg and 20.16 mg /

100 mg) where as in *Cammalanus jadhavii* (Jadhav and Khadap, 2003) Pathan et.al., 2011 is (27.38 mg / 100mg, 24.80 mg / 100mg and 18.46 mg / 100 mg.

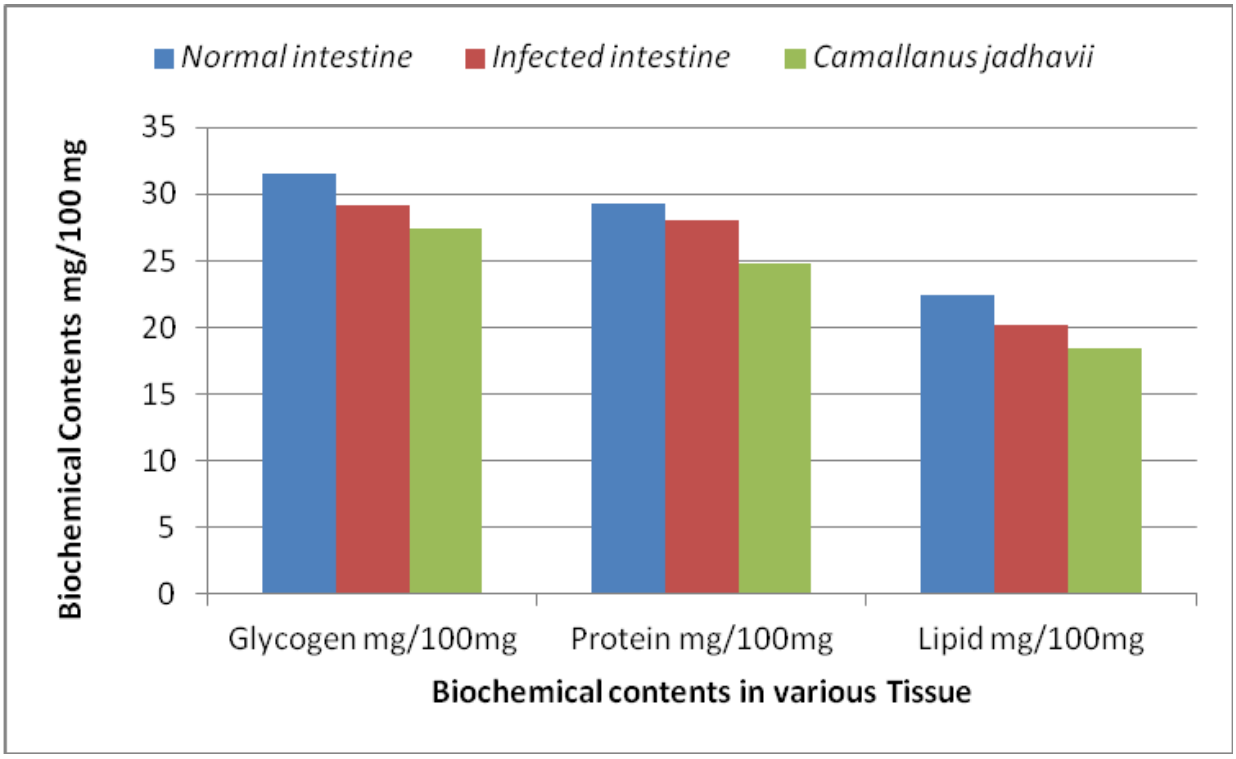
Table 1. Biochemical contents in the intestine of *Wallago attu* (Bleeker, 1857) and their relevant Nematode parasite *Camallanus jadhavii* (Jadhav and Khadap, 2003) Pathan et.al., 2011,

Sr. No.	Tissue	Glycogen mg/100mg	Protein mg/100mg	Lipid mg/100mg
1.	Normal intestine	31.54	29.28	22.40
2.	Infected intestine	29.12	28.02	20.16
3.	*Camallanus jadhavii sp.*	27.38	24.80	18.46

Similar finding were reported by Bhure and Nanware (2013) from *Channa stratus* naturally infected by *Gangesia*. Jadhav et.al (2008) reported low content of glycogen in *Davainea shindei* (15.17 mg/100mg), high in host intestine (17.56 mg / 100 mg). Bhure et.al.(2010) and Nanware et.al. (2010) reported amount of glycogen were lower in parasites than infected and normal intestinal tissue of host. Bhure et.al (2011) estimated glycogen contents in normal intestinal tissue is 93.25 mg / 100 mg, infected intestinal tissue contents 91.02 mg / 100 mg where as *Tylocephalum sp.* contents 88.28 mg / 100 mg. The glycogn level in normal and post helminth infected tissue a *Catla catla* & *Labeo rohita* was determined by P. Anilkumar and Rajlingam (2009); they 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. Graff and Allen (1963) determined glycogen content of *Moniliformiis dubis* from male rat. He noticed, when expressed as mg glycogen/gm wet weight of tissue, was over twice them the amount found worms i.e.16.81 (14.3) in male while 7.87 (11.76) in female.

Similar result for protein contents also reported by Jadhav et.al. (2008) from *Davainea shindei* i.e. amount of protein present in *Davainea shindei* is 13.20 mg/gm wt. of tissue where as in host intestine is 15.42 mg/gm wt. of tissue. Dhondge et.al. (2010) reported amount of Protein was lower in the body of parasites than infected and normal intestinal tissue of host. Bhure et.al., 2011 reported Protein contents in non-infected intestinal tissue was 30.12 mg/mg, infected intestinal tissue contents 27.72 mg/mg where as tapeworm *Tylocephalum sp.* contents 25.01 mg/mg wet tissue. Bhure *et al.,* (2012) recorded lower amount protein (15.88 mg/gm) in *Ascardia galli* as compared to infected intestine (19.33 mg/gm) and normal host intestine (19.77 mg/gm). Nanware *et al.,* (2012) studied amount of proteins in *Cotugnia* sp. is lower (5.77 mg/gm) as compared to protein present in infected intestine (6.66 mg/gm), in host normal intestine (16.22 mg/gm). Bhure *et al., (*2013) reported low amount of protein in *Moniezia expansa* (2.72 mg/gm wet weight) as compared to infected intestine of *Capra hircus* (3.63 mg/gm wet weight) and normal intestinal tissue of *Capra hircus* (4.09 mg/gm wet weight). Bhure et. al. (2015) reported amount of proteins present in nematode parasite *Spinitectus indica* sp. is lower (2.55 mg/gm wet weight) as compared to protein present in infected intestinal tissue (3.11 mg/gm wet weight) as well as in normal intestinal tissue of *M.armatus* (4.22 mg/gm wet weight).

The distribution of protein content shown in present study is an agreement with the previous study. Bhure and Nanware, (2015) determined amount of proteins present in *Gangesia sp*. (2.0 mg/gm) is lower as compared to protein present in infected intestine (2.44 mg/gm) as well as in normal intestine (3.66 mg/gm) of host *Wallago attu*.



Graph 1. Biochemical contents in the intestine of *Wallago attu* (Bleeker, 1857) and their relevant Nematode parasite *Camallanus jadhavii* (Jadhav and Khadap, 2003) Pathan et.al., 2011.

The difference in lipid content of the parasite due to the difference in diet. Hence there is a relationship between the lipid content of parasite and nutrient content in environment. Similar finding was recorded by Dhondge et.al. (2010) reported amount of Lipid was lower in the body of parasites than infected and normal intestinal tissue of host. Bhure et. al., (2011) reported Lipids contents in non-infected intestinal tissue was 19.60 mg/100 mg, in infected intestinal tissue contents 17.37 mg / 100 mg where as in tapeworm *Tylocephalum sp.* contents 16.74 mg / 100 mg. Jadhav et.al (2008) from *D. shindei* is 17.85 mg/gm and its host intestine is 19.85 mg/gm. Nanware et al. (2011) described regional distribution of glycogen in *Stilesia* sp. i.e. immature region contain low glycogen as compared to mature and gravid region. Higher content of lipid in older proglottids has led to the view that much of this lipid largely represents waste products of metabolism (Brand T. Von, 1952). M.R. Siva Sai Kumari (1994) reported total lipids content of cestode *Ncokrimia singhia* in immature mature and gravid region was 4.675 $\pm$1.215, 29.200 $\pm$0.608 and 31.902 $\pm$2.804 mg/gm fresh weight.

Pallewad et. al. (2015) reported Biochemical contents viz. glycogen, Protein and lipid in normal intestinal tissue of *Capra hircus L.* is (32.45 mg / 100 mg, 31.27 mg / 100 mg and 27.60 mg / 100 mg); in infected intestinal tissue is (29.20 mg / 100 mg, 28.36 mg / 100 mg

and 22.36 mg / 100 mg) where as in *Cotylophoron cotylophorum* (Fischoeder, 1901) Stiles et Goldberger,1910 is (26.32 mg / 100 mg, 23.60 mg / 100 mg and 18.42 mg / 100 mg). Bhure et.al. (2015) determined biochemical contents (glycogen, Protein and lipid) is high in normal intestinal tissue of *Mastacembelus armatus* is (27.47 mg / 100 mg, 27.27 mg / 100 mg and 17.36 mg / 100 mg); in infected intestinal tissue is (25.22 mg / 100 mg, 26.06 mg / 100 mg and 17.36 mg / 100 mg) where as low in *S. maharashtrii* sp. (24.32 mg / 100 gm, 20.90 mg / 100 gm and 12.42 mg / 100 gm); in *S. jadhavae sp.* (20.72 mg / 100 mg, 24.24 mg / 100 mg and 13.44 mg / 100 mg); in *S. madhavae sp.*is (23.42 mg / 100 mg, 25.00 mg / 100 mg and 15.84 mg / 100 mg,)*;* in *S. satarensis sp.* is (22.52 mg / 100 mg, 23.63 mg / 100 mg and 14.68 mg / 100 mg); in *S. mangalbaiae sp.*is (21.62 mg / 100 mg, 22.42 mg / 100 mg and 13.16 mg / 100 mg) and in *S. microrostellata sp.* is (21.17 mg / 100 mg, 21.21 mg / 100 mg and 12.88 mg / 100 mg).

Present investigation on Biochemical content in non-infected and infected intestinal tissue of host *Wallago attu* (Bleeker, 1857) and *Camallanus jadhavii* (Jadhav and Khadap, 2003) Pathan et.al., 2011 were found that parasites were capable of extracting nutritious material from their hosts and thus represented a higher level in glycogen, protein and lipids.

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