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LIPASE ACTIVITY IN THE DIGESTIVE TRACT AND LIVER OF *MORMYRIDAE* PISCES, FROM A SMALL LAKE IN ILORIN, NIGERIA

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ABSTRACT: Lipase activity in the digestive tract and liver of *Morimyrus rume ,Mormyrops anguilloides and Gnathonemus cyprinoides* from *a small lake in Ilo*rin was studied The digestive tract was divided into anterior, middle and posterior sections and the crude extract of these sections and liver of these fishes were assayed for lipase activity. Results indicated that there were lipase activity in the whole digestive tract and liver of *M. rume. M.anguilloides* and *G. cyprinoides* Evidence is therefore presented that the digestive tract including stomach of fishes is an important organ where lipid digestion occurs unlike the higher vertebrates.
Keywords: Fish, Enzyme, Lipase, Liver and Digestive tract.

INTRODUCTION

The family *Mormyridae* popularly referred to as elephant-snout fishes are highly variable in the shape of their heads and the extent of their dorsal and anal fins. They are characterized by narrow gill opening with opercular bone hidden under a layer of skin. The eyes are small and weak. They are bottom dwellers and are common in deep water where the current is not swift (Reed *et al.*, 1967). The six genera of mormyrides in freshwater: Mormyrops, Mormyrus, Marcusienus, Hyperopisus, Gnathonemus and petrocephalus (Holden and Reed, 1972).

The genus Mormyrus have a particular trunk like snout and a small terminal mouth at the end of the snout. The anal fin is less than half the length of the dorsal fin. The genus Gnathonemus have terminal mouth, or slightly below the level of the eyes while genus Mormyrops have elongated body and terminal mouth. The base of the dorsal fin originated after the anal fin. These fishes are commercially important to the fisheries of Nigeria.

The ability of fish and other vertebrates to use nutrients depends on factors such as synthesis of appropriate enzyme the production of the enzyme in suitable amount and the enzyme distribution along the gut lumen (Lundstedt *et al.*, 2002). Buddlington *et al* (1997) stated that analysis of gut section is the best way to assess the whole digestive capacity. Lundstedt *et al* (2002) observed that the background on the enzyme specific activities is fundamental in animal comparative biochemistry.

Some of the work reported on lipase include that of Luo and Dove (1996) which examined the effect of dietary copper and fat on Digestive enzyme activities in weaning pigs and showed that 250ppm of copper increase lipase and phospholipase activities in the small intestine. Lundstet *et al* (2002) showed that lipase activity was more active in the intestine of Brazilian catfish *Pseudoplatystoma coruscan* and the highest activity of lipase was observed in the midgut. The liver plays important roles in converting excess glucose and lipoproteins to fatty acids, it is therefore imperative that the lipase activity be measured in the liver because of its role in the body of the fish. Literature reviewed showed little or no work has been done on lipase activity in the *Mormyrids.* The objective of this study is therefore to show activity of lipase in the digestive tract of the *Mormyrids.*

MATERIALS AND METHOD

Specimens of *M. rume, M. anguilloides and G. cyprinoides* in this study were collected from a small lake in Ilorin, Nigeria between March and September, 2004 using gill nets. They were transported to the laboratory in ice chest after capture. Thirty-seven specimens wee examined. Standard laboratory measurements were taken: standard length and total weight. The head was separated from the body by decapitation. The digestive tracts were dissected out and the total length of each digestive tract was measured using measuring board. The digestive tract was divided into three sections according to De Silva and Anderson (1995).

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TISSUE EXTRACT: Samples from anterior medium and posterior sections and the liver were homogenized in cold 0.25m sucrose solution (temp 4 degrees Celsius in the ratio 1.5(w/v). the homogenate were centrifuged at 2,000g for 15minutes and the supernatant (crude extract) were used as enzyme source.

ENZYME ASSAY: Lipase determination was by the method of Tietz and Fiereck (1966) modified by Isong (1987) 2ml of crude extract was put into two test tubes labeled test and blank. The blank was placed in boiling water for 5 minutes and cooled. 0.5ml phosphate buffer of pH 7.4 and 2ml of substrate (Olive Oil) were introduced into both the test and blank test tubes. The test tubes were shaken and incubated at 27 degrees Celsius for 24hrs. The sample was transferred to a conical flask and 2ml of ethanol and 2 drops of phenolphthalein indicator were added to the incubated samples in a conical flask and titrated with standard 0.05N NaOH. Lipase activity was computed and expressed in mg per ml per minute.

RESULTS

The standard length range of *M. rume* was 30.4 to 41.0cm while the standard length range of M. *anguilloides* and *G. cyprinoides* were 16.5 to 26.8cm and 17.8 to 53.2cm respectively (Table 1). The digestive tract lengths were 31 to 42cm and 16 to 28.4cm in M. *rume, M. anguilloides* and *G. cyprinoides* respectively.

Lipase activity was observed in the anterior, middle and posterior portions of the digestive tract of the fishes studied. In *M. rume* the range was 0.1 to 1.15ml/ lipase activity for the anterior section and 0.05 to 0.5 ml/ lipase activity in posterior section. The liver recorded 0.1 to 1.5 ml/ lipase activity (Table 2).

In G. *cyprinoide* lipase activity observed in the anterior section of the digestive tract was 0.2 to 0.81 ml/ lipase activity while the middle section was 0.15 to 1.28 ml/ lipase activity. In the liver of *G. cyprinoides* lipase activity was 0.3 to 1.16 ml/ lipase activity (Table2).

Table 1: Standard length, total weight and gut length of *mormyrus rume Gnathonemus cyprinoides* and *Mormyrops anguilloides*

Species	No of specimens	Standard length			Total Weight			Gut length		
		Range (cm)	Mean	S.D	Range (cm)	Mean	S.D	Range (cm)	Mean	S.D
Mormyrus rume	10	30.4-41	36.5	4 3	225-554	434	152	31-42	35.7	6.1
Gnathonemus cyprinoides	14	16.5-26.8	20.7	3.3	62.5-236	127.6	17.6	15.6-28	20.0	4.3
Mormyrus anguilloides	13	17.8-53,2	32.37	8.7	129-1025.0	418	245.2	16-45.2	25.51	6.2

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Table 2: Lipase activity in the digestive tract sections of *Mormyrus rume*, *Gnathonemus cyprinoides* and *Mormyrops anguilloides*

Species	No of specimens	Anterior			Middle			Posterior			Liver		
		Range	Mean	S.D	Range	Mean	S.D	Range	Mean	S.D	Range	Mean	S.D
Mormyrus rume	10	0.1-1.15	0.45±0.36		0.05-1.35	0.58± 0.5		0.05-0.5	0.23± 0.18		0.1-1.5	0.96±	0.64
Gnathonemus cyprinoides	14	0.2 -1.8	0.81± 0.58		0.15-1.28	0.64± 0.4		0.01-0.73	0.2 ± 0.23		0.3-1.16	0.66±	0.45
Mormyrops anguilloides	13	0.2 - 1.9	0.53± 0.4		0.4-1.8	0.9 ± 0.36		0.03-1.4	0.55± 0.35		0.3-1.6	0.86 ±	0.45

Enzyme activity is expressed in ml / lipase activity

In *M. angulloides* lipase activity in the anterior section was 0.2 to 1.9 ml/ lipase activity while in the middle part of the digestive tract lipase activity was 0.4 to 1.8 ml/ lipase activity and lipase activity in the liver was 0.3 to 1.6 ml/ lipase activity (Table 2). Statistical test for significant difference in the enzyme activity in the various sections of the digestive tract showed that there were no significant difference $p > 0.05$ in the enzyme activity with sections of the digestive tract.

DISCUSSION

The results indicated that enzyme lipase was present in the anterior, middle and posterior sections of the alimentary tract of *M.rume*, *G. cyprinoides* and *M. anguilloides* respectively. Similar result was obtained by Lundstedt *et al* (2002) on *Pseudoplatystoma coruscans*. Fange and Groove (1979) and Bond (1996) reported that fishes secrete some enzymes in addition to pepsin in their stomachs. They showed that other enzymes were found in the stomach of fishes that act on food other than proteins. Amylase were found in the stomach of clupeids while chitinase were obtained from stomach of some insectivorus fishes. Their work also showed the presence of lipase in the stomach of clupeids and Mozambique tilapia. In the present study lipase were present in the stomach of *M. rume*, *M. anguilloides* and *G. cyprinoides*. In fishes the stomach generally stores food and initiate digestion by mixing ingesta with gastric juice. The presence of enzyme lipase in the stomach may initiate lipid digestion. The liver is usually associated with the post absorptive phase or fasting phase in which some processes that occurred during the absorptive phase were reversed. Glycogen store supply energy for a short time. Adipose tissue cells break down triglycerides into fatty acids, this may explain the presence of lipase in the liver (Guttman 1999).

This study has shown that although fishes are lower vertebrates hydrolysis of lipids occur both in the stomach and intestine of *M. rume*, *M. anguilloides* and *G. cyprinoides*. This result differs from that of higher vertebrates where the stomach is very acidic and lipase activity is not observed (Guttman 1999).

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