



## Partial Characterization of Chitosanase from Digestive Tract of *Channa striata*

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### ABSTRACT

The purpose of this study was to partially characterize chitosanase isolated from snakehead fish's (*Channa striata*) digestive tract. Two types of snakehead fish, domesticated and non-domesticated, were used as samples in order to assess the effect of feeding types on chitosanase activity. Chitosanase isolated from the stomach and intestine of domesticated snakehead fish had higher activity than non-domesticated samples with the value of 0.0395 U/mL and 0.0296 U/mL, respectively. The optimum chitosanase activity from the stomach and the intestine of domesticated fish was at pH 7. Lower optimum pH (6) was noticed for non domesticated samples. Chitosanase from both samples showed optimum activity at 70 °C.

**Keywords:** Characterization, chitosanase, digestive tract, snakehead.

### INTRODUCTION

Chitin is the second largest polysaccharide after cellulose which has the chemical formula of poly (2-acetamide-2-dioksi- $\alpha$ -D-Glucose) with  $\alpha$ -glycosidic (1.4) linkage connecting each unit. The chemical structure of chitin is similar to cellulose, only differentiated by a group attached to the atom C2. If the cellulose cluster bound to the atom C2 is OH, then the chitin-bound is acetamide group<sup>1</sup>. Chitosan is a deacetylated product of chitin which

is found in many insects, crustaceans and fungi<sup>2</sup>. Chitin is a fibrous material and very insoluble, while chitosan is slightly soluble in water and is much more tractable material with a broad range of applications<sup>3</sup>.

Chitosan is also found in nature; found in the insect cuticle<sup>4</sup> and the cell walls of fungi class *Zygomycetes*, in chlorophycean algae *Chlorella* sp.<sup>5</sup>. This chitosan naturally synthesized by the joint action of chitin synthetase and chitin deacetylase,

as shown for *Mucor rouxii* and *Colletotrichum lindemuthianum*<sup>6</sup>.

## MATERIALS AND METHODS

### Chitosanase activity

Chitosanase assay was conducted according to Yoon *et al.*<sup>7</sup>, with modification. One (1) unit of chitosanase activity was defined as the amount of the enzyme which produces 1  $\mu$ mol of reducing sugar (glucosamine) per minute.

### Effect of pH enzyme activity

Optimum pH was determined by assaying in buffer with pH values of 6-9 using citric acid buffer

(pH 3-4), citric-phosphate buffer (pH 4-6), phosphate buffer (pH 6-8) and boric buffer (pH 8-9), in the presence of soluble chitosan substrate.

### Effect of temperature on enzyme activity

Optimum temperature was measured at 30, 40, 50, 60, 70 and 80 °C at pH 7 by using soluble chitosan as the substrate.

## RESULT AND DISCUSSION

### Chitosanase Activity

The results of the chitosanase activity from digestive tract of Snakehead fish (*Channa striata*) are presented in Figure 1.

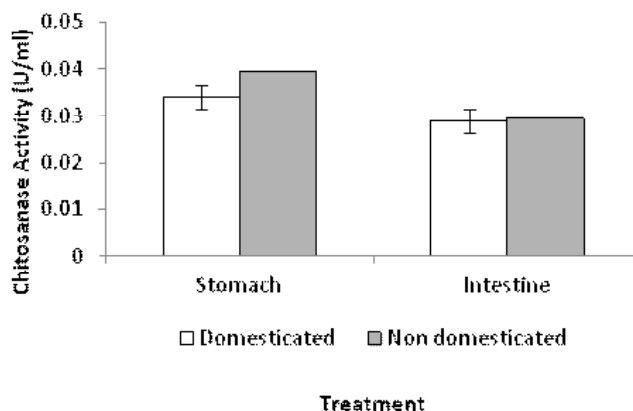


Fig. 1: Chitosanase activity from digestive tract of snakehead fish (*Channa striata*)

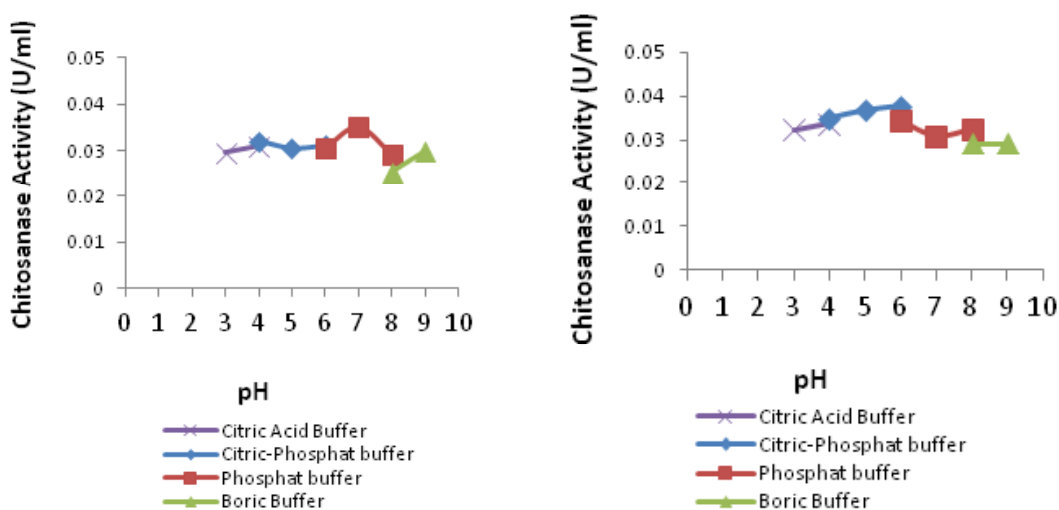


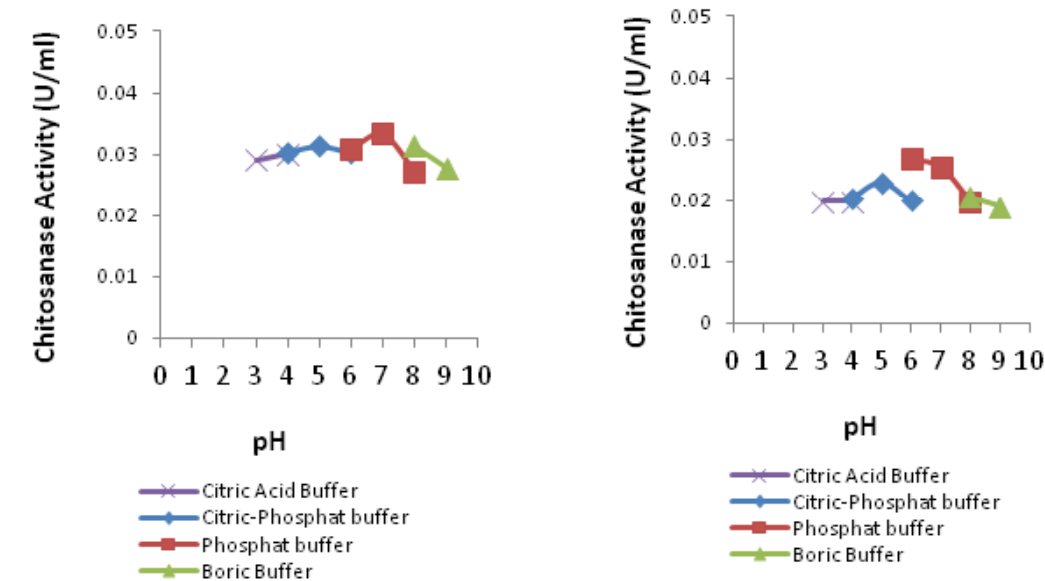
Fig. 2: Effects of pH on the activity of chitosanase isolated from digestive tract of *Channa striata* (a= domesticated; b= non domesticated)

Fig1 shows two different chitosanase activity of *Channa striata* (domesticated and non domesticated fish). Enzymes isolated from both stomach and intestine of domesticated fish had higher activity in the amount of 0.0395 U/mL and 0.0296 U/mL respectively. Chitosanase isolated from the stomach of domesticated and non domesticated

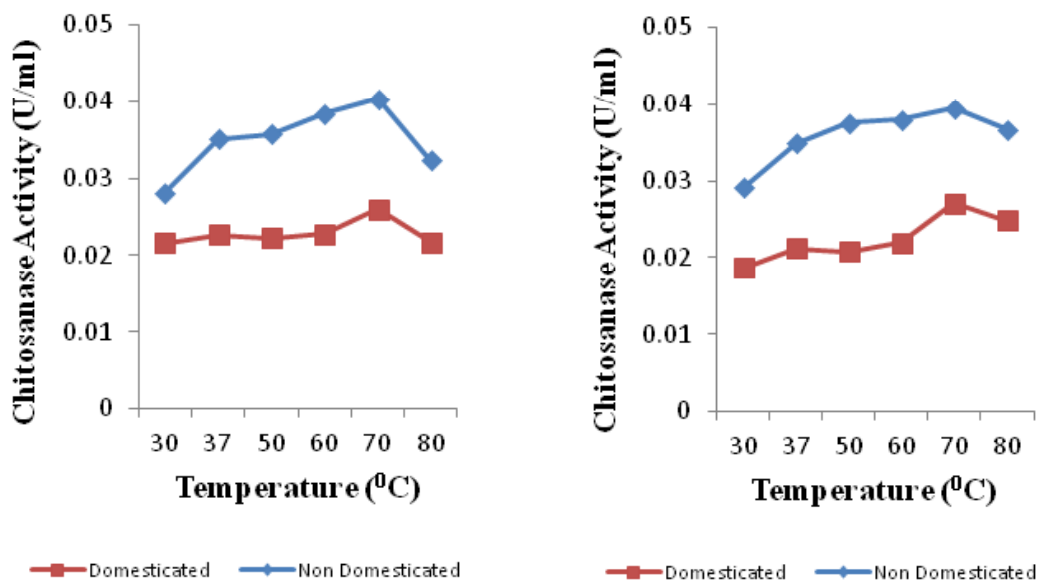
samples considerably showed higher activity than the same enzyme isolated from the intestine.

**Effect of pH on chitosanase activity**

Effects of pH on the activity of chitosanase isolated from digestive tract of *Channa striata* are presented in Figure 2 and 3.



**Fig. 3: Effect of pH on Chitosanase Activity from the Intestine (a= domesticated; b= non domesticated)**



**Fig. 4: Effect of Temperature on Chitosanase Activity (a= the stomach; b=the Intestine)**

Optimum chitosanase activities from the stomach and the intestine were at pH 7 (domesticated) and pH 6 (non domesticated). The results were higher than pH 5.8 of *Bacillus cereus*<sup>8</sup>, pH 5.0 of *Streptomyces cyaneogriseus*<sup>9</sup> and pH 6 of *Paenibacillus ehimensis*<sup>10</sup>.

#### Effect of temperature on chitosanase activity

Temperature ranged between 30 °C and 80 °C were used to study the effect of pH on chitosanase

activity. Fig 4 showed the effect of temperature on the activity of chitosanase isolated from digestive tract of *Channa striata*.

The optimum temperature of 70°C was recorded for the chitosanase (the stomach and the intestine) in this study. The result was higher than the 54 °C optimum temperature reported for *Bacillus cereus*<sup>8</sup>, 50 °C for *Bacillus megaterium*<sup>11</sup>, and *Gongronella* sp.<sup>12</sup>.

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