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by Ace Baehaki

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Characteristics of chitinase isolated from different part of snakehead fish (*Channa striata*) digestive tract

A Baehaki^{1*}, S D Lestari¹, Y Wahidman¹, N Gofar²

¹Fisheries Product Technology Study Program, Faculty of Agriculture, Sriwijaya University, Indralaya, South Sumatera, Indonesia

²Soil Sciences study Program, Faculty of Agriculture, Sriwijaya University, Indralaya, South Sumatera, Indonesia.

*E-mail: ace76_none@yahoo.com

Abstract. Naturally, snakehead fish (*Channa striata*) is a prodigious carnivore feeding mainly on live animals, including small shrimp. Based on its feeding habits, the digestive tract of snakehead is considered as auspicious source of various enzymes including chitinase. The purpose of this study was to partially characterize chitinase enzyme isolated from digestive tract of snakehead fish. Two parts of digestive tract, stomach and intestine were used as enzymes' source. The results showed that chitinase activity from the stomach was higher than chitinase activity from the intestine. The pH and temperature optimum of chitinase activity from digestive tract (the stomach and the intestine) were 6.0 and 70 °C, respectively.

Keywords: *Channa striata*, chitinase, digestive tract

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1. Introduction

Chitin is a polysaccharide created by β -1,4 bonding of N-acetyl glucosamine residues. Chitinases are glycosyl hydrolases, characterized by hydrolyzing β -1,4 linkage of N-acetyl glucosamine present in chitin chains [1]. Chitinases have been divided into two main categories: exochitinases and endochitinases [2]. Chitinase is used to hydrolyze chitin to produce chitin oligomers. Functional properties and physiological activities of chitin oligomers depend on molecular weight and chain length mostly [3]. The digestive tract of fish produces many enzymes and there are many reports describing the enzymes present in digestive tract, including protease [4], chitinase [5], and chitosanase [6]. However, reports on chitinase activity in different part of the digestive tract (stomach and intestine) of snakehead fish (*Channa striata*) are still limited. Therefore, in this research we studied the activity of chitinase isolated from the digestive tract of snakehead fish (*Channa striata*) and partial characterization of this enzyme.

2. Materials And Methods

2.1 Chitinase activity

The chitinase activity was measured according to the Spindler method [7].

2.2 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 chitin substrate (colloidal chitin).



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2.3 Effect of temperature on enzyme activity

Optimum temperature was measured at 30, 40, 50, 60, 70 and 80 °C at pH 7, soluble chitin (colloidal chitin) was used as the substrate.

3. Result And Discussion

3.1 Chitinase Activity

The activity of chitinase isolated from digestive tract of snakehead fish (*Channa striata*) as effected by part difference can be seen in Figure 1.

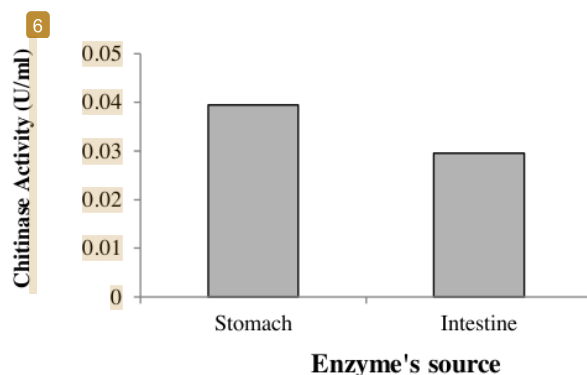


Figure 1. Chitinase activity from digestive tract of snakehead fish (*Channa striata*)

The results showed that the activity of chitinase isolated from the stomach was higher than the activity from the intestine. Chitinase activity from the stomach was 0.41 U/ml while from the intestine was 0.32 U/ml.

3.2 Effect of pH on chitinase activity

Effect of pH on the activity of chitinase isolated from digestive tract of snakehead fish (*Channa striata*) is presented in Figure 2. Optimum activity of chitinase isolated from the stomach and the intestine was achieved at pH 6. The optimum pH ranges of chitinase activity in the stomach and the intestine of Cod (*Gadus morhua*) were 4.5–5.1 and 5.1–6.5, respectively [5]. The ranges were lower than the activity of the same enzyme isolated from the intestine of discus fish (*Symphysodon aequifasciata*) which was optimum at pH 8 [4] but it were higher than the pH 2 reported for enzyme of discus fish (*Symphysodon aequifasciata*) stomach [4], and digestive proteases (acidic protease) of juvenile *Cichlasoma beani* [8].

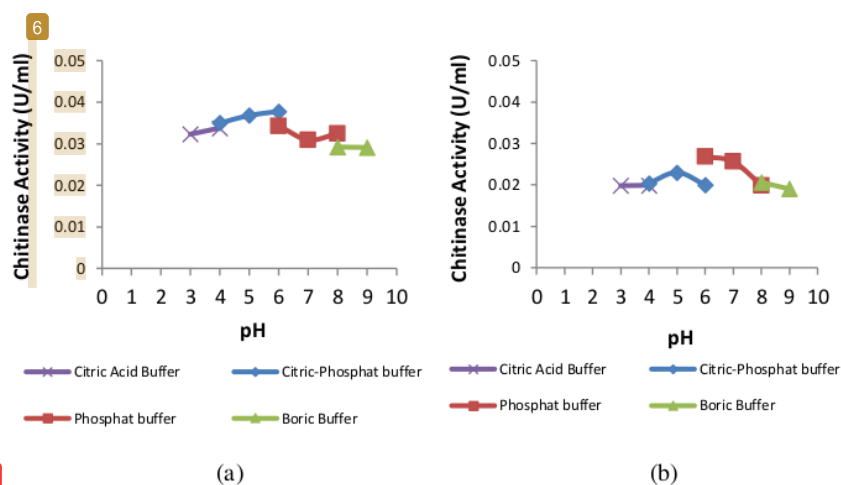


Figure 2. Effect of pH on chitinase activity in the digestive tract of *Channa striata* (a=the Stomach, b=the intestine)

3.3 Effect of temperature on chitinase activity

A temperature range between 30 °C and 80 °C were used in this study. Figure 3 showed the effect of temperature on chitinase activity from digestive tract of snakehead fish (*Channa striata*).

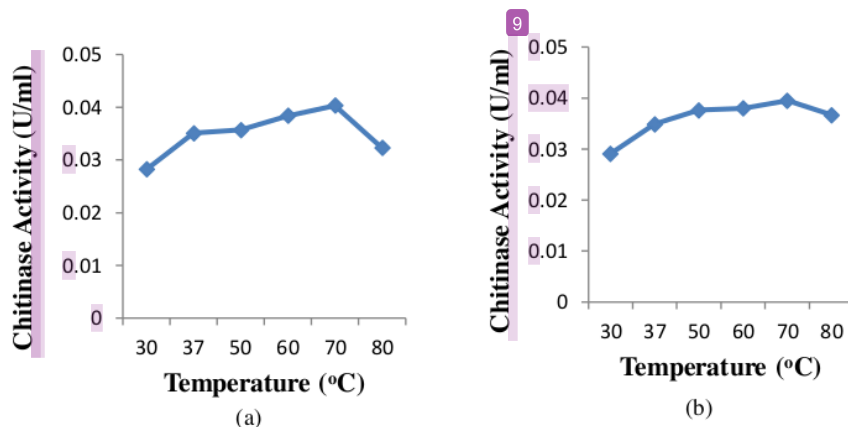


Figure 3. Effect of temperature on chitinase activity in the digestive tract of *Channa striata* (a=stomach; b=intestine)

The optimum temperature of 70°C were recorded for both chitinase (the stomach and the intestine) in this study. This were higher than optimum temperature of 55 °C reported for digestive proteases (acidic protease) of juvenile *Cichlasoma beani* [8], 65 °C for *Atractosteus tropicus* digestive proteases [9] and 50 °C for purified trypsins A, B and C from skipjack tuna spleen [10].

4. Conclusion

The chitinase activity from the stomach was higher than chitinase activity from the intestine. The pH and temperature optimum of chitinase activity from digestive tract (the stomach and the intestine) were 6.0 and 70 °C respectively.

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Acknowledgments

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