Review Article

THE USE OF EXOGENUS ENZYMES FROM PLANT IN FEED FOR VARIOUS CULTIVATION ORGANISMS; LITERATURE REVIEW

ABSTRACT

The presence of enzymes in the feed will increase the digestibility of fish to feed ingredients. Fish need enzymes to help speed up the process of digestion and hydrolysis. Enzymes function as catalysts that can increase the speed of chemical reactions. Therefore, exogenous enzymes are needed that can accelerate the protein hydrolysis process to accelerate fish growth. Several studies have been conducted regarding the use of enzymes derived from plants that aim to accelerate fish growth. It is hoped that this journal can provide information related to the use of several enzymes that have been used for various cultured organisms.

Keywords: Cultivation, Enzyme, Growth, Hydrolysis, Protein

INTRODUCTION

Low daily growth in fish can be caused by several factors, including genetic factors, poor water quality, and the amount of feed that is not following the needs of the fish. Therefore, to provide good growth results, fish feed needs to be added with exogenous enzymes.

The presence of enzymes in the feed will increase the digestibility of fish to feed ingredients. Fish need enzymes to help speed up the process of digestion and hydrolysis [1]. Enzymes can be produced from several sources, such as from animals and also from plants in the form of liquid or solid extraction results. In this case, the enzyme extract in solid form has several advantages such as being easier to store and relatively longer storage period than enzymes in liquid form.

The purpose of writing this journal is to provide information about the use of several enzymes that have been used for various cultured organisms.

ENZYME

Definition, Characteristics, and Types

Enzymes are a group of proteins that regulate and carry out chemical changes in biological systems. Enzymes produced by organs in animals and plants are catalyzed by various reactions, such as hydrolysis, oxidation, reduction, isomerization, addition, radical transfer, carbon-chain termination [2]. In general, enzymes provide speed, specification, and control overreactions in the body. Enzymes function as catalysts, namely compounds that increase the speed of chemical reactions [3].

According to Sutrisno [4], enzymes have five properties, namely:
1. Enzymes are biodegradable, which means they can be biodegraded. Enzymes have properties that are safe and more environmentally friendly because they are part of natural living systems. When degraded, enzymes will produce various amino acids that can be reabsorbed by nature.
2. Enzymes can be used repeatedly. This means that enzymes can be used repeatedly, making them more efficient. This is because enzymes do not undergo permanent changes in the catalytic process.
3. Enzymes are unique or specific, which means that enzymes only work according to their substrates so that enzymes are only suitable for one or a group of substrates whose function and structure are more or less the same.
4. Enzymes are biocatalysts Enzymes can change the rate of a reaction without changing its structure. Changing this speed means that you can slow down or speed up the reaction.
5. The enzyme does not participate in the reaction because the enzyme has a structure that is fixed or will not change. The structure of the enzyme will remain the same, either before or after the reaction. Because enzymes only change the rate of reaction.

Enzymes consist of several groups. According to Zonneveld et al., [5], the enzymes that play a role in the digestion of fish are proteases, amylase, and lipase which catalyze the breakdown of complex nutrients (proteins, carbohydrates, and fats) into simple nutrients.

Table 1. Types and Characteristics of Enzymes

No	Enzyme Type	Enzyme Characteristics
1.	Amylase	Splitting starch amylase molecules at -1,4-glycoside and -1,6-glycoside

		bonds [6].
2.	Lipase	Breaks the ester bonds in fats so that they become fatty acids and glycerol [7].
3.	Protease	Hydrolyze proteins into simpler fragments and hydrolyze polypeptides into amino acids.

Enzyme Working Mechanism in Digestion of Fish

According to Campbell [8], the mechanism of action of enzymes is that the substrate first binds to the enzyme and then is induced until it fits (induced fit), then the catalysis process, and finally, the product is released. The reaction product is released from the active site, and the enzyme remains in its original form. The enzyme can then leave the active site and be reused with a new substrate. As a biocatalyst, the work of enzymes can be influenced by several factors including temperature, pH, substrate concentration, inhibitors, and activators. Some types of enzymes can only work at their optimum temperature and pH. The optimum temperature and pH for each type of enzyme are different from each other. Enzymes cannot work at temperatures that are too low or too high [8].

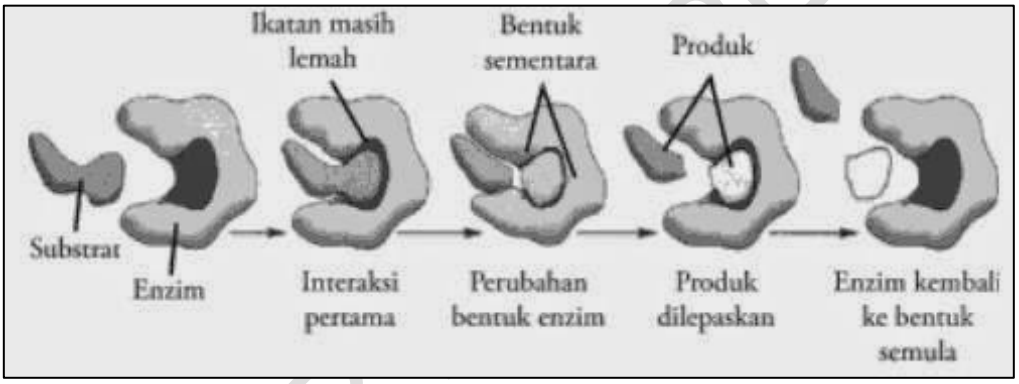

Figure 1. Enzyme mechanism of action
Source: Campbell 2002

APPLICATIONS OF VARIOUS ENZYMES IN CULTIVATION ORGANISMS

One of the things that need to be considered in cultivation activities is feeding. Feed is one of the most important aquaculture inputs because the production cost from feed can reach 60% [9]. One of the important elements in feed is protein because the protein content in feed determines fish growth. Protein is the most expensive feed nutrient compared to other feed nutrients, but the amount of protein available in the feed must be sufficient, and not excessive [10] Therefore, exogenous enzymes are needed that can accelerate the protein hydrolysis process to accelerate fish growth.

Several studies have been conducted regarding the use of enzymes derived from plants that aim to accelerate fish growth. As in Faizal [11] who uses papain enzymes and bromelain enzymes to feed tilapia. Papain is a protease enzyme, one of which is found in papaya. The enzyme is used to break or decompose peptide bonds in proteins so that proteins break down into simpler peptide bonds because papain can catalyze hydrolysis reactions of a substrate.

Bromelain is an enzyme that can help dissolve mucus formation and also speed up the elimination of fat through the kidneys. Bromelain also has citric and malic acids which are important and needed to improve the process of removing fat and manganese and being an important component of certain enzymes needed in protein and carbohydrate metabolism [12].

The content of enzymes in some easily available fruits such as papaya and pineapple have proteolytic properties or can simplify protein into amino acids that can be digested by fish. This encourages the utilization of the enzymes contained in the fruit is very necessary. Putri [13] researched the effectiveness of turmeric flour to optimize the work of digestive enzymes which results in increasing the activity of digestive enzymes and the growth performance of carp.

The research conducted by Insana [14] regarding the substitution of Curcuma flour (Curcuma xanthorhiza sp) in feed on the growth and survival of tilapia fish (Oreochromis niloticus) gave significantly different results. Curcuma given has various benefits for the fish body, especially for health and growth. In addition to containing antibiotics, curcuma also contains essential oils and curcumin. Curcumin functions to increase appetite and plays a role in increasing the work of the digestive organs stimulates bile walls to secrete fluids and stimulates the release of pancreatic juice which contains amylase, lipase, and protease enzymes to improve digestion of carbohydrate, fat, and protein feed ingredients.

The following is a table regarding types of enzymes, sources of enzymes, and test organisms that have been carried out in several studies that have been carried out previously.

Table 2. Types, Sources of Enzymes, Test Organisms

No.	Enzyme Source	Enzyme Type	Test Organism
1.	Papaya	Papain	Tilapia [11] Nilem Fish [15] Catfish [16] Tawes Fish [17] Cantang Grouper [18,19] Fresh Lobster [20]]
2.	Pineapple	Bromelain	Tilapia [11] Nilem Fish [15] Catfish [16]
3.	Turmeric Flour		Gourami [21] Goldfish [13] White Snapper [22,23]
4.	Curcuma Flour		Tilapia [14] Milkfish [24] Goldfish Koi [25]

CONCLUSION

Several studies have been conducted regarding the use of enzymes derived from plants that aim to accelerate fish growth. Several enzymes that have been known to give significant results on growth are papain enzymes and bromelain enzymes which can provide good growth results. In addition, turmeric flour and curcuma flour can also accelerate the protein hydrolysis process because they make the performance of digestive enzymes more optimal in some freshwater and seawater fish commodities

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