

Application of Protease in Poultry Feed to Enhance Nutritional Efficiency

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ABSTRACT

Protease is one of most important enzymes having wide application in industries. It is used for hydrolysis of proteins. Among all enzymes used, proteases represent 60% of the enzyme market. Protease can be produced from plants, animal and microorganisms, but 66% of the proteases are derived from the microbial sources. Microbes are easy to cultivate, so can be used for enzyme production in short span of time. Microorganisms act as an important source of enzymes because of their vast distribution, high reproduction, and potential to be genetically altered for higher productivity.

INTRODUCTION

Proteases are universal entity that are found everywhere, namely, in plants, animals, and microbes. The group of enzymes known as proteases (EC 3:4, 11-19, 20-24, 99) is a sizable and intricate one. (Jisha et al., 2013). Proteases consist not only a single enzyme but a consortium of enzymes that includes proteinases, peptidases and amidases (Naveed et al., 2021). Peptidases are

enzymes that catalyze the hydrolysis reaction of peptide bonds in proteins (Souza et al., 2023). These are degradative enzymes having specificity and selectivity in protein modification. Extracellular proteases catalyze the hydrolysis of large proteins to smaller molecules for subsequent absorption by the cell, whereas intracellular proteases play a critical role in the regulation of metabolism.

Some of the major activities in which the proteases participate are nutrition, germination, regulation of gene expression, sporulation and protein turnover.

Enzymes proteases break down the peptide links in proteins. Proteases represent 60% of the enzyme market and around 66% of the proteases are derived from the microbial sources. Microorganisms act as an important source of enzymes because of their vast distribution, high reproduction, and potential to be genetically altered for higher productivity. Both bacteria (*Bacillus subtilis*, *Bacillus licheniformis* etc.) and fungi (*Aspergillus oryzae*, *Aspergillus niger* etc.) are capable of producing large amounts of protease enzymes. Protease enzymes have wide application in different industries e.g. food & feed industry, pharmaceuticals, detergents and waste management due to their ability to degrade proteins into smaller peptides and amino acids. When protease is added to animal feed, the enzyme aids in degrading anti-nutritional components, promoting the breakdown of proteins and improving feed's nutritional value.

Composition of poultry feed: The composition of chicken feed consists of a range of components, including protein sources (such as soybean meal, fish meal, and meat and bone meal), grains (such as wheat, maize, and barley), lipids, vitamins and minerals (Alagawany et al., 2019). The ingredients used in poultry feed vary depending on factors such as cost, availability, and nutritional requirements of the birds. In case of all animals of all ages, the protein requirement is essential for maintenance. Chick requires extra proteins for increase in tissues or growth and the hen needs extra protein to produce the eggs. All the protein present in poultry feed are not completely digested by the animal. The extent of protein digestion depends on various factors such as the type and quality of protein source,

processing methods and age of the birds (Kerr et al., 2017). Incomplete digestion of protein may lead to excess nitrogen excretion in the form of uric acid, which can have negative environmental implications. The percentage of protein in poultry feed varies according to the kind of feed and the stage of development of the chicken. On a dry matter basis, chicken feed typically has a protein content of 16–24% (Ahmad et al., 2019). There are different kinds of poultry feed available, including starter feed, grower feed, finisher feed and layer feed. Starter feed is typically fed to chicks up to 4-6 weeks of age and contains higher protein levels to support growth and development. Grower feed is given to birds from 6-8 weeks of age until they reach maturity and typically contains lower protein levels compared to starter feed. Finisher feed is given to birds in the final stages of growth to promote weight gain and muscle development. Layer feed is specially formulated for laying hens and contains higher levels of calcium and other nutrients required for egg production (Adejoro et al., 2021).

Benefits of protease:

- Helps in enhanced digestion of proteins by breaking complex protein into simple proteins and further proteins into amino acids.
- Decrease in cost of protein diet without any negative impact on health of chicken.
- Protease digestion leads to removal of anti-nutritional factors like inhibitors of trypsin, glycinin and allergenic proteins.
- Inhibit fermentation of undigested proteins which helps in improvement of gut health and also help in decreasing number of pathogens in intestine in poultry.
- Reduces the cost of normal protein diet without compromising the broiler performance.

- Enhances nutritional efficiency along with improvement in amino acid digestion.
- Reduction in negative impact on environment by reducing wastes

CONCLUSION:

In order to increase dietary protein hydrolysis, proteases are introduced to feed. Proteins are broken down into free amino acids and smaller peptides during this enzymatic hydrolysis. When animals utilize nitrogen in better form, there is a possibility to decrease the diet protein content which in turn also reduces the content of nitrogen in manure. Supplementation of broiler diets with enzymes such as protease has been reported to improve amino acid digestibility of ingredients or complete diets. Protein hydrolysates that have undergone enzymatic debittering and allergen degradation represent yet another significant possibility to raise food value.

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