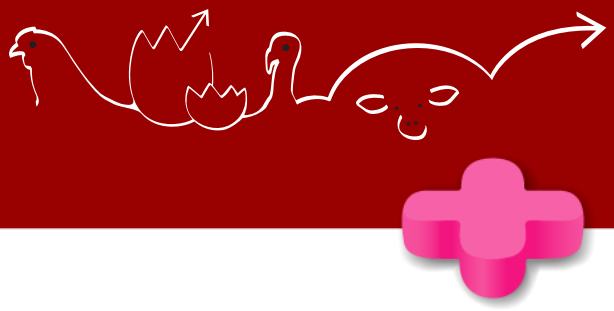
Rovabio®

Enzyme Overview



Protease Enzyme Function - An Overview

Proteases are similar to amylases in that they are produced endogenously by poultry. Proteases are often included in enzyme cocktails that also include NSP-degrading enzymes. Additionally, some NSP multi-enzyme products express some protease activity. More recently, a few pure protease products have become available commercially.

Endogenous proteases are responsible for initiating the breakdown of proteins in the digestive tract through the hydrolysis of the peptide bonds that exist between amino acids in the protein structure. Poultry possess endogenous proteases from three different classes which include metalloproteases, aspartyl proteases and serine proteases. Additionally, these three classes of proteases exert their function over a broad pH range.

Poultry Express 3 Classes of Endogenous Proteases

➢ **Metalloproteases**: i.e. Angiotensin carboxyl enzyme, carboxypeptidase,...	Requirement of an active site metal ion, usually Zn Optimal pH activity : 5-6 Inhibition by metal chelating agents (ex: EDTA)
➢ **Aspartyl proteases:** i.e. Pepsin,...	Presence of 2 active site aspartate residues Optimal pH activity : 2-4 Inhibition by pepstatin
➢ **Serine proteases:** i.e. Trypsin, chymotrypsin,...	Presence of an active site with serine residue Optimal pH activity : 7-9 Inhibition by diisopropylfluorophosphate and phenylmethylsulfonyl fluoride

Bugg, 1997

Continued >

Protease Enzyme Function - An Overview (cont'd)

In addition to the presence of endogenous proteases, most dietary protein sources are highly digestible by poultry. Protein digestibility has been shown to be greater than 85% and 65% for soybean meal and animal protein sources, respectively (Baker, 2000). Conversely, soybean meal contains approximately 21% NSP (Bach-Knudeson, 1997), for which poultry possess no endogenous NSP enzymes.

As poultry appear to be capable of adequately digesting protein, it would seem that supplementing exogenous proteases would be unnecessary. However, some research has demonstrated that poultry-fed diets containing protease improved animal performance (Zanella et al., 1999; Douglas et al., 2000; Café et al., 2002; Cowieson and Adeola, 2005; Novak et al., 2007; Zhou et al., 2009; Moran and Lehman, 2010; Romero et al., 2010). It is important to point out that most of these experiments utilized enzyme cocktails which expressed additional activities such as xylanase, amylase, ß-glucanase, etc. Thus, it is difficult to determine if the performance benefits were due to dietary protease specifically.

Recent research (Arce et al., 2010; Romero and Ravindran, 2010) examined the effects of dietary protease addition both independently and in combination with other exogenous enzymes (xylanase and xylanase plus amylase, respectively). Arce et al. (2010) found that broilers fed diets containing both protease and xylanase had superior live performance over those fed diets containing either enzyme independently. Additionally, Romero and Ravindran (2010) reported that broilers fed diets containing a combination of xylanase, amylase and protease had improved amino acid digestibility compared to those fed a diet supplemented with amylase and xylanase.

Based on these results, it would appear that there is potential for improvements in digestibility through exogenous protease inclusion, particularly when used in addition to, or in a product that also expresses NSP enzyme activity. Perhaps these improvements could be facilitated by complementary actions of protease and NSP enzymes to degrade both structural cell wall proteins and NSP, thereby providing endogenous enzymes improved access to encapsulated nutrients. However, more research needs to be conducted to determine if this is the case.

One Point Royal / 4400 North Point Parkway / Suite 275
Alpharetta, GA 30022
USA - Tel: 678-339-1500 or 800-727-1019 / Fax: 678-339-1600