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Review: Role of Enzyme Inclusion on Monogastric Nutrition

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Abstract
Enzymes are highly effective biological catalysts which can be found in all biological systems and they accelerate chemical reactions in the body of animals. The review of this paper is the role application of exogenous enzyme on monogastric nutrition and its effect. The objective of the review were: (1) to review the general findings of enzyme additives in monogastric feed and functions of supplementary enzymes in monogastric nutrition and (2) to describe common enzymes included in monogastric animal feeds. The use of exogenous enzymes on monogastric nutrition has many advantages. The proper use of enzymes in animal nutrition allows to obtain maximum benefit from their action not only for the animals, but also for the environment. It is now well recognized that ingredients such as maize, wheat and, particularly, grain byproducts contain relatively high levels of dietary fibre and that this fibre has negative impacts on feed digestibility and performance. This allows for the option of using the enzyme to improve feed digestibility maintain performance with lower net feed costs. Enzyme also plays a role in improving health status and well-being of the non-ruminants, reduce in manure volume which is environmental friendly, product quality will maintained and productivity improved.
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1. Introduction

The existence of living things involves a continuous series of chemical reactions and green plants synthesize chemical compounds such as sugars, starch and proteins and in so doing fix and store energy and then these compounds are broken down by the plants themselves, or the animals that consume them, and the stored energy is utilized (McDonald *et al*., 2010). Enzymes are protein molecules functioning as specialized catalysts for chemical reactions in the body (Shuang Li *et al*., 2012). The use of enzymes in animal nutrition has an important role in current farming systems (Yilkal and Getachew, 2015). Exogenous enzymes are added to an animal's feed to supplement its own digestive enzymes and to breakdown anti nutritive fractions in feeds. Currently feed enzyme utilization in diets of swine and poultry is substantially greater than originally anticipated (Bimrew, 2014). Exogenous enzymes are now well accepted as a class of feed additives in diet formulations for poultry and pigs to overcome the negative effects of anti-nutritional factors, and to improve digestion of dietary components and animal performance. Variable response to enzyme supplementation is an important reason limiting the widespread acceptance of feed enzymes (Ravindran and Jang-Ho, 2011). Supplementation of diets with microbial enzymes is one way by which feed input costs can be controlled (Bao *et al.,* 2013). Supplementation of non-starch polysaccharide degrading enzymes in commercial broiler diets improved the efficiency of feed utilization only during starter phase and failed to do so during finisher phase. Non-starch polysaccharide degrading enzymes supplementation did not influence the carcass traits except, relative liver weight (Nadeem *et al*., 2005).

2. Objectives

- To review the general findings of enzyme additives in monogastric feed and functions of supplementary enzymes in monogastric nutrition
- To describe common enzymes included in monogastric animal feeds

3. Role of Enzyme Inclusion for Monogastric Animal Health

Inclusion of exogenous enzyme in animal feed has a good solution to keep their health care management (Mireles-Arriaga *et al*., 2015). Enzymes and direct fed microbial (DFM) that we apply to broiler feed will improve broiler performance and gut health. Enzymes work through targeting specific substrates in the feed to improve digestibility and reduce the effects of anti-nutritional factors. This condition allows producers to reduce feed costs at a time of high commodity prices (Awati *et al*., 2014).

Microbial infections caused by bacteria (*Salmonella*, *Clostridium perfringes*) and parasites particularly *Eimeria* has continued to challenge the poultry industry in the world. Alternative feed supplements that can enhance performance and protect the chickens from microbial infections. Studies showed that dietary supplements containing probiotic, prebiotic and enzymes are able to enhance performance while protecting the chickens from microbial infection (Ohimain and Ofongo, 2012). Wheat diet supplemented with xylanase leads to

greater changes in the mucin composition and carbohydrate expression of goblet cell glycoconjugates, which are associated with a reduction in intestinal viscosity and decreased numbers of Camp. Jejuni (Fernandez F *et al*., 2000). Supplementing fibrous feed with enzyme improves the haematological parameters in growing pigs (Alu *et al*., 2011). And also the addition of NSP enzymes to rough rice-based diets improved performance of pigs, reduced viscosity and increased digestive activity in the small intestine (Wang *et al*., 2008).

4. Enzyme Supplementation for Growth of Monogastric

Non-starch polysaccharide degrading enzymes supplementation is beneficial in enhancing feed utilization during the starter phase, while its effects on weight gain, dressing percentage and weights of organs, except liver weight, were found to be non-significant (Nadeem *et al*., 2005).The supplementation of xylanase in a crumbled wheat-based diet improved the growth performance of guinea fowl broilers (Tufarelli *et al*., 2007). Supplementation of versazyme to corn-soybean based broiler starter diets improved chick growth performance up to market age. Body weight gains and feed conversion rates were generally improved by the dietary supplementation (Odetallah *et al*., 2005). Enzyme inclusion in nursery pigs diet has benefits on growth performance and also improve feed efficiency of pigs fed diets containing Roxazyme G2G(Jones *et al*., 2013).

5. Enzyme Inclusion for Digestibility of Monogastric Feed

When formulating the diet it is better to us on data digestible amino acids since in this way need of poultry for this nutritious matter is fully satisfied (Cmiljanic *et al*., 2005). Enzymes are biological catalyst composed of amino acids with vitamins and minerals. They bring about biochemical reactions without themselves undergoing any change. The benefits of using enzymes in poultry diets include not only enhanced bird performance and feed conversion but also less environmental problems due to reduced output of excreta (Khattak *et al.,* 2006). Supplementing exogenous enzymes in poultry feed has been proved one of useful approaches to further increase nutritional value of soybean meal (Hany El-Shemy, 2011).

Rapeseed meal and its by-products from oil mills are good examples to illustrate the importance and benefit of improving the nutritive value of feed components for poultry rations. Even small inclusion rates of rapeseed products from conventional varieties resulted in compromised thyroid function and reduced productivity forty years ago, but up to 25% of products from improved double and triple varieties can be included in poultry ration today without any problem (H. Jeroch *et al*., 2013**)**. Supplementing a soybean-corn based diet with hemicell at the inclusion level of 1g/kg DM improved ileal digestibility of crude fat and crude protein (Arash Azarfar, 2013). Wheat is consistently improved by the use of exogenous enzymes and the response of a commercial exogenous enzyme mix on pre-caecal starch digestion in the horse is very well (James Rowe *et al*., 2001).

6. Role of Enzyme Supplementation in Monogastric Product Quality

Mixture in pellets are used since better production results are achieved ,lower mortality and often better quality of the product of meat and eggs. This indicates that in future poultry nutrition should be adjusted to consumer demands, consumer is becoming more aware of the quality of poultry products (cmijanic *et al.*, 2005). The addition of enzyme did not significantly impact meat quality traits (pH, cooking loss, water holding capacity, shear force and colour attributes)
(Hana A.H. Zakaria *et al.,* 2010). The addition of commercial feed enzyme preparations have positive effects on egg and eggshell quality (Roberts *et al.,* 2006)

7. Role of Enzymes Inclusion on Monogastric Productivity Performance

Enzyme supplementation significantly improved growth performance through an improvement in the digestibility of certain amino acids but not mineral digestibility, tissue protein contents, or internal enzyme activities (Hossain *et al*., 2014). NSPs degrading enzyme supplementation increased the weight gain, feed efficiency and decreased the feed cost per kg weight gain (Bharathidhasan *et al*., 2010). Decreased egg production in older ages of hens could be corrected to some extent by adding exogenous dietary phytase at 0.15% levels in the diet (Lucky *et al*., 2014). Supplementation of the diet with an enzyme complex containing amylase, protease and xylanase in swine improved piglet performance. (Yi *et al*., 2013). Enzymes supplementation in rabbit's diet will improve body weight gain, final body weight and feed intake (Abd El-Latif *et al*., 2008).

8. Economic Value of Enzyme Supplementation on Monogastric Feeds

Enzyme supplemented BDG can replace up to 50% GNC (16.70% of the diet) as a plant protein source in cockerel chicks diets. Based on the cost of production per kilogramme weight gain, the use of enzyme supplemented BDG is more profitable than GNC in cockerel chicks as long as inclusion level do not exceed 50% (Isikwenu, 2011). Enzyme supplementation could be used to combat heat stress in broiler chickens based on specific fibre–enzyme interaction and reduced feed intake (Ademola *et al*., 2013). Supplementation of enzymes

in swine feed will degrade fiber, and there by improve energy digestibility or voluntary feed intake, will have both metabolic and economic benefit to pork production (Brian and Shurson , 2012).

9. Conclusion and Recommendations

It is now well recognized that ingredients such as maize, wheat and, particularly, grain byproducts contain relatively high levels of dietary fibre and that this fibre has negative impacts on feed digestibility and performance. This allows for the option of using the enzyme to improve feed digestibility maintain performance with lower net feed costs. Enzyme also plays a role in improving health status and well-being of the non-ruminants, reduce in manure volume which is environmental friendly, product quality will maintained and productivity improved. Generally enzyme supplementation on monogastric feed improves all aspects of animal's status and then it will the backbone of monogastric farming in the future.

Conflict of interest

Author declared that no conflict of interest.

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