

NSP Enzymes and their Uses

Chandra Shekhar K^{1*}, Satyam S¹ and Varsha PV²

¹Department of Biotechnology, University College of science and informatics, Mahatma Gandhi University, Telangana, India

²Department of Biotechnology, Gitam Institute of Technology, Gitam University, Visakhapatnam, India

*Corresponding author: Chandra Shekhar K, Department of Biotechnology, UCSCI, Mahatma Gandhi University, Telangana, India, Tel: 91-9700383990; E-mail: shekhar.kagitha@gmail.com

Received date: Aug 07, 2014; Accepted date: Aug 11, 2014; Published date: Aug 21, 2014

Copyright: © 2014 Chandra Shekhar et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

The Poultry formers main problem with forming is the cost of the feed which is given to the birds. The feed cost is about 70% of the total expenditure. This is because the bird cannot produce the enzymes which can digest the polysaccharides present in the feed. These polysaccharides are very rich in feed. And so to avoid this problem of feeding high to bird we add supplements to the feed, i.e. NSP-Enzymes (Non-Starch Polysaccharides) these are the enzymes which a bird cannot produce. As we know that enzymes are Biocatalysts which enhance the reaction without undergoing any changes in them. They also enhance the growth of the bird and as the wastage feed decreases the effect of the bird dropping on environment also decreases. This review tells us that how the enzymes help the environment and the formers of poultry.

Keywords NSP enzymes; Poultry; Feed supplements

Introduction

The poultry feed contains Starch, proteins, fat and fibers [1]. In these the main components present in the feed made of cereals are cellulose, 1-3,1-4-β-glucans and pentosans of the arabinoxylan type [2]. Because of the ability of the NSP enzymes which hydrolyze the components of cereals, a class of feed additive containing the NSP enzymes is mixed in the feed [3]. These enzymes help the bird to hydrolyze the feed. About 0.00% to 9% increase of feed utilization in birds has been observed. Even more good results are observed in piglets.

From the day formers started using the feed enzymes mixture it has been observed that the growth of the bird has increased even more [4,5]. And these enzymes are compared to the probiotics available for humans [6]. But the only difference observed here is that the probiotics are live bacteria while the NSP enzymes are not alive but merely simple proteins but both are available naturally in nature and same in function.

In general soya bean meal and corn meal are used for feeding Birds. As these are available at a very low cost, in Soya bean meal the level of non-starch polysaccharides is 29% while in Corn meal it is 9% [7,8]. The effect of the exogenous enzymes on SBM and CM is less comparative with ray and wheat based diets. The exogenous enzymes with SBM and CM are effectively high in ducks when compared with chicken. It is also found that individual enzymes are showing good results than the cocktail of enzymes [9].

How NSP Compounds Effect the Growth of Bird

- Endogenous enzymes of poultry cannot digest the NSP compounds which are present in the feed
- The digestibility of feed by birds decreases

- As the bird cannot break the cell wall components the other useful and digestible components are also lost as they are entrapped by NSP components
- The intake of feed increases, the utilization of feed by the birds decrease and cost increases
- The food which is taken by bird is not digested and the intestinal viscosity increases
- Absorption of bile juices increases
- Microbial flora of intestine gets altered and its growth increases \
- The competition between microbial flora and the bird increases for the nutrition
- The sticky dropping of indigested feed is observed as the feed is not completely utilized and it absorbs high amount of water
- Increased rate of mixing of bile, pancreatic and intestinal secretions with digesta increases the viscosity and increase the amount of sticky dropping
- As this feed is not completely utilized this feed is not expelled out and because of this the passage tract is blocked and The intake of feed decreases
- As the feed intake is high and endogenous enzyme do get excreted out
- The loss of endogenous enzymes is observed
- Reduction of nutrient availability is observed in birds and the distortion of growth and feed conversion
- As the viscosity of the dropping is high the eggs are dirty
- It effects environment by high nitrogen and phosphorus exertion as the feed id not completely digested

NSP Enzymes

Exogenous enzymes which can hydrolyze the non-starch polysaccharides abundantly found in the feed given to birds [10]. These carbohydrates cannot be digested by birds as they do not have the capability to produce the enzymes, because of this reason the farmers

have practiced using the exogenous enzymes mixture in other words the cocktail of enzymes.

This cocktail contains the enzymes like Xylanase, Amylase, and Protease [1]. These enzymes are produced using microbial source [11]. The microbial sources used here are selected in such a way that they not only produce the enzyme but also they act as Probiotics for birds. The care should be taken when the microbial source is selected are [1].

- The strain should be ecofriendly and should not be a parasite
- It should be suitable for the production in Industrial scale
- It should grow with minimal nutrition
- Should produce higher amounts of enzyme
- The organisms used mainly for the production of enzymes are

The fungal source

- *Aspergillus spp (A. niger)*
- *Penicillium spp*
- *Humicola spp. (H. insolens)*
- *Trichoderma spp*

These are the largest group of enzyme producing fungi. These organisms have a common thing among them that is they can produce the enzymes which can breakdown various substances. Among them the breakdown of the plant cell wall components mainly polysaccharides.

The Bacterial source

- *Bacillus spp. (α -Amylase, proteases)*
- *B. licheniformis and B. subtilis*

These are the largest group of bacteria used for the production of multiple enzymes and also used as probiotics for birds.

Microbial Enzyme Advantages

- Microbes are capable of producing a variety of enzymes.
- Due to high production capacity, there is unlimited supply of enzymes.
- Production capacity can be expanded by strain improvement.
- They can be manipulated easily in the laboratory.
- Large number of enzymes can be obtained economically from microorganism. Only well-designed & intensive search among microbial strains can usually find an appropriate organism to produce any enzyme.
- It is possible to introduce genetic changes in them rather easily, due to simplicity of their genome.
- Their growth requirements are simple & can be precisely defined which is of immense importance in industrial production to maintain consistency of product quality.
- Specific enzyme conversion is required. The only disadvantage is the presence of contaminating enzymes, which can cause undesirable reaction. These contaminated enzymes can be removed by enzyme purification techniques.

Characteristics of Dietary Enzymes

- The enzyme should with stand at the temperature of 40°C
- Should resist low pH
- Specific degradation site in the molecule
- Water content

- Presence of aerators / Inhibitors
- Substrate concentrations

Enzymes and its Actions

- α -amylase: Endo-hydrolysis of α -1, 4-glucosidic linkages
- β -glucanase: Degrades β -glucan by cleaving β -1,3(4) glucosidic linkages
- Pectinase: Degrades pectin α -1,4-linked anhydrogalacturonic acid
- Xylanase: Hydrolysis of 1,4-beta-D-xylosidic linkages hemicellulose

Characteristics of Enzymes used in Animal Feed

- Must act under acidic pH condition of stomach
- Resist low pH
- Resist pepsin proteolytic action
- It should act in digestive tract

Role of Poultry Enzymes

- Poultry do not produce enzyme for the hydrolyses of these non-starch polysaccharide (NSP) present in the cell wall of the grains
- Addition of exogenous enzymes specific for a given feed formulation will enhance the availability of feed components to the birds.
- Increase the energy by hydrolyzing the fibrous contents present in feed.
- These exogenous enzymes act endogenous enzyme supplements in conditions like more stress and at the early aged birds
- Calcium and phosphorus precipitations are prevented and absorption of them is promoted by these enzymes
- These exogenous enzymes will complement endogenous enzymes in few conditions at the early age of the birds.
- The production of endogenous enzymes may be limiting in conditions like age, health, climatic conditions etc. at times these exogenous enzymes help digestion in birds.
- Exogenous enzymes help bird to digest the NSP of cell wall.
- As the NSP components of cell wall breaks the other useful components which are entrapped are also available to the birds
- The viscosity of the bird dropping decreases
- The intake of feed and its utilization increases, intestinal flora is maintained properly
- There will be no Loss of endogenous proteins
- The starch in the cereals get unmasked as the cell wall breaks and the high amount of energy is produced to bird
- The proteins are also utilized up to maximum extent and the maximum absorption of minerals and maximum utilization of feed nutrients is observed

Conclusion

It has been observed that the usage of poultry dietary enzymes has increased drastically in the last decade. The usage of these exogenous enzymes is a good practice for the poultry farmers as it decreases cost to the farmers. The enzymes not only benefit economically but also have many social benefits. These enzymes can be said to be the best significant instruments in the industry of poultry. Although these enzymes are helpful in the poultry industry isolation of these enzymes

is the main task, we should take care that the enzymes isolation should be done from a source that doesn't affect the bird and the purification should be done properly. Even after the isolation and purification of these enzymes cocktail is to be prepared, this cocktail mixture should be in correct proportion. The formulation is to be done best according to the bird.

Hope researchers continue the research and decrease the waste and improve the welfare of chicken, conserve resources and protect environment.

References

1. Dibner JJ, Richards JD (2004) The Digestive System: Challenges and Opportunities. *Poultry Science Association J Appl Poult Res* 13: 86-93.
2. Slominski BA(2013) Recent Advances In Research On Enzymes For Poultry Diets. Poultry Science Association.
3. Khattak FM, Pasha TN, Hayat Z, Mahmud A (2006) Enzymes in Poultry Nutrition. *J Anim Pl Sci* 16: 1-2.
4. Neospark (2014) Role of Enzymes in Poultry Nutrition.
5. Simon O (2000) Non Starch Polysaccharide (NSP) Hydrolysing Enzymes as Feed Additives: Mode of Action in the Gastrointestinal Tract. *Lohmann Information* 23: 7-13.
6. Newman K (2010) Mechanisms of Enzymes in Poultry Production. MA poultry industry , USA.
7. Cowieson AJ , Masey-O'Neill H, Bedford MR (2012) Enzymes beyond Phytase in Poultry Nutrition, USA.
8. Bedford MR (1996) The Effect of Enzymes on Digestion. *Applied poultry science J Appl Poult Res* 5: 370-378.
9. Olukosi OA, Cowieson AJ, Adeola O (2007) Age-Related Influence of a Cocktail of Xylanase, Amylase, and Protease or Phytase Individually or in Combination in Broilers. *Poultry Science Association* 86: 77-86.
10. Robert Burns (2013) Poultry 'enzyme cocktail' saves more than just chicken feed. Texas Agrilife, USA.
11. Zofia Olempska-Bier (2004) Xylanases from *Bacillus Subtilis* expressed in *B. subtilis* Chemical and Technical Assessment (CTA). *JECFA* 63: 1-5.