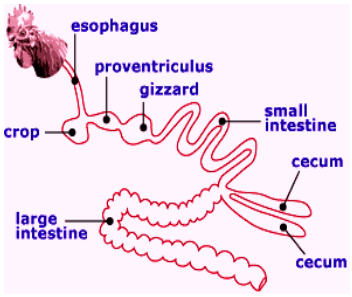
Bio cell
Lifesciences Pvt Ltd

ZYMEX

ENZYMES WITH DIRECT FED ENZYME SECRETING MICROBES

INTRODUCTION

Improved animal health and performance always has been the goal of people associated with livestock production. Consequently, any feedstuff, feed additive, drug or other compound that is capable of enhancing animal health or performance will interest producers, veterinarians, and animal nutritionists. Several compounds have been used to improve animal performance either by manipulation of the rumen environment (e.g., sodium bicarbonate) or by directly altering the composition and metabolic activities of rumen microorganisms (e.g., ionophores).



Digestion is the process of breaking down large, complex molecules, as provided by the birds' feed, into smaller components that can be absorbed into the portal blood system. The process involves changes in both physical and chemical structures of most dietary components. Poultry feeds consist of a complex array of particles differing not only in chemical composition, but also in size, hardness, solubility and ionic characteristics.

Under ideal conditions, this array of particles and chemicals with different characteristics degrade slowly in a step-wise manner as feed passes from the mouth to the large intestine. Particle breakdown is a constant process, although the gizzard provides the major site of this activity.

Enzymes are largely responsible for molecular degradation, although their pH greatly influences their efficacy.
When digestion is reduced, there will be reduced bird growth and/or increased feed intake. Indigestion may also cause problems with manure/litter management, because non-digested residues in the large intestine often adsorb more water or produce feces that are more viscous.

Animal feed contains Cereals and Cakes.
Cell walls of cereals are primarily composed of carbohydrate complexes referred to as Non Starch Polysaccharides (NSP).
ANFs present in these NSP (like ß-glucans and arabinoxylans) are non digestible and form high-molecular-weight viscous aggregates in the gastrointestinal tract.
They

- Affect the digestive enzymes.
- Cause endogenous losses
- Reduce the rate of passage.

- Stimulates pathogenic microbial proliferation.

Enzymes such as xylanase or ß-glucanase into diets having ANF can effectively decrease viscosity and consequently reduce the anti nutritional effect of NSP.
Cellulase, ß-Glucanase, Xylanase, and Pectinase can degrade plant origin cell wall polymers.
Amylase can increase the gut absorption levels of starches.
Hemi Cellulase can degrade the difficult fiber.
Protease can degrade the proteins.
Lipase can degrade the lipids.
Phytase helps in solubilising the phyto phosphorous.
Tannases can degrade the plant toxins.

G.I Tract Region	**Enzyme (or secretion)**	**Substrate**	**End Product**	**pH**
Mouth	Saliva	Lubricates and softens food		
Crop	Mucus	Lubricates and softens food		4.5
Stomach (Gizzard and proventiculus)	HCl	Lowers stomach pH		2.5
	Pepsin	Protein	Polypeptides	
Duodenum	Trypsin, Chymotrypsin and Elastases	Proteins, Peptones and Peptides	Peptones, Peptides and amino acids	
	Carboxy-petidases	Peptides	Peptides and amino acids	6
	Collagenase	Collagen	Peptides	to 6.8
Jejunum	Peptidases	Peptides	Dipeptides and amino acids	5.8 to 6.6
	Polynucleotidase	Nucleic acids	Mono-nucleotides	

Posttranslational glycosylation has been reported to protect enzymes from deactivation caused by high temperatures and proteinases
(Olsen and Thomsen, 1991).

All enzyme feed additives are considered either food additives or GRAS substances

The activity of enzymes retains more than 95% when stored at the temperature of 25 Deg C upto 3 months

PROTEINS:

Protein and amino acid availability are of greatest concern in animal and vegetable protein ingredients. Protein content and availability from cereals and their by-products seem to be more consistent and little affected by processing conditions.

Feedstuff	**C. Protein (%)**	**Digestibility (%)**			
		C. Protein	**Lys**	**Met**	**Cys**
Vegetable sources (cereals)					
Yellow maize	8	82 - 86	81	91	85
Wheat	12	78 - 82	81	87	87
Barley	10	70 -82	78	79	81
Sorghum	10	67 - 72	78	89	83
Vegetable sources (oil seed meals)					
Peanut meals	49	88 - 91	83	88	78
Soybean meals	46	83 - 87	91	92	82
Cottonseed meal	43	61 - 76	67	73	73
Animal sources					
Blood meal	88	82-92	86	91	76
Fish meal	66	86 - 90	88	92	73
Meat meal	60	75 - 80	79	85	58
Feather meal	87	36 - 77	66	76	59

FATS:

G.I Tract Region	**Enzyme (or secretion)**	**Substrate**	**End Product**	**pH**
Mouth	Saliva	Lubricates and softens food		
Crop	Mucus	Lubricates and softens food		4.5
Stomach (Gizzard and	HCl	Lowers stomach pH		2.5

proventiculus)	Lipase	Fats	Fatty acids, mono-glycerides and glycerol	
Duodenum and Jejunum	Bile	Fats	Emulsification	
	Lipase	Fats	Fatty acids, mono-glycerides and glycerol	5.8
	Cholesterol esterase	Fatty acid - cholesterol esters	Fatty acid, cholesterol	to 6.6

	Digestibility		**Metabolizable energy (kcal/kg)**	
Fat Type/Age	**0-21d**	**>21d**	**0-21d**	**>21 d**
Tallow	80	86	7400	8000
Poultry Fat	88	97	8200	9000
Fish oil	92	97	8600	9000
Vegetable oil	95	99	8800	9200
Coconut oil	70	84	6500	7800
Palm oil	77	86	7200	8000
Vegetable soapstock	84	87	7800	8100
Restaurant grease	87	96	8100	8900

Cellulase
Breaks down cellulose and chitin
(chitin is cellulose like fiber found in the cell wall of candida).
Cellulases acts on cellulose molecules by hydrolysing the beta-1, 4 glycosidic linkages. They largely produces cellobiose, which can ultimately yield glucose units, depending on the characteristic of the enzyme.
It helps free nutrients in both fruits and vegetables.
Measured in CU (Cellulase Units).

Activity of Enzyme:
One activity u/mg (u/ml) of cellulase is defined as that quantity of enzyme that can liberate 1g glucose in one minute at pH of 4.8.
Standard Product: 8000 u/g

Use the preparation between pH of 4.0~5.0,
Generally speaking, adding the preparation 50g to 1t dry materials will play well.

Protease:

Bonds with alpha 2-macroglobulin to support immune function when taken on an empty stomach.

Protease is responsible for digesting proteins in food, which is probably one of the most difficult substances to metabolize. Because of this, protease is considered to be one of the most important enzymes that we have. If the digestive process is incomplete, undigested protein can wind up in the circulatory system, as well as in other parts of the body.

When protease is present in higher quantities, it can help to clean up the body by removing the unwanted protein from the circulatory system. This will help to clean up the blood stream, and restore the energy and balance.

One of the tricks of an invading organism is to wrap itself in a large protein shell that the body would view as being "normal". Large amounts of protease can help remove this protein shell, and allow the body`s defense mechanisms to go into action. With the protective barrier down, the immune system can step in and destroy the invading organism.

Protease refers to a group of enzymes whose catalytic function is to hydrolyze (breakdown) peptide bonds of proteins. They are also called proteolytic enzymes or proteinases. Proteases differ in their ability to hydrolyze various peptide bonds. Each type of protease has a specific kind of peptide bonds it breaks. Examples of proteases include: fungal protease, pepsin, trypsin, chymotrypsin, papain, bromelain, and subtilisin.

Proteolytic enzymes are very important in digestion as they breakdown the protein foods to liberate the amino acids needed by the body. Additionally, proteolytic enzymes have been used for a long time in various forms of therapy. Their use in medicine is gaining more and more attention as several clinical studies are indicating their benefits in oncology, inflammatory conditions and immune regulation.

Contrary to old beliefs, several studies have shown that orally ingested enzymes can bypass the conditions of the GI tract and be absorbed into the blood stream while still maintaining their enzymatic activity. Commercially, proteases are produced in highly controlled aseptic conditions for food supplementation and systemic enzyme therapy. The organisms most often used are Aspergillus niger and oryzae.
Measured in HUT (Hemoglobin Units in a Tyrosine Base).

Lipase

Lipase is an enzyme necessary for the absorption and digestion of nutrients in the intestines. This digestive enzyme is responsible for breaking down lipids (fats), in particular triglycerides, which are fatty substances in the body that come from fat in the diet. Once broken down into smaller components, triglycerides are more easily absorbed in the intestines. Lipase is primarily produced in the pancreas but is also produced in the mouth and stomach. Most people produce sufficient amounts of pancreatic lipase.

Along with lipase, the pancreas secretes insulin and glucagon, hormones that the body needs to break down sugar in the bloodstream. Other pancreatic enzymes include amylase, which breaks down amylose (a form of starch) into its sugar building blocks, and protease, which breaks down protein into single amino acids.

Source:
Lipase, monoacylglycerol:
Penicillium camembertii

Lipase, triacylglycerol:
Aspergillus niger
Aspergillus oryzae
Aspergillus oryzae, containing the gene for Lipase, triacylglycerol isolated from *Fusarium oxysporum*
Aspergillus oryzae, containing the gene for Lipase, triacylglycerol isolated from *Humicola lanuginosa*
Aspergillus oryzae, containing the gene for Lipase, triacylglycerol isolated from *Rhizomucor miehei*
Rhizopus arrhizus
Rhizomucor miehei
Rhizophus niveus
Rhizophus oryzae

Uses

In general, lipase supplements are thought to help the body absorb food more easily, keeping nutrients at appropriate, healthy levels throughout the body. Studies suggest that they may also be helpful for the following conditions:

Celiac Disease

Pancreatic enzymes have been most studied as part of the treatment for celiac disease. Celiac disease is a condition in which dietary gluten causes damage to the intestinal tract. Symptoms include abdominal pain, weight loss, and fatigue. People with celiac disease must consume a life-long gluten-free diet. Lipase, along with other pancreatic enzymes, may help in the treatment of this condition by enhancing the benefit of a gluten-free diet. In a study of 40 children with celiac disease, for example, those who received pancreatic enzyme therapy (including lipase) demonstrated a modest increase in weight compared to those who received placebo. The improvement in weight occurred within the first month of use; taking the pancreatic enzyme supplements for an additional month did not lead to more weight gain.

Indigestion

In a small study including 18 subjects, supplements containing lipase and other pancreatic enzymes were found to reduce bloating, gas, and fullness following a high-fat meal. Given that these symptoms are commonly associated with irritable bowel syndrome, some with this condition may experience improvement with use of pancreatic enzymes.

Other
Although scientific evidence is lacking, lipase has been used by trained clinicians to treat food allergies, cystic fibroris, and autoimmune disorders, such as rheumatoid arthritis and lupus.

Dietary Sources
Lipase is produced primarily in the pancreas and is not found in food.

Available Forms
Lipase supplements are usually derived from animal enzymes, although plant sources of lipase and other digestive enzymes have become increasingly popular. Lipase may be taken in combination with protease and amylase enzymes.

Pectinase

Breaks down carbohydrates, such as pectin found in many fruits and vegetables.
Measured in AJDU

Activity of Enzyme: One activity u/mg(u/ml) of pectinase is defined as that quantity of enzyme that can liberate 1 galacturonic acid in one minute at pH of 3.5,
Standard pectinase :1200000 u/ml min
Optimum pH of 3.2~5.0,
The activity of enzymes retains more than 95% when stored at the temperature of 25 Deg C; upto 3 months.

Xylanase

Xylanase (EC 3.2.1.8) is the name given to a class of enzymes which degrade the linear polysaccharide beta-1,4-xylan into xylose, thus breaking down hemicellulose, which is a major component of the cell wall of plants.

As such, it plays a major role in the digestive system of herbivorous micro-organisms (mammals, conversely, do not produce xylanase).
Additionally, xylanases are present in fungi for the degradation of plant matter into usable nutrients.

Commercial applications for xylanase include the chlorine-free bleaching of wood pulp in the papermaking process, and the increased digestibility of silage (in this aspect, it is also used for fermentative composting).

In the future, xylanase may be used for the production of biofuel from unusable plant material.

DIRECT FED MICROBES

Many studies have reported the effective usefulness of DFM in

- Detoxifying
- Enhancing the immunity System,
- Improving F C R
- Reducing the Diarrhoea,

Organism	**End Products or Potential Use**
Bacillus subtilis	amylase, protease
Bifidobacterium bifidum	ureases, lactic acid, formic acid
L. lactis	amylase, hydrogen peroxide, proteases
Lactobacillus acidophilus	lactic acid, acidophilin, glycosidases
Pediococsus acidilactici	pediocin (bacteriocin)
Propionibacteria sp.	Ruminal lactate utilizer, propionate producer
Propionibacterium thoenii	propionicin PLG-1 (bacteriocin)
Bacillus polymyxa	Polymixin B Antifungal Peptide

COMPOSITION OF ENZYMIX

Aamylase	325 Ul/g
Cellulase	200 Ul/g
Lipase	250 Ul/g
Protease	300 Ul/g
DFM	< 1000 Million CFU/g

SALIENT FEATURES OF ZYMEX

- Higher quality end product from cleaner eggs or reduced carcass downgrades
- Improved environment
- improves the digestibility of the feed
- Lower feed costs
- More uniform pigs and birds
- Proven value in antibiotic growth promoter free nutrition
- Provides feed manufacturing with the opportunity to choose low cost feeding stuff to replace high cost feeding stuff.
- Provides feed manufacturing with the opportunity to reduce feed costs

SUGGESTED LEVEL OF INCLUSION:

Generally speaking, adding ZYMEX75- 150 g to 1M T dry materials will play well. But you should reconfirmed suitable dosage depending on your bench-scale experiment results.

OTHER MATTERS OF IMPORTANCE

Use the preparation between pH of 3.8~5.0,
The activity of enzymes retains more than 95% when stored at the temperature of 25 Deg C upto 3 months

WITHDRAWAL PERIOD

Not necessary

STORAGE:

All Enzymes and DFM should be kept away from moisture, excess heat, and light

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