



REPUBLIC OF KENYA



THE ROLE AND APPLICATION OF FEED ADDITIVES IN CHICKEN FEEDS



Introduction

Feed additives are the individual ingredients or combinations added to the fundamental feed mix or its components to address specific nutritional requirements. They are usually applied in small quantities and require thorough mixing. Their primary purpose includes enhancing growth rates, improving feed efficiency, preventing, and controlling diseases, and safeguarding against adverse environmental influences.

Categories of feed additives

Understanding the varied categories of feed additives allows for strategic supplementation, addressing specific nutritional and health needs in chicken diets.

The categories are:

1. Nutrient feed additives. These comprise of amino acids, minerals and vitamins.

- **Amino Acids:** These are essential building blocks for protein synthesis, which support optimal growth and development in the animals.
- **Minerals:** Are vital for various physiological functions, including bone formation, enzyme activation, and overall metabolic balance.
- **Vitamins:** Essential organic compounds that play critical roles in numerous biological processes, promoting health and preventing deficiencies.

2. Non-nutrient feed additives. These comprise of enzymes and probiotics.

- **Enzymes:** Facilitate digestion and nutrient absorption, enhancing feed utilization and overall efficiency.
- **Probiotics and Prebiotics:** Introduce beneficial microorganisms to the digestive system, promoting a healthy gut flora and improving nutrient absorption.

Advantages of feed additives

- Feed additives enhance feed quality by improving taste, aroma, and texture, ensuring heightened palatability for consistent and adequate consumption by chicken. This, in turn, guarantees that the chicken receives essential nutrients crucial for optimal growth and health.
- Feed additives address specific nutritional needs, playing a vital role in promoting efficient growth, optimizing reproduction, and supporting overall physiological functions, resulting in healthier and more productive birds. The positive impact extends to the final product, as certain additives positively improve the nutritional content of meat and eggs.
- Some additives, such as probiotics and prebiotics, contribute to disease prevention and overall health promotion, improving the general well-being of the animals.
- Improved feed efficiency through additives reduces the overall environmental impact of chicken farming, aligning with sustainable agricultural practices.
- Feed additives may reduce the reliance on antibiotic use in animal production in response to consumer concerns regarding potential harm and regulatory restrictions. Some additives may enhance the immunity of the birds. Various non-therapeutic additives are available to replace antibiotics, with popular options including probiotics, prebiotics, enzymes, organic acids, phyto-genic feed additives and essential oils among others. These alternatives aim at enhancing the health and productivity of chicken without relying on antibiotics.

Understanding Various Types of Feed Additives

1. Probiotics

Probiotics, defined by the World Health Organization as live microorganisms providing health benefits when administered in sufficient amounts, have demonstrated positive effects in animal nutrition. Adding probiotics to feed enhances growth, improves feed efficiency, and promotes intestinal

health by influencing factors like pH, bacterial composition, and digestive activity. Mechanisms of action include the stimulation of endogenous enzymes, reduction of toxic substance generation, and production of essential vitamins or antimicrobial compounds. Probiotic bacteria produce molecules like bacteriocins, exhibiting antimicrobial properties that inhibit toxin production and pathogen adhesion, contributing to a healthy intestinal environment. Additionally, probiotics support immune responses and enhance resistance to bacterial colonization, fostering a balanced microbial ecosystem for overall well-being and providing a sustainable and natural approach to improving growth and feed efficiency in animal production systems.

2. Prebiotics

Prebiotics are indigestible feed components that promote the growth and activity of beneficial bacteria in the ileum and caecum, offering potential health benefits to the host. Comprising short-chain polysaccharides and oligosaccharides, prebiotics are derived from yeast cell walls and fermentation products. Although not directly digestible by the host, they serve as substrates for intestinal bacteria, leading to the production of beneficial short-chain fatty acids. Prebiotics support a healthy intestinal tract in poultry that is essential for enhanced feed intake.

3. Enzymes

Enzymes are produced through fungi and bacteria fermentation. They are used to maximize feed conversion. The inclusion of enzymes in chicken feeds provides a myriad of benefits for poultry production. These enzymes, such as amylases, proteases, and lipases, enhance nutrient utilization by breaking down complex compounds, leading to improved feed conversion rates and cost-effective chicken production. Additionally, enzymes aid in neutralizing anti-nutritional factors, promoting gut health, and minimizing environmental impact by reducing nutrient excretion. The adaptation to diet changes, strengthened immune response and enhanced egg production further highlight the positive impact of enzymes in optimizing overall performance. This approach not only fosters efficient digestion but also contributes to sustainable farming practices.

4. Organic acids

Organic acids serve as preservative agents, employed to safeguard feed from microbial and fungal proliferation. Predominantly, these acids are carboxylic acids with a hydroxyl group on the alpha carbon, including malic, lactic, and tartaric acids. Additionally, organic acids encompass simple monocarboxylic acids such as acetic, formic, butyric, and propionic acids. Their antimicrobial efficacy stems from the ability of non-dissociated acids to permeate lipophilic bacterial membranes, thereby disrupting enzymatic reactions and transport systems.

5. Plant-based feed additives

Utilizing Phytogetic Feed Additives (PFAs) derived from plant extracts, herbs, and spices is an effective strategy to improve animal performance. PFAs have demonstrated favourable effects on growth, immune system enhancement, and stress reduction. Recent research highlights PFAs as promising alternatives to antibiotics, particularly in promoting the growth of broiler chickens.

For example, incorporating cinnamon at a rate of 2 g/kg in the diet has shown significant positive effects on growth performance. Results indicate enhanced growth at 28 days (974 g compared to 850 g) and continued positive effects at 42 days (2,111 g compared to 1,931 g) in broilers. These findings emphasize the potential of phytogetic feed additives, like cinnamon, to positively contribute to the development of broiler chicken.

6. Essential oils

Essential oils, derived from volatile aromatic compounds in plants, can be of natural or synthetic origin. While only certain essential oils possess antibacterial properties, their effectiveness lies in their ability to interfere with bacterial enzymatic systems and modulate immune responses. Recent studies suggest that essential oils have significant potential as alternatives to growth-promoting antibiotics in chicken production.

7. Mycotoxin binders

Using mycotoxin binders in chicken feed is like giving your flock an extra layer of protection from infections. These binders play a crucial role in getting rid of harmful substances known as mycotoxins, which can come from moulds in the feed. By soaking up these mycotoxins in the chicken gut, the binders stop them from getting into the blood and causing infections. This not only maintains the feed quality but also helps the chicken well-being and health. Employing toxin binders is environmentally beneficial as it prevents mycotoxins from entering chicken waste and the recycling process. For the best results, ensure to use mycotoxin binders along with good feed management and analyse mycotoxin levels in feed regularly. One example of a mycotoxin binder for chicken feed is bentonite clay.

8. Feed colour additives

Feed colour additives are used in feed to get that perfect yellow yolk and skin color. By using the right chicken feed colour comes with loads of benefits for farmers and customers alike. People love eggs and chicken with a bright yellow color because it not only looks good but also feels fresh and full of healthy nutrients. It gives the impression of healthy, organic, and chicken raised under a free range system that observed animal welfare standards. For farmers, having eggs and chicken with consistent and appealing colors there is a niche in the market – that can fetch higher prices. Chefs and domestic market also like using eggs with a rich yellow yolk because it improves the outcome of their recipes. But, while chasing the perfect color, it is important to make sure the chicken get all the right nutrients they need to stay healthy and keep laying eggs and producing quality meat. Types of chicken feed color additives includes carotenoids, and xanthophyll isomers, lutein and zeaxanthin, carophyll red and yellow, yellow yolk color.



Yellow yolk colour in chicken products

9. Coccidiostat

Coccidiosis is a prevalent and expensive disease in chicken globally, causing substantial economic losses. The disease negatively impacts chicken gut, affecting weight gain and the conversion of feed into meat or eggs. Chicken without symptoms can spread the disease through their droppings. To address coccidiosis, it's a standard procedure to incorporate anticoccidial medications into chicken feeds, along with implementing proper biosecurity measures.

There are two types of anticoccidials: synthetic anticoccidials (robenidine, decoquinate, diclazuril) that kill parasites, and ionophore anticoccidials (lasalocid, maduramicin, salinomycin, monensin, narasin, semduramicin) that have a more intricate mode of action, reducing the likelihood of parasite resistance. Ionophores also aid in chicken immune development. While widely used to maintain chicken health, careful administration is crucial to prevent the development of resistance.

10. Pellet Binders

Using a pellet binder in feed production is crucial for ensuring the strength and durability of feed pellets. These binders contribute to handling and storing efficiency, preventing pellet breakage and minimizing nutrient wastage. They also prevent pellets from turning into dust, which could lead to nutrient loss. Binders enhance the taste of pellets, encouraging

optimal consumption. Various binder options are available, including natural choices like molasses, wheat flour, maize starch, and soybean meal, as well as synthetic alternatives such as carboxymethyl cellulose and polyvinyl alcohol. Factors like cost, availability, and specific pelletizing requirements should be considered when choosing binders, and a combination of different types may be utilized for the best results in poultry farming.

11. Dewormers

Dewormers are formulated to control and eliminate intestinal parasites in chicken. They often come in the form of medicated feed or additives that can be mixed with the chicken feed. Common deworming agents used in chicken feeds include fenbendazole, ivermectin, levamisole, and piperazine. It is essential to follow the recommended dosage and instructions provided by the manufacturer and observe withdrawal periods to ensure that eggs or meat from the treated chicken are safe for consumption. Before using any dewormer, it is advisable to consult with a veterinarian or poultry health professional to determine the specific needs of your flock and to ensure the correct and safe administration of the deworming treatment. Additionally, practicing good hygiene and sanitation in the chicken coop can help prevent parasitic infestations.

Nutrient feed additives

Amino acids

Amino acids are categorized as either “essential” or “non-essential”. Animals are not able to synthesize the “essential” amino acids and these must be provided in the diet. The “essential” amino acids most likely to be deficient are methionine and lysine. Synthetic sources are sold as DL-Methionine and L-Lysine HCL, respectively are the most common nutrient additives.

Minerals

Minerals are critical in the diet of laying birds since they are needed for optimal health, bone and egg shell formation. They are classified into major and trace elements depending on their concentration in the animal or amounts required in the diet. Major elements are calcium, phosphorus, potassium, sodium, chlorine, sulphur and magnesium. Trace elements are iron, zinc, copper, molybdenum, selenium, iodine, manganese and cobalt. Calcium and phosphorus are vital in poultry farming. They are required for skeletal growth and egg production. Use of excess amounts of some minerals may interfere with absorption or utilization of other minerals, e.g. high levels of calcium will interfere with phosphorus, magnesium and zinc utilization. Excess levels of some minerals can be toxic, e.g. Sodium chloride in compounded feed for laying hens must not exceed 0.5 percent.

Premixes

Most minor elements and some vitamins are provided in the form of commercial premixes. While using commercial premixes it is important to note that premixes are species and age-category specific.

What to look for in a layer feed:

16% protein, 3.25% calcium

Day-to-day performance

Prebiotics & probiotics

Immune and digestive health

Amino acids

Feathering and egg production

Added omega-3

Egg nutrition

Marigold extract

Rich, yellow yolks

Calcium, manganese & trace minerals

Bone and shell strength

Vitamins A, D & E

Feathering and egg production



What to look for in chicken feed

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