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SIGNIFICANCE OF FEED ACIDIFICATION IN POULTRY FEED

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Abstract: Feed Acidifiers are acids included in feeds in order to lower the pH of the feed, gut, and microbial cytoplasm thereby inhibiting the growth of pathogenic intestinal micro flora. This inhibition reduces the micro flora competing for the host nutrients and results in better growth and performance of the chicken. They also act as mold inhibitors. They are added up to 0.25% of the diet. Whereas, inorganic acids such as HCl and H_3PO_4 though pH reducing are ineffective. Organic acids normally used as an acidifier in animal feeds have been considered to be attractive alternatives for improving nutrient digestibility and growth.
Keywords: Organic acid, Acidifier, Growth performance, Weight gain, Propionic acid.

Introduction

Organic acids have been used for decades in feed preservation, protecting feed from microbial and fungal destruction or to increase the preservation effect of fermented feed, e.g. silages. In particular formic acid and propionic acid have been used extensively for this purpose.

Organic acids more used in pre-biotic aims and they have been used extensively for more than 25 years in swine production mostly for feed preservation, for which formic and propionic acids are particularly effective and recently in poultry (Boling *et al.,* 2000). Withdrawal of antibiotics from poultry feeds has created the need for alternatives that would influence improvement of healthy production traits of broiler chickens and safety for human consuming poultry products.

Action of organic acid

Acidifiers, particularly, the short chain fatty acids, acetate, propionate and butyrate have contributed greatly to the profitability in poultry and also provide people with health and nutritious poultry products.

Antibacterial effect of organic acids is by

- Modification of bacteria's internal pH,

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- Inhibition of bacteria's fundamental metabolic functions,
- Accumulation of toxic anions in bacteria and
- Disruption of bacteria's cellular membrane.

Organic acids exert their antimicrobial action both in the feed and in the GI-tract of the animal. The antibacterial effect of dietary organic acids in chickens is believed to occur in the upper part of the digestive tract (crop and gizzard). Following the addition of a combination of formic and propionic acid, high concentrations of these acids could only be recovered from crop and gizzard.

Advantages:

- Helps to maintain an optimum pH in the stomach, allowing correct activation and function of proteolytic enzymes (Kim *et al.,* 2005).
- Aids in *total protein digestion* in the stomach
- Stimulates feed consumption.
- Inhibits the growth of pathogenic bacteria.
- Improves protein and energy digestibilities by reducing microbial competition with host nutrients and endogenous nitrogen losses.
- Lowers the incidence of *sub clinical infections* and secretions of immune mediators.
- Reduces the production of ammonia and other growth depressing microbial metabolites.
- Increased pancreatic secretion and *trophic effects on gastrointestinal mucosa*.

Organic acids in poultry feed

Organic acids can be added in many forms including free acid form (powder or liquid) or, as salts form and are included at 0.5 kg / Ton of feed to control molds and at 2.5 to 3.0 kg / Ton of feed to reduce pH and help in control of Salmonella. In addition, the pH reduction conferred by the acidifier helps to establish the pH optimum for phytase.

Formic acid

The use of pure *formic acid* in breeder diets reduced the contamination of tray liners and hatchery waste with S. *enteritidis*.

Lactic acid

It was also found that there was an increased body weight when the diet was supplemented with lactic acid.

Combination of acids

It is evident that combination of acids is preferred to individual acid in obtaining the desired antimicrobial effect. Acidification of diets with weak organic acids such as formic, fumaric, propionic, lactic and sorbic have been reported *to improve digestibility of protein, Ca, P, Mg, Zn* and served as substrate in the intermediary metabolism.

Formic and Propionic acid

It was found that 6 kg/ton (0.6%) of this organic acid blend (mixture of formic and propionic acids) was effective in preventing intestinal colonization with ***Salmonella* spp**. from naturally or artificially contaminated feed (Gunal *et al.*, 2006).

Potassium and Sodium diformate:-

Double salts of organic acids, such as potassium diformate and sodium diformate, which reach the small intestine, have been shown to have a significant impact on nutrient utilization

Potency of organic acids

Comparative studies of six organic acids showed that the inhibiting effect of the acids was more pronounced in stomach contents than in content from the small intestine, probably due to the lower pH in the stomach content. The bactericidal effect of the organic acids is: benzoic acid > fumaric acid > lactic acid > butyric acid > formic acid > propionic acid.

Benzoic acid is superior to other acids in exhibiting bactericidal effect on coliform as well as lactic acid bacteria in both stomach and small intestinal content. Poultry diets usually have high alkalinity characteristics: (very rich in protein and mineral substances). Vegetal protein and calcium carbonate meals in feeds have a strong buffer function. The use of diets characterized by such a high buffer capacity can compromise the intestine capability to keep an acidity level that can support growth and in some cases, maintain beneficial intestinal micro flora.

Other products

Organic acids can be mixed with fatty acids, mono and diglycerides to form micro granules. Organic acid is released slowly from these micro granules. Medium chain fatty acids (chain length: 6 to12 C) with a lower absorption rate by the host may improve the efficacy of the short chain fatty acids. Acids produced by fermentation with microbes (*Pediococcus acidilactici)* may be less expensive and equally effective.4

Limitations

- Palatability may be decreased**,** leading to feed refusal

- Organic acids are corrosive to metallic poultry equipment
- Bacteria are known to develop acid resistance when exposed to acidic environments for over long term.
- Presence of other antimicrobial compounds can reduce its efficiency
- Cleanliness of the production environment
- Buffering capacity of dietary ingredients

Conclusion

Prevention of infections, good nutritional balance and better performance is of paramount importance in poultry production. The use of alternatives to antibiotic growth promoter in specific, the use of organic acids in poultry feed is receiving greater attention. Higher *villus height in duodenum and jejunum* with most organic acidifier added to broiler diets. The increase in villus height may be attributed to the intestinal epithelium acting as a natural barrier against pathogenic bacteria and toxic substances that are present in intestinal lumen. Certain studies proved that dietary acidifier improved the feed conversion of experimental broilers compared to birds fed antibiotics growth promoter counterpart. It is hoped that nutritional control will lead to microbiological control, allowing for more consistent performance response in the absence of antibiotics. The use of acidifiers in poultry diets appears promising. Combination of different acids seems to lead the way to greater efficacy. Hence a *dietary acidifier can suitably replace antibiotics growth promoters in the diets of broilers*.

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