SYNERGISTIC EFFECT OF CITRIC ACID AND MICROBIAL PHYTASE IN BROILER CHICKEN

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Poultry industry has attained remarkable growth in India with a phenomenal increase in broiler production over the past two decades. Among various livestock enterprises, poultry farming has metamorphosed into a modern and vibrant industry contributing substantially to the Gross Domestic Product (GDP). As our country faces an overwhelming demand for animal protein, the broiler chicken that provides the cheapest source of animal protein is being exploited to meet out the demand. However, the productivity level per bird in India on an average is still low compared to several other countries and a wide gap exists between availability and minimum requirement of egg and poultry meat.

One of the crucial inputs that would determine successful and sustainable development in poultry industry is the availability of quality feed in required quantity. As feed accounts for 70-75 per cent of total production cost of poultry, efficient utilization of feed is extremely important to poultry producers. But availability of feed ingredients is critical, due to the competition that exists between human beings and livestock for the same. A feedstuf that is fed to poultry feed rapidly becomes main input for some emerging industries making it unavailable for livestock and poultry production on cost front. This often necessitates the poultry farmer to look into ways and means to develop alternate strategies for maximum utilization of feed.

Major ingredients in poultry diets are of plant origin such as cereals, cereal by-products and oil seeds cakes, which are blended together to provide necessary energy and proteins for optimizing production. The plant-derived ingredients are rich in P, but only about one third of the P is present in inorganic form, which is easily digestible. The remaining two thirds is present as organic P especially in the form of salts of phytic acid – phytates (Myo-inositol hexakisphosphates) that cannot be utilized and excreted as such by poultry, due to insufficient quantities of enzyme phytase in the G1 tract (Nelson, 1967).

Apart from its unavailability, phytates may combine with starch, protein and certain elements such as Ca, Mg, Zn, Mn, Cu, Fe, Co, Ni and K. Being insoluble these compounds precipitate in the gut, without getting absorbed and finally excreted. Over supplementation of P as well as other nutrients is also common in the feed industry because of the safety margin for the requirements. This excess supplementation leads to P excretion through droppings and is responsible for environmental pollution.

The need for inorganic P in the rations can be reduced considerably if phytate P can be utilized by poultry. To make phytate P biologically available, it is necessary to hydrolyse them by phytase. The enzyme phytase, a normal constituent of feed ingredients like soybean meal, rapeseed meal, corn, wheat etc. help in degrading the phytate to a certain extent, but the activity of vegetable phytase is limited as they act only at a narrow pH range. This necessitates the use of extraneous source of this enzyme.
Phytase is more active at low (acidic) pH. Furthermore, low intestinal pH can increase the solubility of P and Ca and improve P and Ca absorption in the small intestine. So organic acids, which lower the gut pH, will potentiate the effects of phytase into the small intestine. Citric acid being an organic acid can improve phytate P utilization. Citric acid and phytase may have some additive or synergistic effects in poultry (Boling et al., 2000). A proper combination of citric acid and phytase may represent a practical solution for improving phytate P utilization and decreasing P levels in poultry excreta, thus environmental pollution. Apart from overcoming the ill effects of phytate P, citric acid and microbial phytase have been reported to enhance the growth performance of broiler chicken.

Studies have been conducted in India, to study the interaction effect of citric acid and microbial phytase in poultry. Maximum weight and weight gain with better Protein efficiency ratio were recorded with combination of citric acid and microbial phytase than the groups fed with phytase or citric acid separately.

Availability of Ca, P, Mg, Zn and Mn were enhanced by citric acid and phytase. Weight of dried tibia and Per cent tibial ash, Tibial and serum Ca, P, Mg, Zn and Mn at sixth and eighth week were also high which could indicate that citric acid and/or phytase favour P utilization and bone development. Serum alkaline phosphatase was significantly reduced with no significant difference in per cent dressed yield, ready-to-cook yield, giblet yield, abdominal fat yield and livability, when compared to control feed.