Modified Glucomannan: a promising solution to bind T-2 toxin in broilers

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Among various mycotoxins, T-2 toxin produced by fungi of genus *Fusarium* has been reported to cause several adverse effects in poultry such as oral and skin lesions, gastric irritation, reduced body weight, regression of ovaries in layers and immunosuppression.

To fight these problems specific ingredients added to the feed can be used to bind the mycotoxins and make them harmless to the animal. One of these binders is Modified Glucomannan (MG), which is derived from the cell wall of a specific strain of yeast and has a wide range of mycotoxin binding properties which are effective against aflatoxin, T-2 toxin, zearalenone, ochratoxin, etcetera.

**Binding ability of MG**

A series of research trials have been conducted at our laboratories and other research centres world wide to study the mycotoxin binding ability of modified glucomannan. Maheesh and Devegowda (1996), in an *in-vitro* study, compared the aflatoxin binding ability of MG and hydrated sodium calcium aluminium silicate using aflatoxin-contaminated poultry feed. At the highest level of inclusion, both products adsorbed aflatoxin up to 80% whereas at low levels, the MG was more effective.

Manoj and Devegowda (2000) observed that MG at 0.1% was effective in counteracting adverse effects of T-2 toxin on egg production and reduced feed intake in laying hens.

Dvorska and Surai (2001) conducted a trial in quails and observed that MG had significant protective effects against T-2 toxicosis by shielding the antioxidant systems of the quail liver from toxin damage.

Raju and Devegowda (2000), evaluated the individual and combined effect of aflatoxin, ochratoxin, and T-2 toxin on organ morphological, serum biochemical and hematological profiles of broiler chickens and found that supplementation of MG was beneficial in reducing the individual and combined mycotoxicosis.

In a recent trial Arvind *et al.* (2003) showed supplementation of MG to ochratoxin-contaminated feed improved body weight gain (3.6%), total proteins (11%) and hematocrit values (4.7%).

**Binding in the biological system**

A live animal trial was conducted to study the binding ability of MG to bind T-2 toxin in the biological system of broiler chickens. To produce T-2 toxin *Fusarium sporotrichoides* was propagated on oatmeal agar to produce T-2 toxin on whole wheat, which was used to formulate the following experimental diets:

- Basal diet (no toxin binder)
- Basal diet + 0.1% MG
- Basal diet + 500 ppb T-2 toxin
- Basal diet + 500 ppb T-2 toxin + 0.1% MG

Commercial broilers were reared in deep litter and...
80 uniformly weighing birds (male and female) were selected from the flock at five weeks of age and divided into four groups of twenty birds. They were separately fed with the experimental diets in individual cages. From each experimental group five birds were sacrificed at an interval of 30 minutes that is at 0, 30, 60, 90, and 120 minutes after feeding. The whole gut contents of each bird were collected separately and dried. The T-2 concentration in the dried samples was determined by TLC method and percent T-2 recovered from each sample was calculated.

**Percentage T-2 toxin bound**

Prior to feeding no toxin was detected in the samples from the groups fed with only the basal diet with and without MG (diet 1 and 2), which indicated that no residual T-2 toxin was present in the gut contents. The toxin recovery reduced with increase in time intervals in the basal diet + toxin group (diet 3). These reduced values can be contributed to absorption of toxin from the gut. There was a further reduction in percent toxin recovery in the toxin + MG group (diet 4), which may be due to binding of T-2 toxin by MG. (Figure 1)

The percentage of T-2 toxin bound by MG is obtained by difference of the percentage T-2 toxin recovered from with (diet 4) and without MG group (diet 3) (Figure 2). The binding of T-2 toxin by MG increased with increasing time intervals. This may be due to selective binding of T-2 toxin by the binder as digestion of feed takes place, preventing the toxin absorption from the digestive tract. In conclusion the results of this trial indicate that supplementation of MG at 1kg/tonne of feed is beneficial in preventing the absorption of T-2 toxin into the biological system. The modified glucomannan had the ability to bind T-2 toxin up to 35% in the gastrointestinal tract of broilers.

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