Modified glucomannans prevent negative effect of ergot mycotoxin in layers.

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Abstract

The present study was conducted to assess the dietary effect of ergot mycotoxins in layers and to evaluate protective properties of modified glucomannans in preventing inhibition of performance. Two groups of layers were formed with 10000 birds in each group (Cross Borki-color) . The treatment diet consisted of the basal diet with naturally contaminated with ergot mycotoxins wheat added to the diet at 40% (mycotoxin content is 0,4%) plus an organic polymer derived from the yeast cell wall (Mycosorb, Alltech Inc.) (1 kg/ ton of feed). After 3 weeks of feeding performance of layers was assessed (egg production, mortality, FCR). Inclusion of naturally contaminated wheat with ergot mycotoxins significantly reduced egg production. Inclusion of modified glucomanns increased egg production by 33,5% in comparison with group without mycotoxin adsorbent. Mortality was also decreased in group fed with modified glucomannans (0,44%) in comparison with group fed contaminated feed without modified glucomannans (2,5%). Feed conversion ratio during consumption of contaminated feed was increased (4,7%). Inclusion of modified glucomannans decreased FCR (3.3%). Our data shown that adding modified glucomannans to the hens diet was able to reduce negative effects of mycotoxicosis.

Introduction

Mycotoxins problem can not be overestimated. It is known that about 25% of world's grain production is contaminated with mycotoxins (Fink-Gremmels, 1999) In farm animals mycotoxins affect growth, reproduction and immunity. The most promising method of mycotoxin decontamination today is neutralizing mycotoxins already in the feed by using different adsorbents. Many kinds of mycotoxin adsorbents have been tested recently (Danicke, 2002). The degree of mycotoxin absorption depends on the chemical nature of the mycotoxin in relation to the surface properties and geometry of adsorbent. (Denicke, 2002). . The adsorbent material selectively binds mycotoxins during digestion, preventing the absorption from the gastrointestinal tract, thereby decreasing toxic effects (Ledoux and Rottingham, 1999; Devegowda et al., 1998). Of several different adsorbent additives studied, an esterified glucan (Mycosorb, Alltech, Inc. USA) has been shown to be the most effective (Devegowda et al., 1998).

Mycotoxicological analysis of feed from 20 poultry farms in Ukraine during last 8 years showed that 214 from 399 samples were contaminated with mycotoxins. Every fifth sample contained T-2 toxin in concentrations: 20-100 mcg/kg - 54, 100-200 mcg/kg - 21 and >200 mcg/kg – 8 samples. When contaminated feed was fed to layers the reduction of egg production and increased mortality rate were observed, and very often the sign of necrotic stomatitis were found (Kotic et al., 2004), Another case of mycotoxicosis was observed on the poultry farm in Sumy region (Dvorska et al, 2003). Mycotoxicological analysis of feed confirmed occurrence of ergot alkaloids in the wheat. The aim of the present study was to assess the dietary effect of ergot mycotoxins in layers and to comparatively evaluate the protective properties of modified glucomannas derived from yeast cell wall.

Materials and Methods

Two groups of layers were formed with 10000 birds in each group (Cross Borki-color) . The treatment diet consisted of the basal diet with naturally contaminated with ergot mycotoxins wheat added to the diet at 40% (mycotoxin content is 0,4%) plus an organic polymer derived from the yeast cell wall (Mycosorb, Alltech Inc.) (1 kg/ ton of feed). After 3 weeks of feeding performance of layers was assessed (egg production, mortality, FCR).

Results and Discussion

Inclusion of naturally contaminated wheat with ergot mycotoxins significantly reduced egg production. Inclusion modified glucomannans helped to prevent its reduction (Figure 1) Inclusion of modified glucomanns increased egg production by 33,5% in comparison with group without mycotoxin adsorbent.

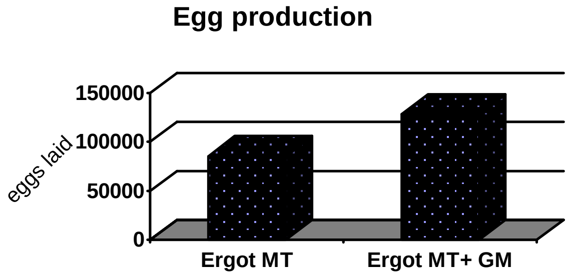

Figure 1. Effect of ergot mycotoxins (MT) and ergot mycotoxins plus modified glucomannans (MG) in feed on the egg production of laying hens.

Mortality was also decreased in group fed with an organic polymer derived from the yeast cell wall (by 2,06%) (Figure 2).

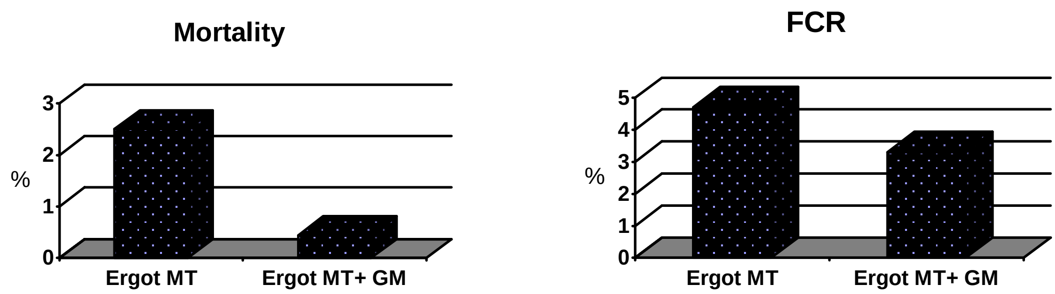

Figure 2. Effect of ergot mycotoxins (MT) and ergot mycotoxins plus modified glucomannans (MG) in feed on mortality and FCR of laying hens.

Feed conversion ratio during consumption of contaminated feed was increased. Adding of modified glucomannans was able to reduce it (4,7% and 3,3% correspondently) (Figure 2). Our data shown that consumption of naturally contaminated with ergot mycotoxins wheat was associated with reduced performance in layer hens. Adding adsorbent of mycotoxins to the hen's diet was able to reduce negative effects of mycotoxicosis.

There are various approaches to control or combat mycotoxin problems. The simplest strategy is based on the prevention of the formation of mycotoxins in feeds by special management programmes including storage at low moisture levels and prevention of grain damage during processing (Dawson, 2001). However, modern agronomic technology is not able to eliminate pre-harvest infection of susceptible crops by fungi (Wood, 1992). Therefore this strategy can only partially be effective; and in countries with warm and humid conditions, this strategy could be quite costly. Other strategies based on use microbial or thermal inactivation of toxins, physical separation of contaminated feedstuffs, irradiation, ammoniation and ozone degradation have not been developed to the industrial

level because they are either time-consuming or comparatively expensive (Dawson, 2001). In recent years, nutritional manipulation has been actively used to improve animal self-defence against mycotoxins or to decrease detrimental consequences of mycotoxin consumption. Many compounds have been tested for adsorbent effects, however comparatively few have proven successful. Still fewer – mainly bentonites, zeolites, aluminosilicates and a yeast-derived glucomannan – are sold commercially for this purpose. The extent to which various compounds adsorb or bind specific toxins varies considerably. Some (zeolites) only bind aflatoxin, leaving other mycotoxins unaltered. In contrast, a glucomannan derived from yeast cell walls (Mycosorb^{TM}) has been shown to be effective against a wide range of mycotoxins (Dawson, 2001; Devegovda, 1998). Work with sorghum ergot, a mycotoxin of emerging importance in countries where grain sorghums are grown, has demonstrated that Mycosorb is an effective binder of this toxin. When sorghum ergot alkaloid was added to the feed of broiler chickens, weight gain was significantly inhibited compared to a control containing no toxin. Adding modified glucomannan to the diet in the presence of toxin restored broiler growth and feed conversion to the same level as the control (Deo et al., 1999). Mycosorb was significantly superior to bentonite clay in binding sorghum ergot alkaloids and exhibited numerically superior binding to zeolite, even though the latter was included in the diet at a higher concentration. In practical situations in Australia, performance has been successfully maintained by adding the esterified glucomannan to the diets of layer breeder and commercial laying hens when sorghum contaminated with sorghum ergot was also present in the feed.

Although a number of systems are available to reduce the negative effects of mycotoxin contamination of animal feed, it is likely the highest success rate will be achieved by good mill hygiene and management combined with an effective toxin adsorbent. The evidence currently indicates that the modified glucomannans fulfill the necessary criteria for a safe and cost-effective solution to mycotoxin contamination.

Conclusion

1. Contamination of wheat in hens diet with ergot mycotoxins resulted in decreased performance of laying hens.
2. Use of modified glucomannans was effective in prevention of negative effect of ergot mycotoxins on the layers perfirmance.
3. Use of mycotoxin adsorbent was economically beneficial.

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