Effects of Mycotoxin Adsorbent on Growth and Detoxification Performance of Broilers

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Abstract: This experiment mainly studies on the effects of mycotoxin adsorbent on the growth capability and the detoxification results of broilers. Meanwhile, products of the same kind on the market are compared so as to study the application results of mycotoxin adsorbent products.

200 one-day-old Cobb Broilers were chosen which were divided into five treatment groups randomly. There were four repetitive groups within each treatment group, so 10 broilers were contained in each repetitive group. Each repetitive group was weighed and data of their production capability was analyzed after the conclusion of the experiment.

The result shows that the daily weight gain of the experiment group added with FUBON MYCOTOXIN ABSORBENT products increases by 5.05% and 14.24% compared with the positive control group and the negative control group respectively. The feed conversion rate of is obviously higher than that of Austrian adsorbent group. The feed conversion ratio of FUBON MYCOTOXIN ABSORBENT products group decreases 4.81% and 6.08 % respectively compared with that of moldy feed group and normal feed group while there are no difference among each groups in terms of the mortality rate.

Key words: mycotoxin; broiler; adsorbent; daily weight gain; detoxification; feed conversion ratio; FUBON MYCOTOXIN ABSORBENT

1 Introduction

Mycotoxin has become a hot point concerned by the planting industry, the animal breeding industry, the food processing industry and other related departments of the country. Food contamination can be easily detected with the establishment of mycotoxin assay method ELISA, but the slightly contaminated raw materials can be used in animal feed.

However, highly contaminated raw materials and auxiliary materials used in grain processing are greatly harmful to animal breeding which need to be processed or modified before being fed to animals. So if the effectiveness of adsorbent products such as bentonite can be qualified, then highly contaminated food crops and processing auxiliary materials

can be safely and economically used in the animal breeding.

The main performance of mycotoxin is that it can be added to animal feed safely and economically. However, different mycotoxin adsorbents have different effects on mycotoxin adsorbing. Recently it's reported that there are many adsorbents sold in the market whose application effects have not been qualified.

FUBON MYCOTOXIN ABSORBENT is a natural and organic mycotoxin adsorbent product of high efficiency which was developed independently by Angel Yeast Co., Ltd. with high technology. Result of adsorbing experiment in vitro shows that its adsorption rate of Aflatoxin is over 98% and zearalenone over 90%. This experiment further studies on the practical application results of FUBON MYCOTOXIN ABSORBENT in animal breeding industry and meanwhile, studies and analyzes the advantages of FUBON MYCOTOXIN ABSORBENT product compared with the application results of Austrian compound additives which enjoys good feedback in the domestic market. This experiment also studies on the effects of FUBON MYCOTOXIN ABSORBENT on growth of broilers and detoxification of animals.

2 Materials and Method

2.1 Experiment animals and feed handling

200 one-day-old Cobb Broilers were chosen which were divided into five treatment groups randomly. There were four repetitive groups within each treatment group, so 10 broilers were contained in each repetitive group. The experiment was carried out with healthy broilers with experiment cycle of 42 days. Details of the experimental design are shown in table 1.

Table 1 Grouping design of the experiment

Group	Group code	Ration
The control group	A	Basic ration
Experiment group 1	B	Basic ration +2kg/t FUBON MYCOTOXIN ABSORBENT
Experiment group 2	C	Moldy feed
Experiment group 3	D	Moldy feed +2kg/t FUBON MYCOTOXIN ABSORBENT
Experiment group 4	E	Moldy feed +2kg/t Austrian adsorbent

Remark: 1. The moldy feed was self-prepared feed on the experiment site

2. Content of AFB1 and zearalenone in corn was detected

3. FUBON MYCOTOXIN ABSORBENT was a mycotoxin adsorbent product manufactured by Angel Yeast Co., Ltd.

4. Austrian adsorbent product was a mycotoxin adsorbent product collected from domestic market which was manufactured by Austrian company.

Preparation of moldy corn: Corn was purchased from the market. After water content was adjusted to 20%, the corn was spread evenly and located in the dark and damp corner, molding under room temperature. The corn was turned over every other day after it radiated heat so as to ensure the corn was molded evenly. Twenty one days after molding, the corn was coarsely crushed firstly to getting a crushing fineness of 30 meshes. After the experiment, Content of Aflatoxin B1 and zearalenone was detected which were 161ppb and 2030 ppb respectively.

2.2 Composition of the ration

Self-prepared compound feed was used in the ration. Formula and nutritional level of the product are shown as follows:

Table 2 Ingredients and nutritional level of basic ration

	Ingredients of basic ration			Nutritional level	
Ingredients	1-3 weeks	4-6 weeks	Items	1-3 weeks	4-6 weeks
Corn	60.7	65.65	Metabolic energy /MJ.kg^{-1}	2.90	2.97
Soybean meal	32.94	28	Crude protein	21.0	18.8
Dicalcium phosphate	1.8	2.0	Methionine	0.50	0.5
Vegetable Oil	1.8	1.7	Methionine + cystine	0.91	0.80
Pre-mixed ingredient	1.0	1.0	Lysine	1.15	1.0
Stone powder	1.0	1.0	Calcium	0.9	0.85
Methionine	0.30	0.3	Available phosphorus	0.4560	0.40
Salt	0.3	0.2			
Lysine	0.09	0.08			
Choline chloride	0.07	0.07			

The ration used in the experiment was self-prepared in accordance with the formula of broilers.

Addition of mycotoxin adsorbent: It was mixed by a series of scale by being mixed with pre-mixed and then being mixed with other ingredients. Then the mixture was added to the ration in a certain proportion and then mixed uniformly by mini-type feed mixer for 8min for subsequent use. Attention should be paid to humid protection and sealing of the testing samples.

2.3 Breeding management

Breeding management should be conducted regularly during the experiment period. The broilers should be raised in floor system, eating and drinking freely. The trough should be cleaned everyday and change water once a day with 24-hour illumination and well controlled temperature between 20℃ to 28℃. The 7-day-old broilers should undergo immunity against Newcastle disease, the 14-day-old broilers should undergo immunity against bursa Fabricii and the 21-day-old broilers should undergo the second immunity against Newcastle disease. The coop should be sterilized by dilute Glutaral Solution and kept warm by infrared lamp during the early stage. It should be ensured that there's no abnormal situation happened during the entire breeding period.

2.4 Experiment record

All the experiment data were recorded and observed during the period of the experiment.

2.4.1 Indicators for growth performance

Feed consumption, mortality rate and weight of broilers were recorded every day during the experiment period. All the broilers were weighed 12 hours after feeding stopping in the beginning and completion of the experiment.

Feed conversion ratio = average daily intake per broiler (calibrated) / average daily weight gain per broiler

Average daily weight gain of broiler: Average daily weight gain per broiler of each phase was calculated by weighing all the broilers on the testing date. The broilers should be on an empty stomach after stopping feeding for 12 hours.

2.4.2 Health condition of the broilers

Occurrence of all kinds of diseases such as intestinal disease, leg disease and respiratory illness were observed and recorded everyday.

2.4.3 Breeding environment and apparent indicators

Appearance characteristics of the broiler group such as spirit, diet, excrement and feather color were recorded everyday.

3 Data Record and Processing

All the testing data were analyzed and processed by the SPSS10.0 data processing software, and significance was analyzed by single factor method with which average intake,

weight gain, feed conversion ratio and mortality rate were investigated with emphasis.

3.1 Effects of mycotoxin adsorbent on growth performance of broilers

3.1.1 Effects of mycotoxin adsorbent at early growth stage of broilers

Table 3 Effects of different mycotoxin adsorbent on growth performance of broilers (1-day-old to 21-day-old)

Group	Average daily feed intake / g/broiler·day	Average daily weight gain / g/broiler·day	Feed conversion ratio	Average weight of broilers /g	Number of died broilers	Mortality rate /%
The control group	37.2 ±1.4	21.2±1.2	1.7575±0.0449	445.5±24.7	1	2.5
The control group + FUBON MYCOTOXIN ABSORBENT	38.5±5.5	22.4±4.0	1.7274±0.0835	468.0±7.7	2	5
Moldy feed group	40.8±2.4	21.6±1.4	1.8809±0.0413	456.6±31.0	2	5
Moldy feed group + FUBON MYCOTOXIN ABSORBENT	42.3±3.9	22.9±2.6	1.8392±0.0628	484.7±46.0	1	2.5
Moldy feed group + Austrian adsorbent	38.6±3.4	20.9±1.7	1.8441±0.0686	442.0±33.0	1	2.5

Remark: Values in the table are average ± standard error; Different superscripts indicate significant differences with each other (P<0.05), and different superscripts indicate extremely significant differences with each other (P<0.01). Groups with significant differences are marked in red.

It can be seen from table 3 that at the early growth stage of broilers, average intake of moldy feed group added with FUBON MYCOTOXIN ABSORBENT is obviously higher than other experiment groups. In terms of daily weight gain, that of moldy feed group added with FUBON MYCOTOXIN ABSORBENT is also distinctly higher than that of moldy feed group added with Austrian adsorbent. Moreover, growth speed of moldy feed group added with FUBON MYCOTOXIN ABSORBENT has been enhanced by 9.57% compared with that of moldy feed group, and similarly, growth speed of normal feed group added with FUBON MYCOTOXIN ABSORBENT is obviously 5.66% higher than normal feed group. In terms of feed conversion ratio, that of moldy feed group added with FUBON MYCOTOXIN ABSORBENT and that of normal feed group added with FUBON MYCOTOXIN ABSORBENT both decreases 2.22% and

1.71% respectively compared with their control groups. The result shows that FUBON MYCOTOXIN ABSORBENT has a relatively favorable effect on normal feed preventing from toxin and improving growth. And in terms of mortality rate of broilers, there's no significant difference among each group.

It is shown by significance analysis that there's no significant difference among each experiment group.

5.1.2 Effects of mycotoxin adsorbent at late growth stage of broilers

Table 4 Effects of different mycotoxin adsorbent on growth performance of broilers (21-day-old to 42-day-old)

Group	Average daily feed intake / g/broiler·day	Average daily weight gain / g/broiler·day	Feed conversion ratio	Average weight of broilers /g	Number of died broilers	Mortality rate /%
The control group	85.0 ±8.1	35.3±6.6	2.4408±0.2336	1186.6±137.5	1	2.56
The control group + FUBON MYCOTOXIN ABSORBENT	90.9±17.4	41.9±10.0	2.1896±0.1049	1346.7±281.6	0	0
Moldy feed group	87.2±8.2	36.6±6.9	2.4148±0.2498	1225.7±176.0	1	2.63
Moldy feed group + FUBON MYCOTOXIN ABSORBENT	91.7±15.1	39.5±9.0	2.2675±0.1505	1270.7±218.3	3	7.69
Moldy feed group + Austrian adsorbent	83.0±14.9	36.7±8.8	2.2885±0.2431	1254.6±164.4	1	2.56

Remark: Values in the table are average ± standard error; Different superscripts indicate significant differences with each other (P<0.05), and different superscripts indicate extremely significant differences with each other (P<0.01). Groups with significant differences are marked in red.

It can be seen from table 4 that at the late growth stage of broilers (21 to 42 days old), daily weight gain of the experiment group added with FUBON MYCOTOXIN ABSORBENT has increased 7.92% and 18.70% respectively compared with that of moldy positive control group and negative control group. Meanwhile, daily weight gain and daily intake of moldy feed group added with FUBON MYCOTOXIN ABSORBENT are higher than those of moldy feed group added with Austrian adsorbent. Moreover, in terms of feed conversion ratio, that of moldy feed group added with FUBON MYCOTOXIN ABSORBENT is higher than that of moldy feed group

added with Austrian adsorbent. And feed conversion ratio of the experiment group added with FUBON MYCOTOXIN ABSORBENT has decreased 6.10% and 10.29% respectively compared with that of moldy positive control group and negative control group.

The result shows that daily weight gain can be increased by adding FUBON MYCOTOXIN ABSORBENT product to moldy feed and that would be most effective by adding FUBON MYCOTOXIN ABSORBENT product to normal feed. The effects of FUBON MYCOTOXIN ABSORBENT product are obviously better than that of Austrian product in terms of feed conversion ratio. And in terms of mortality rate of broilers, there's no significant difference among each group. It is shown by significance analysis that there's no significant difference among each experiment group.

5.1.3 Effects of mycotoxin adsorbent at late growth stage of broilers

Table 5 Effects of different mycotoxin adsorbent on growth performance of broilers (1-day-old to 42-day-old)

Group	Average daily feed intake/ g/broiler·day	Average daily weight gain / g/broiler·day	Feed conversion ratio	Average weight of broilers /g	Number of died broilers	Mortality rate /%
The control group	63.0±4.4	28.8±3.6	2.1868±0.1197	1186.6±137.5	2	5
The control group + FUBON MYCOTOXIN ABSORBENT	66.7±11.7	32.9±7.1	2.0423±0.09619	1346.7±281.6	2	5
Moldy feed group	65.7±5.4	29.7±4.4	2.2293±0.1529	1225.7±176.0	3	7.5
Moldy feed group + FUBON MYCOTOXIN ABSORBENT	67.5±8.5	31.2±4.3	2.1220±0.1185	1254.6±164.4	2	5
Moldy feed group + Austrian product	67.2±9.6	30.9±5.5	2.1843±0.08782	1270.7±218.3	4	10

Remark: Values in the table are average ± standard error; Different superscripts indicate significant differences with each other ($P<0.05$), and different superscripts indicate extremely significant differences with each other ($P<0.01$).

Groups with significant differences are marked in red.

It can be seen from table 5 that during the entire breeding period of broilers, daily weight gain of the experiment group added with FUBON MYCOTOXIN ABSORBENT has increased by 5.05% and 14.24% respectively compared with that of moldy positive control group and negative control group. Meanwhile, the effects of FUBON MYCOTOXIN ABSORBENT product on improving the feed conversion rate is obviously better than that of Austrian product, and feed conversion ratio of FUBON MYCOTOXIN ABSORBENT product group has decreased by 4.81% and 6.08 % respectively compared with that of moldy feed group and normal feed group. In terms of mortality rate of broilers, there's no significant difference among each group.

5.2 Effects of mycotoxin adsorbent on apparent performance of broilers

At the late stage of the experiment, some broilers appeared to be dispirited with loose feathers whose lower extremities failed to develop well and were unable to stand. Also, the spirit of broilers bred with normal feed added with FUBON MYCOTOXIN ABSORBENT was better than that of other groups.

6 Summary

During the entire breeding period of broilers, daily weight gain of the experiment group added with FUBON MYCOTOXIN ABSORBENT has increased by 5.05% and 14.24% respectively compared with that of moldy positive control group and negative control group. Meanwhile, the effects of FUBON MYCOTOXIN ABSORBENT product on improving the feed conversion rate is obviously better than that of Austrian product, and feed conversion ratio of FUBON MYCOTOXIN ABSORBENT product group has decreased by 4.81% and 6.08 % respectively compared with that of moldy feed group and normal feed group. In terms of mortality rate of broilers, there's no significant difference among each group. Moreover, FUBON MYCOTOXIN ABSORBENT also has favorable effects on improvement of spirit condition and decreasing leg disease of broilers.

It is also shown by the experiment result that the feed conversion ratio of each experiment group is higher than that of commercial feed which owes to the fact that the cooked degree of the basic ration self-prepared in the experiment was lower than that of the commercial feed and did not undergo granulation process. As this experiment has been performed under the same experiment condition, the result is reliable.

It is further verified by the experiment that FUBON MYCOTOXIN ABSORBENT product has favorable effects on mycotoxin adsorption in vitro. Meanwhile, the production performance can be significantly improved and the mycotoxin can be notably lowered by FUBON MYCOTOXIN ABSORBENT product which is demonstrated by all the production performance indicators that it is better than Austrian adsorbent product. Similarly, FUBON

MYCOTOXIN ABSORBENT has a good effect on animals such as pigs and cows by decreasing the toxic effects of mycotoxin on animals so as to improve the growth and product quality of animals.

7 References (omitted)