Effect of the Different Thermostable Phytase on the Growth Performance of Broilers

Zaibin Yang [1], **Pan Wang** [1], **Yanjun Liu** [1], **Caiyun Yu** [1], **Ningbo Chen** [2]

[1]Shandong Agriculture University, College of Animal Science and Technology

[2]Jinan Bestzyme Bio-Engineering Co., Ltd.

Abstract: In order to study the effect of different thermostable phytase on growth performance, survival rate and tibia development of broilers, a total of 560 one day-old healthy broilers were randomly divided into 7 treatments with 8 replicates of 10 chickens per replicate according to body weight (mixed sex) in singer factor design. Broilers were fed with different diets with 7 different thermostable phytase products (1000 U/kg) for 28 days. The results showed that feed intake of A, B, E and F were higher compared with C and G treatments, and the feed intake of D was the lowest (P = 0.002). The weight gain and 28d body weight were different by the different thermostable phytase (P = 0.083). There were no differences in feed weight ratio and survival rate between treatments (P > 0.05). The tibia weight of A was greater compared with D, G, and H (P = 0.109), and there were no differences in tibia strength and tibia diameter treatment (P > 0.05). In this experiment, compared with other thermostable phytase, the supplement of thermostable phytase A to the broiler diet effectively increased the feed intake, promoted bone development, and enhanced bone strength. Thus, there were some differences in growth performance, tibia weight and apparent utilization of phosphorus by using different source thermostable phytase in pellet feed, especially thermostable phytase A.

Key words: Thermostable phytase; broiler; growth performance; survival rate; tibia development; phosphorus absorption rate

1 Materials and method

1.1 Test materials

Thermostable phytase: Bestzyme thermostable phytase (A) and 6 thermostable phytases from competitor in the market.

1.2 Test design

In this experiment, 560 healthy broilers (mixed chicks) of 1 day-old were randomly divided into 7 treatments with 8 replicates and 10 chickens per replicate according to body weight. Broilers were fed with diet supplemented 7 thermostable phytase from different sources products (A, B, C, D, E, F and G) for 28 days. The dosage of thermostable phytase in each treatment is 1000 U/kg. All experimental diets were formulated to meet nutrient requirements recommended by Feeding Standard of Chicken of the People's Republic of China (NY/T 33-2004) without calcium hydrogen phosphate. The formula and nutritional level of the diet were shown in Table 1.

1.3 Feeding experiment

All broilers were fed with cage in the experimental station of Shandong Agricultural University. The diets and water were provided ad libitum throughout the whole experimental period. Feed intake was recorded every day. Body Weight on an empty stomach before early feeding was recorded every week. Average daily feed intake (ADFI), average daily gain (ADG), feed-gain ratio and mortality were calculated. The lameness and mortality of broilers were observed every day during the experiment.

At the end of the experiment (28d), two broilers with similar weight were slaughtered in every repetition. The left tibias were detached to measure the degreased dry bone weight, radius and tibia strength.

During the experiment, mortality and leg disease (swelling, bending or unable to stand) were recorded every day. The survival rate and leg disease rate were calculated.

Mortality (%) =the number of dead broilers in whole period/the total number of broilers in the experiment *100%.

Survival rate = 100% - mortality (%).

1.4 Statistical analyses

The data from all broilers were subjected to analyze statistically by SAS 8.0. In all analyses, significant differences were stated on the level of $P < 0.05$.

2 Results and analysis

2.1 Growth performance

The effects of thermostable phytase from different sources on the production performance of broilers are shown in Table 2. Compared with D and G treatments, the feed intakes of A, B, E and F were higher and the lowest intake was D (P = 0.002). The weight gain of thermostable phytase from different sources and 28 day weight has different trends (P = 0.083), and there was no difference in the feed/gain ratio (P > 0.05).The effects of thermostable phytase from different sources on broilers, the total feed intake (TFI) and final weight (28d) changes are shown in Table 2. The results showed that the total feed intake of D and G and the final weight were lower compared with A, B, C, E and F.

Leg disease and diarrhea doesn't occur during the entire test. The effect of thermostable phytase from different sources on the death rate of broilers was shown in Figure 1. Mortalities of A, C and E were relatively lower compared with other treatments. No significant differences were observed in the total number of dead broilers with different phytase supplemented to the diets (P > 0.05).

2.2 Tibia index

The effect of thermostable phytase from different sources on the tibia weight, tibia diameter and tibia strength of 28-day broilers were shown in Table 3. The results showed that the tibia weight of A was higher than treatment C, F and G (P = 0.039). There were no differences between tibia strength and tibia diameter (P > 0.05).

3 Conclusion

In this experiment, compared with other thermostable phytase, supplement of Bestzyme thermostable phytase (A) to broiler diet effectively improved the feed intake, promoted the broiler bone development and enhanced bone strength. Bestzyme thermostable phytase (A) had a positive effect on growth performance and tibia quality. Detailed mechanisms need further confirmation.

Table 1 Broiler diet formula and nutrition level

Materials	Formula, %	Nutrition index	Nutrition level, %
Corn starch	51.25	ME, Mcal/kg	3.14
Soybean meal	24.00	CP	19.61
Rapeseed meal	4.00	Lys	0.98
Cottonseed meal	4.00	Met	0.48
Rice bran meal	10.00	Thr	0.71
Soybean oil	3.20	Trp	0.23
Stone powder	1.80	Calcium	0.77
Salt	0.35	Total phosphorus	0.54
L-lysine (70%)	0.20	Non phytic acid phosphorus	0.16
DL-methionine (98%)	0.20	Phytate phosphorus	0.38
Premix	1.00		
Total	100		

Table 2 Effect of thermostable phytase from different sources on growth performance of broiler

Item	TFI，g	ADFI，g/d	0 d BW，g	28 d BW，g	ADG，g/d	F/G
A	1492.6±87.63^{a}	53.31±3.12^{a}	43.80±0.85	1064.3±46.36	36.45±1.66	1.463±0.05
B	1461.7 ±62.34^{a}	52.20 ±2.23^{a}	45.61± 0.80	1058.8±42.30	36.18±1.51	1.443±0.08
C	1442.2±73.9^{ab}	51.51±2.64^{ab}	44.45± 0.83	1024.7±38.84	35.01± 1.38	1.471±0.04
D	1333.2±74.53^{c}	47.62± 2.66^{c}	44.56± 0.86	983.8±38.22	33.55±1.35	1.419±0.09
E	1458.8±79.00^{a}	52.10±3.56^{a}	43.20± 0.82	1031.9±37.02	35.31±1.35	1.475±0.06
F	1457.4±59.69^{a}	52.05±2.13^{a}	43.78± 0.78	1040.5±45.47	35.60±1.65	1.462±0.07
G	1366.8±48.40^{bc}	48.81±1.73^{bc}	43.74± 0.83	981.6±49.80	33.50±1.77	1.457±0.07

Table 3 Effect of thermostable phytase from different sources on tibia index of broiler

Item	Tibia weight, g	Tibia strength, N/mm2	Tibia diameter (short),mm	Tibia diameter (long), mm
A	7.85±0.73^{a}	11.11±0.24	5.93±0.39	6.8±2.860
B	6.53±1.26^{abc}	8.51±0.39	5.81±0.44	6.63±1.89
C	5.81±1.65^{bc}	9.39±0.71	5.77±0.60	6.60±1.34
D	6.83±1.26^{abc}	10.16±0.61	5.97±0.67	6.75±1.84
E	6.46±1.20^{abc}	10.04±0.40	5.75±0.45	6.49±2.23
F	6.13±1.17^{bc}	9.85±0.62	5.74±0.57	6.45±1.80
G	5.30±1.34^{c}	8.63±0.50	6.08±0.31	6.69±2.05

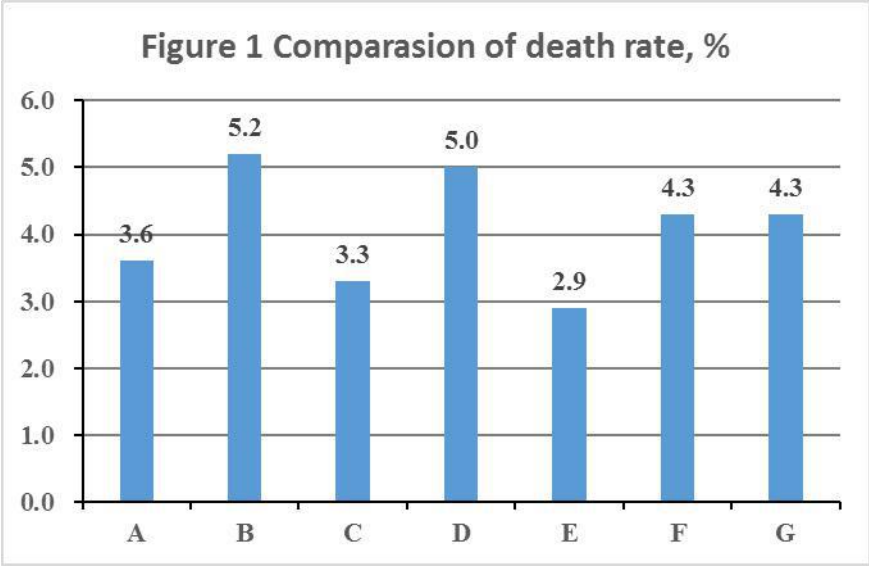
Figure 1 Comparasion of death rate, %
6.0
5.0
4.0
3.0
2.0
1.0
0.0
3.6
5.2
3.3
5.0
2.9
4.3
4.3
A
B
C
D
E
F
G