Effects of GroPro on Growth Performance, Intestinal Morphology and Intestinal Absorption Ability of Broilers

Abstract: This study was conducted to investigate the effect of GroPro on performance of broilers by measuring the growth performance, intestinal morphology and intestinal absorption ability. 288 1-day-age Rose-308 broilers with similar body weight were randomly allocated to two groups, one treatment was fed with basal feed, and the other supplemented with 800g/t GroPro. The results showed that, dietary supplementing with GroPro was able to improve the production performance of broilers, increase the average daily gain (3.78g), enhance average daily feed intakes (ADFI, 2g), reduce the feed:gain (F:G, 0.065). Thus, it is possible to conclude that GRORPO improves the intestinal morphology, boosts the villus and the ratio of villus height and crypt depth, and improves the adsorptive function of small intestine.

1. Materials and methods

1.1. Experimental material

GroPro used in this experiment was provided by Angel Yeast Co., Ltd, China.

1.2. Experimental animals

288 1-day-age Rose-308 broilers were grouped 2 treatments (A, B) based on their similar BW, each treatment had 12 replicates with 12 broilers per replicate.

Table 1 Experiment design

Group	No.	Experimental diet
Control group	A	Basal diet
Experimental group	B	Basal diet *+800g/t GroPro

1.3. Feeding and management

All broilers in this experiment had ad libitum access to diet and water during the three stages, including the earlier stage (1～7d), middle stage (8～21d), later stage

(22～42d). Animals of each group were vaccinated with the bivalent vaccine of Newcastle disease (ND) and infectious bronchitis on d 7 and 21, and Infectious Bursal Disease Vaccine on d 14 and 28 respectively.

1.4. Testing items and methods

1.4.1. Production performance

Production performance of broilers was recorded on d 7, d 21 and d 42, including the average daily gain (ADG), average daily feed intake (ADFI), feed conversion ratio (FCR) and average body weight (ABW).

1.4.2. Intestinal structure

1 broiler of similar body mass was selected randomly to weigh and slaughter from each replicate of each treatment on d 7, 21, took out the digestive tract to separate the duodenum, jejunum and ileum, measured the length of each intestinal segment with a flexible rule, and recorded the relative length of small intestine segment, Relative length=the length of intestine segment (cm)/body weight (kg), and then cut off 2 cm intestinal tissue of duodenum (3cm away from the gastric pylorus), the middle piece of jejunum and ileum respectively, after cleaning the contents with normal saline, the intestinal tissue was fixed in 4% paraformaldehyde solution, the tissue was subject to a series of treatment, including dehydration→ transparency→ waxing→ embedding→ cutting block→ slicing→ unfolding→ slice pasting, etc., after dyeing, form the tissue slice with hematoxylin- eosin was formed(H.E.), every part of tissue slice was randomly selected 10 typical fields of vision (complete villus and straight trend) under the microscope to measure the height (V) of the longest villus, the relevant crypt depth (C), and the ratio (V/C) of villus height and crypt depth was calculated.

1.4.3. The absorptive ability of small bowel

The absorptive ability of small bowel of 21-day-age broilers was evaluated with classical *D*-wood sugar absorption test. Broilers were drenched 2ml 10% *D*-wood sugar solution in the fasting state (4h of water-fast), and collected blood sample

jugular vein sterilely after 1h, which was used to prepare serum centrifugal speed of 3000rpm for 10h.*D*-wood sugar concentration in serum was measured with phloroglucinol colorimetry, the reagent box of which was bought from the Nanjing Jiancheng Bioengineering Institute.

2. Results and analysis

2.1. Growth performance

The results of growth performance were shown in Table 2 , there were no differences in growth performance between experimental group and control group on d 21 (P>0.05); however ADG of experimental group was significantly higher than that of control group (P<0.05) in the second period; during the whole experimental period, ADG of experimental group was significantly higher than that of control group (P<0.05), with an increase in the average daily gain of 3.78g(55.90*vs*52.12); ADFI increases 2g, and F:G decreases 0.065(P>0.05).

Table 2 Production performance of broilers

Period	treatment	ADG (g/d)	ADFI (g/d)	FCR	ABW /g
1~7 d	A	21.85±0.79	25.61±0.70	1.165±0.042	200.29±5.78
	B	21.24±0.56	25.73±1.09	1.196±0.033	196.63±4.13
8~21 d	A	47.52±0.97	78.34±4.05	1.644±0.078	866.72±16.28
	B	47.78±1.97	78.61±1.75	1.665±0.066	866.75±26.50
22~42 d	A	66.79±6.97^{b}	143.89±10.41	2.117±0.067	2262.95±157.90^{b}
	B	73.89±4.52^{a}	148.28±7.00	2.017±0.087	2411.29±90.29^{a}
1~42 d	A	52.12±4.26^{b}	99.17±5.40	1.885±0.058	
	B	55.90±2.08^{a}	101.15±3.06	1.820±0.053	

Means followed by no letters or the same letter within the same column do not differ (P>0.05), and with different letters have significant difference (P<0.05).

2.2. Intestinal structure

As shown in table 3, the relative length of intestinal segment of 7-day-age broilers of experimental group had a trend of improvement compared with control group. The relative length of 21-day-age jejunum was significantly higher than that of the control group (P<0.05).

Compared to control group, villus height/crypt depth (V/C) of 7-day-age broilers of experimental group improved, and there was an improvement trend of villus height of experimental group, especially the villus height of 21-day-age jejuna (1104.89*vs*1416.91); villus height/crypt depth (V/C) of all intestine segments of experimental group is higher than that of control group, there was significant improvement of V/C (3.96*vs*6.18) of Jejuna(*P*<0.05) (Table 4).

Table 3 Relative length of small intestine of broilers, cm/kg

Stage	treatment	Relative length of duodenum	Relative length of jejunum	Relative length of ileum
7-day-age	A	96.95±9.94	226.84±24.14	203.36±27.63
	B	97.43±5.22	227.82±23.16	208.38±19.87
21-day-age	A	24.09±2.36[a]	54.37±4.50b	53.33±5.95
	B	21.47±0.97[b]	59.12±2.87a	53.20±3.08

Means followed by no letters or the same letter within the same column do not differ(*P*>0.05), and with different letters have significant difference (*P*<0.05).

Table 4 Intestinal morphology of broilers, μm

Index	treatment	7-day-age			21-day-age		
		Duodenum	Jejunum	Ileum	Duodenum	Jejunum	Ileum
Villus Height(V)	A	1067.11±139.22	902.36±108.02	576.55±63.78	1595.40±150.28	1104.89±204.65	854.75±102.24
	B	1130.16±120.67	882.99±93.10	523.33±92.76	1578.41±244.35	1416.91±225.19	886.67±153.86
Crypt Depth(C)	A	153.45±30.94	126.17±8.39	124.21±20.53	249.51±76.74	295.83±65.88	220.88±32.31
	B	148.42±11.30	127.51±16.58	110.54±21.11	214.79±32.07	234.25±32.72	192.91±32.34
V/C	A	7.38±1.50	7.31±0.62	4.88±0.85	7.03±2.12	3.96±1.22[b]	4.03±0.93
	B	7.87±0.74	7.29±1.39	4.94±0.64	7.64±1.43	6.18±1.15[a]	4.72±0.47

Means followed by no letters or the same letter within the same column do not differ (*P*>0.05), and with different letters have significant difference (*P*<0.05).

2.3. Absorptive ability of small intestinal of broilers

Dietary supplementation of GroPro was able to increase the absorptive ability of small intestine significantly. *D*-wood sugar concentration in serum of broilers on d 21 of experimental group was significantly higher than that of control group (*P*<0.05)(Table 5).

Table 5 Absorptive ability of small intestinal of broilers

treatment	D- wood sugar concentrationin (mmol/L)
A	1.76±0.40[b]
B	2.79±0.73[a]

Note: Means followed by different letters have significant difference (P<0.05).

3. Conclusion

GroPro supplemented in dietary was able to improve the production performance of broilers, with an increase in ADG 3.78g and ADFI 2g, and decrease F/G0.065; GroPro could improve the intestinal morphology structure, increase the villus height and the ratio of villus height and crypt depth, and improve the absorptive ability of small intestine of broilers.