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530 **Tables and Figures****Table 1.** Chemical composition of illite

Items	content
Ingredient, %	
SiO <sub>2</sub>	67.40
Al <sub>2</sub> O <sub>3</sub>	20.30
K <sub>2</sub> O	5.50
Fe <sub>2</sub> O <sub>3</sub>	2.35
Na <sub>2</sub> O	0.54
Ti <sub>2</sub> O	0.27
MgO	0.24
CaO	0.04
P <sub>2</sub> O <sub>5</sub>	0.04
MnO	0.01

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**Table 2.** Ingredient composition of experimental diets<sup>a</sup>

Items	Pre-starter, d 1-7	Starter, d 8-14	Grower, d 15-21	Finisher, d 22-28
Ingredients, %				
Corn	37.6	41.6	45.2	48.9
Wheat fine	15.3	15.1	15.6	15.2
Rice pollards	2.4	2.5	2.5	2.6
Soybean meal, 45% CP	26.9	21.0	17.7	15.5
Cookie wheat flour	1.9	2.0	2.0	2.0
DDGS	5.0	7.0	6.0	5.0
Animal protein	6.3	6.1	6.4	6.2
Animal fat	1.7	1.9	1.9	1.9
L-lysine	0.6	0.6	0.6	0.5
DL-methionine	0.4	0.3	0.3	0.4
L-threonine	0.2	0.1	0.1	0.1
L-tryptophan	0.1	0.1	0.1	0.1
Salt	0.2	0.2	0.2	0.2
Limestone	0.5	0.6	0.5	0.5
MDCP	0.2	0.2	0.2	0.2
Liquid-Choline	0.1	0.1	0.1	0.1
Vitamin premix <sup>b</sup>	0.3	0.3	0.3	0.3
Mineral premix <sup>c</sup>	0.3	0.3	0.3	0.3
Total	100.0	100.0	100.0	100.0
Chemical composition				
AMEn, Kcal/kg	3,000	3,020	3,070	3,100
CP, %	23.3	21.3	20.2	19.1
Ether extract, %	5.5	5.9	6.0	5.8
Crude fiber, %	3.4	3.4	3.2	3.0
Crude ash, %	5.8	5.3	5.1	4.8
Calcium, %	0.9	0.8	0.8	0.7
Phosphorus, %	0.5	0.6	0.5	0.5
Lysine, %	1.5	1.3	1.2	1.1
SAA, %	1.1	1.0	1.0	1.0

<sup>a</sup>Abbreviation: DDGS, Dried distiller's grains with soluble; MDCP, Mono-dicalcium phosphate; SAA, Sulfur amino acids; AMEn, Nitrogen-corrected apparent metabolizable energy.

<sup>b</sup>Supplied per kg diet: vitamin A, 9000 IU; vitamin D<sub>3</sub>, 3000 IU; vitamin E, 48 mg; vitamin K, 3 mg; thiamin, 1.8 mg; riboflavin, 6 mg; pyridoxine, 3 mg; vitamin B<sub>12</sub>, 0.012 mg; niacin, 42 mg; folic acid, 1.2 mg; biotin, 0.24 mg; pantothenic acid, 12 mg.

<sup>c</sup>Supplied per kg of diet: manganese, 120 mg; zinc, 100 mg; iron, 80 mg; copper, 20 mg; iodine, 2 mg; selenium, 0.3 mg; cobalt, 0.5 mg.

**Table 3.** Effects of illite and probiotics supplementation on growth performance of *Salmonella enterica* serotype *typhimurium*-challenged broilers

Items	NC	CC	IA	ICB	SE	<i>p</i> -value
BW, g						
Initial	35.22	35.35	35.22	35.33	0.152	0.890
7 d	166.67	155.33	160.25	162.00	4.191	0.319
14 d	482.19	446.97	458.51	466.45	13.723	0.349
21 d	1027.70 <sup>a</sup>	891.75 <sup>b</sup>	1011.56 <sup>ab</sup>	1019.50 <sup>a</sup>	31.414	0.019
28 d	1655.00	1455.58	1610.28	1601.11	51.649	0.066
1-7 d						
BWG, g	131.45	119.99	126.61	126.67	3.954	0.267
FI, g	145.50	148.33	141.39	143.12	4.935	0.774
FCR, g/g	1.11	1.24	1.12	1.14	0.037	0.086
1st Challenge						
8 to 14 d						
BWG, g	315.25	288.94	297.19	304.45	11.553	0.443
FI, g	403.61	459.77	448.33	435.85	16.478	0.124
FCR, g/g	1.28 <sup>b</sup>	1.60 <sup>a</sup>	1.51 <sup>ab</sup>	1.44 <sup>b</sup>	0.047	0.001
15 to 21 d						
BWG, g	545.50 <sup>a</sup>	438.56 <sup>b</sup>	546.92 <sup>a</sup>	548.89 <sup>a</sup>	29.722	0.040
FI, g	738.34	861.28	800.37	778.25	45.174	0.304
FCR, g/g	1.36 <sup>b</sup>	1.99 <sup>a</sup>	1.46 <sup>b</sup>	1.44 <sup>b</sup>	0.084	<0.001
2nd Challenge						
22 to 28 d						
BWG, g	627.31	563.83	598.72	581.61	25.663	0.369
FI, g	1093.73	1149.94	982.09	969.84	67.261	0.201
FCR, g/g	1.74	2.05	1.64	1.69	0.116	0.091
1 to 28 d						
BWG, g	1619.78	1420.07	1574.97	1565.78	51.653	0.065
FI, g	2381.50	2620.07	2385.70	2328.72	101.328	0.211
FCR, g/g	1.47 <sup>b</sup>	1.85 <sup>a</sup>	1.52 <sup>b</sup>	1.50 <sup>b</sup>	0.066	0.001

NC, non-challenge control, birds fed with basal diet; CC, *Salmonella enterica* serotype *typhimurium* challenge control, birds fed with basal diet; IA, CC with 1% illite alone; ICB, IA with 0.1% of *Bacillus subtilis* ( $1 \times 10^8$  CFU/kg) and *Clostridium butyricum* ( $1 \times 10^8$  CFU/kg), respectively; BWG, body weight gain; FI, Feed intake.

1st Challenge: *Salmonella enterica* challenge at  $1 \times 10^7$  CFU/mL with 1.5 mL for 3 consecutive days on 8 d. 2nd Challenge: *Salmonella enterica* challenge at  $1 \times 10^7$  CFU/mL with 2.1 mL for 3 consecutive days on 15 d.

<sup>a, b</sup>Means within column with different superscripts differ significantly ( $p < 0.05$ ).

**Table 4.** Effects of illite and probiotics supplementation on nutrients digestibility of *Salmonella enterica* serotype *typhimurium*-challenged broilers

Items, %	NC	CC	IA	ICB	SE	<i>p</i> -value
14 d						
DM	75.40 <sup>a</sup>	73.04 <sup>b</sup>	73.56 <sup>b</sup>	74.15 <sup>ab</sup>	0.369	0.002
CP	77.21	76.31	76.49	77.17	0.412	0.318
GE	78.89	78.46	78.68	78.85	0.270	0.664
28 d						
DM	75.22 <sup>a</sup>	72.84 <sup>c</sup>	73.86 <sup>bc</sup>	74.44 <sup>ab</sup>	0.324	<0.001
CP	77.60	77.13	77.07	77.77	0.413	0.558
GE	79.89	79.24	79.32	79.36	0.284	0.382

NC, non-challenge control, birds fed with basal diet; CC, *Salmonella enterica* serotype *typhimurium* challenge control, birds fed with basal diet; IA, CC with 1% illite alone; ICB, IA with 0.1% of *Bacillus subtilis* ( $1 \times 10^8$  CFU/kg) and *Clostridium butyricum* ( $1 \times 10^8$  CFU/kg), respectively.

<sup>a-c</sup>Means within column with different superscripts differ significantly ( $p < 0.05$ ).

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**Table 5.** Effects of illite and probiotics supplementation on blood profile of *Salmonella enterica* serotype *typhimurium*-challenged broilers

Items	NC	CC	IA	ICB	SE	<i>p</i> -value
14 d						
RBC, 10 <sup>6</sup> /μL	2.56	2.45	2.85	2.78	0.263	0.688
WBC, 10 <sup>3</sup> /μL	23.11	33.73	28.64	24.50	3.704	0.207
Heterophil, 10 <sup>3</sup> /μL	9.85 <sup>b</sup>	25.36 <sup>a</sup>	20.97 <sup>ab</sup>	17.54 <sup>ab</sup>	3.386	0.028
Lymphocyte, 10 <sup>3</sup> /μL	10.01	4.34	6.62	5.35	1.770	0.155
IL-6, pg/mL	150.78	175.08	168.59	165.84	10.050	0.393
TNF-α, pg/mL	176.76 <sup>b</sup>	243.89 <sup>a</sup>	211.73 <sup>ab</sup>	205.05 <sup>ab</sup>	13.644	0.021
28 d						
RBC, 10 <sup>6</sup> /μL	1.95	1.99	2.31	2.08	0.234	0.718
WBC, 10 <sup>3</sup> /μL	17.41	18.83	17.95	18.13	2.581	0.984
Heterophil, 10 <sup>3</sup> /μL	3.41	2.88	3.65	3.25	0.673	0.876
Lymphocyte, 10 <sup>3</sup> /μL	11.15	16.67	13.21	14.17	2.327	0.426
IL-6, pg/mL	151.12 <sup>b</sup>	200.97 <sup>a</sup>	185.40 <sup>ab</sup>	175.39 <sup>ab</sup>	11.166	0.034
TNF-α, pg/mL	131.16 <sup>b</sup>	174.70 <sup>a</sup>	152.98 <sup>ab</sup>	141.10 <sup>ab</sup>	10.222	0.039

NC, non-challenge control, birds fed with basal diet; CC, *Salmonella enterica* serotype *typhimurium* challenge control, birds fed with basal diet; IA, CC with 1% illite alone; ICB, IA with 0.1% of *Bacillus subtilis* ( $1 \times 10^8$  CFU/kg) and *Clostridium butyricum* ( $1 \times 10^8$  CFU/kg), respectively.

RBC, red blood cell; WBC, white blood cell; TNF-α, tumor necrosis factor α; SE, standard error.

<sup>a, b</sup>Means within column with different superscripts differ significantly ( $p < 0.05$ ).

**Table 6.** Effects of illite and probiotics supplementation on bacteria counts of *Salmonella enterica* serotype *typhimurium*-challenged broilers

Items, Log CFU/g	NC	CC	IA	ICB	SE	<i>p</i> -value
14 d						
<i>Salmonella</i>	3.16 <sup>b</sup>	5.31 <sup>a</sup>	4.92 <sup>ab</sup>	4.47 <sup>b</sup>	0.131	<0.001
<i>Lactobacillus</i>	6.68	6.20	6.33	6.49	0.134	0.104
28 d						
<i>Salmonella</i>	2.80 <sup>c</sup>	4.68 <sup>a</sup>	4.22 <sup>ab</sup>	3.89 <sup>b</sup>	0.124	<0.001
<i>Lactobacillus</i>	6.83 <sup>a</sup>	6.19 <sup>b</sup>	6.73 <sup>a</sup>	6.77 <sup>a</sup>	0.125	0.005

NC, non-challenge control, birds fed with basal diet; CC, *Salmonella enterica* serotype *typhimurium* challenge control, birds fed with basal diet; IA, CC with 1% illite alone; ICB, IA with 0.1% of *Bacillus subtilis* ( $1 \times 10^8$  CFU/kg) and *Clostridium butyricum* ( $1 \times 10^8$  CFU/kg), respectively.

<sup>a-c</sup>Means within column with different superscripts differ significantly ( $p < 0.05$ ).

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**Table 7.** Effects of illite and probiotics supplementation on small intestinal morphology of *Salmonella enterica* serotype *typhimurium* challenged broilers

Items	NC	CC	IA	ICB	SE	<i>p</i> -value
VH, $\mu\text{m}$	1074.53 <sup>a</sup>	686.01 <sup>b</sup>	712.73 <sup>b</sup>	776.63 <sup>b</sup>	27.615	<0.001
CD, $\mu\text{m}$	85.70 <sup>b</sup>	120.66 <sup>a</sup>	91.71 <sup>b</sup>	86.84 <sup>b</sup>	5.343	<0.001
VH:CD	12.54 <sup>a</sup>	5.87 <sup>c</sup>	7.83 <sup>b</sup>	9.01 <sup>b</sup>	0.418	<0.001

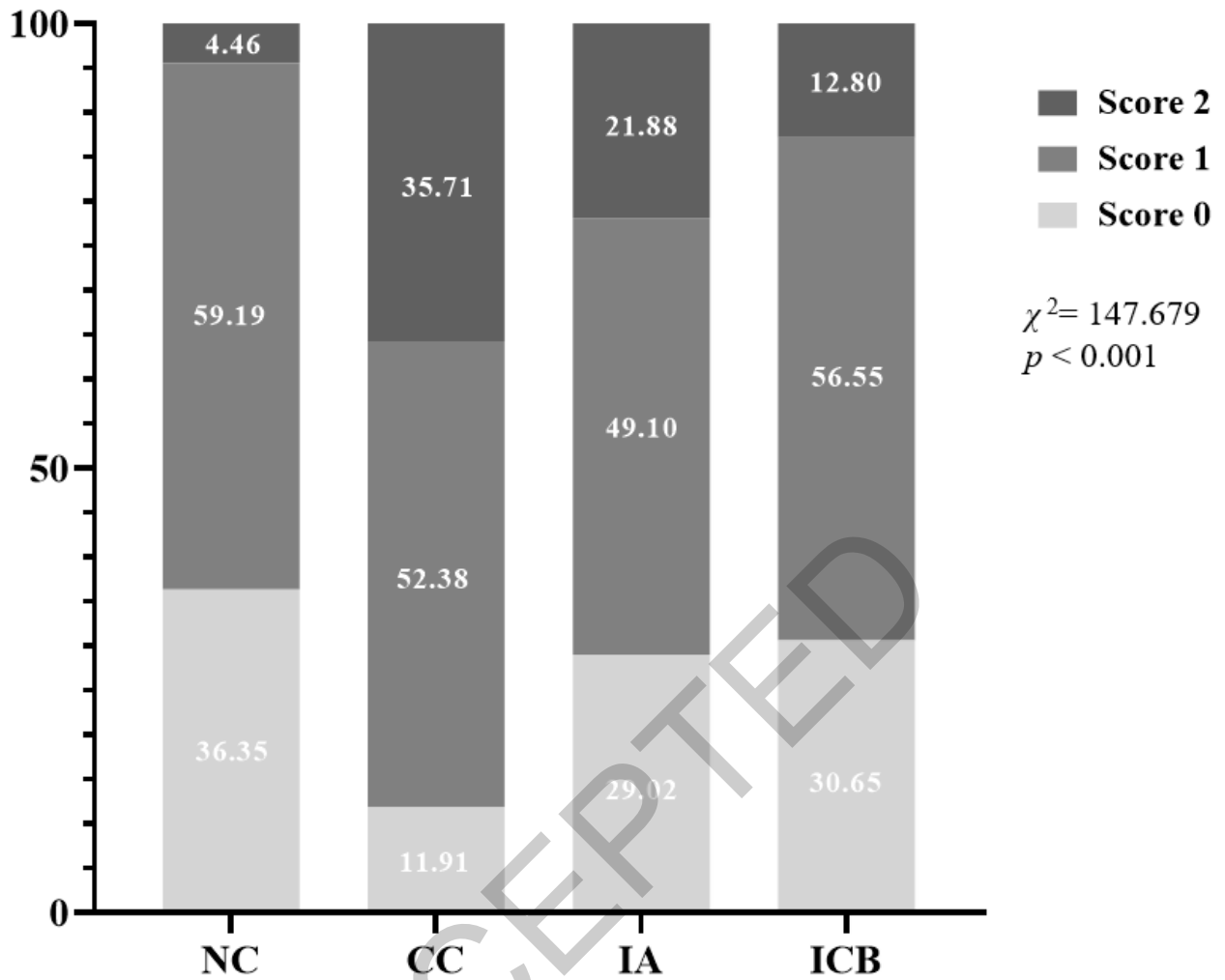
NC, non-challenge control, birds fed with basal diet; CC, *Salmonella enterica* serotype *typhimurium* challenge control, birds fed with basal diet; IA, CC with 1% illite alone; ICB, IA with 0.1% of *Bacillus subtilis* ( $1 \times 10^8$  CFU/kg) and *Clostridium butyricum* ( $1 \times 10^8$  CFU/kg), respectively; VH, villus height; CD, crypt depth; VH:CD, VH to CD ratio.

<sup>a-c</sup>Means within column with different superscripts differ significantly ( $p < 0.05$ ).

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541 **Fig 1.** Effects of illite alone and in combination with *Clostridium butyricum* and *Bacillus subtilis* complex on  
 542 fecal score in broilers challenged with *Salmonella enterica* serotype *typhimurium*. Score 0, normal dropping; 1,  
 543 normal to pasty; 2, liquid; 3, liquid with blood; 4, bloody droppings.  $\chi^2 = 147.679$ ,  $p < 0.001$ .

544 NC, non-challenge control, birds fed with basal diet; CC, *Salmonella enterica* serotype *typhimurium* challenge  
 545 control, birds fed with basal diet; IA, CC with 1% illite alone; ICB, IA with 0.1% of *Bacillus subtilis* ( $1 \times 10^8$   
 546 CFU/kg) and *Clostridium butyricum* ( $1 \times 10^8$  CFU/kg), respectively.

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