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Qiao Yingying
ORCID https://orcid.org/0000-0002-0090-6430
Henan Institute of Science and Technology of China and Sumy National Agricultural University of Ukraine
e-mail: 623001806@qq.com
Kyselov Oleksandr
ORCID https://orcid.org/0000-0003-0134-7893
Sumy National Agricultural University of Ukraine
e-mail: oleksandr.kyselov@snau.edu.ua
Liu Changzhong
ORCID https://orcid.org/0000-0002-7014-4486
Henan Institute of Science and Technology of China
e-mail: 15103733474@163.com

EFFECTS OF AMBIENT TEMPERATURE ON BODY SIZE AND ORGAN DEVELOPMENT IN BROILERS

Abstract. The current study investigated the effect of poultry house temperature change on the growth and development of both broiler chickens themselves and the development of their individual organs. Following 42 days of rearing, results showed that the body oblique length, chest width, chest depth, chest angle, keel length, pelvic width, and tibial length of broilers in the low temperature group were significantly lower than those of the control group ($P<0.05$), while the breast depth of broiler chickens in the high-temperature group was significantly lower than those in the control group ($P<0.05$). Furthermore, low temperatures significantly increased the function of the heart, liver, spleen and pancreas of broiler chickens ($P<0.05$). After 7 days of rearing, the bursal index of broilers in the high temperature group was significantly higher than in the control group as well as in the low temperature group

($P<0.05$). Previous research has established that ① high and low temperatures significantly affect the growth and development as well as the immunity of broiler chickens, namely that low environmental temperatures have a more adverse effect on broiler chickens than high temperatures. ②Consequently, using and maintaining high temperatures early in rearing helps to improve the immunity of broilers and improve their performance. The results of our study provides an opportunity to provide both a theoretical and a practical basis for accurate temperature setting in poultry houses for effective breeding of broiler chickens, which will make it possible to increase the productivity of broiler chickens and increase the economic efficiency of the poultry house.

Key words: temperature, breeding, body weight, organ development, broilers chickens.

Problem statement and analysis of recent research. Broiler breeding has now become one of the most market-oriented, intensive, and large-scale industries in China's animal husbandry [1]. An important feature of today's animal husbandry is the high-density, large-group broiler breeding, so the primary issue affecting the health status and production performance of livestock and poultry is the environmental quality in the barn. Different environmental parameters have different effects on the health and growth of livestock and poultry, among which temperature is the primary environmental factor that affects the health and growth performance of livestock and poultry [2]. Too cold or too hot ambient temperature will cause cold and heat stress to the poultry, which will reduce the resistance of the poultry body, and then affect its production performance [3]. This experiment studies the body size characteristics and organ development of broilers from high and low ambient temperatures, and provides some references for better application in animal production.

The aim of the research. At present time it's not many research about influence to the chicks-broiler environment temperature (inside of poultry house) is mostly research is focused on acute or short-term high temperature and low temperature stress, and there is little research on long-term relative high temperature and low temperature on broiler growth performance, on body size and organ development in broilers. Therefore, this experiment passed the research the influence of relatively high temperature and low temperature on broiler growth performance, on body size and organ development in broilers, to achieve the control of broiler house environment, in order to obtain a higher feed conversion rate, improve broiler quality, maximize the performance of broiler, increase the poultry farm. The economic benefits will lay the foundation for the healthy breeding of broilers.

Material and methods of research. For research were selected 240 healthy 1-day-old avian chicks, they were selected using a single-factor completely randomized group test. All birds were vaccinated against. They were randomly divided into 3 groups of 80 chicks each groups. According to the two-stage feeding of the NRC diet, they were divided into a relatively high temperature group (HT), a control group (C) and relatively low temperature group (LT).

The initial temperature was set to 36.5C°, 33.5C° and 30.5C°, respectively. The environmental temperature of each group decreased with 0.5C° with the age (the temperature during the fattening period remained the same), and at 42th days of age, each group was reduced to 22C°, 19C°, and 16C°, and the other feeding conditions were the same. After 7th and 6th days broilers were slaughtered, then after 14th days, 21st days, 28th days, and 35th days, and 12 broilers were slaughtered at 42th days.

The experiment was carried out in Yunnan Academy of Animal Science, and each chicken house has 7.20 × 3.50 × 3.50m. There are use three chicken houses in total. The houses can automatically control temperature, humidity and ventilation. Each house provides four trough feeders and four automatic water feeders. Except for different temperatures in the house, other environmental conditions and feeding conditions are basically the same. Broilers are managed according to routine, routine immunization procedures, and free to eat and drink.

Table 1 Basic diet composition and nutrition level

Raw material	Preliminary materials（1-21days）	Late material (22-42days）
Corn	60.00	66.40

Soybean meal	27.40	20.00
Corn gluten meal	6.00	8.00
Fish meal	1.00	0.00
Soybean oil	1.90	1.60
Limestone	1.10	1.20
CaHPO4	1.10	1.14
NaCl	0.35	0.35
DL-Met	0.07	0.06
L-Lys	0.08	0.25
Premix1)	1.00	1.00
Total	100	100
Nutrient levels2)		
ME（Mcal/kg）	2950	3000
CP	21.00	19.00
Ca	0.81	0.80
P	0.50	0.50
Lys	1.10	1.00
Met	0.50	0.38
Met+Cys	0.90	0.72
Thr	0.80	0.74
Trp	0.20	0.18

1)The premix provided the following per kg of the diet: VA 10000 IU,VD_3 3 400 IU,VE 16 IU,VK_3 2.0 mg, VB_1 2.0 mg,VB_2 6.4 mg, VB_6 2.0 mg, VB_{12} 0.012 mg, pantothenic acid calcium 10 mg, nicotinic acid 26 mg, folic acid 1.0 mg, biotin 0.1 mg, choline 500 mg, Zn ($ZnSO_4.7H_2O$) 40 mg, Fe ($FeSO_4.7H_2O$) 80 mg, Cu ($CuSO4.5H_2O$) 8 mg, Mn ($MnSO4 \cdot H_2O$) 80 mg, I (KI) 0.35 mg, Se ($Na_2 SeO_3$) 0.15 mg. For humidity and light, see Table 1-4 .

Table 2 The temperature control of the house

Group	Age（days）													
	1 d	2d	3d	4d	5d	6d	7d	8d	9d	10d	11d	12d	13d	14d
High	36.5	36	35.5	35	34.5	34	33.5	33	32.5	32.5	32	32	31.5	31
Control	33.5	33	32.5	32	31.5	31	30.5	30	29.5	29.5	29	29	28.5	28
Low	30.5	30	29.5	29	28.5	28	27.5	27	26.5	26.5	26	26	25.5	25
Group	15d	16d	17d	18d	19d	20d	21d	22d	23d	24d	25d	26d	27d	28d
High	31	30.5	30.5	30	30	29.5	29	29	28.5	28	28	27.5	27.5	27
Control	28	27.5	27.5	27	27	26.5	26	26	25.5	25	25	24.5	24.5	24
Low	25	24.5	24.5	24	24	23.5	23	23	22.5	22	22	21.5	21.5	21
Group	29d	30d	31d	32d	33d	34d	35d	36d	37d	38d	39d	40d	41d	42d
High	27	26.5	26	26	25.5	25	25	24.5	24	24	23.5	23	22.5	22

Control	24	23.5	23	23	22.5	22	22	21.5	21	21	20.5	20	19.5	19
Low	21	20.5	20	20	19.5	19	19	18.5	18	18	17.5	17	16.5	16

Note: High means high temperature group, Control means Control group, Low means low temperature group. When the heater is lower than 1℃, the fan is turned off; when the heater is higher than 0.5℃, the fan is turned on.

Table 3 Humidity Management

Age (days)	Relative humidity（%）
1	30-50
7	40-60
14	40-60
21	50-70
28	50-70
35	50-70
42	50-70

Table 4 Lighting Management

Age (days)	Light off time	Light on time	Light time（h）	Note
1			24	The first week is 30-60lux, the weight reaches 160g, and the light limitation is adjusted to 5-10lux (1 watt = 10.76 lux).
2-7	20:00	21:00	23-18	
Reached 160g	20:00	8:00	12	
22-35	20:00	2:00	18	
7 days before listing	20:00	21:00	Add 1h to 23h every day	

At 1st, 7th, 14th, 28th, and 35 th days, 6 broilers in each experimental group were randomly selected to measure body weight, and 12 broilers in each experimental group were randomly selected to measure body weight and body size.

Body oblique length, chest width, chest depth, chest angle, keel length, pelvic width, tibia length, tibia circumference, main feather length, measured in accordance with the method in the "Technical Manual for Survey of Local Breed Resources of Domestic Poultry" [4]. The measurement method is as follows:

Weight: Weigh on an empty stomach with a platform (unit: kg).

Body oblique length: Measure the distance from the shoulder joint to the ischial tuberosity with a tape measure on the body surface (unit: cm).

Chest depth: Measure the distance from the first thoracic vertebra to the front edge of the keel with a caliper (unit: cm).

Chest width: Measure the surface distance between the shoulder joints with a caliper (unit: cm).

Keel length: Measure the distance from the front of the keel process to the end of the keel with a tape measure (unit: cm).

Pelvic width: measure the distance between two hip bone nodules with calipers (unit: cm).

Tibial length: Use a caliper to measure the straight line distance from the upper tibial joint to the third and fourth toes (unit: cm).

Tibia circumference: the circumference of the middle part of the tibia (unit: cm).

At 42^{th} day-old, 12 broilers were weighed accurately with a bench scale, and the heart weight, liver weight, spleen weight, pancreatic weight, bursal weight, tonsil weight, and stomach weight were weighed with an analytical balance. Calculate the organ index, the calculation formula is as follows:

Organ index = [organ weight (g) / live weight before slaughter (g)] × 100%

Statistical analyses of the data were performed using SPSS11.0. Data were evaluated by using one-way ANOVA where treatment was the main factor. Duncan test was applied to compare the mean values among the experimental groups. Data are expressed as mean ± SD.

Results and analysis. As can be seen from table 5, the average body weight of each group of broilers in each time period showed an upward trend. The body weight of broilers in the low temperature group at 14 and 42^{th} day-old was significantly lower than that in the high temperature group and the control group ($P <0.05$). The weight of broilers in the low-temperature group was 23.6% and 32.4% lower than that in the high-temperature and control groups, respectively, indicating that the effect of low temperature on the average body weight of broilers in each stage was greater.

Table 5 Effect of ambient temperature on average body weight of broilers at different ages（kg）

Age / Group	7 days old	14 days old	21 days old	28 days old	35 days old	42 days old
High	0.13±0.01	$0.32±0.01^{a}$	0.63±0.03	$1.00±0.03^{b}$	1.53±0.15	$2.18±0.09^{a}$
Control	0.13±0.02	$0.34±0.03^{a}$	0.64±0.02	$1.07±0.03^{a}$	1.57±0.07	$2.25±0.16^{a}$

Low	0.12±0.01	0.23±0.04^{b}	0.61±0.01	1.03±0.06^{ab}	1.60±0.10	1.72±0.11^{b}

Note: For the same index in the table, there is a significant difference between those with different letters on the right shoulder of peers (P <0.05), and those with the same letters are not significantly different (P> 0.05). The following table is the same.

As shown in table 6, the body oblique length, chest width, chest depth, chest angle, keel length, pelvic width, and tibial length of broilers in the low temperature group were significantly lower than those in the control group (P <0.05). Chest depth was significantly lower than outside the control group (P <0.05), and there were no significant differences in other indicators (P> 0.05). During the whole test period, the low temperature environment had a great influence on the body size of broilers.

Table 6 Effect of ambient temperature on body size of 42th days broilers (cm)

Group / Body traits	High	Control	Low
Body oblique length	20.5±1.09^{a}	21.0±1.28^{a}	18.73±1.62^{b}
Chest width	8.95±0.65^{a}	8.66±0.59^{a}	7.71±0.64^{b}
Chest depth	7.66±0.43^{b}	8.29±0.44^{a}	7.49±0.58^{b}
Chest angle	77.71±3.45^{a}	73.83±1.94^{b}	66.50±2.92^{c}
Keel length	13.4±0.58^{a}	13.75±0.61^{a}	12.12±0.40^{b}
Pelvic width	6.33±0.26^{a}	6.40±0.38^{a}	5.35±0.46^{b}
Tibia length	10.07±0.41^{a}	9.98±0.38^{a}	8.96±0.71^{b}
Shin circumference	5.40±0.19	5.33±0.33	5.57±0.30

As shown in table 7, during the whole experimental period, the number of dead cull of broiler chickens was in the order of low temperature group> high temperature group> control group. The number of dead cull in the low temperature group was 250% higher than that in the control group and 133.3% higher than that in the high temperature group, while the rate of dead cull in the high temperature group was higher than the control group by 33.3%, indicating that the low temperature environment had the greatest effect on the broiler die panning.

Table 7 Effect of ambient temperature on broiler mortality（%）

Dongshe	High	Control	Low
Death rate	7.5	5.0	17.5

As can be seen from table 8, the heart index of broilers in the low temperature group was significantly higher than those in the control group and the high temperature group at 14th, 2th, 28th, and 42th days (P <0.05). The heart index of broilers in the high temperature group was significantly lower than those in the control group at 28th and 35th days (P <0.05), and there was no significant difference compared with the heart index of broilers in the low temperature group (P>0.05). Up to 54.7%, indicating that low temperature has a greater impact on the heart development of broilers.

Table 8 Effects of ambient temperature on heart development of broilers at different ages（%）

Age / Group	7 days old	14 days old	21 days old	28 days old	35 days old	42 days old
High	10.58±1.16	9.06±1.05^{b}	6.06±0.46^{b}	5.40±0.30^{c}	5.32±0.35^{b}	5.95±0.53^{b}
Control	10.05±1.28	8.36±0.48^{b}	6.31±0.34^{b}	5.92±0.16^{b}	5.93±0.28^{a}	5.39±0.51^{b}
Low	9.83±0.96	10.57±1.01^{a}	7.20±0.59^{a}	6.73±0.37^{a}	5.76±0.33^{ab}	8.34±1.26^{a}

As shown in table 9, the liver index of broilers in the low temperature group was significantly higher than that in the control group (P <0.05), except for 21th and 35th days. The liver indices of broilers at 7th, 14th and 21th days were significantly higher than those at high temperature (P <0.05). The liver indices of broilers at 35d and 42d were significantly higher than those of control group (P <0.05). It showed that low temperature had an effect on the liver development of broilers during the whole experimental period, while high temperature had a greater effect on the liver development of broilers during the later growth period.

Table 9 Effects of ambient temperature on liver development of broilers at different ages (%)

Age / Group	7 days old	14 days old	21 days old	28 days old	35 days old	42 days old
High	37.09±1.57^{b}	35.3±0.63^{b}	25.67±2.21^{b}	29.40±0.67^{ab}	29.28±1.05^{a}	23.57±2.19^{a}
Control	39.25±4.78^{b}	36.46±1.84^{b}	28.29±1.56^{ab}	27.93±2.42^{b}	24.73±1.16^{b}	20.37±1.73^{b}
Low	48.38±5.66^{a}	47.7±4.37^{a}	31.1±2.98^{a}	33.79±4.19^{a}	25.76±1.7^{b}	25.38±1.11^{a}

As shown in table 10, the spleen index of broilers in the low temperature group at 7th, 14th, and 35th days was significantly higher than that in the high temperature group and the control group (P <0.05). The spleen index of broilers in the high temperature group at 7th days was significantly lower than that in the control group (P <0.05). The spleen index of broilers at 7th, 14th, 21st days, and 35th days in the low temperature group was significantly higher than that in the high temperature group (P <0.05), indicating that both high and low temperature have an effect on the spleen development of broilers, especially low temperature has a greater effect on spleen development of broilers.

Table 10 Effect of ambient temperature on spleen development of broilers at different ages (%)

Age / Group	7 days old	14 days old	21 days old	28 days old	35 days old	42 days old
High	0.74±0.09^{c}	1.18±0.07^{b}	0.99±0.095^{b}	1.77±0.24	1.12±0.14^{b}	1.12±0.08
Control	1.17±0.15^{b}	1.07±0.14^{b}	1.23±0.56^{ab}	1.59±0.17	1.18±0.27^{b}	1.20±0.3
Low	1.71±0.26^{a}	2.21±0.65^{a}	1.82±0.48^{a}	1.88±0.71	1.59±0.26^{a}	1.25±0.25

As shown in table 11, the pancreas index of broilers in each group showed a decreasing trend with age. The pancreatic index of the three groups of broilers at 14th days was significantly different (P <0.05), showed as low temperature group> high temperature group> control group, at 28th days, the pancreas index of broilers in the control group and the low temperature group was significantly higher than that of the high temperature group (P <0.05). The our research has established that no significant difference between the other age groups.

Table 11 Effect of ambient temperature on pancreas development in broilers at different ages (%)

Age / Group	7 days old	14 days old	21 days old	28 days old	35 days old	42 days old
High	5.05±0.83	4.63±0.52^{b}	3.29±0.21	2.68±0.18^{b}	2.34±0.18	2.34±0.18
Control	4.78±0.42	3.81±0.13^{c}	3.82±0.39	3.02±0.43^{a}	2.15±0.18	2.15±0.18
Low	4.86±0.91	5.50±0.60^{a}	4.13±0.34	3.05±0.44^{a}	2.27±0.42	2.27±0.42

As shown in table 12, the bursal index of broilers in the high temperature group at 7th days was significantly higher than that in the control group and the low temperature group (P <0.05). The bursal index of the low temperature group at 14th days and 42th days was lower than that of the high temperature group and the control group ($P < 0.05$). It shows that low temperature has an effect on the development of broiler bursa in the early and late growth period, and high temperature mainly affects the development of broiler bursal in the early growth period.

Table 12. Effects of environmental temperature on the development of bursa of broilers at different ages（%）

Age / Group	7 days old	14 days old	21 days old	28 days old	35 days old	42 days old
High	2.06 ± 0.48^{a}	2.55 ± 0.39^{a}	2.53±0.31	1.43±0.06	0.82±0.19	0.82 ± 0.19^{a}
Control	1.42 ± 0.15^{b}	2.52 ± 0.11^{a}	2.46±0.09	1.28±0.14	0.72±0.09	0.74 ± 0.1^{a}
Low	1.58 ± 0.43^{b}	2.06 ± 0.21^{b}	2.37±0.46	1.82±0.51	0.61±0.2	0.50 ± 0.06^{b}

Discussion. When animals are in low temperature environment, gastrointestinal motility slows down, resulting in reduced feed intake [5]. Under low temperature conditions, the animal's energy intake changed from maintaining production to maintaining body temperature, resulting in weight loss, which is consistent with the results that the average body weight of chickens in the low temperature group was significantly lower than that in the control group at 42^{th} days ($P < 0.05$). At the same time, low temperature stress significantly increased the mortality of broiler chickens and significantly reduced the feed conversion rate [6], which is consistent with the results that the mortality rate of chickens in the low temperature group at 42^{th} days was higher than that of the control group by 250%. The adverse effects of chickens in low temperature environments are directly reflected in growth performance. The energy intake of chickens is first used to maintain body temperature, and secondly to maintain production. When chickens are under low temperature conditions, the part of energy that was originally used to maintain production is also used to maintain body temperature, which causes feed intake. Increased input, as well as increased basal metabolic rate and decreased energy reserve. In the low temperature environment, the chickens need to maintain energy, increase feed intake, reduce digestion rate, cause slow growth and lower production levels [7]. The body size traits of poultry are important contents of breed characteristics, and also important apparent traits to measure production performance [8]. The body oblique length, chest width, chest depth, chest angle, keel length, pelvic width, and tibial length of the chickens in the low-temperature group were significantly lower than those in the control group ($P<0.05$), indicating that low temperature significantly affects the growth and development of broilers, resulting in slowed growth. Compared with the high temperature group, the broiler chickens in the low temperature group still had significantly reduced body oblique length, breast width, breast angle, keel length, pelvic width, and tibial length ($P<0.05$), it shows that the adverse effect of low temperature on the growth and development of broilers is greater than that of high temperature.

High temperature stress reduces feed consumption and reduces metabolic heat production. In order to maintain calorie balance, it results in lower weight gain and higher mortality [9]. The results are consistent with the mortality of broilers in the high temperature group increased by 33.3% compared with that in the control group. High temperature stress reduces the absorption and utilization of nutrients in broilers, often accompanied by changes in chicken physiology and behaviour, such as growth rate, feed conversion rate, survival rate, decreased immunity, and even causes chicken death to negatively affect productivity impact [10]. In the results of this test, most body measurements such as oblique length, chest width, keel length, pelvic width, tibial length, and tibial circumference of broilers in the high temperature group were not significantly different from those in the control group ($P>0.05$). This result is consistent with the effect of high temperature on the weight of broilers in this experiment, indicating that high temperature has little effect on the growth and development of broilers under this test condition.

The effective deposition of nutrients in poultry mainly reflects the growth and development of musculoskeletal and other organs. The growth and development stages and physiological functions of animals are often expressed by organ index [11]. The organ index is one of the important biological characteristics of animals. The heart, liver, and pancreas are important metabolic and digestive organs in the body [12]. Among the organ index indicators in this test, the heart index, liver index, spleen index, and pancreas index of broilers in the hypothermia group were higher or significantly higher than those in the control group ($P<0.05$). It shows that the low temperature environment affects the development of organs and organs, which may cause these organs to hypertrophy. This may be because chickens growing at low temperatures need higher oxygen levels, and their cardiopulmonary system cannot provide enough oxygen to meet their needs, causing Increased symptoms of heart failure [11]. The results of low temperature environment affecting organ development are consistent with the conclusion that the low temperature environment reported by Liao Man et al. [13] significantly increased the relative weight of the heart.

Studies show that low temperature stress can affect neuroendocrine, antioxidant and immune system functions [14]. Some tests have shown that cold stress affects the production of immune cells in the body. Hyaline brown chicks reared under long-term cold stress have significantly reduced alkaline granulocytes and H/L (heterophil/ lymphocyte) [15]. Low temperature stress can reduce the body's resistance to disease and reduce cellular immune function. It will also affect the functions of the neuroendocrine system, antioxidant system and immune system. Low temperature stress can significantly affect the immune system of mice, humans and chicken ($P<0.05$) [16]. It has also been reported that cold stress suppresses humoral immunity in rats and reduces cellular immunity in chickens [17]. Immune organs are one of the important goals of low temperature stress. Low temperature stress induces oxidative stress in tissues by affecting the activity of antioxidant enzymes in immune organs, which affects the immune function of chicks. In addition, research has shown that the effect of low temperature stress on the immune response may depend on the duration of stress and the intensity of the stress [18,19]. The bursal and spleen are important immune organs in the body to participate in the cellular and humoral immunity of the whole body. The level of the immune organ index represents the developmental status of the immune organs of the birds and the strength of the body functions. An increase in the relative weight of the organ means an increase in the body's immunity, and a decrease in the relative weight of the organ means a decrease in the immunity [12]. The bursal index of 14^{th} and 42^{th}-day-old broilers in the low temperature group was lower than that in the high temperature group and the control group ($P<0.05$).

Broilers in the low-temperature group became smaller in the early and late stages of growth, indicating that low temperature reduced the immune function of broilers. Exposure to periodic high ambient temperatures will lead to changes in metabolism, physiology and cellular levels, reducing specific physiological mechanisms and immune functions of broilers [20]. In the results of this test, the liver index of broilers in the high temperature group was higher than that in the control group starting from 28th days and the heart to 42th days. The effect of hypertrophy of broiler organs caused by high temperature was only shown later, and the effect was slower than that of low temperature. The spleen index was not significantly different between the high temperature group and the control group ($P>0.05$), and the bursa of broilers in the high temperature group in the early growth stage (before 7th days) became larger, indicating that under this test condition, the appropriate high temperature in the early stage is beneficial to improve the immune function. The high temperature environment may affect the development of broiler organs, but the effects on different organs are different.

Conclusion. (1) Low temperature reduces the body weight and body size of broilers, and the effect of low temperature on body size development of broilers is greater than high temperature. (2) The low temperature makes the heart, liver, and spleen of broilers larger. The bursa of broilers in the high-temperature group in the early growth period becomes larger, and the bursa of broilers in the low-temperature group in the later growth period becomes smaller.

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Цзао Іньінь

Кисельов О.Б.

Лю.Чанчжун

Вплив температури навколишнього середовища на розмір тіла і розвиток органів у бройлерів

Анотація. В статті вивчається вплив різної температури у пташнику на ріст та розвиток як самих курчат-бройлерів, так і розвиток у них окремих органів. Результати досліджень показали, що такі показники як коса довжина тулуба, ширина грудей, глибина грудей, кут грудей, довжина кіля, ширина таза і довжина великої гомілкової кістки у бройлерів з низькотемпературної групи були значно нижче, ніж у контрольній групі ($P<0,05$), при цьому такий показник як глибина грудей курчат-бройлерів у високотемпературній групі також був значно нижче, ніж у контрольній групі ($P<0,05$) через 42-дні після вирощування. Дослідження показали, що низька температура збільшує навантаження на роботу серця, печінки, селезінки та підшлункової залози курчат-бройлерів ($P<0,05$). Бурсальний індекс бройлерів через 7-днів після вирощування у групі з високою температурою був значно вище, ніж у контрольній групі, а також в групі з низькою температурою ($P <0,05$). На основі досліджень встановлено, що ①високі та низькі температури істотно впливають на ріст та розвиток, а також імунітет курчат-бройлерів, а саме низька температура має більш негативний вплив на курчат-бройлерів, у порівнянні з високою температурою. ②Використання і підтримка високої температури на ранній стадії вирощування допомагає підвищити імунітет курчат-бройлерів і поліпшити продуктивність. Результати наших досліджень дають можливість забезпечити як теоретичну, так і практичну основу для точного встановлення температури в пташниках та ефективного розведення курчат-бройлерів, що в майбутньому дасть можливість підвищити продуктивність курчат-бройлерів і збільшити економічну ефективність роботи пташників.

Ключові слова: температура, розведення, приріст маси тіла, розвиток органів, курчата-бройлери.

Цзао Иньинь

Киселев. А.Б.

Лю.Чанчжун

Влияние температуры окружающей среды на размер тела и развитие органов у бройлеров

Аннотация. В статье изучается влияние различной температуры в птичнике на рост и развитие как самих цыплят-бройлеров, так и развитие у них отдельных органов. Результаты исследований показали, что такие показатели как косая длина туловища, ширина груди, глубина груди, угол груди, длина киля, ширина таза и длина большой берцовой кости у бройлеров с низкотемпературной группы были значительно ниже, чем в контрольной группе (P<0,05), при этом такой показатель как глубина груди у цыплят-бройлеров в высокотемпературной группе также был значительно ниже, чем в контрольной группе (P<0,05) через 42-дня после выращивания. Исследования показали, что низкая температура увеличивает нагрузку на работу сердца, печени, селезенки и поджелудочной железы цыплят-бройлеров (P<0,05). Бурсальной индекс бройлеров через 7-дней после выращивания в группе с высокой температурой был значительно выше, чем в контрольной группе, а также в группе с низкой температурой (P <0,05). На основе исследований установлено, что ①высокие и низкие температуры существенно влияют на рост и развитие, а также иммунитет цыплят-бройлеров, а именно низкая температура имеет более негативное влияние на цыплят-бройлеров, по сравнению с высокой температурой. ②Использование и поддержание высокой температуры на ранней стадии выращивания помогает повысить иммунитет цыплят-бройлеров и улучшить их продуктивность. Результаты наших исследований дают возможность обеспечить как теоретическую, так и практическую основу для точного установления температуры в птичниках и эффективного разведения цыплят-бройлеров, что в будущем даст возможность повысить продуктивность цыплят-бройлеров и увеличить экономическую эффективность работы птичников.

Ключевые слова: температура, разведение, прирост массы тела, развитие органов, цыплята-бройлеры.