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Production Performance of Different Generations of Muchuan Black-bone Chicken

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Abstract In order to formulate feasible conservation measures and develop and utilize Muchuan black-bone chicken rationally, two generations of Muchuan black-bone chicken were bred, and their production performance and slaughter traits (at the age of 300 d) were compared. The results showed that the reproductive performance, slaughter performance and body size of the Muchuan black-bone chicken of Generation 1 (G_1) were all improved compared with those of the Generation 0 (G_0) ($P < 0.05$). At the age of 300 d, the live weight, carcass weight, and leg muscle weight of the G_1 were significantly higher than those of the G_0 ($P < 0.05$); and the chest width of the cocks of the G_1 was significantly higher than that of the G_0 ($P < 0.05$). It suggests that after rigorous selection and utilization of modern poultry breeding techniques, the reproductive performance, slaughter performance and survival rate of Muchuan black-bone chicken can be improved significantly.

Key words Muchuan black-bone chicken, Reproductive performance, Slaughter traits, Body size measurement

1 Introduction

Muchuan black-bone chicken is a local excellent breed of Sichuan Province, mainly produced in Muchuan County, Leshan City, Sichuan Province. It has a long history in the region, also known as Danan black chicken, which is an important strain of the black-bone chicken in southern Sichuan. Muchuan black-bone chicken is named for its black skin, mouth, comb, bristles, oral cavity, meat, bone and internal organs. In particular, the feather on the whole body of Muchuan black-bone chicken is black and shines blue-green light, unique and rare in the world. It is the champion of the black-bone chicken. This breed is resistant to roughage, with delicious meat and unique appearance, and is popular among consumers as a meat and medicinal variety. In particular, the medicinal value of Muchuan black-bone chicken is high. According to the record of Li Shizhen's *Compendium of Materia Medica*, Muchuan black-bone chicken was ever used as a tribute to Beijing in the Qing Dynasty. For the "whole black", Muchuan black-bone chicken has been listed as the best choice for people to nourish, strength the body, and improve the looks. It has huge comprehensive development potential.

Muchuan black-bone chicken was included in the *China Livestock and Poultry Genetic Resources: Poultry* in 2010, belonging to an important strain of the black-bone chicken in mountainous areas of Sichuan Province. In 2009, an original breed farm was estab-

lished in Muchuan County, making the variety relatively effectively protected. At present, the preserved population of Muchuan black-bone chicken has reached more than 2 000. However, due to the lack of systematic research and development and utilization, the variety still has problems such as poor uniformity, low productive performance and slow survival rate. For the problems of Muchuan black-bone chicken, two generations of Muchuan black-bone chicken were bred using modern breeding techniques, and their production performance was compared to provide a basis for the industrial utilization and development of Muchuan black-bone chicken.

2 Material and methods

2.1 Experimental material The experimental material was Muchuan black-bone cocks (80) and hens (400), provided by the original breed farm of Muchuan black-bone chicken Muchuan County Black Phoenix Black-bone Chicken Co., Ltd.

2.2 Experimental methods

2.2.1 Experimental design. The experiment was conducted in the original breed farm of Muchuan black-bone chicken Muchuan County Black Phoenix Black-bone Chicken Co., Ltd. from June 2016 to May 2017. Breeding was carried out using family selection in the lineage and individual selection in the family. No external blood was introduced into each lineage. The inbreeding coefficient was strictly controlled. Under the premise of avoiding full-sib mating, half-sib mating and 1/4 sibling mating, random mating was conducted.

2.2.2 Feeding and management. Modern poultry production technology was used to raise and manage Muchuan black-bone chicken. The chicken were raised in cages and fed with complete

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feed during the whole experimental period. The nutritional level was as follows. Brooding period: protein 20% , metabolizable energy 2.9 Mcal/kg. Breeding period: protein 15% , metabolizable energy 2.7 Mcal/kg. Lay period: protein 16% , metabolizable energy 2.7 Mcal/kg. Free access was provided to feed during the brooding period, and accurate feeding was carried out according to the feed management program during the breeding period and laying period.

2.2.3 Measured indexes and methods. The reproductive performance, slaughter performance and body size of each generation of Muchuan black-bone chicken were measured and recorded. The slaughter performance was measured in accordance with the *Performance Firms and Measurement for Poultry* promulgated in 2004.

Table 1 Comparison of reproductive performance between different generations of Muchuan black-bone chicken (mean)

Generation	Age at first egg//d	Egg weight//g	Number of eggs laid within 500 d	Fertilization rate//%	Hatch rate of fertilized eggs//%	Survival rate//%
G ₀	170	46.2	138	87.7	88.4	86.7
G ₁	166	48.9	145	90.7	91.6	90.4

3.2 Comparison of slaughter traits between different generations of Muchuan black-bone chicken As shown in Table 2, at the age of 300 d, the slaughter traits of the G₁ were all improved compared with those of the G₀. Among them, the live weight, car-

Table 2 Comparison of slaughter traits between different generations of Muchuan black-bone chicken

(Unit: g)

Generation	Gender	Live weight	Carcass weight	Semi-eviscerated weight	Eviscerated weight	Leg muscle weight	Chest muscle weight
G ₀	Cock	2 277 ^b ± 278.02	2 137 ^b ± 222.50	2 013 ± 198.07	1 697 ± 179.78	383.24 ^b ± 52.74	266.00 ± 33.70
	Hen	1 611 ^b ± 176.72	1 460 ^b ± 142.61	1 325 ± 141.58	1 128 ± 109.35	236.30 ^b ± 46.80	205.67 ± 45.01
G ₁	Cock	2 451 ^a ± 250.33	2 240 ^a ± 186.50	2 105 ± 194.53	1 790 ± 164.62	408.80 ^a ± 56.74	275.40 ± 46.25
	Hen	1 680 ^a ± 166.65	1 520 ^a ± 167.93	1 440 ± 147.02	1 244 ± 117.51	262.40 ^a ± 37.35	219.20 ± 39.44

Note: Different lowercase letters in the same column indicate significant differences at the 0.05 level. The same as below.

3.3 Comparison of body size between different generations of Muchuan black-bone chicken As shown in Table 3, at the age of 300 d, the chest width ($P < 0.05$), body length, chest

Table 3 Comparison of body size between different generations of Muchuan black-bone chicken

Generation	Gender	Body weight//g	Body length//cm	Chest width//cm	Chest depth//cm	Shank length//cm	Shank circumference//cm
G ₀	Cock	2 277 ^b ± 278.02	27.7 ± 2.72	8.1 ^b ± 0.87	10.0 ± 0.93	10.4 ± 0.87	5.0 ± 0.37
	Hen	1 611 ^b ± 176.72	22.8 ± 2.05	7.3 ± 0.57	8.4 ± 0.76	8.6 ± 0.71	4.6 ± 0.30
G ₁	Cock	2 451 ^a ± 250.33	28.9 ± 2.57	8.9 ^a ± 0.70	10.7 ± 0.90	11.2 ± 0.75	5.5 ± 0.32
	Hen	1 680 ^a ± 166.65	24.0 ± 2.14	7.7 ± 0.51	8.9 ± 0.75	9.0 ± 0.73	4.8 ± 0.28

4 Conclusions and discussions

The reproductive performance, slaughter performance and body size of different generations of Muchuan black-bone chicken were compared. It was found that the G₁ of Muchuan black-bone chicken is superior to the G₀ in all aspects. This shows that after rigorous selection and utilization of modern poultry breeding techniques, the reproductive performance, slaughter performance and survival rate of Muchuan black-bone chicken can be improved significantly.

2.2.4 Data statistics and analysis. The data was statistically analyzed using the GLM module of the SAS9.0 statistical software.

3 Results and analysis

3.1 Comparative analysis of production performance between different generations of Muchuan black-bone chicken

As shown in Table 1, compared with those of the G₀, the age at first egg of the G₁ was 4 d earlier, the egg weight increased by 5.83% , the number of eggs laid in 500 d increased by 4.74% , the fertilization rate increased by 3.0% , the hatch rate of fertilized eggs increased by 3.2% , and the survival rate during the brooding period increased by 3.7% .

carcass weight, and leg muscle weight of the G₁ were significantly higher than those of the G₀ ($P < 0.05$), and the semi-eviscerated weight, eviscerated weight, and chest muscle weight showed no significant differences between the two generations ($P > 0.05$).

depth, shank length and shank circumference ($P > 0.05$) of the cocks of G₁ was significantly higher than those of the G₀.

In this study, the slaughter performance of Muchuan black-bone chicken was also measured to provide a basis for formulating scientific and feasible conservation measures, and developing and utilizing rationally Muchuan black-bone chicken resources. This is of positive significance to promote the breeding and further development and utilization of Muchuan black-bone chicken.

China has abundant wild animal resources and local livestock and poultry varieties. But in the past 20 years, a large number of exotic high-yield varieties have been introduced, and a large num-

ber of local varieties have been improved, leading to the replacement of some local varieties by bred varieties or hybrid and serious damage and great impact of local genetic resources. On the other hand, in order to pursue short-term economic benefits, hybridization has been conducted within or between varieties, some varieties have been subjected to continuous directional selection, and the intensification and scale of aquaculture have become high, leading to the destruction of genetic diversity within and between varieties and serious threat and even extinction of more and more livestock and poultry germplasm resources in China. Therefore, it is necessary to take certain measures for the problems of local poultry germplasm resources^[1-3].

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prevent falling and drying of soil. (iv) Branch cutting for large tree transplantation should be professional. It is required to wrap up the cut area of branches to reduce the water loss. (v) It is recommended to strengthen the management after transplantation, and do a good job in sun-proof, insect and pest prevention, and watering.

5.3 First pseudo planting then field planting Now, there is a kind of company that is engaged in transplanting large trees. They enclose land to plant trees. In other words, they first conduct pseudo planting, then sell trees to other places for field planting. After going through the pseudo planting, large trees will become more adapted to new ecological environment, so the survival rate will be higher. Companies specially engaged in enclosing land for planting large trees have professional personnel to provide technical guidance. This way is favorable for increasing the survival rate of transplanted large trees. All areas should establish their own nursery bases, plant trees in enclosed land, and provide pseudo planted trees for urban greening.

5.4 Setting up the overall point of view For urban greening, beautification, and protection of forest ecology, it is recommended to set up a global concept and overall point of view. It is required to stick to the basic state policy of conserving resources and protecting the environment, cultivate trees from the whole society, plant more trees, increase forest resources, and establish the for-

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est ecological environment for a local area and place. Besides, it is required to get rid of the practice of "robbing Peter to pay Paul" and get rid of the wrong manner of building the local areas into forest cities through destroying the forest ecology of other places. Large tree transplantation is a wrong way of urban greening. It leads to very low survival rate and fails to reach the purpose of urban greening and beautification. In summary, large tree transplantation destroys ecology and wastes forest resources. It is required to get rid of the practice of large tree transplantation.

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