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Performance and Meat Quality Of Males Chicken Of 2 Lines Sasso (S51 And S31) Reared by Free Range System

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Research Article

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Abstract

In hatcheries, the majority of males are killed shortly after hatching as they are considered waste, which is wasteful. Meanwhile, the interest of consumers in products from alternative systems (organic, free-range) is increasing. Stemming from the above fact, we had a idea that is to use one-day-old males, which continue to be raised freely to produce good quality chicken. This study was carried out at Hai Yen farm, Thai Nguyen province on 2 broiler Saso chicken lines: low-weight line (SA51) and heavy-weight lines (SA31), 150 male one-day-old chicks each line (5 repeats) reared in captivity to 21 days with density 6 birds/ m2, then free range reared in the garden with natural grass and fruit tree with density 5m2/ bird, monitor up to 90 days of age. The aim of this study was to evaluate the performance and compare the meat quality of two broiler lines at 49 and 90 days of age. The result as followed: Live weight, carcass yield, breast meat yield and the proportion of abdominal fat were significantly higher ($P < 0.001$) in SA31 at both ages. The proportions of fat in the breast meat were significantly lower ($P < 0.01$) in SA51 at both ages. The value of pH 24 h was significantly higher in SA51 and the meat was darker ($P < 0.001$) in these chickens. The overall acceptability was significantly better ($P < 0\ 01$) in SA51 at 90 days of age. The males are acceptable for an alternative system of poultry meat production from the aspect of meat quality.

Keywords: Free Range System; One-Day-Old Male; Sasso

Introduction

In recent years, the interest of consumers in products from organic (free-range) systems organic is increasing mainly because these systems can be environmentally friendly, sustaining animals in good health with high welfare standards and resulting in higher quality products [1] and has a particularly attractive natural flavor [2], so some assessors prefer breast fillets from a free-range or organic system to standard system [3]. In organic production, the minimum slaughter age is 70 days. In France, chickens raised under carefully specified conditions may be given the Label Rouge or the Fermier Label of quality. There are strict rules in the Label Rouge system; in which the slow growing genotype is selected and the slaughter age is not less than 84 days [4]. Fast-growing commercial hybrids are not suitable for these production systems, because they are slaughtered between 5 and 7 weeks and at 84 days of age they are too heavy. However, in the United States organic and other specialty poultry production mostly utilizes the same fast-growing broiler genotype as in conventional production systems [5]. At Vietnam, the free-range production of chicken meat is

regulated by Ministry of Agricultural and Rural Developing of Vietnam (2010) in National Technical Regulation Conditions for biosecurity of poultry farms (QCQG-01-15) [6].

The antagonistic relationship between meat and egg production led to the separation of the meat and egg-type strains of fowl. Consequently, the day-old male layer chickens have been used in the pet foud industry as a high quality animal protein. Moreover, in hatcheries the male chickens of layer breeds have to be killed due to their poor fatten ing performance and high costs. The superiority and genetic improvement of meat-type chickens in terms of growth is well documented [7,8], however there are only a few studies concerning the carcass composition and meat quality of commercial layer males in comparison with broilers at the same age [9]. Lewis, et al. [4] and Fanatico, et al. [5] evaluated the effect of genotypes on the carcass quality, but they compared fast and slower growing broilers, but no layer males. They also compared the carcass quality birds at the same live weight (different age) and compared the carcass quality of slower and faster growing birds at the same carcass weight (different age and different live weight). Grashorn, et al. [10] conducted a very extensive study concerning the performance and slaughter characteristics of broiler breeds for extensive production, but they also used slow-growing chickens without free range. Berri, et al. [11] compared the retention of protein and fat in the meat of heavy-weight and light-weight lines, but they kept the chickens in cages. Sasso chicken bred to grow under all manner of rearing systems and reach a market weight of 2 kilograms in 3 months, so as the Sasso breed is a choice for those who want to take advantage of the in-betweens of the traditional free-range chicken and the fast-growing hybrid broiler. The difference of this study compared with previous studies is to evaluate and compare the performance and meat quality of the heavy and low weight lines of Sasso chickens raised in the grazing system.

Material and Methods

Birds and Diets

The formal experiment was conducted from July to November 2021 at Hai Yen farm Song Cong town, Thai Nguyen province on 2 broiler Sasso chicken lines: low-weight line (SA51) and heavy-weight line (SA31); 150 one-day-old males each line (5 repeats) reared in captivity to 21 days with density 6 birds/ m2, then free range reared in the garden with natural grass and fruit tree with density 5m2/ bird, monitor up to 90 days of age. All birds raised by the process of Vietnam MARD [6]. Temperature was maintained at 30°C at the beginning of the experimental period, and gradually decreased to 22°C by the fourth week of age. The birds were confined to indoor at night and free range at day. The birds had free access to feed and water at all times with the same diets (Table 1).

Physical and Chemical Analysis

At 49 and 90 days of age 10 birds from each group were slaughtered by manual. The carcasses were chilled for 24 h at 5°C before dissection. The right sides of breast meat were individually wrapped in tinfoil and put to a -24°C freezer before sensory evaluation. The left sides of breast meat were evaluated for colour, pH, drip loss and chemical analysis. Breast meat (4-5 g) were carefully weighed, then put in a refrigerator (5°C) for 24 h and then dried with filter paper and precisely weighed again.

Ingredient	Starter (1-14 days)	Grower (15-44 days)	Finisher (45-90 days)
EM (Kcal /kg)	2694	2807	2714
Crude protein (%)	21.36	18.66	16.51
Methionine (g/kg)	5.12	4.23	3.9
Lysine (g/kg)	10.71	9.3	8.05
Calcium (g/kg)	8.46	9.21	8.03
Phosphorus Availble (g/kg)	2.62	5.61	6.07

Table 1: Diet calculated analyses.

The pH values were measured with a digital pH meter PORTAMESS 911 Ph KNICK (Knick Elektronische Messgeriite, Berlin), 1 cm from the sternum in the middle part of the muscle and at a depth of 1 cm at 0.5, 1.0, 1.5, 2.0 and 24 h intervals. The colour parameters (L*, a*, b*) were measured on raw muscles and on the skin of thigh using a spectrophotometer (CM-2600d, Konica Minolta, Osaka). In this method, higher L* values are light, higher a* values are red, and higher b* values are yellow. Colour measurements were taken on the cross-section of the breast muscle. Chemical analyses of the breast meat were done as follows: Moisture was determined by drying at 105”C for 6 h and total lipids were analysed by extraction with petroleum ether (Soxtec method). Sensory assay: 10 chickens from each

genotype in both age categories were assessed by five highly trained panellists under controlled conditions of a sensory study in a sensory laboratory. Only the cooked breast meat was subjected to the sensory evaluation due to the lack of homogeneity of thigh muscles. The breast samples were cooked in foil in their own juice at 90°C for 1.5h. Panellists described the colour, flavour, texture, juiciness, taste and overall acceptability. Each attribute was scored on an unstructured linescale 100 mm long. The extreme points of the linescales were as follows: colour 0-dark, 100-light, flavour 0-typical, very pleasant, 100-untypical, off-flavour, texture 0-soft, 100-tough, juiciness 0-very juicy, 100-dry, taste 0-unpleasant, aftertaste, 100-pleasant, without aftertaste, overall acceptability 0-pleasant, 100-unpleasant.

Statistical Analyses

Data on live weight and sensory assays were analysed by £-test and the chemical and physical characteristics were analysed by the nonparametric Mann-Whitney U-Test using the software package Unistat 5.1, England.

Results

The result at Table 2 show that due to selective breeding decisions the live weight of SA31 was significantly higher ($P < 0.001$) than that in SA51 both of 49 and 90 day of age, as it was already reported many times [8,9]. Survival rate at 90 days of age was 92.38% in SA51 and 90.75% in SA31 ($P < 0.05$). The feed conversion ratio at 90 days of age was 3.12 kg/kg in SA31 and 3.56 kg/kg in SA51 ($P < 0.05$). The carcass characteristics and meat quality are shown in Table 3. As expected, carcass weight and carcass yield percentages were also significantly higher ($P < 0.001$) in SA31. Regardless of the age, breast yield was significantly higher ($P < 0.001$) in heavy-weight SA31 than in low-weight SA51. This is the result of intensive selective breeding for this characteristic in broilers. The heavier weight of SA31 resulted in all their components being heavier than those of SA51, but there were no significant differences between the genotypes in the percentage of leg muscle plus skin (thigh and drumstick). Horsed, et al. [12] found that the proportion of the less valuable parts and the percentage of leg tended to be higher in egg-type males than in broilers. Fanatico, et al. [13] observed a significant effect of the genotype (fast vs. slow) on the percentage of both breast and leg meat to the total weight of the carcass. In their experiment with slow-growing chickens, the percentage of breast meat was lower, but the percentage of leg meat was higher in comparison with fast-growing broilers. The quality of carcasses with the same weight of slow and fast growing broilers was compared by Lewis, et al. [4]. They did not note a significant difference in the breast, thigh, or total meat production. In this experiment, at both ages, the amount of abdominal fat was significantly lower ($P < 0.001$) in SA31 than in SA51.

The chemical characteristics of breast meat Table 3 showed almost the same values of dry matter at 49 days but significantly higher ($P < 0.001$) in SA31 at 90 days. Fanatico, et al. [5] showed significantly higher dry matter in fast-growing hybrids but they compared birds of the same weight but at different ages.

Targets	Day of age	SA51	SA31	Significance
Survival rate (%)	49	94.79	93. 84	NS
	90	92.38a	90.75b	*
Average bodyweight (g)	49	1224.12 a	1423.45b	***
	90	2019 .01a	2218.10b	***
Feed conversion ratio (kg/kg)	49	3.94	3.59	*
	90	3.56	3.12	*

*, * *, ** * indicates significance level sat 0.05, 0.01 and 0.001, respectively

Table 2: Survival rate, growth and feed conversion.

However, age (maturity) significantly affects the content of dry matter in breast meat. At both ages, the content of fat was significantly higher ($P <0.01$) in SA31, which corresponds with the findings of some authors [13-15]. According to Lonergan, et al. [8] the breast meat of modern fast-growing broilers also contained a higher percentage of lipids and a lower percentage of proteins compared with the slow-growing strains. Sanka, et al. [16] suggested that the selection of birds based on their body weight concomitantly promoted fat accretion. On the other hand, Peter, et al. [17] did not observe any increase in breast fat content in fast - growing broilers depending on their age, but they found a significant increase in breast fat content in slow-growing chickens ($P < 0.01$) depending on their age. There was no significant difference between samples regarding drip losses at 49 days. But at 90 days the drip loss was significantly

higher (P < 0.001) in SA51 as Debut, et al. [18] also reported. Regardless of the age, the genotype had no significant effect on pH 0.5 h but pH 24 h was significantly higher (P < 0.01) in SA51 for both ages. Castellini, et al. [19] and Alvarado, et al. [20] also reported higher pH in slow-growing chickens. These authors did not observe a significant difference between slow and fast growing chickens in L*, a*, b*, either. Sosnówka, et al. [21] showed the correlations between the colour values and pH were all highly significant but in this experiment the meat colour as an indicator of meat quality was also affected by genotype. The L* values of the breast were significantly higher at both ages in SA31 (49 days P < 0.05; 90 days P < 0.001). The same effect of genotype on L* was reported by some authors [10,18]. The SA51 had higher redness (a*) at 49 days (P < 0.05) but at 90 days the difference was not significant. Did not observe a significant difference between slow and fast growing lines in a* values, either. Significantly higher (P < 0.01) b* values were found at both ages in SA51, which confirmed the effect of genotype on this characteristic [5,8,22]. The colour difference was apparent not only by instrumental means but was also visible and confirmed by sensory evaluation. The b* values of skin were also significantly higher in SA51 (49 days P < 0.05; 90 days P < 0.01). The yellowness of the Sasso birds meat may be related to the increased foraging of plant material.

Carcass quality	Day of age	SA51 (n=10)	SA31 (n=10)	Significance
Live weight (g)	49	1224.12 a	1423.45b	* * *
	90	2019 .01a	2218.10b	* * *
Carcass weight (g)	49	751.97a	980.75 b	** *
	90	1285.50a	1584.83b	** *
Carcass yield (%)	49	61.43a	68.90b	**
	90	63.67a	71.45b	***
Breast yield (%)	49	15.23a	17.94 b	* * *
	90	16.68a	19.24 b	***
Leg muscle + skin yield (%)	49	25.12	25.48	NS
	90	26.44	26.65	NS
Abdominal fat (%)	49	0.12a	2.02 b	** *
	90	0.73a	2.77 b	***
Dry matter - breast (%)	49	25.14	25.41	N S
	90	27.64a	25.75b	***
Fat - breast (%)	49	0.42a	2.08 b	**
	90	0.65a	1.43 b	**
Drip loss - breast (%)	49	3.13	3.45	NS
	90	1.51a	0.70b	**
pH 30 min	49	6.12	6.14	NS
	90	6.14	6.29	NS
pH 24h	49	5.75a	5.57b	**
	90	5.73a	5.64b	**
Skin colour 24 h	49	71.43	71.53	NS
L *	90	68.15	71.06	NS
a *	49	6.54	6.15	NS
	90	7.18	8.69	NS
b*	49	27.43a	20.54b	*
	90	31.63a	26.65b	**
Breast colour 24 h				

L*	49	54.16a	58.13b	*
	90	50.33a	54.31b	***
a *	49	2.78a	1.27b	*
	90	0.05	0.17	NS
	49	17.72a	15.45b	**
b*	90	12.82a	10.79b	**

*, * *, ** * indicates significance level sat 0.05, 0.01 and 0.001, respectively.
Table 3: Slaughter trait, chemical and physical characteristics of breast meat.

The results of sensory evaluation of breast meat are shown in Table 4. At both ages 49 days and 90 days, the color of breast meat of S51 line was significantly darker (P < 0.001) than that of S31 line. This is explained by the selective work to increase breast meat weight of SA31 line resulting in lighter flesh color [23]. The breast meat of SA51 was tougher (P < 0.01) at 49 days, but at 90 days there was no significant difference in the texture of breast meat between SA31 and SA51. There were no significant differences between genotypes in juiciness at both ages. This result is consistent with the study of Castellini, et al. [19] on ISA chickens or fast growing lines had found no difference in breast meat juiciness at 7, 9 and 11 weeks of age. The results of the analysis of the overall acceptability criteria showed that at 49 days of age there was no difference between genotypes, however at 90 days of age SA51 was significantly higher (P < 0.01) compared to SA31line.

Breast meat quality	Day of age	SA51	SA31	Significance
Colour	49	35.69a	50.04b	***
	90	52.78a	63.09b	***
Flavour	49	49.28	54.17	NS
	90	33.5	38.11.00	NS
Texture	49	54.22a	44.53b	**
	90	47.97	55.17.00	NS
Juiciness	49	64	60.84	N S
	90	38.89	47.23	N S
Taste	49	51.05	50.88	N S
	90	39.43a	48.00b	**
Overall acceptability	49	56.38	53.32	N S
	90	47.98a	56.19b	**

*, * *, ** * indicates significance level sat 0.05, 0.01 and 0.001, respe.
Table 4: Sensory quality of breast meat.

The Sasso males of the S51 have a lower growth rate and meat production compared to the S31 line, but the meat quality is better, even with many outstanding quality criteria. Thereby, color, flavor and overall acceptability seem to be influenced by genotype to the greatest extent, on the other hand, chickens raised with organic methods have a more favorable fatty acid composition in muscle compared to conventionally raised chickens [24].

Conclusions

The males one-day-old of both SA51 and SA31 lines can be used for free range system to provide high quality chickens to the market. At the 90 day of age, the SA31 chicken line had a significantly higher live weight, carcass and breast meat ratio compared to the SA51 line, in contrast, the meat quality of the SA51 line was better than that of the S31 line.

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