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## **EFFECT OF THE PRODUCTION SYSTEM ON THE CARCASS TRAITS OF THE LOCAL BREED OF ALBANIAN RABBIT**

### **ABSTRACT**

The carcass characteristics of the Albanian local rabbit breed farmed in two different production systems were compared. The carcasses were measured and retailed according to the norms of the World Rabbit Scientific Association. The rabbits that were reared on the family farms, the traditional system (n=36), showed a lower live weight at the slaughter age of 101 days (2025 vs. 2303 g,  $P<0.03$ ), as well as a lower dressing out percentage (59.41 vs. 60.53%,  $P<0.05$ ), than the rabbits (n=40) reared on the commercial farms, the conventional production system. A higher proportion of the hind part of the carcass (42.11 vs. 36.93%,  $P<0.05$ ) and two shoulders (17.5 vs. 16.1%) were observed in the conventional production system when compared to the traditional one. The average of the pelts was also different at 286.5 g (traditional system) and 328.2 g (conventional system) ( $P<0.01$ ), while the ratio of the pelts to the live weight at slaughter age were equal. The production system did not affect the total inedible parts percentage. In conclusion, the local rabbits reared in the conventional systems showed better carcass characteristics.

**Keywords:** rabbit, local breed, production system, carcass characteristics

### **INTRODUCTION**

The rabbits of the Albanian local breed are reared as an alternative production activity for small scale family farms (Daija et al., 2009). This production system is a traditional one with low inputs, and the meat production is mainly used for family consumption. The conventional system, with better feeding and housing conditions, is applied in commercial farms that produce rabbit meat for market.

Recently, farmers' interest in raising rabbits has increased as a consequence of the increased demand in the market for rabbit meat. This situation has initiated studies to evaluate the production capacities of local rabbit breeds and to explore ways to increase rabbit meat production in Albania (Piu et al., 2005; Daija et al., 2009; Papa et al., 2010; Llambiri et al., 2010).

The Albanian local rabbit breed is classified in the middle breeds group. According to previous studies (Daija, A., 2010), the rabbits of the Albanian local

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breed have good performances in rearing during the fattening period, a high feed efficiency and can be successfully farmed in commercial farms.

The carcass characteristics are the main criteria used to evaluate the productive capacities in the meat production of animals. Special attention is paid to studying the meat characteristics of local rabbit breeds reared under different systems of production (Lambertini et al., 2001; Metzger et al., 2003; Paci et al., 2003; Pascual et al., 2007; Pinheiro et al., 2008; Dal Bosco et al., 2008; Ouyed et al., 2008).

The objective of this study was the assessment of the effects on the carcass traits of the Albanian local rabbit breed from two different production systems, the traditional and conventional.

## MATERIALS AND METHODS

### *Animals*

A total of 76 local breed rabbits were used in this study. Of these, 36 rabbits were held on small scale family farms (the traditional system) and the other 40 rabbits were held on commercial farms (the conventional system). The rabbits kept in the traditional system were weaned at the age of 37 days, and the rabbits kept in the conventional system were weaned at the age of 35 days.

On the family farms the rabbits were housed in wooden cages equipped with a roof and plastic wired floor and placed one meter above the ground. Sixteen rabbits per cage or eight animals per square meter were raised. The cages were placed in open areas near the farmer's house.

The rabbits farmed in the conventional system were housed in metallic cages at a density of 6 animals/m<sup>2</sup>. The cages were placed in closed environments equipped with a ventilation system.

In the traditional production system the feed ration during the entire fattening period was alfalfa hay given ad libitum, and combined with some fresh alfalfa depending on the season. Some limited quantity (20 g/day/head) of grains such as wheat and barley and household wastes were also provided. Drinking water was available throughout the day.

The rabbits farmed in the conventional system were fed 35 g/day of concentrated feedstuff comprised of rice, oats and wheat (12.5% crude protein, 12.5% ether extract and 7.9% crude fibre). Alfalfa hay was given ad libitum. The feed ration used provided 2375 kcal/kg ME and 16% crude protein. The drinking water was available continuously from nipples.

### *Carcass traits*

The warm carcasses were weighed 30 minutes after slaughter and stripping. To study the carcass characteristics the measures were done according to the methodology described by Blasco et al. (1996). The weights of the blood, skin and the terminal portion of the tail, the extremities of the front and hind legs, and the gastrointestinal and urogenital tracts were not included in the warm carcass weight. However, it did include the weights of the head, liver, kidneys,

heart, lungs, oesophagus and trachea. The carcass was divided in accordance with the WRSA norms (Blasco and Ouhayoun, 1996). The weights of the front proportion (shoulder and legs) and the back proportion (rear thighs and sacrum) were expressed as a percentage of the reference carcass weight. The reference carcass weight was calculated as the difference between the weight of the hot carcass and that of all of the interior organs. The technical ratio was estimated as a percentage of the hot carcass weight to the live weight. The reference ratio was estimated as a percentage of the reference carcass weight to the live weight.

#### *Analysed traits and statistical analysis*

The following variables were analysed: WbF- Live weight before fasting (g), LWS- Live weight at slaughter (g), HCW- Hot carcass weight (g), RCW- Reference carcass (g), TSH- Two shoulders (g), HL- Hind legs (g) and GP- Giblet (%) (heart, liver and kidneys). The inedible parts and rapport, inedible: edible, were evaluated.

To identify the statistical effects of the production system on the different carcass traits, the analysis of variance with the GLM procedure was applied using the following statistical model:

$$Y_{ijk} = \mu + a_i + b_j + (ab)_{ij} + e_{ijk}$$

where:

$Y_{ijk}$  - carcass traits

$\mu$  - theoretical average

$a_i$  - effect of production system (i=1,2)

$b_j$  - sex effect (j=1,2)

$(ab)_{ij}$  - interaction effect "production system x sex"

$e_{ijk}$  - residual effect

## **RESULTS AND DISCUSSION**

### *Analysis of variance*

The ANOVA results, df, residual mean square and tests of significance for the carcass traits are reported in Table 1. The analysis of variance led to the coefficient of determination ( $R^2$ ) varying from 57% to 73%. A highly significant effect,  $P < 0.01$  or  $P < 0.05$ , of the production system factor on the studied traits was observed. The rearing system was the most important factor affected by the carcass traits variance. This result is in agreement with those reported by Metzger et al. (2003), Bergoglio et al. (2004), Toscano and Lazzaroni (2004), Pinheiro et al. (2008) and Paci et al. (2008). The effect of sex was not significant ( $P > 0.05$ ) in the TSH and HL, only. The male rabbits tended to have a higher WbF, LWS and HCW (+11%) than did the female rabbits. This result was similar to that reported by Frindt et al. (1979), Lukefahr (2004) and Ozimba et al. (2010). The interaction factor "production system x sex" was significant ( $P < 0.05$ ) for the WbF, LWS and HL.

Table 1: Measurements of analysed carcass variables

Item	df	WbF	LWS	HCW	RCW	TSH	HL	GP
Production system	1	**	**	**	*	*	*	*
Sex	1	*	*	*	*	NS	NS	*
Production system x Sex	1	*	*	NS	NS	NS	*	NS
Residual	74							
Residual mean square		6.342	5.897	5.125	5.348	1.892	2.067	0.08
Model R <sup>2</sup>		.71	.73	.68	.71	.57	.63	.62

Notes. Trait abbreviations: WbF- Live weight before fasting (g), LWS- Live weight at slaughter (g), HCW- Hot carcass weight (g), RCW- Reference carcass (g), TSH- Two shoulders (g), HL- Hind legs (g), GP- Giblet (%) (heart, liver, kidneys), NS-non significant, \*P<0.05, \*\*P<0.01

### Least squares means

The least squares means and their standard errors of the WbF, LWS and carcass traits are reported in Table 2. At the end of the fattening period (age of 101 days) the rabbits of the local breed farmed in the conventional system realized about a 13% higher WbF than the rabbits farmed in traditional system. The hot carcass (g) and the reference carcass (g) of the rabbits reared in the conventional system were, respectively, + 190 g and + 126 g higher than those of the rabbits reared in the traditional system. The differences of about 21-28% higher in the TSH and HL of the rabbits reared in the conventional system were likely because of better feeding. The effect of the feed ration was the creation of better musculature development when compared with the rabbits reared in the traditional system. The same situation is referred to by Paci et al. (2008).

The dressing yield indicators had similar values for all of the local breed rabbits despite the rearing system. It was the same situation for the total inedible parts, as the ratio inedible:edible did not have a significant difference (P>0.05). The least squares means for the HC (%) and RC (%) were comparable with those reported in the literature about rabbits of the middle breeds group (Raddy et al. 2002; Metzger et al., 2003; Paci et al., 2005; Ghosh and Mandal, 2008; Ouyed and Brun, 2008).

The estimate of the means and variation coefficients of the internal body organs and the weights of the head, blood and fur are given in Table 3. The estimated mean values are comparable with those reported by Larzul et al. (2005) and Ghosh and Mandal (2008). The significant differences in these values of the rabbits farmed in the two systems are rather low. The same situation is reported by Singh et al. (2005) and Ghosh et al. (2008).

The dressing yield indicators had similar values in all of the rabbits of the local breed despite the rearing system. It was the same situation for the total inedible parts since the ratio inedible:edible did not have a significant difference (P>0.05). The least squares means for the HC (%) and RC (%) were comparable with those reported in the literature about the rabbits of the middle breeds group (Metzger et al., 2003; Paci et al., 2005; Ghosh and Mandal, 2008 and Ouyed and Brun, 2008).

The estimate of the means and variation coefficients of the internal body organs and the weights of the head, blood and fur are comparable with those reported by other authors (Ghosh and Mandal, 2008). The significant differences of these values of the rabbits farmed in the two different rearing systems are rather low. The same situation is reported by Ghosh et al. (2008).

Table 2: The least squares means and their standard errors for WbF, LWS and carcass traits

Trait	Traditional system	Conventional system
Live weight before fasting, g	2074±169 <sup>a</sup>	2350±181 <sup>b</sup>
Live weight at slaughter, g	2025±209 <sup>a</sup>	2303±197 <sup>b</sup>
Fasting loss, g	<b>48.6±3.0<sup>a</sup></b>	48.1±3.9 <sup>a</sup>
%	2.13	1.86
Weight after bleeding, g	1966±162 <sup>a</sup>	2243±189 <sup>b</sup>
<i>Edible parts</i>		
Hot carcass, g	1204±67 <sup>a</sup>	1394±57 <sup>b</sup>
Reference carcass, g	1009±64 <sup>a</sup>	1135±62 <sup>b</sup>
Giblet-liver, heart, kidneys, g	115.6±4.91 <sup>a</sup>	134.5±5.7 <sup>b</sup>
%	5.71	5.84
Head, g	114.6±4.7 <sup>a</sup>	138.5±5.3 <sup>b</sup>
%	5.64	6.01
Hind part	372.7±9.2 <sup>a</sup>	478±10.1 <sup>b</sup>
% reference carcass	36.93	42.11
Two shoulders	163.3±4.9 <sup>a</sup>	198.4±5.3 <sup>b</sup>
% reference carcass	16.18	17.5
<i>Dressing yield</i>		
Hot carcass, %	59.41±0.3	60.53±0.3
Reference carcass, %	49.87±0.2	49.66±0.2
<i>Inedible parts</i>		
Blood, g	60.1±3.82 <sup>a</sup>	60.8±4.82 <sup>a</sup>
%	2.97	2.64
Pelt, g	286.5±8.1 <sup>a</sup>	328.2±7.6 <sup>b</sup>
%	14.12	14.24
Feet and tail, g	80±4.2 <sup>a</sup>	84.5±3.9 <sup>b</sup>
%	3.95	3.67
Spleen, g	1.97±0.1 <sup>a</sup>	2.11±0.1 <sup>a</sup>
%	0.097	0.091
Lungs and trachea, g	21.2±1.3 <sup>a</sup>	24.0±1.5 <sup>a</sup>
%	1.22	1.04
G.I. tract full, g	248±7.1 <sup>a</sup>	256±6.4 <sup>a</sup>
%	12.24	11.11
Total inedible parts	677.7±41 <sup>a</sup>	770.1±35 <sup>b</sup>
%	33.47	33.44
Inedible: edible	1:1.806	1:1.797

Means with different letters in the same row differ significantly

## CONCLUSIONS

The production system and sex significantly affected the phenotypical variance in the carcass traits of the local rabbit breed.

The rabbits of the local breed farmed in the conventional system had higher meat production performances. The positive effect of this rearing system did not appear in the dressing yield. The carcass characteristics of the rabbits of the Albanian local breed were comparable with the ones in the middle group breeds despite the production system.

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## **UTICAJ PROIZVODNIH SISTEMA NA KLANIČNA SVOJSTVA LOKALNIH RASA ALBANSKOG ZECA**

### **SAŽETAK**

Izvršeno je upoređivanje karakteristika trupova albanske lokalne rase zeca gajene u dva različita proizvodna sistema. Trupovi su mjereni i prodavani u skladu sa standardima Svjetskog udruženja za naučno izučavanje zečeva. Zečevi koji su gajeni na porodičnim farmama, po tradicionalnom sistemu (n=36), imali su manju živu masu u uzrastu za klanje od 101 dan (2025 naspram 2303 g,  $P<0.03$ ), kao i niži randman (59.41 naspram 60.53%,  $P<0.05$ ) od zečeva (n=40) gajenih na komercijalnim farmama, po konvencionalnom proizvodnom sistemu. U konvencionalnom sistemu proizvodnje su takođe primijećene i veće proporcije zadnjeg dijela trupa (42.11 naspram 36.93%,  $P<0.05$ ) i oba ramena (17.5 naspram 16.1%). I sirove kože su se u prosjeku razlikovale, 286.5g (tradicionalni sistem) i 328.2g, (konvencionalni sistem) ( $P<0.01$ ), dok su razmjere sirove kože živih masa u uzrastu za klanje bile iste. Sistem proizvodnje nije uticao na ukupni procenat nejestivih djelova.

Sve ovo navodi na zaključak da su lokalni zečevi gajeni po konvencionalnom sistemu imali bolje karakteristike trupa.

**Ključne riječi:** zec, lokalna vrsta, sistem proizvodnje, karakteristike trupa