Scientific Papers. Series D. Animal Science. Vol. LXI, Number 2, 2018
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

COMPARATIVE STUDY ON CARCASS TRAITS OF TWO DIFFERENT RABBIT GENOTYPES REARED IN TRADITIONAL AND CONVENTIONAL SYSTEMS IN ALBANIA

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Abstract

Carcass characteristics of Albanian local rabbit breed, farmed in two different rearing systems traditional family production system and conventional one and commercial hybrid "Local rabbit x Californian breed" farmed only in conventional system, were compared. The carcasses were measured and retailed according to the norms of the World Rabbit Scientific Association. Local rabbits reared in traditional system in family farms (n=36) had lower live weight at slaughter age of 101 days (2040 v. s 2314 g, P<0.05) than the animals (n=36) reared in the conventional production system of commercial farms. Dressing yield, hot carcass (HC %) and reference carcass (RC %) of local breed rabbits were not affected by rearing system. Commercial hybrid had higher live weight at slaughter age (2493 g), dressing yield: HC (62.03%) and RC (50.26%) than local breed rabbits. Rearing system (P<0.01) and the genotype (P<0.01) were the main factors affecting on the carcass characteristics. The Albanian local breed rabbits despite of rearing system had carcass characteristics similar to them of middle rabbit breeds. The F_1 crosses reared in commercial farms could be one of effective ways to improve rabbit meat production in Albania.

Key words*: rabbit, local breed, crosses, carcass traits, production system.*

INTRODUCTION

The rabbits of local breed are reared in general as an alternative production activity of small scale family farms in Albania (Daija et al., 2009). The rearing system is traditional one with low inputs. The conventional system with better feeding and housing conditions is applied in commercial farms producing rabbit meat for market. Rabbits of local breed and (F_1) crosses "Local rabbit x Californian breed" are reared in commercial farms. The farmer's interest to farm rabbits is growing up recently as consequence of increased request of market for rabbit meat. This situation has initiated the studies to evaluate the production capacities of local rabbit breed and finding out the ways to improve rabbit meat production in Albania (Piu and Daija, 2005, Daija et al., 2009, Llambiri et al., 2010, Daija et al., 2009).

In National Action Plan for conservation of animal genetic resources less attention is paid to small animals like as poultries and rabbits. While the interest of market for rabbit meat is growing up. As consequence the farmers interest to farm improved rabbit breeds and commercial hybrids is increasing (Toscano Pagano and Lazzaroni, 2004; Paci et al., 2008. Daija et al., 2009). In such conditions the local rabbit breed is threatened to be extinct and the need for the conservation of this indigenous genetic fund is current. Continuation the farming of local breed rabbits in traditional system could be an effective alternative for the conservation of this genetic fund as well as a real possibility for biological farm development (Paci et al., 2008). The Albanian local rabbit breed is classified in middle breeds group. According to previous studies of (Daija et al.,2009), the rabbits of Albanian local breed have good performances of rearing during fattening period, high feed efficiency and can be successfully farmed in commercial farms. The carcass characteristics are the main criteria's used to evaluate the productive capacities of animals for meat production. Special attention is paid to study these characteristics of local rabbit breeds and their crosses with genetically improved breeds reared in different systems from different authors. (Metzger et al.,2003a, Paci et al., 2008, Bawa et al., 2008, Pinheiro et al., 2008, Ouyed

and Brun, 2008, Elamin et al., 2011a, Elmaghraby, 2011).

MATERIALS AND METHODS

Animals

A total of 116 rabbit, 64 male and 52 female, of local breed farmed in traditional and conventional systems, and commercial hybride (F_1) "Local breed x Californiane" farmed only in conventional system were used in this study. The local breed rabbits kept in traditional system were weaned at age of 37 days. The local breed and commercial hybrid (F_1) rabbits kept in conventional system were weaned at age of 35 days.

The rabbits of local breed farmed in traditional system of family farms, were housed in wooden cages equipped with roof and plastic wired floor placed one meter high from the ground. Sixteen rabbits per cage or eight animals for square meter were kept. The cages were placed in open areas near the farmer's house.

The rabbits farmed in conventional system were housed in metallic cages, in density of 6 animal/m^2.

The cages were placed in closed environment equipped with ventilation system. In traditional system the feed ration during all fattening period was alfalfa hay given ad libido and combined with some fresh alfalfa depending on the season. Some limited quantity (20g/day/head) of grains like as wheat, barley and other farms waste were also provided. Drinking water was available.

The rabbits farmed in conventional system were fed with 35 g/day concentrate feedstuff constituted by rise, oat and wheat (12.5% crude protein, 12.5% ether extract, 7.9% crude fibre). Alfalfa hay was given ad-libido. The feed ration used 2375 kcal/kg ME and 16% crude protein). Good quality drinking water was available continuously from nipples.

Carcass traits

The warm carcass were weighed 30 minutes after sloughtering and stripping. To study the carcass characteristics the measures were done acoording to the methodology decribed by Blasco et al. (1996). In the warm carcass weight were not included the weights of: blood, skin and the terminal portion of the tail, the extremities of the front and hind legs, gastro-intestinal and uro-genital tract. It were included the weights of: head, liver, kidneys, heart, lungs, ezofagues and tracheas.

The carcas was divided in accordance with WRSA normes (Blasco et al., 1996).

The weights of the front porpotion (shoulder and the legs) and the back porpotion (the rear thighs and sacrum part) were expresed as percentage of the reference carcas weight.

The reference carcas weight was calculated as difference between the weight of hot carcas and that of all interior organs.

The technic ratio was estimated as pecentege of hot carcass weight to live weight.

The reference ratio was estimated as percentage of reference carcass weight to live weight

The traits and statistical analysis

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

The carcasse traits were estimated by the last squares means and analyses of variance with the fixed effects of genotype, sex, season and rearing system using the procedure of GLM (Statgraf Centurion ver. IX):

$$Y_{ijkln} = \mu + g_i + s_j + c_k + r_l + (gs)_{ij} + (gc)_{ik} + (gr)_{il} + (sr)_{jl} + e_{ijkln}$$

where :

Y_{ijkln} - carcass traits

μ - Theoretical average

g_i - effect of genotype (i=1,2)

s_j - sex effect (l=1,2)

c_k - season effect (k=1,2)

r_l - effect of rearing system (k=1,2)

$(gs)_{ij}$ - interaction effect "genotype x sex"

$(gc)_{ik}$ -interaction effect "genotype x season"

$(gr)_{il}$ - interaction effect "genotype x rearing system"

$(sr)_{jl}$ - interaction effect "sex x rearing system"

e_{ijkln} - residual effect.

RESULTS AND DISCUSSIONS

The ANOVA results, df, residual mean squares, and tests of significance for carcass traits are presented in Table 1. Genotype was significant for all traits (P<0.05, 0.01). These results are in agreement with those reported by Ozimba and Lukefahr, 1991, Ouyed and Brun, 2008. The effect of sex was not significant (P>0.05) for TSH and HL. Male rabbits tended to have a higher WbF, LWS and HCW (+11%) than did female rabbit. It was the same situation with that reported by (Ozimba and Lukefahr, 1991; Yakubu et al., 2007), Gasim-Boubaker et al. 2007). The effect of season of birth was significant for WbF, LWS and HL (P<0.05). The effect of rearing system was significant for all traits and it was the most important factor that affected the variance of carcass traits. This result was in agreement with those reported by Bergoglio et al. 2004, Pinheiro et al., 2008, Paci et al., 2008.

The "genotype x rearing system" interaction affect was significant for all traits (P<0.05, 0.01), meanwhile "genotype x season" was not significant (P>0.05), the "sex x rearing system" interaction was not significant for HL and GL, only (P>0.05) and the "genotype x sex" interaction affect was significant for WbF, LWS, HCW, TSH and HL (P<0.05) (Table 1).

Table 1. Degree of freedom, tests of significance and residual main squares for carcass traits[a]

Item	df	WbF	LWS	HCW	RCW	TSH	HL	GP
Genot.	1	**	**	**	*	*	*	*
Sex	1	*	*	*	*	NS	NS	*
Season	1	*	*	NS	NS	NS	*	NS
Rearing system	1	**	***	**	*	**	**	*
Genot. x Sex	1	*	*	*	NS	*	*	NS
Genot. x Season	1	NS	NS	NS	NS	NS	NS	NS
Genot. x Rearing system	1	**	**	**	*	*	*	*
Sex x rearing system	1	*	*	*	*	*	NS	NS
Residual	109							
Residual mean square		9.672	10.106	8.762	8.659	2.125	3.542	0.09
Model R^2		.71	.74	.63	.66	.58	.61	.65

[a]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, *** P<0.001

Least squares means

The least squares means and their standard errors of WbF, LWS and carcass traits are presented in Table 2.

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

Item	Local bred		Local breed x Californian breed
	Traditional system	Conventional system	Conventional system
Rabbit (n)	36	36	44
Live weight before fasting, g	2088±189[a]	2361±21[b]	2543±242[c]
Live weight at slaughter (LWS),g	2040±194[a]	2314±207[b]	2493±237[c]
Hot carcass, (HC), g	1213±74[a]	1391±84[a]	1547±89[c]
Reference carcass, (RC), g	1008±69[a]	1140±72[b]	1253±72[c]
Giblet (heart, liver, kidneys), g	100.2±3.6[a]	119.3±3.2[b]	133.3±3.6[c]
% RC	*9.6*	*10.42*	*10.58*
Head, g	115.2±4.1[a]	138.5±4.7[ab]	146.4±5.0[b]
% HC	*8.7*	*9.8*	*9.6*
Two shoulders	164±5.2[a]	195±5.8[b]	246±6.1[c]
% RC	*16.2*	*17.3*	*20.3*
Hind legs	336.2±7.2[a]	398.6±7.9[b]	438±8.6[c]
% RC	*33.4*	*34.2*	*35.3*
Dressing yield			
Hot carcass, %	59.46±0.2[a]	60.12±0.2[a]	62.03±0.3[b]
Reference carcass, %	49.13±0.2[a]	49.28±0.2[a]	50.26±0.2[b]
Total inedible parts	682.3±35[a]	775.1±42[a]	856.2±47[b]
%	*33.4*	*33.5*	*33.9*
Inedible: edible	1:1.78[a]	1:1.79[a]	1:1.81[a]

These results are comparable with those reported by Bergoglio et al., 2004; Pinheiro et al., 2008; Paci et al., 2008; Mehrez and Mousa, 2011, at the end of fattening period (age of 101 days) the rabbits of local breed farmed in conventional system realized around 13% higher WbF that one in traditional system. The same differences were noted and in HC and RC weights. Meanwhile the differences of 13-15 % higher of TSH and HL of local breed rabbits reared in conventional system were almost because of better feeding. The feeding ration

has affected to better musculature development in comparison with rabbits reared in traditional system. The same situation is referred by Paci et al., 2008. Commercial hybrid F_1 rabbits had higher carcass performances in comparison with rabbits of local breed. Their hot carcass and reference carcass weights were 11-25% heavier than them of local breed rabbits and the same phenomena could be noted for TSH and HL that were about 15-33% heavier. The data reported point out the positive effects of industrial crosses and rearing system on the improvement of rabbit meat production. Similar results are reported from Ozimba and Lukefahr, 1991; Raddy and Eady, 2002; Prayaga and Eady, 2003; Larzul et al., 2005; Dimitrova et al., 2008; Llambiri et al., 2010.

The dressing yield indicators had similar values to all rabbits of local breed despite of rearing system. In contrast the commercial hybrid rabbits had higher dressing yield ($P<0.05$). The same situation was for total inedible parts, while the ratio "Inedible: edible" did not have significant difference ($P>0.05$). The least squares means for HC (%) and RC (%) were comparable with them reported by the literature about rabbits of middle breeds group (Metzger et al., 2003b; Paci et al., 2008; Ghosh and Mandal, 2007; Ouyed and Brun, 2008; Yakubu et al., 2007; Ekpo et al., 2009; Elamin et al., 2012). The estimation of means and variation coefficients of internal body organs and the weights of head blood and fur are given in Table 3.

The estimated mean values are comparable with them reported by (Ghosh and Mandal, 2007). The significant differences of these values of rabbits of different genotypes and farmed in two systems are rather low. The same situation is reported by Ghosh and Mandal, 2007, Elamin et al., 2011b.

The values of variation coefficients are within 6.0–11.2% edges being lower than them reported by Ghosh and Mandal (2007).

Table 3 Statistical means of giblets and other carcass traits

	Local breed				Local breed x Californian breed	
	Traditional system		Conventional system		Conventional system	
	Male	Female	Male	Female	Male	Female
Rabbit (n)	20	16	20	16	24	20
Liver	76.7±3.1^{a}	72.1±3.1^{a}	91.4±4.6^{b}	86.5±4.0^{b}	104.2±4.8^{d}	96.7±4.3^{b}
%RC	*7.1*	*7.5*	*7.6*	*7.9*	*7.8*	*8.0*
Kidneys	17.2±0.9^{a}	15.3±0.5^{b}	21.2±0.9^{c}	18.3±0.9^{a}	22.4±1.0^{c}	20.5±0.9^{c}
%RC	*1.58*	*1.63*	*1.79*	*1.67*	*1.71*	*1.74*
Heart	10.0±0.2^{a}	9.2±0.1^{a}	10.5±0.1^{a}	9.5±0.1^{a}	11.2±0.2^{b}	9.8±0.1^{a}
%RC	*0.91*	*0.98*	*0.87*	*0.87*	*0.85*	*0.83*
Lunngs	17.3±0.6^{a}	15.4±0.7^{b}	18.6±0.7^{ac}	16.2±0.6^{b}	20.1±0.5^{c}	18.4±0.6^{ac}
%RC	*1.61*	*1.64*	*1.58*	*1.49*	*1.54*	*1.56*
Blood, g	60.3±3.87^{a}	59.7±4.25^{a}	60.1±5.02^{a}	61.5±5.12^{ab}	67.2±4.87^{c}	66.8±5.11^{c}
% LWS	*2.78*	*3.14*	*2.63*	*2.78*	*2.58*	*2.85*
Pelt, g	284±8.3^{a}	259±8.6^{a}	365±8.1^{b}	312±6.7^{c}	384±5.1^{b}	346±5.9^{b}
% LWS	*13.14*	*11.65*	*15.21*	*14.31*	*14.6*	*14.8*
Feet and tail, g	82±4.1^{a}	78±4.3^{a}	87±4.5^{b}	82±5.2^{a}	92±5.3^{c}	86±5.1^{b}
% LWS	*3.81*	*4.12*	*3.65*	*3.67*	*3.63*	*3.66*
Spleen, g	2.03±0.1^{a}	1.91±0.1^{a}	2.15±0.2^{a}	2.09±0.1^{a}	2.24±0.1^{b}	2.12±0.1^{a}
% LWS	*0.09*	*0.10*	*0.09*	*0.92*	*0.86*	*0.09*
Lungs and trachea, g	22.4±1.6^{a}	20.1±1.3^{a}	24.2±1.1^{b}	23.8±1.4^{b}	28.6±1.3^{c}	26.3±1.3^{c}
% LWS	*1.04*	*1.06*	*1.02*	*1.06*	*1.09*	*1.12*
G.I. tract full.g	264±7.5^{a}	232±6.9^{b}	272±5.3^{c}	246±6.1^{ab}	302±5.3^{d}	284±5.2^{c}
% LWS	*13.61*	*13.8*	*11.4*	*11.6*	*15.6*	*12.3*

Means with different letters on the same row differ significantly.

Figure 1. View from a rabbit Farm in Albania

CONCLUSIONS

Genotype, sex and rearing season effected significantly on the variation of carcass characteristics. Genotype, the farming system and the interaction "genotype x rearing system" had higher effects on these variations.

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

The commercial hybrid reared in commercial farms had better carcass performances and higher dressing yield than rabbits of local breed.

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