

## COMPRISING STUDY OF PRODUCTIVE CHARACTERISTICS OF LOCAL RABBIT BREED AND F<sub>1</sub> CROSSBREDS (CALIFORNIAN LINE (♂) X ALBANIAN LOCAL RABBIT BREED (♀)) REARING IN TRADITIONAL AND IMPROVED SYSTEM

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### Abstract

PAPA, L., K. KUME and A. LLAMBIRI, 2013. Comprising study of productive characteristics of local rabbit breed and F<sub>1</sub> crossbreds (Californian Line (♂) x Albanian local rabbit breed (♀)) rearing in traditional and improved system. *Bulg. J. Agric. Sci.*, 19: 806-809

A total of 267 male and female rabbits coming from local rabbit breed and F<sub>1</sub> crossbreds (Californian Line crosses (♂) x Albanian local rabbit breed (♀)) rearing in traditional and improved system were used for this study. The evaluation and comparison of productive performances live weight at weaning (WLW), live weight at slaughter age (SLW), and average of weight gain (AWG) of these two genotypes reared in two different systems was the aim of this study.

Statistical and multivariate analyses used to evaluate and compare the productive characteristics of local rabbit breed and F<sub>1</sub> crossbreds showed that the differences between two genotypes are significant only in improved rearing system (SLW 2822.1 g vs 2338.5 g, P<0.01), AWG 26.24 g vs 35.51 g, P<0.05. The differences between sexes and the effect of rearing season are statistically significant in both rearing systems, (P<0.05). The Gompertz curves have significant differences affected by the genotype (P<0.01) only in rabbits reared in improved system.

The rabbits of local breed reared in improved system produce more meat than in traditional system. (SLW 2338 g vs, 2042.4 g P<0.05 AWG 35.51 g, vs 26.24 g P<0.05). The (F<sub>1</sub>) crosses could improve meat production from rabbits only if they are kept in improved system.

*Key words:* rabbit, local breed, Californian line, F<sub>1</sub> crossbreed, traditional, improved, system, fattening

*Abbreviations:* WLW- live weight at weaning, SLW- live weight at slaughter age, AWG- average of weight gain

### Introduction

Actually, farming of rabbits is a limited production activity in Albania, developed on small- scale family farms. This production activity is most frequent in coastland, central and southern regions. It is carried out mainly to produce meat for self-consumption and a small quantity of production is destined for market.

Local rabbit breed named as “common rabbit” is predominant rabbit population in Albania (Toro, 1981, Piu, Daija, 2005). It is rather difficult to define the origin of this popu-

lation. Three different hypothesis are discussed: (i) Actual population originates from domestic animals, during the last period of Medievalism, in the region of South-eastern Europe, France, Italy, Spain etc. which have been brought, during XIX century and later in Albania by travellers who have visited these part of Europe, (ii) common rabbit is a population created as a result of the spontaneous process of the domestication of the wild rabbit that lives in the different regions of Albania and (iii) actual population originates from a casual mixture of the animals domesticated in Albania and those brought from other regions of Europe (Llambiri et al., 2010).

Considering rabbits' capacities to produce meat, its quality and increasing interest of Albanian market for rabbit meat, two developments are going on in Albania: (i) increasing the investments to improve the rabbits housing and feeding in small scale family farms; (ii) the crossbreed of local rabbit breed with exotic one of meat breeds that according to different authors could be considered as an effective way to improve meat production (Prayaga and Eady, 2003; Ouyed et al., 2007; Pinheiro et al., 2008; Ouyed and Brun, 2008; Daija et al., 2009).

The study of the effect of industrial crosses of local rabbit breed with Californian strain on productive characteristics and growth dynamic of fattening rabbits reared in traditional and improved systems in small scale family farm conditions is the goal of this study.

## Material and Methods

This experiment was carried out at small family farms that traditionally used to keep rabbits to produce meat for self-consumption and for market. The experimental time was from December 2009 – to April 2010 and from June – to October 2010. A total of 267 male and female rabbits of local breed and F<sub>1</sub> crossbred (Californian Line (♂) x Albanian local rabbit breed (♀)) reared in two systems, traditional and improved ones were used in this study. In average 6.2 animal/nest and 6.3 animals/nest at weaning period respectively of local rabbit and F<sub>1</sub> crosses were included in the experiment. In total 153 rabbits (87 males and 66 female) of local breed and 84 F<sub>1</sub> rabbits (68 males and 46 females) were fattened: 121 rabbits (76 rabbits of local breed and 45 F<sub>1</sub> rabbits) in traditional system and 146 rabbits (77 rabbits of local breed and 69 F<sub>1</sub> rabbits) in improved system. During all the fattening period, the rabbits kept in traditional system were fed, *ad libitum* with feed ration based on feeds produced in farms, mainly alfalfa hay. The feed ration for rabbits kept in improved system was, in average supplemented, with 25 g/day of compound feed (CN320 with 88.0% dry matter, 17.0% crude protein, 3.2% ether extract, 9.0% ash, 12.5% crude fibre, 12000 IU Vitamin. A, 1500 IU Vitamin. D, 60 mg Vitamin E) for all fattening period that lasted 101 days. The rabbits were individually weighed with a balance of 0.001 accuracy, every 7 days starting from 37 days of weaning age up to 101 days. The average daily gain were calculated from weekly weighing and the average live weight at weaning and at the end of fattening period for each sex was calculated.

To evaluate the effect of genotype, rearing system and other non genetic factors on live weight at weaning, live weight at slaughtering age and weight gain 101-37 d (g/d), the data were analysed according the general linear model (GLM, *STAT-GRAF Centurion XVI.*) as follow:

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

Where:

$Y_{ijkln}$  - productive characteristic (LWW, LWS, AWG)

$\mu$  - 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.

Using estimates for the averages of live weight in different phases, from 0-101 days of age, growth curves of rabbits of local breed and (F<sub>1</sub>) crosses rearing on traditional and improved systems were evaluated according to Gompertz model:

$$y = k \exp(-\exp(-b(t-c)))$$

$Ku$  - rabbit live weight

$t$  - the age of rabbit in days

$k$  - asymptote of live weight growth curve

$b, c$  - parameters that adjust both slope and inflection point of growth curve of live weight.

To estimate the effect of crossing of local rabbit with exotic one and rearing system the means of "Last squares" of live weight at the end of fattening period were compared.

## Results and Discussions

### Analyse of variance

The ANOVA results, df, residual mean squares, and tests of significance for productive characteristics, WLW, SLW, AWG, are presented in Table 1. The effect of genotype is significant for all traits. The effect of sex is significant (P<0.05) for WLW, only. Male rabbits tended to have a higher WLW (+12%) than did female rabbits. The effect of season of birth is significant for three production characteristics (P<0.05). Effect of rearing system is significant for WLW (P<0.05), SLW (P<0.001) and AWG (P<0.01)

The "genotype x sex" interaction is significant for both WLW and AWG (P<0.05), meanwhile "breed x season" interaction have not any significant effect to all traits. The "genotype x rearing system" interaction affect is statistically significant for SLW (P<0.01) and AWG (P<0.05) and the "sex x rearing system" affect all three characteristics (P<0.05).

### Least squares means

Genotype least squares mean and their standard errors for productive performances of rabbits are presented in Table 2.

**Table 1**  
Degree of freedom, tests of significance and residual main squares for productive characteristics

Item	df	Live weight at weaning (37 days)	Live weight at slaughtering age (101 days) g	Weight gain 101-37 d (g/d)
Genotype	1	NS	**	**
Sex	1	*	NS	NS
Season	1	*	*	*
Rearing system	1	*	***	**
Genotype x Sex	1	NS	*	*
Genotype x Season	1	NS	NS	NS
Genotype x Rearing system	1	NS	**	*
Sex x rearing system	1	*	*	*
Residual	261			
Residual mean square		4.231	13.896	1.15
Model R <sup>2</sup>		.63	.81	.54

NS-non significant, \*P<0.05, \*\*P<0.01

**Table 2**  
Genotype least squares means and standard errors

	Local breed	(F <sub>1</sub> ) crosses
Rabbits (n)	153	114
Live weight at weaning (37 days) (g)	638.5±5.4 <sup>a</sup>	662.8±6.7 <sup>a</sup>
Live weight at slaughter age (101 days) g	2196.3±38 <sup>a</sup>	2462.2.3±42 <sup>b</sup>
Weight gain 101-37 d (g/d)	24.36±1.8 <sup>a</sup>	28.06±3.2 <sup>b</sup>

Mains with different letters on the same row differ significantly

The differences on growth performances of different rabbit genotypes appear only during fattening period. During the suckling period the growing dynamic of rabbits is statistically the same (P>0.05). The rabbits of local breed have lower average daily gain (AWG) during fattening period (P<0.05) and lower live weight at slaughter age (SLW) (P<0.01). SLW and AWG of local rabbit are in average respectively 12 % lower and 3.7 g/day less than they of F<sub>1</sub> crosses are. Thus, it seems likely that crosses animal would produce more meat than local breed. This result shows that the positive effect of local rabbit crossing with genetically improve breeds appears

**Table 3**  
Genotype x rearing system least squares means and standard errors

Traits	Local breed		(F <sub>1</sub> ) crosses	
	Traditional system	Improved system	Traditional system	Improved system
Rabbits (n)	76	77	45	69
Live weight at weaning (37 days) (g)	640.3±4.1 <sup>a</sup>	648.2±4.9 <sup>a</sup>	650.2±5.2 <sup>a</sup>	663.3±5.3 <sup>a</sup>
Live weight at slaughter age, (101 days) g	2062.3±29 <sup>a</sup>	2338.3±37 <sup>b</sup>	2014.3±37 <sup>a</sup>	2806.7±43 <sup>c</sup>
Weight gain 101-37 d (g/d)	22.01±1.1 <sup>a</sup>	26.12±2.4 <sup>b</sup>	21.35±1.7 <sup>a</sup>	33.2±3.1 <sup>c</sup>

Mains with different letters on the same row differ significantly

in terms of small family farms that do not practice intensive rearing system. These results are in agreement with those reported by Prayaga and Eady (2003); Ouyed et al. (2007); Pinheiro et al. (2008); Ouyed and Brun (2008); Daija et al. (2009).

The data of Table 3 are used to judge about the way of reaction of local breed rabbits and F<sub>1</sub> crosses to rearing system, traditional or improved ones.

Rabbits of local breed reared in improved system realise about 23 % higher ADG (P<0.05) than in traditional system. Rabbits of F<sub>1</sub> crosses have difficulties to support the traditional system conditions. AWG and SLW realised by F<sub>1</sub> crosses reared in traditional system tend to be closer to values realised by local rabbit reared in the same system. The differences are small (P>0.05).

The improving effect of crossing on productive performances of rabbits appears in improved system conditions. F<sub>1</sub> rabbits reared in this system have higher AWG and SLW respectively about 27% and 20% (P<0.01) than rabbits of local breed reared in the same system. F<sub>1</sub> crosses produce about 36 % more meat than local rabbits reared in traditional system. These results are in agreement with those reported by

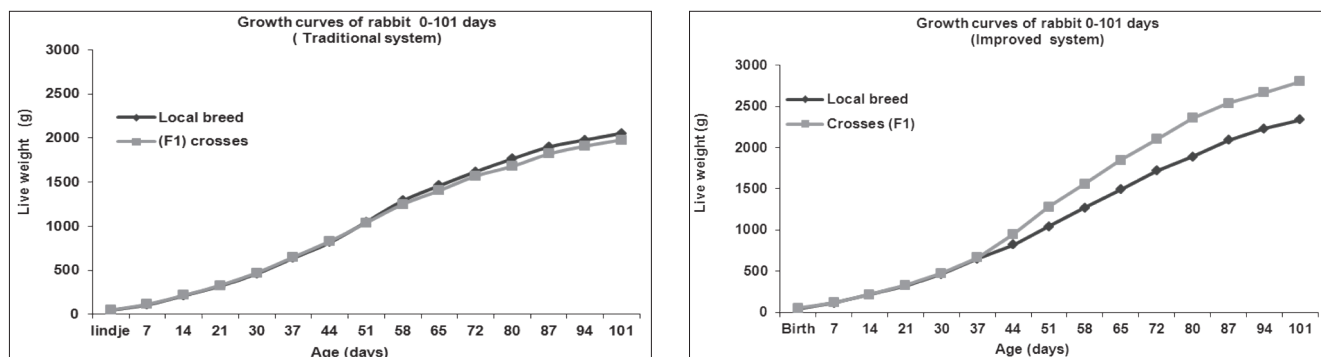


Fig. 1. The effect of genotype and rearing system on the growth dynamic of rabbits (0-101 days)

Llambiri et al (2010); Llambiri et al. (2009); Dimitrova et al. (2008); Raddy et al. (2002).

### Growth curves

The growth curves of local breed and F<sub>1</sub> crosses estimated as Gompertz model are given in Figure 1

The growth curves are an approximation statistically acceptable ( $P < 0.01$ ) of Gompertz model. The coefficient of determination of this model is estimated in the limits of  $0.77 \leq R^2 \leq 0.89$ .

The growth dynamic of rabbits of both groups (local breeds and F<sub>1</sub> crosses) is similar during suckling period regardless of the rearing system. The Gompertz curves for this period almost match. This situation does not differ during the fattening period (37-101 day) for rabbits reared in traditional system.

Differentiation begins after weaning period only for rabbits reared in improved system. The gradient of live weight gain is higher for F<sub>1</sub> crosses than that one of local rabbits. Although the improved system implemented in small Albanian farms has differences with the intensive system of commercial farms the improving effect of Californian strain on productive performances of rabbits appears.

### Conclusions

Implementation of local rabbit breed (♀) and Californian line (♂) industrial crosses affect positively on rabbit meat production reared in small-scale family farms. The meat production of F<sub>1</sub> rabbits is increased with about 12 % in comparison with the production of rabbits of local breed.

The improving effect of local breed rabbit crossing with Californian strain on productive performances of rabbits appears if the rabbits are reared in improved system conditions.

The rearing of F<sub>1</sub> rabbits in traditional system of small-scale family farms does not affect the meat production.

The F<sub>1</sub> rabbits reared in improved system produce 36 % more meat than rabbits of local breed reared in the same system.

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### References

- Daija, A., K. Kume and L. Papa, 2006. Rabbit growing in small family farm conditions. *LRI, Tirana*.
- Daija, A., K. Kume and L. Papa, 2009. Rabbit local breed. Identification and use as an alternative activity in small-scale farms Preliminary study. IV International Symposium of Livestock Production, Struga, Macedonia, 9-12 September.
- Dimitrova, I., T. Dimitrov, A. Teneva and H. Tzvetkova, 2008. Rabbit production in Bulgaria. *Biotechnology in Animal Husbandry*, **24** (1-2): 149-154.
- Llambiri, A., L. Papa and K. Kume, 2010. Farming of rabbit local breed as an alternative activity in small-scale farms in Albania. *Biotechnology in Animal Husbandry*, **24** (1-2): 149-154.
- Llambiri, A., L. Papa and K. Kume, 2010. Studim i efektit te te ushqyerit ne majmerine e lepujve te races locale qe rriten ne fermat e vogla familjare. *Buletini i shkencave bujqesore*, (A1).
- Ouyed, A., F. Lebas, M. Lefrançois and J. Rivest, 2007b. Performances de croissance de lapins de races pures et de lapins croisés en élevage assaini au Québec. In: *Proc. 12èmes Journ. Rech. Cunicole, INRA-ITAVI, 2007 November*, Le Mans, France, pp. 149-152.
- Ouyed, A. and J. M. Brun, 2008. Heterosis, direct and maternal additive effects on rabbit growth and carcass characteristics. In: *Proc. 9th World Rabbit Congress, 2008 June*, Verona, Italy, pp. 195-200.
- Pinheiro, V., S. R. Silva, J. A. Silva, D. Outor-Monteiro and J. L. Mourão, 2008. Growth and carcass characteristics of rabbits housed in open-air or standard systems. In: *Proc. 9th World Rabbit Congress, June*, Verona, Italy, pp. 1421-1424. Rabbit genetic resources in Mediterranean Countries, *Options Mediterranean's*, **38** CIHEAM
- Piu, Th. and A. Daija, 2005 Farm management of rabbit. *LRI, Tirana*.
- Prayaga, K. C. and S. J. Eady, 2003. Performance of purebred and crossbred rabbits in Australia: Individual growth and slaughter traits. *Aust. J. Agric. Res.*, **54** (2): 159-166.
- Raddy, K. and S. Eady, 2002. Performance of pure breed and crossbred rabbits in Australia. *J. Animal.Sci.*, **80**: 2036-2042.