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Pages 371-377

## GROWTH PERFORMANCES AND SLAUGHTER TRAITS OF A LOCAL KABYLIAN POPULATION OF RABBITS REARED IN ALGERIA: EFFECTS OF SEX AND REARING SEASON

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### ABSTRACT

Growth performances of 189 rabbits (102 females and 87 males) from the local Kabyle population were studied from 4 to 11 weeks and for 90 of them until 15 weeks. The average growth rate was  $27.7 \pm 6.3$  g/d between 4 and 8 weeks, and was reduced to  $22.2 \pm 5.4$  g/d during the 3 following weeks, and to only  $18.0 \pm 6.3$  g/d between 11 and 15 weeks. At 15 weeks, the rabbits have reached 2.29 kg which are 81% of the adult weight. Feed intake was maximum at  $73$  g/kg LW<sup>0.75</sup> during the 7<sup>th</sup> week and then decreased regularly down to the  $56$  g/kg<sup>0.75</sup> observed during the 14<sup>th</sup> week. Growth rate and feed intake were similar for both sexes. Growth rate was reduced by 13% in summer time (weanings of June-July) when compared to spring (weanings of February). Most of the slaughter traits were similar in males and females sacrificed at 15 weeks. Slaughter rate was the highest for rabbits slaughtered in August (compared to June and September) in relation with a significant reduction of the full digestive tract (11.2% vs 12.4-12.6% of body weight).

**Key words:** local population, growth, slaughter, sex, season.

### INTRODUCTION

Up to now, selected rabbit lines were not available in Algeria for rabbit meat production. Utilization of non selected lines issued from local populations could be an alternative to solve this problem, but their production capacity must be known. Such a population was studied in the Tizi-Ouzou University since some years for a total of 5 generations. Reproduction performance of this Kabyle local population was characterized by a low litter size at parturition (ZERROUKI *et al.*, 2001), but this population was considered as suitable for rabbit production according to its high tolerance to hot summer conditions (ZERROUKI *et al.*, 2004). The first experimental uses of this population for fattening studies were mainly oriented to pelleted feeds trials conducted during fixed standard periods (BERCHICHE *et al.*, 1999, 2000). The aim of the present study based on young of the 5<sup>th</sup> generation, was mainly the description of both sexes growth, during a longer period. The aim was also the determination of sensitivity of growth rate and slaughter parameters of rabbits of this population to Algerian season effects.

## MATERIAL AND METHODS

### Animals and controls

The 189 young rabbits used in this study were born between December 2001 and June 2002, from females of the 5<sup>th</sup> generation of the Kabylean local population studied in the Tizi-Ouzou University. They were born from 28 does in a total of 43 litters. All rabbits were weaned at 28-29 days and introduced in the experiment within a maximum of 2 days after weaning. Arbitrarily, weight at beginning was considered as the "4 weeks" weight. All rabbits were weighed every 7 days and the feed consumption measured at the same weekly interval until all rabbits were 11 weeks old. Controls were continued at the same rhythm for some of them until the age of 15 weeks.

Pelleted feed was provided *ad libitum* and water was always available through automatic nipple drinkers in each wire mesh cage. The pelleted feed was composed of dehydrated alfalfa 36%, barley 25%, wheat bran 26%, soy meal 12% and minerals & vitamins 1%. The analytical gross composition (as fed basis) was dry matter 89.6%, proteins 16.1%, crude fibre 11.7% and minerals 7.0%. Cages with one or 4 rabbits were placed in the experimental building in the "flat deck" disposition. Ventilation was natural and temperature was not controlled.

At the end of the experiment 59 rabbits were slaughtered between 99 and 108 days of age. Carcass traits were measured as recommended by BLASCO *et al.* (1993), with the noticeable difference that the head was not skinned. This late point in relation with traditional local market induced a relatively lower "skin weight" and a higher slaughter rate than the standard method.

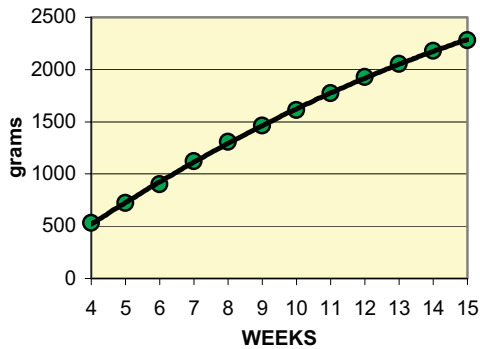
### Statistical analysis

For growth and feed intake study, the parameters taken in account were caging type (1 or 4 /cage), sex and season of weaning (5 levels : January, February, April, May, June+July). In all cases data were calculated as weights in grams, daily growth rate or daily feed intake in grams per day and per rabbit. For slaughter study, only 3 "seasons" or groups were considered : group 1 : slaughtered between 18 May and 8 July, group 2 : slaughtered between 3 and 10 August , group 3 : slaughtered between 8 September and 6 October. According to the effects studied, slaughter traits were expressed in grams or as percentage of live or carcass weight. Main effects were studied by single way variance analysis and variability expressed generally as residual coefficient of variation or as standard deviation.

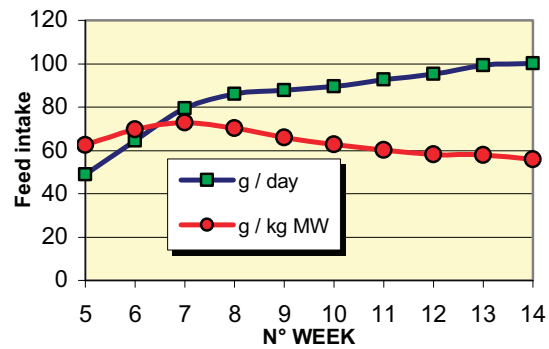
## RESULTS AND DISCUSSION

Only rabbits alive at the end of the experimental period were taken in consideration in this study. Nevertheless it could be important to notice that during this period, the mortality rate was 9.32%. Losses were noticed mainly during the 3 weeks following weaning. No differences in growth rate or feed intake were observed between contemporaneous rabbits housed individually or 4 per cage. Thus for the following presentation, type of caging was not taken in account.

The average growth curve was regular (figure 1) but not rectilinear. The average growth rate was  $27.7 \pm 6.3$  g/day between 4 and 8 weeks, and was reduced to  $22.2 \pm 5.4$  g/d during the 3 following weeks, and to only  $18.0 \pm 6.3$  g/d between 11 and 15 weeks.



**Figure 1. Average evolution of live weight between 4 and 15 weeks**  
(189 rabbits between 4 and 11 weeks and number reduced to 90 at 15 weeks)



**Figure 2. Evolution of feed intake during between the 5<sup>th</sup> and the 14<sup>th</sup> week of live**

At 15 weeks, the rabbits have reached 2.29 kg which are 81% of the adult weight, determined for this population at 2.81 kg by ZERROUKI *et al.* (2004). At the same age, POUJARDIEU and MATHERON (1984) observed a percentage of 72% of the adult weight for a New Zealand White (NZW) line reared at 23°C, the adult weight being 3.9 kg (COUDERT and LEBAS, 1984). This means that the local Kabyle population was more precocious than the classical NZW reference.

Feed intake was studied from the 5<sup>th</sup> week of live of rabbit until the 14<sup>th</sup>. Average daily feed intake increased quickly from the 5<sup>th</sup> to 8<sup>th</sup> week (from  $49 \pm 17$  to  $86 \pm 29$  g/day) and then increased slowly, to reach  $100 \pm 25$  g/day during the 14<sup>th</sup> week (figure 2). The calculated average feed intake per kg of metabolic weight (MW =  $LW^{0.75}$ ) increased from 63 g/kg MW up to maximum of 73 g/kg during the 7<sup>th</sup> week and then decreased regularly down to the 56 g/kg observed during the 14<sup>th</sup> week (figure 2). These values of relative feed intake are 25 to 30% lower than the corresponding values calculated from the data provided by POUJARDIEU and MATHERON (1984) for the previously mentioned NZW line.

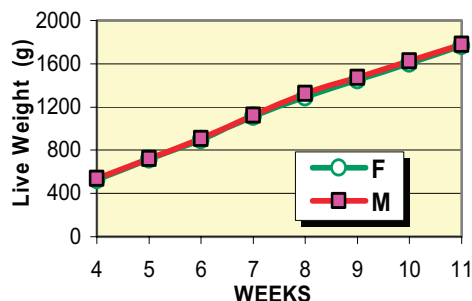
### Effect of sex on growth performance

The effect of sex was studied only on growth rate, because sexes were mixed in collective cages and then feed consumption per sex was not available.

A first analysis was made for the 4-11 weeks period when all rabbit were studied (102 females and 87 males). As it appears clearly on figure 3, there is strictly no difference between females and males growth curve during this period.

In addition an analysis of growth performance was done for a small group of contemporaneous females and males reared until 15 weeks (Table 1). Despite small numerical differences, no significant effect of sex was observed even at the end of the fattening period. Thus the present Kabyle population could be added to the long list of

populations and lines were no significant sex differences are observed during the fattening period (LEBAS *et al.*, 2001).



**Figure 3. Average live weight of rabbits of both sexes from 4 to 11 weeks**

**Table 1. Live weight and growth rate of males and females reared until the age of 15 weeks**

		<b>FEMALES</b>	<b>MALES</b>	rCV%	Significance
N° of rabbits		<b>26</b>	<b>22</b>	-	-
Live weight (g)	4 weeks	<b>667</b>	<b>610</b>	22.6	NS
	11 weeks	<b>2037</b>	<b>1966</b>	10.9	NS
	15 weeks	<b>2543</b>	<b>2427</b>	10.1	NS
Daily gain (g/day)	4 -11 weeks	<b>27.94</b>	<b>27.66</b>	11.1	NS
	11 -15 weeks	<b>18.09</b>	<b>16.48</b>	35.9	NS
	4 -15 weeks	<b>24.36</b>	<b>23.60</b>	10.8	NS

### Effect of season on growth performance

The season effect was studied on the growth rates and feed intakes observed for the whole population between 4 and 11 weeks of age. Season had a great influence on all parameters (Table 2). The low performance observed after January weanings may be explained mainly by the fact that all rabbits weaned during this month were born from the first litters of the females. Later, the best performance corresponded to February weanings. During the following periods, feed intake and growth rate decline regularly with the increase of temperature during fattening. This late type of effect of temperature was in good agreement with the observation of previous authors (POUJARDIEU and MATHERON, 1984).

**Table 2. Effect of the weaning month on feed intake and growth rate of rabbits between 4 and 11 weeks**

Weaning month	January	February	April	May	June-July	rCV%	Signific.
<i>N° observations</i>	18	16	14	28	24	-	-
Daily Intake (g/d)	<b>56.9<sup>a</sup></b>	<b>97.1<sup>d</sup></b>	<b>94.2<sup>d</sup></b>	<b>82.7<sup>c</sup></b>	<b>71.0<sup>b</sup></b>	15.0	P<0.001
<i>N° observation</i>	34	35	28	54	38	-	-
Live weight 4 weeks	560 <sup>b</sup>	681 <sup>c</sup>	534 <sup>b</sup>	477 <sup>a</sup>	452 <sup>a</sup>	20.9	P<0.001
Live weight 11 weeks	1570 <sup>a</sup>	2059 <sup>d</sup>	1894 <sup>c</sup>	1737 <sup>b</sup>	1654 <sup>ab</sup>	11.9	P<0.001
Average Daily Gain (g)	<b>20.6<sup>a</sup></b>	<b>28.1<sup>c</sup></b>	<b>27.8<sup>c</sup></b>	<b>25.7<sup>b</sup></b>	<b>24.5<sup>b</sup></b>	13.7	P<0.001
Calculated Feed conversion ratio	2.76	3.45	3.39	3.22	2.89	-	-

### Effect of sex on slaughter performance

The slaughter traits were quite identical for males and females. It could be only mentioned a tendency of females to have a heavier digestive tract and kidneys, and to have significantly lighter "paws and feet" and liver (Table 3). It could be pointed out that no significant difference in fatness was observed despite the fact that frequently at 15 weeks females were fatter than males (LEBAS *et al.*, 2001). Independently of sex effects, the low proportion of digestive tract (12.2% on average) could be underlined; this value is effectively far lower than the classical 15-16% observed for rabbits of the same age but of selected lines (LEBAS, 2004). The only proposition of the authors to explain this observation is the relative under-nutrition which prevailed by the farmers which have provided the initial stock, situation inducing an adaptation to "permanent" feed restriction.

**Table 3. Average slaughter traits and effect of sex on rabbits slaughtered at 15 weeks ± 3 days**

Weights in g	Average	Females	Males	rCV%	Signif
<i>N° rabbits</i>	59	13	46	-	-
Live Weight	2274	2279	2272	9.34	ns
Skin	271.1	270.1	271.4	14.5	ns
Digestive Tract	278.5	299.7	272.5	14.3	P=0.054
Hot Carcass	1652	1626	1659	9.94	ns
Cold Carcass	1606	1586	1611	10.1	ns
"paws and feet"	63.5	57.7	65.1	11.6	P<0.001
Slaughter rate (%)	70.6	69.7	70.9	4.13	ns
Liver	79.6	70.3	82.2	20.0	P=0.024
Kidneys	15.9	14.6	16.3	20.5	P=0.085
Abdominal fat	36.6	32.2	37.8	30.4	ns
Scapular fat	12.3	12.2	12.4	43.8	ns

### Effects of season on slaughter traits

The effect of season of slaughter was studied only for males because of the too small number of sacrificed females. Because slaughter weight of rabbits was significantly affected by season (Table 4) slaughter traits were expressed as percentage of slaughter weight or of cold carcass weight.

**Table 4. Slaughter traits of males sacrificed at 3 periods**

	Season §			rCV%	Significance
	1	2	3		
N° of rabbits	15	17	14	-	
Age (days)	108 <sup>a</sup>	104 <sup>b</sup>	105 <sup>b</sup>	2.56	P=0.002
Live weight (g)	2401 <sup>a</sup>	2246 <sup>b</sup>	2166 <sup>c</sup>	8.52	P=0.007
Slaughter rate%	70.1 <sup>a</sup>	73.0 <sup>b</sup>	69.2 <sup>a</sup>	5.09	P<0.001
Skin % LW	12.0	12.2	11.6	16.44	NS
Dig Tract% LW	12.4 <sup>a</sup>	11.2 <sup>b</sup>	12.6 <sup>a</sup>	11.71	P=0.009
Liver%Carc	5.13 <sup>a</sup>	4.59 <sup>b</sup>	5.73 <sup>a</sup>	16.46	P=0.002
Kidneys%Carc	1.12 <sup>a</sup>	0.93 <sup>b</sup>	0.99 <sup>b</sup>	14.40	P=0.003
Dissect.	3.40 <sup>a</sup>	3.15 <sup>ab</sup>	2.67 <sup>b</sup>	23.46	P=0.031
Fat%Carc					

§ Season1 = 18 May-8 July ; 2 = 3-10 August ; 3 = 8 Septembre-6 October

The higher slaughter rate was observed for rabbits slaughtered in August, for an intermediate live weight. This situation was non common since generally the slaughter rate increased with live weight at fixed age (DALLE ZOTTE, 2002). This high slaughter rate was mainly related with a smaller digestive tract itself related with the low feed intake observed during the hot season. The other slaughter and carcass traits were also affected by season with the only noticeable exception of the proportion of skin.

### CONCLUSION

The local Kabyle population may be characterized by a relatively low growth rate. At 15 weeks when the live weight reached 2.2-2.3 kg, the best slaughter weight for the local market, this weight represents 81% of the adult weight. This high degree of maturity induces a high feed expense when compared to the 50-55% of maturity commonly observed e.g. in France in commercial rabbitries. Thus this population cannot be considered as suitable for the production of 2.2-2.3 kg rabbits, if used as "pure bred", despite his high slaughter rate (consequence of the low proportion of digestive tract). Because of the good adaptation to reproduction elsewhere mentioned (ZERROUKI *et al.*, 2004), for commercial rabbit meat production it may be indicated to use females of this population in crossing with males characterized by a high growth rate. The sensitivity of growth parameters to hot temperature observed in summer in Algeria may be considered as classical, with no specific adaptation, contrary to the



heat tolerance observed for reproduction parameters. This involves a non unique mechanism of adaptation to hot temperatures.

### ACKNOWLEDGMENTS

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### REFERENCES

- BERCHICHE M., LOUNAOUCI G., LEBAS F., LAMBOLEY B. 1999. Utilisation of three diets based on different protein sources by Algerian local growing rabbits. *2<sup>nd</sup> international Conference on Rabbit Production in Hot Climates Cahiers options méditerranéennes* **41**:51-55.
- BERCHICHE M., KADI S.A., LEBAS F. 2000. Valorisation of wheat by-products by growing rabbits of local Algerian population. *7<sup>th</sup> World Rabbit Congress, World Rabbit Sci.* **8 suppl. 1C**:119-124.
- BLASCO A., OUHAYOUN J., MASOERO G. 1993. Harmonization of criteria and Terminology in meat research. *World Rabbit Sci.* **1**:3-10.
- DALLE ZOTTE A. 2002. Perception of rabbit meat quality and major factors influencing the rabbit carcass and meat quality. *Livest. Prod. Sci.* **75**:11-32.
- COUDERT P., LEBAS F. 1984. Effets du rationnement alimentaire avant et pendant la première gestation sur la productivité et la morbidité des lapines reproductrices. *3<sup>rd</sup> World Rabbit Congress Rome, II*:131-140.
- LEBAS F., RETAILLEAU B., HURTAUD J. 2001. Evolution de quelques caractéristiques bouchères et de la composition corporelle de 2 lignées de lapins entre 6 et 20 semaines d'âge. *9<sup>ème</sup> Journ. Rech. Cunicole Paris*, 55-58.
- LEBAS F. 2004. La Biologie du Lapin. in <http://www.cuniculture.info> (consultation Avril 2004)
- POUJARDIEU B., MATHERON G. 1984. Influence d'une ambiance chaude et humide sur la croissance de futures reproductrices. *3<sup>rd</sup> World Rabbit Congress, Rome, I*: 107-118.
- ZERROUKI N., BOLET G., BERCHICHE M., LEBAS F. 2001. Caractérisation d'une population locale de lapins en Algérie: Performances de reproduction des lapines. *9<sup>ème</sup> Journ. Rech. Cunicole Paris*, 28-29 nov : 163-166.
- ZERROUKI N., BOLET G., BERCHICHE M., LEBAS F. 2004. Breeding performance of local Kabyle rabbits does in Algeria. *8<sup>th</sup> World Rabbit Congress* (accepted communication).