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TERMINAL SIRE AND PRODUCTION OF MEAT RABBIT

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ABSTRACT

An experiment has been carried out concerning the progeny of pure line or crossbred dams mated to non-specialised(NS) or specialised terminal sires. Two types of specialised terminal sires were considered, both of them pertaining to the same line: the standard of the line(ST) and the top(TP, ranking in the 25% higher on post-weaning daily gain). The objective of the experiment was to compare the offspring of the different types of sires on the following traits: individual weights at weaning(28d), at 49 d and 63d; daily weight gains at the same times; daily feed consumption and feed conversion index; dressing out percentage, post-mortem weight losses and post-weaning mortality. Concerning the use of specialised terminal sires, they have been advantageous in post-weaning daily gain(4.8gr/d), feed consumption(7.9gr/d), and feed conversion(0.1) , neutral in weaning weight, dressing out percentage and post-weaning mortality and disadvantageous in 24h post-mortem drip losses(6.5gr). No differences were found between standard and top sires, and crossbred dams revealed superior to the pure in daily gain (0.7gr/d) and no different in the other traits.

INTRODUCTION

An important component to produce rabbit meat is the breed or line of the bucks mated to the does because of its influence in offspring traits such as growth, feed efficiency, dressing out percentage, carcass composition or meat quality (Ouhayoun ,1978; Feki et al. 1996; Gómez et al, 1998; Pla et al, 1998).

The companies and public organisations involved in the meat rabbit genetic improvement develop specialised paternal lines, generally selected on weights at marketing age (Rochambeau et al. 1994**)** or post-weaning daily gain (Rochambeau et al. 1989; Estany et al,1992) expecting correlated responses, favourable on feed efficiency and unfavourable on dressing out percentage and carcass and meat quality if the market weight is not increased. An attempt to select for daily gain and carcass quality, assessed as the average surface of *m. longissimus dorsi,* has been carried out in the Pannon rabbit (Szendro et al, 1996) and an experiment of divergent selection involving daily gain and feed conversion has been carried out by Moura et al.(1997).

The production scheme recommended for the farmers is to use a crossbred female, coming from the cross of two maternal lines, as the doe to be mated to bucks of paternal lines, as the way to combine reproductive and growth efficiency in production of meat rabbit. Nevertheless the farmers follow this scheme in very different degrees and they can use pure breed does, heterogeneous mixed does or true crossbred does. Concerning the bucks they can use , bucks of non-specialised or specialised paternal lines. Now there is a trend to use the top bucks of the specialised lines if reproduction is by artificial insemination in place of natural mating. The objective of this experiment is to evaluate the effects of the type of the

doe and the sire on the growth , feed efficiency and dressing out percentage of the offspring.

MATERIAL AND METHODS

The experiment has been carried out in the experimental farm of the Escuela de Capacitación y Experiencias Agrarias of Lorca (Murcia, Spain), where the young rabbits were weaned at 28 d and placed in cages of 8 young and fattened until 63 d. Each rabbit was individually identified by an ear tag and weighted at 28, 49 and 63 d. When a rabbit died, the date and weight at death were recorded. Feed consumption by cage was registered and the conversion index by cage was also computed. At 63 d a random sample of the rabbits were slaughtered and the carcass was weighted at this time and 24 h post-mortem.

The traits that have been studied are: individual weights at 28 ($\mathbf{W_4}$), 49 ($\mathbf{W_7}$) and 63 ($\mathbf{W_9}$) days; individual weight daily gain between 28 and 49 ($\mathbf{DG_{47}}$), 49 and 63 ($\mathbf{DG_{79}}$) and 28 and 63 days ($\mathbf{DG_{49}}$); feed consumption ($\mathbf{FC_{47}}$, $\mathbf{FC_{79}}$, $\mathbf{FC_{49}}$ **)** and conversion index ($\mathbf{CI_{47}}$, $\mathbf{CI_{79}}$, $\mathbf{CI_{49}}$) for the same periods, both of them as average per rabbit within cage; 24h post-mortem drip losses (**CDL**); dressing out percentage (**DP**) as the percentage of the weight of the carcass 24 h post-mortem (chilled carcass) to live weight at 63 days and mortalities between 28 and 49 ($\mathbf{MO_{47}}$), 49 and 63 ($\mathbf{MO_{79}}$) and 28 and 63 days ($\mathbf{MO_{49}}$), computed as cage average.

The model used to analyse the traits is a fixed effect model with three factors, without interactions, using a ordinary least square method to solve the model and testing the significance of the difference between levels of the factor by F tests. The factors considered were:

-**season** with three levels; spring, summer and winter.

-**type of dam** with two levels; pure line A does and crossbred (UVxTA) does. Lines A and V are specialised maternal lines selected for litter size at weaning, evaluating the best matings by a family index in line A (Baselga et al. 1984) and by BLUP under an animal repeatability model in line V (Estany et al, 1989).

-**type of sire** with three levels; bucks of line A that are called **NS** non-specialised terminal sires, bucks of line R, centred around the 50% of the mean that are called **ST**, standard sires, and bucks, also pertaining to line R, but ranking in the 25% highest for post-weaning daily gain , that are called **TP**, top sires. Line R is a paternal line , individually selected for post-weaning daily gain. The number of cages controlled in each combination of the factors and rabbits slaughtered at 63days to record carcass traits are shown in Table 1.

Table 1. Number of cages(rabbits with carcass traits) controlled in each combination of season, type of dam and type of sire.

Type of dam	**Pure line**			**Crossbred**		
Type of sire[1]	**NS**	**ST**	**TP**	**NS**	**ST**	**TP**
Spring	7(22)	6(25)	7(14)	7(18)	7(20)	7(20
Summer	6(20)	6(20)	6(20)	6(20)	6(19)	6(20)
Winter	6(12)	7(24)	7(21)	7(21)	6(24)	6(12)

[1]. **NS**, non-specialised line sire ; **ST**, standard specialised line sire ; **TP**, 25% top specialised line sire

RESULTS AND DISCUSSION

Least square means of the different types of sires and dams for weights at different ages are shown in Table 2. There is not effect of the type of sire on the weight at weaning(**W_4**) but the effect of the type of dam is significant, being the difference 70 gr. in favour of the crossbred does . It has been found in other experiments(Feki et al 1996) that line A has higher weaning weight that line V, thus, these results confirm the importance of the maternal effects and heterosis in this trait.

Table 2. Least square means of type of sire and dam for weights(gr.) and daily gains(gr./d).

	Sire[2]			**Dam**	
Trait[1]	**NS**[3]	**ST**	**TP**	**Pure**	**Crossbred**
W_4	559±7	550±7	553 ± 7	519^{a}±6	589^{b}±6
W_7	1368^{a}±14	1509^{b}±14	1476^{b} ± 14	1401^{a} ± 11	1502^{b} ±11
W_9	1917^{a} ± 15	2081^{b} ± 15	2068^{b} ± 15	1975^{a} ± 12	2068^{b} ± 12
DG_{47}	38.4^{a} ± 0.4	45.5^{c} ± 0.4	43.9^{b} ± 0.4	41.8^{a} ± 0.3	43.4^{b} ± 0.3
DG_{79}	38.5^{a} ± 0.4	40.5^{b} ± 0.4	41.8^{c} ± 0.4	40.7^{b} ± 0.3	39.8^{a} ± 0.3
DG_{49}	38.7^{a} ± 0.3	43.7^{b} ± 0.3	43.2^{b} ± 0.3	41.5^{a} ± 0.2	42.2^{b} ± 0.2

[1] **W_i**, weight at the week i ; **DG_{ij}**, daily gain between week i and week j

[2] **NS**, non-specialised line sire ; **ST**, standard specialised line sire ; **TP**, 25% top specialised line sire

[3] Means within trait and factor with different letters are statistically different

The effects of sire and dam are significant on the weights at 49 and 63 days. The effect of the crossbred dams exceed in 100 gr. the effect of the pure dams, increasing a little the difference at weaning. Concerning the types of sires there were differences between non specialised and specialised terminal sires but there were not between the standard(**ST**) and top(**TP**) sires of the specialised line. The same pattern of differences was found for individual daily gain(Table 2) between 28 and 63 days. The difference between the two types of dams was 0.7gr/d, but the difference between the non specialised and specialised sires was 4.8 gr./d, being the value of the latter in agreement with the results of Feki et al.(1996). A difference of 0.635gr./d was expected in daily gain between 28 and 63 days of the top and standard specialised sires, difference that would have been in the limit of significance in this experiment where the standard error for the corresponding least square means has been 0.3 gr./d. However the actual difference has had a sign opposite to the expected but the difference has not been statistically significant. Adding the effects of the specialised sires and the crossbred dams on post-weaning daily gain an advantage of near 200 gr. in total post-weaning weight gain is obtained when these animals are used as breeders in place of pure maternal dams and sires.

Analysing the post-weaning growth in a first period since 28 to 49 days and a second period, since 49 to 63 days the results show some discrepancies between both and the whole period. In all cases the difference in favour of the specialised sires is kept, but significant differences appear among the specialised sires. During the first period the difference is in favour of the standard sires and just contrary to the expected. During the second period the effect of the top sires was higher than the effect of the standard sires as it was expected. A similar result has been produced for the dam effects, in the sense that during the first period the favourable effect was the one corresponding to the crossbred does but the reverse was true in the second period where the effect of the pure dams on daily gain was higher than the effect of the crossbred dams. There are no explanation for the reversion of the effects found in dams and specialised sires. The absolute value of the differences found during the first period is higher than for the second and the length of the period is also higher for the first, consequently the differences for the whole post-weaning period are similar to the differences found during the

first period.

Referring daily feed consumption (Table 3) from 28 to 63 days there were significant differences between non specialised and specialised types of sires but there was not difference between pure and crossbred dams. The difference between specialised and non specialised sires is 7.9 gr./d in favour of the specialised sires, similarly to the difference found in daily gain for the same period. Considering that the specialised line has been genetically improved for post-weaning daily gain and it is admitted (Feki et al, 1996) that a correlated response is produced in daily feed consumption, the result of the comparison among specialised and non-specialised sires would be expected. A positive difference between the effect of top sires and standard sire would be also expected but the actual non significant difference was negative.

Table 3. Least square means of type of sire and dam for daily feed consumption(gr/d) and conversion index(gr./gr.)

	Sire[2]			**Dam**	
Trait[1]	**NS**[3]	**ST**	**TP**	**Pure**	**Crossbred**
$\mathbf{FC_{47}}$	$79.5^{a} \pm 1.6$	$89.7^{b} \pm 1.6$	$88.1^{b} \pm 1.6$	$83.7^{a} \pm 1.3$	$87.7^{b} \pm 1.3$
$\mathbf{FC_{79}}$	122.0 ± 2.7	126.1 ± 2.8	125.1 ± 2.8	122.3 ± 2.3	126.5 ± 2.3
$\mathbf{FC_{49}}$	$95.6^{a} \pm 1.6$	$104.0^{b} \pm 1.7$	$102.9^{b} \pm 1.7$	99.0 ± 1.4	102.8 ± 1.3
$\mathbf{CI_{47}}$	$2.08^{a} \pm 0.03$	$1.97^{b} \pm 0.03$	$2.03^{a} \pm 0.03$	2.02 ± 0.02	2.04 ± 0.02
$\mathbf{CI_{79}}$	3.16 ± 0.07	3.14 ± 0.08	3.03 ± 0.08	3.03 ± 0.06	3.12 ± 0.06
$\mathbf{CI_{49}}$	$2.50^{a} \pm 0.03$	$2.39^{b} \pm 0.03$	$2.41^{b} \pm 0.03$	2.41 ± 0.03	2.46 ± 0.03

[1] $\mathbf{FC_{ij}}$, daily feed consumption between week i and week j; $\mathbf{CI_{ij}}$, feed conversion index between week i and week j

[2] **NS**, non-specialised line sire ; **ST**, standard specialised line sire ; **TP**, 25% top specialised line sire

[3] Means within trait and factor with different letters are statistically different

Breaking down the post-weaning period, during the first period both factors, type of sire and type of dams are significant, being the sign of the differences positive for the specialised sires and for the crossbred dams. During the second period the differences were not significant. For this trait, feed consumption , it is repeated the phenomenon observed for daily gain in the sense, that the amplitude of the differences in the first period was higher than in the second.

The least square means of feed conversion index are pointed out in Table 3. Non significant effect of type of dam has been found, but the specialised sires had significantly lower conversion indexes than the non specialised sires. This result is not necessarily expected when the comparison is made at a constant age, because it is known that feed efficiency, converting feed in live weight, increases with daily gain but decreases with final weight and age(Ouhayoun, 1978; Torres et al ,1992; Feki et al., 1996) and it means that the favourable effects of higher daily gains of specialised sires could have been compensated by their effect of higher final weights. Another consequence of the previous discussion is that the value of the differences reported would had been higher if the comparison would had been made at a constant final weight, in place of a constant final weight. In this sense the non significant difference found between non specialised sires and top sires during the first post-weaning period probably would have been significant and favourable to the top sires at fixed weight basis of comparison. Nevertheless , the comparison for the whole period at fixed age means an advantage of 0.1 points of the specialised sires versus the non specialised sires.

Concerning carcass traits, Table 4 reports the least square means of dressing out percentage of the chilled carcass, 24h post mortem, and the drip losses for the same period. The effects of

the factors, type of dam and type of sire were not significant for dressing out percentage, being the values around 59%. In other experiments the effect of fast growing sires has been significant reducing the dressing out percentage(Gómez et al, 1998; Pla et al, 1998) when the comparison has been made at a constant weight because of the lower degree of maturity and higher intestinal content of the offspring of the specialised sires at a constant weight. In order to overcome this unfavourable effect on dressing out percentage it is recommended to increase final weight and to fast lightly before slaughtering. The results of this experiment are in agreement with the recommendation of increasing final weight.

Only the sire effect was significant for the trait 24 h post-mortem drip losses, being significant the differences between non specialised and specialised sires. The carcasses of the offspring sired by bucks of fast growing lines lost more weight than the ones of the non specialised lines. These losses were around 52 gr. and the magnitude of the difference among specialised and non specialised sires was around 6.5 gr., a low value, 0.32% of the live weight.

Table 4. Least square means of type of sire and dam for dressing out percentage(DP), 24h post-mortem drip losses (CDL, gr.), and post-weaning mortality(MO[1]).

	Sire[2]			**Dam**	
Trait	**NS[3]**	**ST**	**TP**	**Pure**	**Crossbred**
DP	59.2 ±0.3	59.1 ± 0.3	58.6 ± 0.3	58.8 ± 0.2	59.2 ± 0.2
CDL	48.2 [a] ± 1.3	53.5 [b] ± 1.2	55.9 [b] ± 1.3	51.3 ± 1.0	53.8 ± 1.0
MO_{47}	0.029 ± 0.010	0.016 ± 0.010	0.025 ± 0.01	0.030 ± 0.008	0.017 ± 0.008
MO_{79}	0.037 ± 0.009	0.021 ± 0.009	0.014 ± 0.009	0.016 ± 0.007	0.031 ± 0.007
MO_{49}	0.065 ± 0.013	0.037 ± 0.013	0.039 ± 0.013	0.046 ± 0.011	0.047 ± 0.011

[1] **MO_{ij}**, percentage of mortality between week i and week j
[2] **NS**, non-specialised line sire ; **ST**, standard specialised line sire ; **TP**, 25% top specialised line sire
[3] Means within trait and factor with different letters are statistically different

The mortalities during the fattening period were around 4.6% and there were not significant effects of any factor, neither the sire type nor the dam type. That value is in the lower part of the range of weaning-slaughter mortalities reported for the Spanish farms(Rafel et al, 1996), and during the first period the mortality was2.3%, the same that for the second

In conclusion, summarising the results concerning specialised terminal sires for producing meat rabbits, they have been advantageous in post-weaning daily gain, feed consumption, and feed conversion , neutral in weaning weight, dressing out percentage and post-weaning mortality and disadvantageous in 24h post-mortem drip losses.

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