ABSTRACT

The aim of this thesis was to estimate differences between genetic groups, and estimate crossbreeding parameters for growth, carcass and meat quality traits of rabbits, the dams from which were from full diallel cross among four maternal lines and the sires from a paternal line. The maternal lines were A, V, H and LP, founded for different criteria but all of them selected for litter size at weaning since the foundation until present. For the paternal line, the selection was for postweaning daily gain from 28 to 63 d, and candidates were exclusively evaluated based on their phenotype.

Chapter 1 is a comparison of the maternal lines, at their foundation and at fixed periods of time, for weight at weaning (WW, 28 days), slaughter weight (SW, 63 days) and average daily gain between weaning and slaughter (ADG). Important differences for growth traits were detected between maternal lines at their origin. The H and LP lines were the heaviest. These differences could be partly explained by their different foundation criteria. The procedures for the creation of A and V lines were from New Zealand White and from specialized maternal lines, respectively, while the H and LP were created from crossbred does from meat rabbit commercial populations that could have had some introgression of genes of paternal lines. This would explain the superiority of lines H and LP for growth traits. The comparison of these lines at fixed times allows for the observation of line differences, which were reduced along the generations of selection. This result could have been a consequence of a correlated response on growth after the selection for litter size at weaning, as well as to direct response to a concomitant, non-programmed selection for growth traits, which was different in intensity between the lines, or also simply as a consequence of genetic drift. These differences show that the processes and criteria followed for the foundation of the lines should be carefully considered, and to base the foundation only on the concept of breed, without considering production criteria does not seem beneficial.

ABSTRACT

On commercial farms, crossbred does from simple crosses between maternal lines are the most common type of females and, consequently, some differences for growth traits in dam effects might have an economic impact. Chapters 2, 3 and 4 had the objective of evaluating the value of the four maternal lines and their 12 types of crossbred does with regards to growth, carcass and meat characteristics of their three-way crossbred progeny. Crossbreeding parameters were estimated according to Dickerson's model. The averages values for all traits were within the range in the bibliography consulted.

In Chapter 2, genetic group differences and crossbreeding parameters for body weight at weaning (28 days, BW28), body weight at slaughter (at 63 days, BW63), post-weaning average daily gain (ADG), feed intake (FI) and feed conversion ratio (FCR) were measured in 1,955 young rabbits during the complete fattening period. The traits were recorded weekly with the cage being the experimental unit for FI and FCR (283 cages). The rabbits of the sixteen genetic groups were distributed on four Spanish farms and one genetic group (V line) was present on all farms in order to connect records among them and to be used as reference group. Regarding dam effects between purebreds for BW at weaning, A line had the largest effect and showed significant differences with respect to LP and V lines (61 g and 30 g, respectively). During the complete fattening period, the differences favoring A line for BW at weaning were compensated. During the whole fattening period, no significant differences were observed between the lines. At the end of the fattening period, no significant differences were observed between the crossbred groups. Regarding the reciprocal effects, the most important results were the significant effects for FCR favoring H line as sire in HA and HL (AH-HA=0.22 and LH-HL=0.15, respectively). The estimates of maternal heterosis were, in general, negative. This could be a consequence of positive heterosis for litter

size, but the analysis using number born alive as covariate did not confirm this hypothesis. The combination of direct and maternal effects of the V line was poorest for all growth traits showing significant differences with the LP line for most of them, for instance 0.13 was poorest for FCR between 28 and 63 d. Grand-maternal effects were less important than direct-maternal effects.

In Chapter 3, the genetic group effects and the crossbreeding genetic parameters of slaughter and carcass traits were estimated using carcass parts of the rabbits from work reported in Chapter 2. The slaughter traits recorded were live weight at 63 days (day of slaughter), commercial skin weight, full gastrointestinal tract weight, hot carcass weight, and dressing percentage. After slaughtering, the carcasses were stored at 4º C for 24 hours. The carcass traits studied were carcass colour, commercial carcass weight, head weight, liver weight, kidneys weight, thoracic viscera weight, reference carcasses weight, scapular carcass weight, perirenal fat weight, hind leg weight, loin weight, fore leg weight, thoracic cage weight and meat bone ratio. A and LP lines had the smallest effects for dressing percentage (-1.71 and -1.98 compared with H line and -1.49 and -1.75 with the V line, respectively). A line had the strongest effect on commercial carcass weight (83 g more than H line and 60 g more than V line). The differences between purebred animals on dressing percentage were transferred to crossbred groups although their magnitude was lower than in purebred lines. For the rest of traits studied, no significant differences were observed between the crossbred groups and between reciprocal crosses. Grand-maternal effects were of lower magnitude and with opposite signs to the direct-maternal effects. The estimates of maternal heterosis were, in general, negative. This result was previously discussed for the growth traits, which again could have been a consequence of positive heterosis for litter size but, again, the inclusion of number born alive into the models did not support this hypothesis.

ABSTRACT

Chapter 4 of this thesis dealt with meat quality traits. These traits were pH, colour, intramuscular fat (IMF), protein, fatty acid groups (SFA, MUFA, PUFA, n-3PUFA and n-6PUFA), fatty acid ratios (n-6/n-3 and PUFA/SFA) and the individual fatty acids. The pH and meat colour were measured in 950 *Longissimus* muscles (LM) which were excised from carcasses used in Chapter 3. The rest of the meat quality traits were recorded by NIRS from a sample of 285 LM that were previously used. For pH, A line showed a 0.05 higher unit advantage than LP line, although this difference was significant but not relevant. No differences in protein were found. The line A had significant differences over the the V line for IMF, SFA, MUFA, PUFA, n-3PUFA and n-6PUFA of 230, 67, 66, 34, 3.1 and 25 (mg/100 g of muscle), respectively, and for the majority of individual fatty acids. Regarding the comparisons between the crosses and V line, the effect of the crossbred AH was superior for IMF, SFA, MUFA, PUFA, n-3PUFA, n-6PUFA and for some of individual fatty acids. No significant differences were found for other contrasts, although it seems that crossbreds involving A line tended to have higher content for IMF and fatty acids groups. No significant differences were found for the contrasts All-V. In general, the reciprocal cross effects were not significant. With regards to crossbreeding parameters, there were significant differences between A and LP lines in direct-maternal effects for pH (0.08) and between A and V for IMF, SFA, MUFA, PUFA, n-3PUFA and n-6PUFA of 200, 63, 61, 33, 2.9 and 31 mg/100g, respectively, in favor of the A line. No significant differences were found for the grand-maternal effects, and in general were of lower magnitude than the direct-maternal effects. No significant values of maternal heterosis were found, being explained by the relative independence of meat quality traits from litter size.