ABSTRACT

The general aim of this thesis was to evaluate the productive performance of a rabbit line (OR-LS) selected by ovulation rate during first 6 generations (period 1), and later by ovulation rate (OR) and litter size (LS) during 11 generations using independent culling levels (Period 2). Genetic parameters, direct response for OR and LS and the correlated response for embryo (ES), foetal (FS) and prenatal survival (PS) were estimated. Also, the correlated response on growth rates (GR), weaning (WW) and slaughter weight (SW) were estimated. Lately, it was studied the magnitude and timing of embryo and early foetal survival in females with high ovulation rate using hormonal treatment as a model for selection by ovulation rate.

The objective of chapter 3 was to estimate the genetic parameters of the productive traits and the response to selection by OR and LS of OR-LS line. For traits analysis, Bayesian methods were used. Heritability values of litter size traits were low, 0.10, 0.07, 0.07 and 0.07 for number of total born (LS), number of born alive (NBA,) number of kits at weaning (NW) and marketing (NM), respectively, while it was 0.14 for number of dead born (NBD). Heritability for ovulation rate (OR) obtained was moderate (0.25), while it was low (0.13 and 0.14) for number of implanted embryos (IE) and number of live foetuses at 12 days of gestation (LF_{12}), respectively. Low heritability values for survival traits were found, 0.09 for embryo survival (ES), 0.16 for foetal survival (FS) and 0.14 for prenatal survival (PS). Repeatability estimates were low for all litter size traits, ranged from 0.14 to 0.17 except for NBD (0.24). For OR, IE, LF_{12}, repeatability values were moderate (0.30, 0.22 and 0.22, respectively) and low for ES (0.18). In the second period, after 11 generations of selection by OR and LS, a genetic response of 0.17 kits per generation for LS was achieved. This response was higher than the obtained in period 1 (0.07 kits per generation), in which just selection by OR was performed. The opposite effect was found for OR; the highest response for OR appeared in the first period (0.24 ova per generation) versus the second period (0.17 ova per generation). This reduction in OR response can be due to the decrease in selection differential during the second period of selection. Since high genetic correlations were obtained for LS and other litter size traits, a positive correlated response was observed for NBA, NW and NM (0.12, 0.12 and 0.11 kits per generation, respectively) in the second period. In the first period, no correlated response on ES was observed and a decrease in FS (-0.04) was found. Nevertheless, in the second period a correlated response on PS appeared due to an improvement in both ES (0.04) and FS (0.03). Summarizing, the improvement in litter size in the second period is due to an increase in ovulation rate as well as an increase in prenatal survival.

The objective of chapter 4 was to study the correlated response on growth traits in the OR-LS line in both periods of selection, the selection by OR during six generations and the selection by independent levels by OR and LS during 11 generations. The heritability estimates were low for weaning weight (WW), marketing weight (MW) and growth rate (GR), 0.09, 0.13 and 0.14, respectively. The estimated genetic correlations of WW, GR and MW with LS were around zero and with OR were positive and from low (0.19) to moderate (0.38). The positive moderate genetic correlation estimated between OR and MW could explain the correlated response found in MW. Correlated response on WW could be explained by positive and high genetic correlation between MW and WW.

Selection for ovulation rate in prolific specie has not improved litter size due to an increase in prenatal mortality. Most of the mortality was observed in the foetal period. The aim of chapter 5 was to investigate magnitude and timing of embryo and early foetal survival in females with high ovulation rate using hormonal treatment as a model for selection by ovulation rate, as it was commented before. Two groups of females (treated and untreated) were used. Treated females were injected with 50 IU eCG 48 hours before mating. Females were slaughtered at day 18 of gestation. Ovulation rate (OR), number of implanted embryos (IE), number of live foetuses at 12 and 18 d (LF_{12} and LF_{18}, respectively) were recorded. Besides, embryo survival (ES= IE/OR), foetal survival at 18 d of gestation (FS_{LF18}=LF_{18}/IE) and foetal survival between 12 and 18 d of gestation ($FS_{LF18/LF12}$=LF_{18}/LF_{12}) and prenatal survival (PS_{LF18}=LF_{18}/OR) were estimated. For each female, the mean and variability of the weight for live foetuses (LFW and VLFW, respectively) and their placentas (LFPW and VLFPW, respectively) were calculated. Treated females had a higher ovulation rate (3.02 ova) than untreated females with a probability of 0.99. An increase in the differences (D) between treated and untreated females was observed from implantation to day 18 of gestation (D=-0.33, -0.70 and -1.28 for IE, LF_{12} and LF_{18}, respectively). These differences had a low accuracy and the probability that treated females had a lower number of foetuses also increased along gestation (D=0.60, 0.70 and 0.86 for IE, LF_{12} and LF_{18}, respectively). According to the previous results for OR and LF_{18}, treated females showed a lower survival rate from ovulation to 18 d of gestation (D=-0.12, P=0.98 for PS_{LF18}). Treated females also had lower embryo and foetal survival (D=-0.10 and P=0.94 for ES and D=-0.08 and P=0.93 for FS_{LF18}). Main difference in foetal survival appeared from day 12 to 18 of gestation (D= -0.09 and P= 0.98 for $FS_{LF18/12}$). Unexpectedly, treated females showed similar foetus weight and higher foetal placenta weight than untreated females (D=0.25 g, P=0.98) and lower variability for these traits (D=-0.02 g, P=0.72 for VLFW and D= -0.05 g, P= 0.83 for VLFPW). These results are not related to a lower number of IE or LF_{18}. Then, the effect of increasing three ova in rabbits leads to a lower embryo and early foetal survival. It seems there is not a relationship between foetal mortality and foetus weight.