# **CONTENTS**

ABSTRACT	1
RESUMEN	7
RESUM	13
LITERATURE REVIEW	19
1. Crossbreeding	20
2. Crossbreeding effects	23
2.1. Diallel cross	
2.2. Other types of crosses	
3. Crossbreeding for growth, carcass and meat quality in farm	
animals	29
3.1. Beef cattle	
3.2. Dairy cattle	
3.3. Sheep	
3.4 Goats	
3.5 Pigs	
3.6 Poultry	
3.7 Rabbits	
4. Genetic improvement in rabbits. Selection and crossbreeding	46
5. Literature cited	50
OBJECTIVES	68
CHAPTER 1. Growth traits of four maternal lines of rabbits founded	
on different criteria. Comparisons at foundation and at	
fixed times after selection	71
CHAPTER 2. Genetic analysis of growth traits in the progeny of	
rabbit does from a diallel cross	101

CHAPTER 3.	Genetic analysis of slaughter and carcass quality traits	
	in crossbred rabbits from a diallel cross of	
	four maternal lines	139
CHAPTER 4.	Genetic analysis of meat quality traits in the progeny	
	of rabbit does from a diallel cross	185
GENERAL D	ISCUSSION	232
CONCLUSIO	NS	246

# **INDEX OF TABLES**

### CHAPTER 1.

Table 1	Descriptive statistics for litter size at weaning, weaning weight,	
	slaughter weight and average daily gain.	82
Table 2	• Statistics of the estimated marginal posterior distributions of the	
	heritability for litter size at weaning and growth traits	83
Table 3	. Statistics of the estimated marginal posterior distributions of the	
	permanent effects variance for litter size at weaning and the total	
	maternal effects variance for growth traits with respect to their	
	phenotypic variances	84
Table 4	• Statistics of the estimated marginal posterior distributions of the	
	common litter effect variance for growth traits with respect to their	
	phenotypic variances	85
Table 5	• Statistics of the estimated marginal posterior distributions of the	
	genetic, permanents and residuals effects correlations between	
	growth traits and litter size at weaning	86
Table 6	Observed and expected differences between the effects of the line	
	at foundation and a fixed times for weaning weight	89
Table 7	Observed and expected differences between the effects of the line	
	at foundation and at fixed times for slaughter weight	91
Table 8	Observed and expected differences between the effects of the line	
	At foundation and at fixed times for average daily gain	93

#### CHAPTER 2.

Table 1. Localizations of the genetic groups of the does	106
Table 2. Coefficients for computing estimable functions of the	
crossbreeding parameters from the differences of the doe	
genetic groups to the line V	112
Table 3. Descriptive statistics for body weight, average daily gain,	
individual feed intake and feed conversion ratio	113
<b>Table 4.</b> Contrasts between the lines for body weight, average daily gain,	
individual feed intake and feed conversion ratio	115
Table 5. Contrasts between crossbred genetic groups and V line for body	
weight, average daily gain, individual feed intake and feed	
conversion ratio	119
Table 6. Contrasts between reciprocal crosses for body weight, average	
daily gain, individual feed intake and feed conversion ratio	121
Table 7. Direct-maternal differences between lines for body weight,	
average daily gain, individual feed intake and feed conversion ratio	124
Table 8. Grand-maternal differences between lines for body weight,	
average daily gain, individual feed intake and feed conversion ratio	127
Table 9. Maternal heterosis for body weight, average daily gain, individual	
feed intake and feed conversion ratio	130

### CHAPTER 3.

Table 1. Descriptive statistics for slaughter and carcass quality traits	149
Table 2. Contrasts between the lines for slaughter and carcass colour traits	151
Table 3. Contrasts between the lines for carcass quality traits	155
Table 4. Contrasts between crossbred genetic groups and V line for	
slaughter and carcass colour traits	157
Table 5. Contrasts between crossbred genetic groups and V line for	
carcass quality traits	159
Table 6. Contrasts between reciprocal crosses for slaughter and carcass	
colour traits	161
Table 7. Contrasts between reciprocal crosses for carcass quality traits	162
Table 8. Direct-maternal differences between lines for slaughter and carcass	
colour traits	166
Table 9. Direct-maternal differences between lines for carcass quality traits	167
Table 10. Grand-maternal differences between lines for slaughter and	
carcass colour traits	170
Table 11. Grand-maternal differences between lines for carcass quality traits	171
Table 12. Maternal heterosis for slaughter and carcass colour traits	174
Table 13. Maternal heterosis for carcass quality traits	175

### CHAPTER 4.

<b>Table 1.</b> Descriptive statistics of pH, intramuscular fat and protein of the	
Longissimus muscle	192
Table 2. Descriptive statistics of fatty acid groups and fatty acid ratios of	
the Longissimus muscle	192
Table 3. Descriptive statistics of individual fatty acid composition of the	
Longissimus muscle	193
Table 4. Contrasts between the lines for pH, intramuscular fat and protein	
of the Longissimus muscle	197
Table 5. Contrasts between the lines for fatty acid groups and fatty acid	
ratios of the Longissimus muscle	198
Table 6. Contrasts between the lines for SFA and MUFA composition	
of the Longissimus muscle	199
<b>Table 7.</b> Contrasts between the lines for PUFA composition of the	
Longissimus muscle	200
Table 8. Contrasts between crossbred genetic groups and V line for pH,	
Colour, intramuscular fat and protein of the Longissimus muscle	202
Table 9. Contrasts between crossbred genetic groups and V line for fatty	
acid groups and fatty acid ratios of the Longissimus muscle	203
Table 10. Contrasts between crossbred genetic groups and V line for SFA	
and MUFA composition of the Longissimus muscle	204
Table 11. Contrasts between crossbred genetic groups and V line for PUFA	
composition of the Longissimus muscle	205
Table 12. Contrasts between reciprocal crosses for pH, colour, intramuscular	
fat and protein of the Longissimus muscle	207
Table 13. Contrasts between reciprocal crosses for fatty acid groups and	
fatty acid ratios of the Longissimus muscle	208

Table 14. Contrasts between reciprocal crosses for SFA and MUFA	
composition of the Longissimus muscle	209
Table 15. Contrasts between reciprocal crosses for PUFA composition	
of the Longissimus muscle	210
Table 16. Direct-maternal effect differences between lines for pH, colour,	
intramuscular fat and protein of the Longissimus muscle	212
Table 17. Direct-maternal effect differences between lines for acid groups	
and fatty acid ratios of the Longissimus muscle	213
Table 18. Direct-maternal effect differences between lines for SFA and	
MUFA composition of the Longissimus muscle	214
Table 19. Direct-maternal effect differences between lines for PUFA	
composition of the Longissimus muscle	215
Table 20. Grand-maternal effect differences between lines for pH, colour,	
intramuscular fat and protein of the Longissimus muscle	217
Table 21. Grand-maternal effect differences between lines for acid groups	
and fatty acid ratios of the Longissimus muscle	218
Table 22. Grand-maternal effect differences between lines for SFA and	
MUFA composition of the Longissimus muscle	219
Table 23. Grand-maternal effect differences between lines for PUFA	
composition of the Longissimus muscle	220
Table 24. Maternal heterosis for pH, colour,intramuscular fat and protein	
of the Longissimus muscle	222
Table 25. Maternal heterosis for acid groups and fatty acid ratios of the	
Longissimus muscle	223
Table 22. Maternal heterosis for SFA and MUFA composition of the	
Longissimus muscle	224
Table 23. Maternal heterosis for PUFA composition of the <i>Longissimus</i> musc	ele <b>225</b>

# **INDEX OF FIGURES**

Figure 1. Simple cross	21
Figure 2. Backcross	21
Figure 3. Three-way cross	22
Figure 4. Rabbit industry breeding scheme	46