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REPRODUCTIVE AND GROWTH PERFORMANCES OF FOUR RABBIT GENOTYPES

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Reproductive and growth performances of four rabbit genotypes

The insemination rate, probability of culling of does after the insemination, weight of does and weight of young, litter size, as well as litter weight were measured in groups of rabbits with different genotype. Four groups were formed: 30 multiparous does of SIKA maternal line (line A) were inseminated with males from the same line (A×A group), 23 multiparous does of SIKA sire line (line C) were inseminated with the males from the same line (C×C group), 30 multiparous does of line A were inseminated with the males from line C (A×C group) and 30 multiparous does of line A were inseminated with the males from Californian breed (A×Cal group). The young were individually weighed once a week from birth to weaning (at the age of 35 days). Considering insemination rate, probability of culling and litter size from birth to weaning there were no heterosis effect found. There were no differences between groups A×C and A×Cal in the majority of studied traits as well, except for the number of stillborn which was in group A×C significantly higher than in A×A and A×Cal group. Live weight of young in group A×C was significantly higher than of group A×A at each weighting from birth to weaning, and higher than of group C×C at each weighting from birth to 21st day of age. Live weight of young in A×C group was significantly higher than live weight of young in A×Cal at each weighting.

Key words: rabbits / genotypes / reproduction / reproductive performances / growth / selection

Plodnostne in rastne lastnosti kuncev štirih različnih genotipov

Primerjali smo uspešnost osemenitve, verjetnost izločitve samice po osemenitvi, telesno maso samic in mladičev ter velikost in maso gnezda v skupinah kuncev različnih genotipov. Formirali smo 4 skupine: 30 samic SIKA materne linije (linija A) smo osemenili s samci iste linije (skupina A v× A), 23 samic SIKA očetovske linije (linija C) s samci iste linije (skupina C × C), 30 samic linije A s samci linije C (skupina A × C) in 30 samic linije A s samci kalifornijske pasme (skupina A × Cal). Mladiče smo individualno tehtali tedensko od rojstva do odstavitve (na 35. dan starosti). Pri uspešnosti osemenitve, verjetnosti izločitve samic in velikosti gnezda od kotitve do odstavitve se heterozis ni pojavil, prav tako ni bilo razlik med A × C in A × Cal skupino v večini proučevanih lastnosti. Izjema je bilo število mrtvorojenih mladičev v gnezdu, ki je bilo pri A × C skupini višje kot pri A × A in A × Cal skupini. Kunci v skupini A × C so bili statistično značilno težji od skupine A × A pri vseh tehtanjih od rojstva do odstavitve, od skupine C × C pa pri tehtanjih od rojstva do 21. dne starosti. Mladiči v skupini A × C so bili težji tudi od skupine A × Cal pri vseh tehtanjih.

Ključne besede: kunci / genotipi / reprodukcija / lastnosti plodnosti / rast / selekcija

1 INTRODUCTION

In rabbits the traits directly or indirectly associated with reproduction, like insemination rate, number of litters per doe per year, number of liveborn and stillborn offspring and weight gain of young/litter from birth to weaning are highly influenced by the genotype (mainly mother's), environmental circumstances like lighting duration, season and physiological conditions of the doe as well as nutrition (Lukefahr *et al.*, 2000). The reproductive

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performance can be improved by crossing animals from adequate maternal and paternal lines. In Rabbit centre of Biotechnical Faculty the selection of Slovene selection line for meat production (SIKA) was established: the selection of maternal SIKA line (A line) started in 1988 and the sire SIKA line (C line) in 1995. In order to estimate the heterosis effect of cross between maternal line A and paternal line C, the reproductive performances of pure lines A and C were compared with the reproductive performances of does from maternal line A inseminated with sires from line C. The performance of this cross was compared with the reproductive performance of does from maternal line A inseminated with male from Californians breed which is one of the most used sire breeds for terminal crossing.

2 MATERIAL AND METHODS

Four groups were formed by inseminating 30 mulitparous does from line A with males from same line (A×A group), 23 mulitparous does from line C with males from the same line (C×C group), 30 mulitparous does from line A with the males from C line (A×C group) and 30 mulitparous does from line A with the males from Californian breed (A×Cal group). At the start of the experiment all females were weighted. The does were weighted also on 28th day of pregnancy, at delivery and then once a week until the young were weaned. Young rabbits were weaned at the age of 35 days. The young were also weighted at birth and then each week until weaning. All animals were weighed individually. Animals were fed on standard feed mixture (17% CP, 14% CF) *ad libitum*. During the experiment the following traits were registered: the insemination rate, the probability of culling of does after the insemination, the weight of does, the weight of young, the litter size (number of liveborn and stillborn young) and the litter weight. Data were analysed by using SAS GLM procedure (SAS, 2000). When analysing data we supposed that the following traits were distributed normally: the weight of does, number of liveborn, the weight of young and the litter weight. The number of stillborn was supposed to be distributed according to Poisson's distribution, and insemination rate and probability of culling according to Bernoulli distribution. For testing the significance of differences between groups we used Scheffe's multiply test of means for traits with normal distribution, and Wald's^2 test for other traits.

Table 1: *The insemination rate and the probability of culling of does after the insemination*
Preglednica 1: *Uspešnost osemenitve in verjetnost izločitve samice po osemenitvi*

Group Skupina	Insemination rate (%) Uspešnost osemenitve (%)	Probability of culling (%) Verjetnost izločitve (%)
A×A	87.66^a	26.47^a
C×C	91.30^a	39.13^a
A×C	86.66^a	30.00^a
A×Cal	93.33^a	23.33^a

^{a,b} Values marked with different letter differ significantly (P<0.05)
^{a,b} Vrednosti, označene z različnimi črkami, se statistično značilno razlikujejo (p < 0,05)

3 RESULTS AND DISCUSSION

Differences between groups in the insemination rate and in the probability of culling of does after insemination were not significant (Table 1).

Table 2: *Litter size from birth to weaning*
Preglednica 2: *Velikost gnezda od rojstva do odstavitve*

		At birth / Ob rojstvu		From birth to weaning / Od rojstva do odstavtive				
Group Skupina		Stillborn Mrtvorojeni	Liveborn Živorojeni	7th day 7. dan	14th day 14. dan	21st day 21. dan	28th day 28. dan	35th day 35. dan
A×A	LSM	0.28^a	8.73^a	8.41^a	8.04^a	7.95^a	7.86^a	7.54^a
	±SE	0.14	0.34	0.35	0.36	0.38	0.37	0.35
C×C	LSM	0.71^{ab}	8.28^a	8.00^a	7.86^a	7.43^a	7.28^a	7.14^a
	±SE	0.27	0.43	0.44	0.45	0.47	0.46	0.44
A×C	LSM	0.90^b	7.38^a	7.19^a	7.00^a	6.47^a	6.46^a	6.45^a
	±SE	0.25	0.35	0.36	0.37	0.39	0.38	0.36
A×Cal	LSM	0.26^a	8.69^a	8.35^a	8.26^a	8.04^a	7.96^a	7.87^a
	±SE	0.13	0.33	0.34	0.35	0.37	0.36	0.35

^{a,b} Values marked with different letter differ significantly (P<0.05)
^{a,b} Vrednosti, označene z različnimi črkami, se statistično značilno razlikujejo (p < 0,05)

Results presented in Table 1 indicate that insemination rates in all groups were very high in comparison with data reported by other authors (Eiben *et al.*, 2001; Lopez and Alvarino, 1998; Rebollar *et al.*, 2001). The group A×C had the lowest insemination rate of all groups. The reason for this could be that the does in this group were a bit lighter and were inseminated a couple of hours later than does from other groups. There are data in literature indicating that the insemination rate is lower in does with lower live weight at insemination (Szendro and Biro-Nemeth, 1991) and that the rate of insemination is influenced by the time between semen collection and insemination (Lopez and Alvarino, 1998).

Groups did not differ significantly on number of liveborn and weaned rabbits (Table 2). Differences were observed only in the number of stillborn: the group A×C had significantly more stillborn rabbits than group A×A, while the difference between A×C and C×C group regarding this trait was not significant (Table 2).

Depres *et al.* (1996) found that genotype affected the litter size at birth but not the number of liveborn or stillborn rabbits: litters were larger in New Zealand White does inseminated with Californian bucks than in pure New Zealand White. Gomez *et al.* (1999) found larger number of liveborn and weaned rabbits in linecrossing between two Spanish lines selected for the litter size than in pure lines.

Heterosis effect can occur when different breeds or lines are used for crossing: larger is the difference between parent's genotypes larger heterosis effect can be expected (Borojević, 1986). The occurrence of heterosis effect in our experiment was not consistent: there was no heterosis effect observed in the litter size, while the heterosis effect appeared in the growth of young (Table 3). The young of group A×C were at birth significantly heavier than young of groups and C×C. The results from Table 3 indicate that the Californian breed compared to line C is less appropriate as a sire line considering the group performance.

4 CONCLUSIONS

Results obtained show no heterosis effect in litter size and a moderate heterosis effect in growth performance. For better expressed linecrossing effect the time from the beginning of the separate selection of maternal and sire lines is probably too short. Namely, the selection of sire SIKA line C started from one part of maternal SIKA line population as late as in the year 1995.

Comparison between line C and Californian breed as sire line indicate that SIKA line C is more appropriate than the Californian breed:

5 SKLEPI

Dobljeni rezultati kažejo, da do heterozisa ni prišlo pri velikosti gnezda, pri rasti mladičev v gnezdu pa se je pokazal zmeren učinek. Za bolj izrazit učinek križanja bi verjetno moralo preteči več časa, odkar selekcioniramo obe SIKA liniji ločeno. Selekcija moške SIKA linije C se je namreč začela iz dela populacije materne SIKA linije A šele leta 1995.

Primerjava med moško linijo C in kalifornijsko pasmo kot očetovsko linijo kaže, da je SIKA linija C primernejša od kalifornijcev.

Table 3: *Live weight of young from birth to weaning*
Preglednica 3: *Telesna masa mladičev od rojstva do odstavitve*

Group Skupina		Live weight of young (g) / Telesna masa mladiča (g) At birth Ob rojstvu	7th day 7. dan	14th day 14. dan	21st day 21. dan	28th day 28. dan	35th day 35. dan
A×A	LSM	65.14 [a]	143.07 [a]	253.42 [a]	366.04 [a]	532.94 [a]	836.61 [a]
	±SE	0.82	2.37	4.09	6.09	9.13	13.21
C×C	LSM	65.29 [a]	157.37 [bc]	252.20 [a]	349.21 [a]	632.33 [c]	1015.56 [b]
	±SE	1.03	3.03	5.19	7.87	11.86	17.01
A×C	LSM	69.69 [b]	168.33 [c]	300.33 [c]	424.18 [c]	665.89 [c]	1005.00 [b]
	±SE	0.91	2.61	4.49	6.79	10.19	14.48
A×Cal	LSM	65.30 [a]	153.74 [b]	272.29 [b]	391.42 [b]	580.31 [b]	870.71 [a]
	±SE	0.80	2.36	4.02	6.00	9.03	12.89

[a,b] Values marked with different letter differ significantly (P<0.05)
[a,b] Vrednosti, označene z različnimi črkami, se statistično značilno razlikujejo (p < 0,05)

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