LONG TERM SELECTION - COMPARISON OF TWO RABBIT STRAINS.

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SUMMARY

Two rabbit strains have been selected during 18 generations, one, the A1077, to improve the litter size at weaning, the other, the A2066, the litter size at birth. Data of 10541 litters from 2205 A1077 dams and data of 5580 litters from 1144 A2066 dams are analyzed. Values of héritabilities and (standard-errors), first for A1077 then A2066 0.07 (0.02) or 0.06 (0.02) for born alive, 0.03 (0.02) or 0.04 (0.03) for weaned, 0.07 (0.02) 0.08 (0.03) for total litter weight and 0.09 (0.03) or 0.08 (0.03) for individual weight at weaning are lower than that observed in bibliography. We observe a response to the selection and corellated responses on litter sizes. In both strains, the total litter weight follows the litter sizes but below. The mean individual weight decreases. The selection response on selected trait is 0.162 (0.004) in A1077 strain and 0.152 (0.008) in A2066 strain.

INTRODUCTION

Two strains of rabbits, the one, the A1077 derived from New-Zealand white population and the other, the A2066 derived from Californian population have been selected during 18 generations, the first to improve the litter size at weaning, the second, the litter size at birth. These strains are commercialised. Is-it possible to improve a very variable trait whose heritability is low? Such is the purpose of these experiments.

This paper deals with direct and correlated responses to the selection estimated by mixed model analysis (SORENSEN et KENNEDY, 1984; THOMSON, 1986)

MATERIALS AND METHODS.

The zootechnical management of the animals is described in detail by POUJARDIEU and THEAU-CLEMENT (1994). Data of 10541 litters from 2205 A1077 dams and data of 5580 litters from 1144 A2066 dams are analyzed. The mono-trait selection index used during the selection experiments combines, according to the multiple linear regression theory, the performances of the candidate recorded during the six first months of production, those of its full-sibs and paternal half-sibs, and of its mother; to compute indexes, genetical parameters are estimated in the previous generation by full and half-sibs correlations.

To estimate the selection response the genetic values are computed again by a BLUP animal model under REML (POIVEY, 1986). The values of heritabilities are computed by GROENEVELD et KOVAC (1990a b) method. In both models the fixed effects of the time (61 levels), of the physiological status of the dam combining the lactating status and the parity (17 levels) and the random effects of the litter repetition within dam and of the dam are taken into account. Only the additive genetic variances are taken into account. We assume the consanguinity influences the traits. Pedigrees are gone back the founders.

RESULTS

The number of dams, the number of productive dams, the genetic size computed according to the HILL's (1972) method, the mean value and the standard error of the consanguinity of animals kept for breeding are tabulated by generation and by strain on table 1.

Table 1. Some demographic data by generation and by strain.

	A1077				A2066			
Gen	Dams number	Dams with litters	Genetic size	consan guinity	Dams number	Dams with litters	Genetic size	consan guinity
1	240	208	65.8	0.00 (0.00)	84	54	29.0	0.00 (0.00)
2	210	185	34.8	0.00 (0.00)	120	100	32.1	0.00 (0.01)
3	210	171	37.4	0.01 (0.02)	150	115	48.7	0.03 (0.04)
4	210	175	23.4	0.01 (0.01)	150	122	156.3	0.04 (0.03)
5	121	115	16.1	0.02 (0.03)	84	66	58.9	0.05 (0.02)
6	121	112	11.4	0.05 (0.04)	84	59	36.2	0.06 (0.03)
7	121	110	21.1	0.06 (0.03)	84	56	39.1	0.08 (0.02)
8	121	106	14.7	0.11 (0.08)	84	53	32.7	0.09 (0.02)
9	121	110	32.2	0.11 (0.08)	84	62	47.1	0.13 (0.06)
10	121	99	31.7	0.10 (0.03)	84	46	38.5	0.13 (0.02)
11	121	104	22.5	0.11 (0.04)	84	62	34.6	0.14 (0.02)
12	121	107	24.6	0.11 (0.02)	84	68	34.4	0.16 (0.03)
13	121	105	34.0	0.13 (0.05)	84	64	52.6	0.17 (0.04)
14	121	109	33.3	0.14 (0.04)	84	69	45.0	0.18 (0.02)
15	121	101	33.8	0.14 (0.04)	84	53	62.1	0.18 (0.01)
16	121	91	30.7	0.16 (0.04)	84	71	60.7	0.18 (0.01)
17	121	111	15.9	0.14 (0.03)	84	63	42.8	0.18 (0.01)
18	121	108	12.8	0.15 (0.04)	84	61	45.2	0.18 (0.01)

In the A1077 strain the genetic size varies from 11.4 to 65.8; on average a sire gets 1.4 efficient males and 2.2 efficient females and a dam gets 1.2 efficient males and 2.4 efficient females. In the A2066 strain, the genetic size varies from 29.0 to 156.3; on average a sire gets 0.9 efficient males and 1.4 efficient females and a dam gets 0.6 efficient males and 1.2 efficient females. In both strains the first consanguine animals appears in the 3rd generation ; all animals kept for breeding are consanguine at the 8th generation (A1077) or at the 7th generation (A2066). The increase of consanguinity coefficient is not regular.

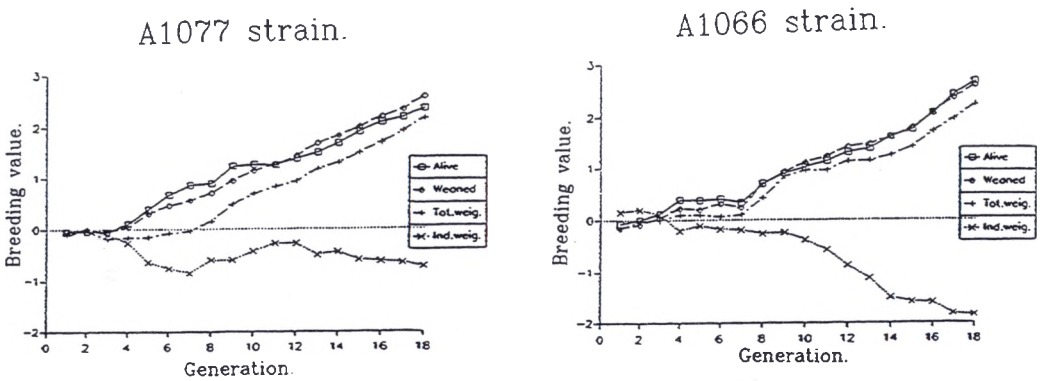
The values of heritabilities used to compute again the breeding values for the born alive, the weaned young rabbits, the total weight of the litter at weaning and the mean individual weight of the young rabbit at weaning are tabulated by strain on table 2.

Table 2. Values of heritabilities by strain.

	Born alive	Weaned	Total litter weight	Individual weight
A1077	0.07 (0.02)	0.03 (0.02)	0.07 (0.02)	0.09 (0.03)
A2066	0.06 (0.02)	0.04 (0.03)	0.08 (0.03)	0.08 (0.03)

The graph 1 presents the evolution with time of the means by generation of the breeding values.

Graph 1. Evolution with time of mean breeding values.



In both strains, the litter sizes at birth and at weaning increase and results are quite close. The total litter weight at weaning follows the litter sizes but below. The mean weight of young rabbits at weaning decreases. The values of regression coefficients of selected traits to the number of generation, measure of the selection responses, are 0.162 (0.004) for number of weaned rabbits in A1077 strain and 0.152 (0.008) for number of born alives in A2066 strain.

DISCUSSION and CONCLUSION

The values of the heritabilities computed in this study are lower than those reported in the litterature (KHALIL and al., 1986). In our model, we take into account the effect of repetition of litters within dam and the dam effect; so we absorb in repetition effect a lot of additive genetic variance

The results of our experiment is linked to the management of strains. The dams begin their lifetime production at 16 weeks of age; to compute breeding values, we record performances during the six first months of production; we use together the performances of the candidate, of its full and paternal half-sibs and of its mother. In these circumstances, we observe quite similar responses in both strains. The litter sizes and the total weight of the litter at weaning increase. The mean weight at weaning of the youn rabiits decreases.

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