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CONSERVATION AND IMPROVEMENT OF THE CARMAGNOLA GREY RABBIT

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Abstract

The rabbit breeds presently reared in Italy for meat production are very few: New Zealand White, California and commercial hybrids, with a consequent reduction in genetic variability and loss of local breeds.
The survival and rescue of the local breed Carmagnola Grey Rabbit becomes therefore of great interest for genetic as well as productive pourposes.
Rabbits, chosen in small family run farms following the breed standard, are reared with a semi-intensive mating paying attention to inbreeding coefficient.
During the past ten years selection work was conducted and data on homogeneity in coat colour, reproductive efficiency, maternal behaviour, adaptability to environmental contitions, growth rate, feed conversion ratio, carcass characteristics at slaughter were collected and analysed.
Productive traits of Carmagnola Grey Rabbit are similar to NZW control group, but a genetic improvement of our Grey Rabbit is still possible, so that its selection and survival are well justified and still promoted for the maintenance of genetic variability in rabbit production.

Introduction

Very few rabbit breeds are presently reared in Italy for meat production: New Zealand White, California and commercial hybrids, with a consequent reduction in genetic variability and loss of local breeds.
In order to evaluate both the productive performances of a local breed-population of grey rabbits and the possibility to preserve it, a relatively complex research has been carried out for about ten years.
This note is reporting the work undertaken for the conservation and improvement of the Carmagnola Grey Rabbit, for genetic as well as productive pourposes.

Materials and Methods

Initially we provided a breed standard of the Carmagnola Grey Rabbit (Pagano Toscano et al., 1983) so that a selection of the rabbits, on the basis of the established morphological characteristics, could be carried on in small family run farms following the breed standard, and an initial group of 84 female and 29 male rabbits was collected.

These animals, reared with a semi-intensive system (first mating at 120 days of age and 3.3-3.5 kg of live weight, remating 14-18 days after kindling, weaning at 28-30 days of age) paying attention to inbreeding coefficient [R = $(\frac{1}{2})^n$], are housed in a rabbit-hutch with controlled light, temperature and ventilation; does are put in single deck cages (0.4 m^2) with nest, while for the growing period rabbits are kept in cages of californian type; all the animals are fed ad libitum with the same feed.
A group of New Zealand White is kept in the same hutch as a control group.
For each female the number of insemination for each pregnancy and the number of total born, live born and still born are collected. Rabbits are weighed weekly from 0 to 90 days of age and slaughter data are also recorded.

Results and Discussion

During the ten years selection work data on homogeneity in coat colour, reproductive efficiency, maternal behaviour, adaptability to environmental conditions, growth rate, feed conversion ratio, carcass characteristics at slaughter are collected and analysed.
Some does and bucks of the initial group have been eliminated for different reasons, as specified in table 1 (Zoccarato et al., 1986), but other rabbits, both reared or bought, have been included in selection and nowadays more than 450 does are being tested.

table 1 - Percentage and reasons for does and bucks elimination during the selection work on the initial group of rabbits.

	does	bucks
coat color	23.80	10.34
maternal behaviour	9.25	-
reproductive efficiency	7.14	-
other	5.95	13.79
total	46.14	24.13

It is now possible to identify a uniform strain of Carmagnola Grey Rabbits, with an inbreeding coefficient R<0.125, showing good reproductive performances, good fertility, good growth rate and a fair slaughtering weight.
It is worthwhile mentioning the characteristic roughness of the breed (Zoccarato et al., 1991), often showing good longevity (table 2).
The reproductive and productive performances are being studied in different periods, to evaluate the effects of the selection work. At the beginning the number of insemination was 1.6 for each pregnancy and the number of newly born for cage-place was 24.7 of which 20 born alive, the fertility rate has been calculated as being 48.23% and the litter size 7.2 (table 3). After a few years the global fertility shows an increase of about 50%, the litter size becomes 8.5 and the number of live born 7.8 per litter. No important differences are found between Grey and NZW does (Zoccarato et al., 1991).

table 2 - Reproductive traits of more productive does of both breeds.

does	parity (n)	kindling interval (d)	live born/ litter (n)	weaned kits/ litter (n)
Grey				
46	16	61.56	9.56	8.18
112	14	51.71	7.57	5.50
268	14	51.21	8.14	7.07
300	12	43.16	6.17	5.00
163	11	49.45	9.18	5.36
296	10	47.40	6.60	5.70
334	10	46.60	10.00	7.90
NZW				
20	11	55.54	8.00	6.45
30	10	44.80	7.70	5.90
35	10	41.70	7.70	5.40
53	10	51.60	7.10	5.30
64	10	48.70	5.70	4.60

table 3 - Effect of selection on reproductive performances of does: mean ± sd.

	Grey				NZW
	1982-83	1983	1984-87	1987-89	1987-89
fertility rate (kindling/mating)	48.23	57.84	62.80	80.37	82.43
litter size	7.2±2.4	8.1±3.4	8.4±2.4	8.5±2.6	8.3±3.0
live born/ litter	5.8±2.8	6.5±4.1	7.1±3.3	7.8±3.1	7.8±3.3
weaned litter rate	44.72	57.62	71.05	77.33	83.61
weaned kits/ weaned litter	4.9	5.5	6.6	6.8	7.3
mortality rate 0-28 days	61.95	51.68	33.76	31.73	21.23

The effect of season on the reproductive performances is shown in table 4: there are no differences between breeds, except for the number of weaned kits per litter. The kindling interval is longer in winter, but in summer the number of died kits at birth increases (Pagano Toscano et al., 1990 and 1991a).

table 4 - Reproductive performances of loes quarterly during the year: means and ANOVA.

	Grey quarter				NZW quarter				error mean square	F ratio		
	1	2	3	4	1	2	3	4		breed	quarter	b*q
kindling interval (d)	54.2	54.0	56.9	62.1	53.9	51.2	54.5	62.6	12.87	0.64	8.47**	0.28
mating/ kindling	1.2	1.1	1.0	1.1	1.1	1.0	1.1	1.4	0.35	3.23	3.42*	4.34*
live born/ litter	7.5	7.8	7.3	7.5	7.6	7.5	7.3	8.9	3.15	1.50	1.33	1.36
dead born/ litter	0.8	0.9	1.2	0.4	0.7	0.8	0.7	0.1	1.71	1.48	3.31*	0.26
weaned kits/ litter	5.1	4.8	4.8	5.1	6.4	5.6	5.6	6.5	3.21	10.98**	1.04	0.22

*: P<0.05
**: P<0.01

As for productive performances we have first obtained a live weight of 650 g at 28 days, 1500-1550 g at 60 days and 2650-2700 g at 90 days, and after some years these weights have slightly changed (table 5), but a difference is evident in favour of grey rabbits for the weight at 28 days (590 vs 545 g) and at 60 days (1695 vs 1630 g) ($P<0.001$) (Zoccarato et al., 1991).

table 5 - Live weigth at 28 (weaning), 60 and 90 days of age: mean ± sd (g).

	Grey			NZW
	1982-83	1984-87	1987-89	1987-89
28 days	650 ± 105	619 ± 159	589 ± 140B	543 ± 128A
60 days	1537 ± 266	1633 ± 279	1693 ± 242B	1628 ± 252A
90 days	2682 ± 341	2650 ± 310	2673 ± 267	2665 ± 329

A,B: $P<0.001$

As shown in the graphic of figure 1 Grey rabbits are heavier than NZW ($P<0.001$) from weaning until 91 days (Lazzaroni et al., 1991).
Gompertz's equation fits very well the growing trend in both breeds and the same is for polynomial equations (2nd and 3rd degree); parameters of the different equations are reported in table 6 (Lazzaroni et al., 1991).

table 6 - Parameters of different equations used to study growth rate trend in rabbits.

Gompertz's equation

$$y = a * \exp(-(b/c) * \exp(-cx))$$

breed	a	b	c	R^2
Grey	3922.52	0.10	0.03	0.99
NZW	3995.46	0.09	0.02	0.99

polynomial equation 2nd degree

$$y = a + bx + cx^2$$

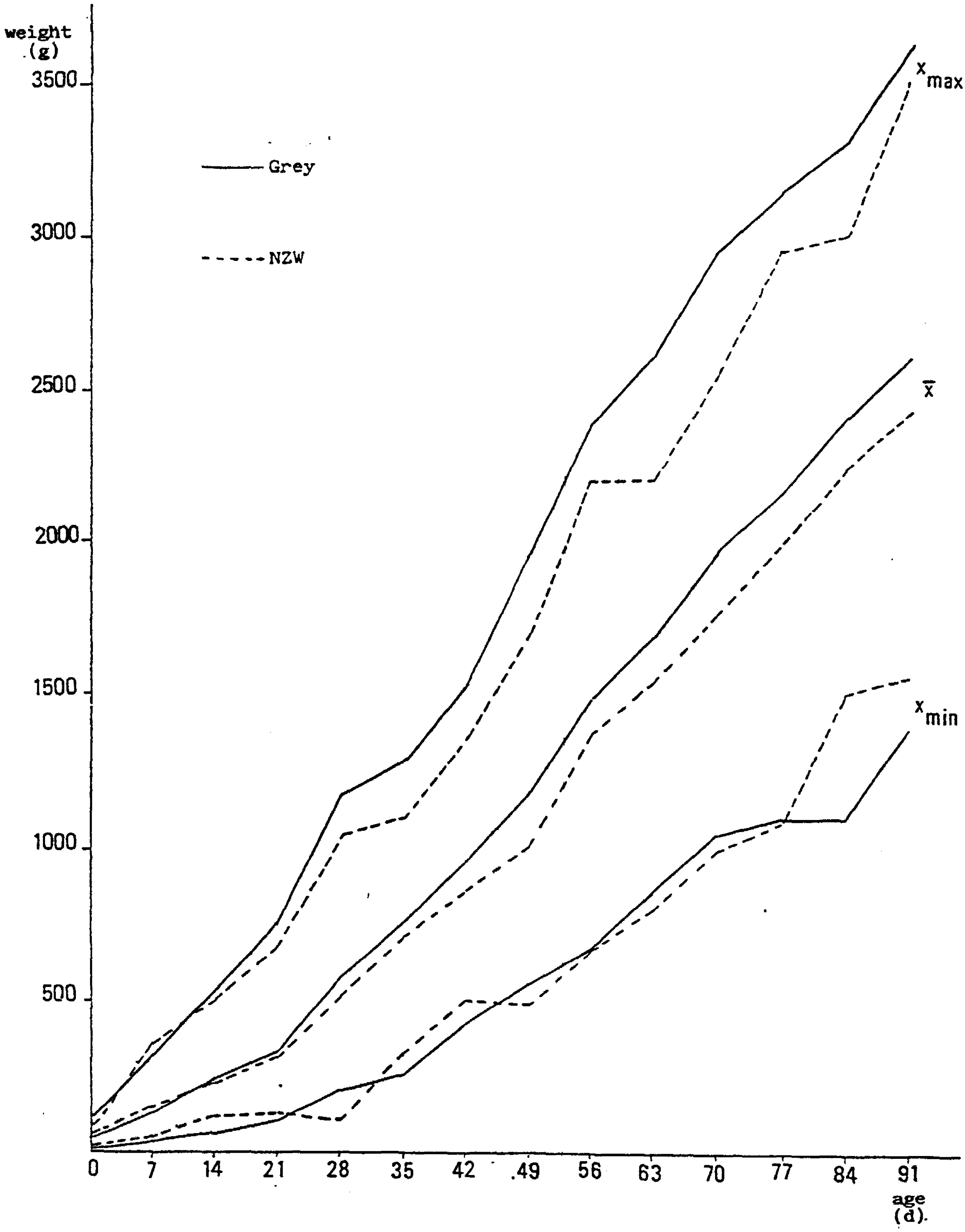
breed	a	b	c	R^2
Grey	-26.83	19.13	0.12	0.99
NZW	-0.11	15.97	0.13	0.99

polynomial equation 3rd degree

$$y = a + bx + cx^2 + dx$$

breed	a	b	c	d	R^2
Grey	57.49	5.41	0.51	-0.00	0.99
NZW	60.90	6.05	0.41	-0.00	0.99

figure 1 - Minimum, mean and maximum weigth at different ages.



The slaughter data of table 7 do not show any difference between Grey rabbits and NZW (dressing percentage 58.1 vs 57.8%) (Zoccarato et al., 1990).

table 7 - Slaughter data: mean ± sd (g).

	Grey	NZW
live weight	3190.5 ± 229.4	3081.8 ± 351.2
dead weight	3079.8 ± 222.3	2980.3 ± 345.6
skin & feets weight	580.2 ± 79.4	559.1 ± 82.1
gut weight	515.9 ± 68.3	506.7 ± 91.6
liver weight	129.8 ± 14.7	129.5 ± 18.8
carcass weight	1853.1 ± 139.8	1779.2 ± 196.8
dressing %	58.1 ± 2.2	57.8 ± 2.8

Productive traits of Carmagnola Grey Rabbit are similar to NZW control group, but a genetic improvement of our Grey Rabbit is still possible, so that its selection and survival are well justified and still promoted for the maintenance of genetic variability in rabbit production.
The data obtained encouraged further studies in order to deepen our knowledge on this population and to preserve its germplasm for genetic improvement programs.
Nowadays for the market demand as well as for the productive and reproductive performances, compared with a NZW control group, these animals could be reared as pure breed and could be also usefully utilized in future breeding programs for production of male sires.

References

Lazzaroni C., Zoccarato I., Pagano Toscano G., Benatti G. (1991). "Atti IX Congresso Nazionale ASPA", Roma (Italy), 3-8 June, 881-893.

Pagano Toscano G., Benatti G., Zoccarato I., Andrione A. (1983). "Rivista di Coniglicoltura", 20 (11), 51-54.

Pagano Toscano G., Zoccarato I., Benatti G., Lazzaroni C. (1990). "Rivista di Coniglicoltura", 27 (2), 23-29.

Pagano Toscano G., Zoccarato I., Benatti G., Lazzaroni C. (1991a). "Annali Accad. Agric. Torino", 133.

Pagano Toscano G., Lazzaroni C., Zoccarato I., Benatti G. (1991b). "Proceedings World Conference on Gene Conservation and Rare Breeds Survival", Budapest (Hungary), 21-25 August (Abstr.).

Zoccarato I., Pagano Toscano G., Benatti G. (1986). "Rivista di Coniglicoltura", 23 (2), 41-43.

Zoccarato I., Benatti G., Pagano Toscano G., Lazzaroni C. (1990). "Rivista di Coniglicoltura", 27 (3), 41-45.

Zoccarato I., Pagano Toscano G., Benatti G., Lazzaroni C. (1991). "Atti III Convegno Unità di Ricerca Coordinata Allevamento Piccole Specie del C.N.R.", Roma (Italy), 7 March.