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Influence of coat colour, season and physiological status on reproduction of rabbit does in an Algerian local population

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ABSTRACT

In Algeria, rabbit meat production is small-scale, mainly on small farms with rabbits from local populations whose productivity and growth are rather low, but which are well adapted to the local environment. Of these, farmers prefer white rabbits, with the Albino or Himalayan alleles of gene C. Our objective was to verify the appropriateness of this preference for white rabbit does over a period long enough to also assess the effect of season. From September 2006 to June 2010, reproduction data from 209 females (138 white and 71 coloured) mated by 51 males from the same population were recorded. There was neither effect of sire coat colour nor any interactions between coat colour, season and physiological status of does. There was a significant relationship between coat colour (white *vs.* coloured) and most reproductive traits, except receptivity and fertility, in favour of coloured females. Litter size was higher by 0.67 kits born ($P = 0.041$), 1.27 born alive ($P < 0.0001$) and 1.04 weaned ($P = 0.0011$). There was a highly significant effect of season on all the measured traits. Receptivity, fertility and prolificacy were significantly higher before the hot period; in summer, reproductive performance was depressed, but no more than during the following period, confirming the good adaptation of this local population to hot conditions. We can conclude that the preference of farmers for white animals is not justified because there is in this population an unfavourable genetic association between reproduction and Albino or Himalayan alleles of C gene, which needs to be explored in more detail.

1. Introduction

In Algeria, rabbit meat is mainly produced on small farms with rabbits from local populations, whose productivity and growth are rather low, but which are well adapted to the local environment (Daoud-Zerrouki, 2006). During the 1980s, attempts were made to introduce rabbits from European selected strains. However, these strains were not carefully maintained as pure breeds, and gradually mixed with the local populations. As they were Albino or Himalayan (alleles c and ch of the C gene for coat colour, Aigner et al., 2000), these alleles are now in segregation in the local populations, and white rabbits (Albino or Himalayan) often appear in the progeny of white or coloured parents. Many farmers prefer white rabbits. The objective of this experiment was to verify the validity of

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Table 1
Results of the analysis of variance of reproductive performance of rabbit does: statistics and *P* values for fixed effects.

	Number of data	Mean	RSE	Dam coat colour (1)	Dam coat colour (2)	Physiological status	Season	Year within season
Dam weight at presentation (g)	3270	3314	283	<0.001	0.056	<0.001	<0.001	<0.001
Receptivity (%)	3564	38.3	0.43	0.150	0.450	<0.001	<0.001	<0.001
Fertility (%) of receptive does	1364	62.3	0.45	0.500	0.570	<0.001	0.001	0.002
Weaning rate (%)	748	74.9	0.42	0.029	0.058	0.054	0.035	0.006
Total litter size at birth	850	6.98	2.20	0.004	0.028	0.002	0.112	0.020
Alive litter size at birth (all litters born)	850	5.81	2.80	<0.001	0.001	0.001	0.037	<0.001
Alive litter size at birth (with at least 1 born alive)	748	6.60	2.20	<0.001	0.004	0.033	0.025	0.014
Survival rate at birth % (all litters born)	850	80.54	31.48	0.001	0.006	0.117	0.245	<0.001
Survival rate at birth % (litters with at least 1 born alive)	748	91.52	15.54	0.007	0.016	0.962	0.010	0.340
Litter size at weaning (litters with at least 1 born alive)	748	4.02	2.84	0.001	0.003	0.009	0.006	<0.001
Survival rate at weaning % (litters with at least 1 born alive)	748	60.40	37.32	0.078	0.125	0.085	0.008	0.003
Litter size at weaning (litters with at least 1 weaned)	560	5.37	2.05	0.019	0.029	0.2046	0.003	0.077
Survival rate at weaning % (litters with at least 1 weaned)	560	80.68	20.97	0.720	0.728	0.896	0.034	0.131

RSE: residual standard error; (1): residual used as an error term; (2): female within phenotype random effect used as an error term.

this preference for white rabbit does during a period long enough to also assess the effect of season.

2. Materials and methods

2.1. Animals

At the ITMAS (Agricultural Technical Institute) of Tizi-Ouzou (Algeria), an experimental herd was set up from the local population, and managed from September 2006 to June 2010 as a closed herd, restocking with no introduction of new rabbits. Reproduction data from 209 females (138 white and 71 coloured) mated by 43 males (9 white, 20 coloured and 14 of unknown phenotype) were recorded.

The livestock building was open to daylight by windows. It included a maternity cell with a capacity of 80 cages, and a fattening cell with 100 cages. The animals were housed individually in wire cages on a flat deck. Environmental conditions, temperature, humidity and lighting were natural. The animals were fed *ad libitum* with a commercial pellet feed (16.6% crude protein and 12.3% crude fibre). Watering was automatic.

Females were mated first between 4 and 5 months of age according to their weight. At presentation to the male, weight was recorded. If the female was not receptive, i.e. if it did not accept the mating, it was mated again 3 or 4 days later. Gestation was checked by abdominal palpation 12 days after mating; if it was negative, the rabbit does were immediately mated again. The receptivity rate (i.e. the percentage of females which accepted the mating) and the fertility rate (percentage of mated females which gave birth) were calculated. At birth, live and stillborn kits were counted, together with their number at weaning, at about 30 days later, which allowed analysis of the survival rate at birth and at weaning. Weight and growth of kits were also recorded (Abdelli-Larbi et al., 2012).

2.2. Statistical analysis

Data were analysed with an analysis of variance procedure (GLM/SAS).

2.2.1. Selection of fixed effects

In a first step, the statistical model included the fixed effect of coat colour (two levels: Albino or Himalayan *vs.* coloured) of the female, of the male mated, the season of mating with three levels (February–May: before hot season, June–September: hot season, October–January: after hot season), the year of mating (2006–2010) within season, the physiological status of the doe at mating (five levels: nulliparous, lactating or non-lactating primiparous, lactating or non-lactating multiparous), and the interactions two by two between all these effects. On this subsample (2908 data for receptivity), where coat colour of the male was recorded, there was no significant effect of the coat colour of the male nor any significant two by two interactions on any of the analysed traits.