World Rabbit Science

World Rabbit Sci. 2014, 22: 231-240
doi:10.4995/wrs.2014.1493

PRE-WEANING GROWTH PERFORMANCE OF KITS OF A LOCAL ALGERIAN RABBIT POPULATION: INFLUENCE OF DAM COAT COLOR, PARITY AND KINDLING SEASON

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Abstract: This study evaluated the effect of dam coat colours, doe's parity order, year and kindling season on litter size and growth of suckling kits of a local Algerian rabbit population. Rabbits were reared in the rabbitry of Tizi Ouzou (Algeria) in wire mesh cages placed in a building with natural lighting and ventilation and absence of temperature regulation. Weights and size of 572 litters (3795 kits) at birth, 7, 14, 21 and 28 d were analysed. The mother's coat colours (2 levels only: albino or coloured coat), the doe's parity (1, 2, 3, 4-5, 6-8, ≥9 kindlings), the kindling year (4 consecutive years) and the kindling season (3 seasons: Feb-May, June-Sept and Oct-Jan), were used as main fixed factors in a factorial analysis. The population was characterised by an average individual weight of 54 g at birth and 404 g at 30 d, growth rate of 10.24 g/d between birth and 24 d and of 19.02 g/d between 24 and 30 d. The coloured females were more prolific than the albino ones: 5.59 *vs*. 5.09 weaned/litter (P=0.016); but kits born from albino does had a larger individual weight at weaning: 391 *vs*. 362 g (P=0.006). The doe's parity order had no significant influence on the litter weight, individual weight or litter size at kindling. However, it influenced litter weight and litter size from 7 d of age up to 28 d in favour of 2nd and 3rd parity (P<0.02). Litter size was not significantly affected by year of kindling at any considered age. On the contrary, year of birth greatly influenced litter and individual weights. For example, the difference in individual weights at 28 d between the best and the worst year represented 19% of the average weight at this age. The birth season influenced mainly (P<0.001) litter size from birth until weaning in favour of the spring season: 5.92 weaned/litter *vs*. 5.05 or 5.04 for the 2 other seasons. From day 7 until weaning, the litter weight was larger for the Feb-May season (P<0.02) and represented +0.87 grams per litter at 28 d. The litter weight was similar for the 2 other seasons (non significant differences) whatever the age in consideration. Season had no significant effect on individual weight of kits from birth until weaning.

Key Words: kit weight, coat colour, parity, season, local population.

INTRODUCTION

In Algeria in recent years, rabbit breeding has become a renewed interest. Considering the unavailability of selected lines, the rabbit breeding is mainly based on the use of local rabbit populations, which requires better knowledge of their biological possibilities and adaptability to the rearing conditions. The rabbits used in local rearing have several coat colours (coloured and white animals). White rabbits are albino or Himalayan (recessive alleles c-c, ch-ch or c-ch of the C gene locus for coat colour). These alleles are now in segregation in the local populations and white animals (albino or Himalayan) often appear in the progeny of coloured parents.

Various studies were conducted to characterise and preserve the genetic wealth of this population (Berchiche and Kadi, 2002; Zerrouki *et al.*, 2005).

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http://dx.doi.org/10.4995/wrs.2014.1493

One part of these results was presented during the 10th World Rabbit Congress (Sharm El-Sheikh, Egypt, September 2012).

A few works are available on the growth abilities of very young rabbits of this local population under Algerian local conditions and they are related to some factors such as the dam capacities, the environment and the rearing conditions. This population is considered suitable for rabbit production for its high tolerance to hot summer conditions (Zerrouki *et al.*, 2004). In the past, several researchers have studied the inheritance of coat colour in rabbits (Robinson, 1958, 1978; Cheeke *et al.*, 1987), but few authors have examined the relationship between coat colour and productive performance (Lukefahr *et al.,* 1982). Some breeders using this local Algerian population prefer white rabbits. Therefore, it would be interesting to verify the validity of this preference in terms of production.

The aim of the present work is to study in the local Algerian population the effect of the female phenotype (limited to the coat colour managed by the C locus), dam parity order and the breeding period on litter size and growth of young rabbits during the birth to weaning period.

MATERIALS AND METHODS

Animals and Management

The study began in March 2007 and finished in July 2010 with the local Algerian population of rabbits reared at the *Institut de Technologique Moyen Agricole Specialisé* (ITMAS) in Tizi Ouzou, Algeria, as a closed herd, where restocking was carried out without any introduction of animals. The maternity building contained 80 single level mother cages. It was naturally ventilated and lit by natural day light by windows. Temperature and hygrometry were not controlled. The animals were fed *ad libitum* with rabbit pelleted feeds (on av. 15% protein and 27% neutral detergent fibre) produced by the UAB SARL "Local production" company situated in Bouzaréah, Algiers. Drinking water was provided *ad libitum* with automatic nipple drinkers.

At birth, number of total and live kits was counted, as well as their number at weaning, about 30 d later. Litter weight and average growth of kits were also recorded during the suckling period.

Weight at different times between birth and weaning was measured for 572 litters corresponding to 3795 kits born alive. All litters were weighed 7 to 10 times between birth and weaning at 27-32 d, with an interval which never exceeded 7 d. Only 112 litters were effectively weighed on day of kindling. The females were classified according to only 2 phenotypes: "albino" (true albino and Himalayan coats, 124 does) and all other coats classified as "coloured" (69 does) (Figure 1). The females were mated the first time generally when they were 22 wk old and then 7-10 d after kindling. The female whose pregnancy diagnostic was negative were presented again to a male 12 d after the unfertile mating. The nest boxes were placed 3 d before the estimated date of kindling. The litters were issued from 10 sires of each colour phenotype, mated with both phenotypes of does. In addition during the 2 first years of the study, some does of both phenotypes were mated by male of unknown phenotype (non registered information), accounting for 17% of the total number of registered kindlings.

Statistical analysis

Throughout the study, individual kit weight was calculated by division of litter weight by the actual litter size. Different regressions were calculated between the individual kit weight and the actual age at the time of weighting. The 2 best linear regressions obtained (0-23 d and 24-30 d; Figure 2) were used to estimate individual and litter weights at standard ages 7, 14, 21 and 28 d. As previously mentioned, litter weight was effectively measured 7 to 10 times between 0 and 32 d, at various times, but with intervals which never exceeded 7 d. Thus, individual kit weights at standard ages of 7,

Albino does Mixed colors litter Colored does

Figure 1: Examples of rabbit coat colors. All colored rabbits carry at minimum one C gene at the locus of coloration, and albino rabbit none. At this locus albino rabbits carry only c or c^h genes.

14, 21 and 28 d were estimated as the average of the 1 to 3 effectively measured weights around the standard age ±3 d, increased or reduced of the average growth rate during this period according to one of the above mentioned 2 equations. For litter weight estimation at standard age, the estimated individual weight was multiplied by the average number of kits present at the time of the weighing taken in consideration. For birth weight, only whole litters effectively weighed the day of mother kindling were used in calculation, because the extrapolation from a weight controlled 3 to 5 d later with the above mentioned equation or any other, was considered as non suitable to estimate the real birth weight.

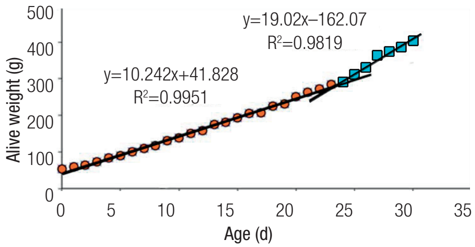

Figure 2: Evolution of young rabbits average weight, between birth and the age of 30 d - Red dots (●) correspond to data used for the first period regression (0-24 d) and blue squares (■) to those used for the second period regression (24-30 d).

The data analysis was performed using the SAS program (2001) with the MIXED procedure for litter size and weight, and individual kit weight at standard ages. In a first step, the fixed effects taken into consideration were sire phenotype, dam phenotype, year, kindling season, dam parity at kindling and all 2×2 interactions. The sire phenotype had 3 levels: albino, coloured and unknown. The dam phenotype had 2 levels (albino or coloured). The 3 levels of the kindling season factor were: before summer (February to May, average temperature mini-maxi: 8.5-21.3°C) summer (June to September, average temperature mini-maxi: 18.3-31.0°C) and after summer (October till January, average temperature mini-maxi: 9.0-20.5°C). Year effect had 4 levels, each year ending on May 31st, and the first "year" beginning in March of the previous year (15 mo of observation). Dam parity order had 6 levels: 1, 2, 3, 4-5, 6-8, 9 and more. Dam number (193 dams included in the model) was considered as a random factor because of the repetitions of litters by the same does.

Because the sire phenotype and interactions were not significant, in a second step the mixed model was applied to all the analysed traits with dam coat colour, dam parity at kindling, kindling year and kindling season as fixed factor and dam number as random factor. In text and tables, average performances were presented separately for each fixed factor, as least square means±least square mean standard error, corresponding to the last mixed statistical model.

RESULTS AND DISCUSSION

Average weight evolution

The average individual birth weight was 54.4 g. This result was close to the 51 g obtained by Zerrouki *et al.* (2007) in the same local population or the 54.0 g observed by Lebas (1969) for "Fauve de Bourgogne" rabbits. But it was lower than the 60.5 or 63.5 g recorded by Delaveau (1982) or Szendrő and Barna (1984) for European commercial rabbits.

The Figure 2 shows that growth was linear during 23-24 d after birth (10.24 g/d; R^2=0.995) and faster with 19.02 g/d (R^2=0.982) from 24 until 30 d.

At 7, 14 and 21 d average individual weights were 110 g, 181 g and 257 g. These weights were weak compared to the standards reached by Delaveau (1982): respectively 152 g, 265 g, and 372 g at the same ages. However, the present values are higher than those obtained by Khalil and Khalil (1991) with a weight at 21 d of 222 g and 205 g for Egyptian Bouscat and Giza White.

From the 24th d, the growth accelerates to reach an average daily gain of 19.0 g/d due to the fact that young rabbits, besides the strict milk feeding during the 3 first weeks, start to eat solid food (Lebas, 2002).

At weaning time (30 d), the average weight obtained was 404 g. The value for this light population (Berchiche and Kadi, 2002) was weak compared to that obtained with heavier breeds or lines select for growth. Poujardieu and Theau-Clément (1995) recorded an average weight at weaning of 629 g and Lazzaroni *et al.* (1999) who studied the local population of Grey Carmagnola rabbits weight at weaning of 946 g. Bolet *et al.* (2001) reported a weight at weaning of 826 g and 925 g respectively for the C77 line and Champagne d'Argent.

Female permanent effect

The mixed program used to study the fixed effects with dam number as random factor was also able to calculate the part of the total phenotypic variance explained by this random factor. For litter size at birth, the female random effect accounted for 11-12% of the total variance. The proportion then decreased to 4.2% at 28 d. The evolution of the relative contribution of female random effect on total variance was similarly reduced from 10 to 3.9% for the litter weight from birth to 28 d. The part of the kit's individual weight variance was the greatest for young kits (20.0% at 7 d) but it was reduced to only 3.1% at 28 d. From a practical point of view it can be accepted that at weaning (28 d) the female random effect had a limited contribution to the variability of the different studied traits (3.1 to 4.2% of the total variance).

Female coat colour effect

At birthing time, the albino females had significantly smaller litter sizes than the coloured ones ($P<0.01$), but for the reduced group of litters the kits of which were effectively weighed at 0 d, the difference was not significant (Table 1). It must be underlined that this result was obtained in only 20% (112 litters) of all studied litters. The general result is in line with results of another study presented by Mazouzi-Hadid *et al.* (2012) on the same population, where a significant higher prolificacy at birth for the coloured compared to the albino females was encountered. Probably in relation with the smaller litter size, individual weights of kits born from albino females are numerically heavier: 55.3 *vs.* 51.8 g, although due to the small number of observations the difference was not significant ($P>0.10$).

It must be noted that Lukefahr *et al.* (1986) put forward the hypothesis that the C gene coding for coat colour could be associated with better early survival and growth performance of kits than the recessive genes at the same locus.

Table 1: Effect of female coat colour on litter size and kit weight (least square means±standard error).

	Female coat colour		
	Albino	Coloured	*P*-value
Litter a birth			
No. of records	354	218	
Total born/litter	7.01±0.15	7.60±0.19	0.0111
Born alive/litter	6.36±0.16	7.10±0.20	0.0019
Litter at 0 d			
No. of records	69	43	
Litter weight (born alive) (g)	396±18	397±20	0.9544
Individual weight (g)	55.3±1.6	51.8±1.8	0.1214
Litter size	7.29±0.33	7.75±0.35	0.2991
Litter at 7 d			
No. of records	354	218	
Litter weight (g)	617±15	658±19	0.0607
Individual weight (g)	114.1±2.0	108.0±2.6	0.0474
Litter size	5.65±0.15	6.29±0.19	0.0044
Litter at 14 d			
No. of records	308	200	
Litter weight (g)	962±21	988±26	0.3954
Individual weight (g)	190.9±3.9	174.3±4.9	0.0051
Litter size	5.39±0.14	5.93±0.17	0.0091
Litter at 21 d			
No. of records	298	194	
Litter weight (g)	1303±29	1352±36	0.2524
Individual weight (g)	269.6±5.4	252.8±6.5	0.0327
Litter size	5.23±0.15	5.72±0.18	0.0215
Litter at 28 d			
No. of records	292	193	
Litter weight (g)	1828±40	1889±49	0.2946
Individual weight (g)	390.8±7.3	361.5±8.8	0.0059
Litter size	5.08±0.15	5.59±0.18	0.0159

From 7 d until 28 d, the effect of the female coat colour for the number of kits per litter remained significant (*P*<0.02) in favour of coloured females. At 28 d, the advantage represents 0.51 kits (+10%) in litter with at least one kit alive (weighed), in agreement with Mazouzi-Hadid *et al.* (2012). Overall litter weights were not significantly affected by the female phenotype. Nevertheless, kits from the albino females have a higher individual weight (significant differences from 7 till 28 d) and the final advantage observed at 28 d was +8.3%. This agrees with the observation by Afifi and Khalil (1992) of genetic differences that could be significant at weaning but not necessarily at birth.

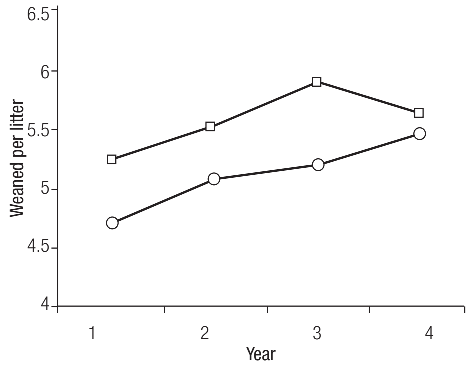

Figure 3: Variation of litter size at weaning according to the kindling year, for the 2 phenotypes of dams. ○ Albino, □ Colored.

Year effect and interaction with female phenotype

Litter size was not significantly affected by the year of production (*P*>0.05), whatever the age taken in consideration. (Table 2). On the contrary, whole litter or individual kit weights were the lowest during the 2nd yr of observation and the highest during the 4th (*P*<0.001; Table 2). This difference was most probably a consequence of variation of climatic and nutritional conditions from one

Table 2: Effect of kindling year on litter size and kit weight (least square means±standard error).

	Year				
	1	2	3	4	*P*-value
Litter at birth					
No. of records	90	205	171	106	
Total born	7.30±0.29	7.26±0.18	7.26±0.19	7.38±0.23	0.9750
Born alive	6.62±0.30	6.59±0.19	6.75±0.20	6.94±0.24	0.7143
Litter at 0 d					
Number	13	37	27	35	
Litter weight (g)	377±37^{a}	362±21^{a}	390±24^{a}	457±21^{b}	0.0233
Individual birth weight (g)	52.1±3.3	52.7±1.8	53.9±2.1	55.7±1.9	0.6451
Litter size	7.46±0.68	7.06±0.38	7.37±0.43	8.19±0.39	0.2126
Litter at 7 d					
No. of records	90	205	171	106	
Litter weight (g)	591±28^{a}	584±18^{a}	669±18^{b}	706±23b	<0.0001
Individual weight (g)	106.9±3.6^{ab}	100.2±2.4^{a}	114.4±2.5^{b}	122.7±3.0^{c}	<0.0001
Litter size	5.66±0.28	6.01±0.18	6.08±0.19	6.11±0.23	0.5710
Litter at 14 d					
No. of records	83	175	150	100	
Litter weight (g)	934±41^{ab}	873±27^{a}	1032±27^{cb}	1062±33^{c}	<0.0001
Individual weight (g)	186.0±7.0^{ab}	162.8±4.8^{c}	183.1±4.8^{b}	198.4±5.7^{a}	<0.0001
Litter size	5.15±0.28	5.65±0.18	5.98±0.18	5.85±0.23	0.0679
Litter at 21 d					
No. of records	83	163	147	99	
Litter weight (g)	1300±54^{b}	1182±37^{c}	1386±36^{ab}	1442±44^{a}	<0.0001
Individual weight (g)	274±10^{ab}	230±7^{c}	259±7^{b}	282±8^{a}	<0.0001
Litter size	5.01±0.28	5.52±0.19	5.73±0.19	5.65±0.23	0.1723
Litter at 28 d					
No. of records	83	158	145	99	
Litter weight (g)	1830±76^{b}	1613±51^{c}	1937±50^{ab}	2054±61^{a}	<0.0001
Individual weight (g)	395±14^{a}	333±9^{b}	375±9^{b}	402±11^{a}	<0.0001
Litter size	4.95±0.28	5.30±.18	5.54±0.18	5.55±0.22	0.2688

^{abc}Means not sharing the same superscript in one row are significantly different at *P*<0.05.

Table 3: Effect of kindling season on litter size and kit weight (least square means±standard error).

Average weights and litter size	Kindling season			*P*-value
	Before summer	Summer	After Summer	
Litter at birth				
No. of records	298	131	143	
Total born	7.61±0.15^{a}	7.33±0.22^{ab}	6.96±0.21^{b}	0.0199
Born alive	7.10±0.15^{a}	6.55±0.22^{b}	6.52±0.21^{b}	0.0221
Litter at 0 d				
Number	55	22	35	
Litter weight (g)	434.0±17.4^{a}	370.7±27.3^{b}	384.4±22.8^{b}	0.0958
Individual weight (g)	53.4±1.6	54.9±2.4	52.6±2.0	0.7363
Litter size	8.25±0.32	7.02±0.50	7.29±0.42	0.0772
Litter at 7 d				
No. of records	298	131	143	
Litter weight (g)	687.7±14.3^{a}	591.52±21.0^{b}	633.5±20.2^{b}	0.0002
Individual weight (g)	111.1±1.9	109.4±2.7	112.7±2.6	0.5916
Litter size	6.49±0.15a	5.70±0.22^{b}	5.72±0.21^{b}	0.0005
Litter at 14 d				
No. of records	275	119	114	
Litter weight (g)	1069±21a	921±31^{b}	935±31^{b}	<0.0001
Individual weight (g)	183.8±3.7	183.0±5.3	180.9±5.3	0.8829
Litter size	6.21±0.14^{a}	5.43±0.21^{b}	5.33±0.22^{b}	<0.0001
Litter at 21 d				
No. of records	271	111	110	
Litter weight (g)	1464±27^{a}	1263±42^{b}	1256±42^{b}	<0.0001
Individual weight (g)	260.6±5.1	267.3±7.9	255.7±7.9	0.5207
Litter size	6.11±0.14^{a}	5.13±0.22^{b}	5.18±0.22^{b}	<0.0001
Litter at 28 d				
No. of records	270	104	111	
Litter weight (g)	2020±38^{a}	1808±61^{b}	1748±59^{b}	<0.0001
Individual weight (g)	370.3±6.9	390.9±11.2	367.3±10.9	0.1986
Litter size	5.92±0.14^{a}	5.05±0.22^{b}	5.04±0.21^{b}	0.0002

^{ab}Means not sharing the same superscript in one row are significantly different at *P*<0.05.

year to the other. At this point, it must be emphasised that the observations were made in a commercial rabbitry with possibilities for the measuring of production parameters, but not in well controlled experimental facilities.

The year effect never interacts with dam coat colour effect for individual kit weight or litter size, whereas the difference between the 2 colour phenotypes remained quite constant (Figure 3 for litter size at 28 d). The relative order of the 2 colour phenotypes for the total litter weight at 28 d was inversed for the 4th yr of observation, but we must bear in mind that the average colour phenotype effect was not significant at this age (*P*=0.295; Table 1).

Kindling season effects

First of all it must be noted (Table 3) that the largest number of observations was performed during the 4 mo preceding summer (February to May): 52% of the total number of litters were observed during only 1/3 of the year. For the 2 other seasons, the number of litters was similar.

At birth, the season had a significant effect (*P*<0.05) on litter size, with the best results for the kindlings of the February-to-May season. In contrast, season did not significantly influence the birth weight of individual kits. From the age of 7 d till 28 d, litter size and litter weight were significantly (*P*<0.001) larger for the "before summer" season than for the 2 others seasons, without deterioration of kits' individual weight. This result agrees with that obtained by Afifi *et al.* (1985 and 1987) or by Khalil and Khalil (1991) in Egyptian conditions. However, Ayyat *et al.* (1995) also in Egypt did not observe any significant season effect on the growth of suckling rabbits. In Algeria, Zerrouki *et al.* (2005) observed a season effect on the same population, but in another rabbitry. In this latter case, individual weaning weight was significantly reduced for kits born in summer when compared with those born in winter or spring (434 *vs.* 488 and 473 g).

Finally, it must be underlined that at 28 d, the litter size difference between the "before summer" season and the other 2 seasons was amplified when compared to that observed at birth: +0.87 kits *vs* +0.54 at birth (Table 3), without alteration of the individual kit weight in comparison with the effect of the other 2 seasons.

Parity effect

According to our results at birth (Table 4), the female parity order has no significant effect on litter weight, individual kit weight or on the number of young rabbits. However, Zerrouki *et al.* (2004, in the same population) or Gacem *et al.* (2009 in a synthetic line) observed that total litter size and mean birth weight of kits were lower in young primiparous does compared with older multiparous ones. Similarly, Rebollar *et al.* (2009) reported individually lighter kits in litters born from primiparous does.

Our results are similar to those of Singh *et al* (2004), who reported that parity did not significantly modify litter birth characteristics in German Angora rabbit.

The litter weight and the litter size were affected by female parity order at 7, 14, 21 and 28 d in favour of 2nd and 3rd parity. Individual kit weight tended to be affected by the dam's parity order only at the age of 28 d (P=0.055), and increased quite regularly with the parity order: +14% at 28 d between the kit born from the oldest females (9 kindling and more) and the kits born from primiparous females.

Table 4: Effect of dam parity order on litter size and kit weight (least square means±standard error.)

	Parity Order						
	1	2	3	4-5	6-8	≥9	*P*-value
Litter at birth							
No. of records	109	99	96	112	83	73	
Total born	6.84±0.22	7.58±0.23	7.49±0.24	7.32±0.23	7.51±0.27	7.05±0.31	0.1193
Born alive	6.50±0.23	7.08±0.24	7.07±0.25	6.61±0.24	6.78±0.27	6.33±0.32	0.1746
Litter at 0 d							
No. of records	26	20	27	13	11	15	
Litter weight (g)	365±24	393±27	414±24	386±34	432±37	387±33	0.6126
Individual weight (g)	51.9±2.1	55.5±2.4	55.5±2.1	51.8±3.0	50.5±3.3	56.3±2.9	0.5209
Litter size	7.19±0.44	7.45±0.50	7.59±0.45	7.57±0.62	8.44±0.68	6.88±0.60	0.5869
Litter at 7 d							
No. of records	109	99	96	112	83	73	
Litter weight	612±21^{b}	685±22^{a}	702±23^{a}	627±23^{bc}	629±26^{bc}	570±30^{c}	0.0012
Individual weight	108.3±2.7	110.3±2.9	113.9±3.0	112.7±2.9	111.7±3.4	109.3±4.0	0.7119
Litter size	5.95±0.22^{ab}	6.45±0.23^{a}	6.42±0.24^{a}	5.75±0.23^{ab}	5.87±0.26^{ab}	5.36±0.30^{b}	0.0196
Litter at 14 days							
No. of records	95	89	92	99	70	63	
Litter weight (g)	917±33^{b}	1036±34^{ab}	1043±35^{a}	964±34^{b}	968±39^{b}	923±45^{b}	0.0269
Individual weight (g)	173.7±5.5	179.5±5.7	182.7±5.8	184.0±5.7	185.7±6.8	189.9±8.0	0.5595
Litter size	5.61±0.23^{ab}	6.05±0.24^{ab}	6.12±0.24^{a}	5.52±0.24^{ab}	5.59±0.27^{ab}	5.06±0.30^{b}	0.0503
Litter at 21 d							
Number	90	88	89	93	69	63	
Litter weight (g)	1229±44^{b}	1396±45^{a}	1405±46^{a}	1329±45^{b}	1355±52^{ab}	1252±60^{b}	0.0234
Individual weight (g)	246.3±8.2	251.8±8.4	261.4±8.7	264.9±8.5	270.1±9.7	272.8±11.2	0.2507
Litter size	5.38±0.24	5.88±0.24	5.85±0.25	5.38±0.24	5.44±0.27	4.95±0.31	0.1198
Litter at 28 d							
No. of records	89	86	90	88	69	63	
Litter weight (g)	1687±62^{b}	1993±64^{a}	1987±66^{a}	1864±65^{ab}	1878±73^{ab}	1741±83^{b}	0.0021
Individual weight (g)	351±12	362±12	370±12	391±12	382±13	400±15	0.0553
Litter size	5.12±0.23^{ab}	5.82±0.23^{a}	5.81±0.24^{a}	5.11±0.24^{ab}	5.33±0.27^{ab}	4.83±0.31^{b}	0.0175

^{ab}Means not sharing the same superscript in one row are significantly different at P<0.05.

CONCLUSION

At the end of this study, it could be concluded that within this local population, the "albino" females were less prolific than the coloured ones. As a counterpart, the pre-weaning individual growth was significantly affected by the female's coat colour from the age of 7 d till weaning, resulting in larger individual weights for kits born from "albino" females. Total litter weight seems independent of the dam's coat colour.

The year of production significantly modified the different weight parameters, but not litter size. Regarding the season factor, the "before summer" season was significantly the best for litter size without degradation of individual kit weight at any time. If this season was the best, the "after summer" season with a similar temperature pattern would be the worst for whole litter weight. The absence of interaction between phenotype and kindling season or year shows that the coloured female's advantage for litter size and the superiority of the albino female performance for individual weight could be of genetic origin. Albino females are able to produce at 21 or 28 d litters of the same total weight as the coloured ones, despite a significantly lower number of kits. This is probably related with a better milk production capacity of albino does. The coloured individuals deserve to be taken into account in order to ameliorate the Algerian rabbit breeding.

At birth, kit weight, litter weight and litter size were not affected by their dam parity order. However, parity order influences all performances at 28 d in favour of 2nd and 3rd parity

These results suggest that genetic effects of coat colour (more precisely genes near of the C locus) should be studied further. As there is no interaction between year or season and coat colour, we can conclude that it is not some environmental effect but really a genetic association between reproduction and growth performance and this C locus which needs to be further studied.

Acknowledgements. The authors wish to thank Mr S.A. KADI, teacher in the Mouloud Mammeri University, for his availability and precious help.

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