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CHARACTERISATION OF A KABYLIAN POPULATION OF RABBITS IN ALGERIA: BIRTH TO WEANING GROWTH PERFORMANCE.

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ABSTRACT: The aim of this study was to characterize the growth of rabbits of a local Algerian population (Kabyle) from birth to weaning at 28 days. A total of 216 litters from 82 females of the local population were regularly weighed between birth and weaning (28 d) in the experimental rabbitry of the Tizi-Ouzou University (100 km east of Algiers). The average weight of young rabbits at birth was 51 g. During the first three weeks of nursing, the young rabbit's weight increased from 119 g at the end of the first week to 308 g at the end of the third week. At weaning the average weight of kits was 475 g. The 0-28 d daily weight gain (DWG) was modest (15.7g/d). DWG was significantly lower in summer (12.6 g/d) than during the three other seasons (15.9 to 16.9 g/d) mainly as a consequence of a reduced growth rate during the fourth week. There was no significant effect of season on growth rate until the age of three weeks, which implies that there was no significant effect of season on milk production of the does. The birth weight decreased from 62.1 g for kits born in litters of 1-4, to 43.0 g for those born in litters with 9 or more born alive. Similarly the DWG was reduced from 18 to 12 g/day. Individual kit's birth weight was the smallest for primiparous does (44.2 g) when compared to multiparous does (52.7 g), but at weaning, differences were not significant (438 to 496 g for kits born from does in parity class 1 to 4 or more). These results confirm the low growth rate of this local population, but also the good resistance of does to hot summer conditions.

Key words: Young rabbit, Algeria, growth performance, birth, weaning, sucking period.

INTRODUCTION

In Algeria, studies on the reproductive performance of a local Kabyle rabbit population (Zerrouki *et al.*, 2002, 2004, 2005 a,b; Belhadi, 2004) have shown a relatively low litter size at weaning (5.5 weaned per litter) This situation generally favours a relatively high individual weight at weaning and a high post-weaning growth rate (Lebas, 1969). Growth performance recorded for this population showed that the daily growth rate from 4 to 8 weeks was 28 g/day and the classical slaughter weight of 2.3 kg was not obtained before 15 weeks (Lakabi *et al.*, 2004), for an adult weight of around 3.0 kg (Zerrouki *et al.*, 2004)

The objective of this study was to evaluate the growth of the young rabbits of this population from birth to weaning and the parameters that influence it.

MATERIALS AND METHODS

Animals

The work was carried out at the animal unit of the Tizi-Ouzou University from 1998 to 2003, during six generations of a closed herd of the local Kabyle population (reared in wire mesh cages in a building

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with natural ventilation and lighting 16h/24h). The autumn was characterized by mean temperatures of 20°C, with daily minimum and maximum temperature averagily 11.4°C and 16.9°C. The winter was characterized by an average daily minimum temperature of 7.4°C. In spring, the average temperature was 20.4°C with a daily maximum averaging 27.3°C. The most elevated temperatures were recorded in summer season with a daily maximum averaging 35.7°C.

A total of 216 litters born from 82 does were studied from birth until weaning at 28 days. Immediately after parturition, litter was counted and weighed. Litters were raised by their own mother without fostering or culling. From birth to 21 days, does had access to the nest box only once a day in the morning for 5-10 minutes. The litters were weighed before suckling every day from birth (D1) to 21 days and again at weaning (D28). The breeding conditions were the same as those described by Zerrouki *et al.* (2005b).

Statistical analyses

The variables analyzed were the mean individual weights (litter weight / litter size) at each weighing (D1, D7, D14, D21, D28) and the average individual birth-to-weaning daily growth rate. The variables were analyzed using the analysis of variance according to a linear model using fixed effects (GLM procedure; SAS, 2000). The model included the following four main effects: doe's parity [4 levels: 1, 2, 3, and 4 or more], parturition season [4 levels: autumn (October-December), winter (January to March), spring (April to June), and summer (July to September)], the number of kits suckled per litter [4 levels: 1-4, 5-6, 7-8 and 9 or more] and year of production [6 classes]. The last effect is not presented in the present paper.

RESULTS AND DISCUSSION

General growth characteristics of kits of local Kabyle population (Table 1)

At birth, the kits average weight was 51.0 g. This weight increased progressively during the suckling phase to reach an average weight of 310 g at the end of the third week. Similarly, according to Lebas (1969), live weight of Fauve de Bourgogne kits was 330 g at 21 days. On the other hand Khalil and Khalil (1991) found a weight at 21 days lower than our results with 222 g and 205 g for the Bouscat and the Egyptian Giza White rabbits, respectively. The mean weight of the rabbits at weaning (28 d) was 475 g with a daily weight gain of 15.7 g/d. According to Brun (1990), the average weight of young at weaning (30 d) varied from 595 to 640 g in three INRA lines and their crossbred products.

Birth season effect

The summer season, which is characterized by high temperatures (35°C), did not affect the body weight of the young at birth nor during the first three weeks after kindling. However, at weaning, the lowest value was recorded in the summer (Table 2). Since kit's growth between birth and the end of the third week depends mainly on the doe's milk production (Lebas, 1969), these results imply that doe milk production was not affected by season. On the contrary, after 21 days when kits began to

Table 1: Growth performance (mean \pm standard deviation) of kits from birth to weaning (216 litters)

	Means and standard deviation	Coefficient of variation (%)
Average weight (g) at :		
Birth	51.0 \pm 12.0	23.5
7 th day	119.3 \pm 33.0	27.0
14 th day	218.6 \pm 59.0	27.0
21 th day	308.1 \pm 84.2	27.5
28 th day	475.0 \pm 97.6	20.5
Average Daily Gain (g/d)	15.7 \pm 8.1	52.0

Table 2: Effect of kindling season on kit weights (Mean ± standard error)

Kindling season	Autumn	Winter	Springs	Summer	P-value
No. of litters observed	39	70	63	44	
Average weight (g) at Birth	51.7±3.1	51.9±2.8	49.9±1.7	51.3±2.8	ns
7 th day	112.8±8.6	118.6±5.7	119.1±4.8	120.9±5.8	ns
14 th day	209.8±15.4	219.1±10.1	218.0±8.5	217.6±14.0	ns
21 th day	317.5±22.2	321.2±14.5	306.4±12.2	279.7±20.0	ns
28 th day	500.0±26.7 ^a	507.3±16.9 ^a	472.9±13.3 ^a	400.0±22.7 ^b	<0.01
Average daily gain (g/d)	16.5±1.1 ^a	16.9±0.7 ^a	15.9±0.6 ^a	12.6±1.0 ^b	<0.01

^{a,b} Means within a row with unlike superscripts differ ($P<0.05$). ns= non significant

eat solid food (Gidenne and Fortun-Lamothe, 2002) the growth rate was affected by the hot summer temperatures, as generally described for growing rabbits (Gidenne and Lebas, 2005)

Contrary to our results, Afifi *et al.* (1987) and Khalil and Khalil (1991) working in Egypt observed an influence of the kindling season on the young rabbit's weights during the whole birth-to-weaning period. On the other hand, in the same country Ayyat *et al.* (1995) did not observe any effect of the kindling season on the young rabbit's weights.

Number of suckled young

The weights of kits decreased when litter size increased (Table 3). This highly significant decrease was observed throughout the birth to weaning period. At birth, kits born in litters of 1 to 4 kits weighed 31% more than those in born litters of 9 or more. The relative difference is more important at weaning (41%). As a consequence, daily gain was also affected by the number of suckled kits ($P<0.001$). The reduction of daily gain was due to the reduction of the milk quantity available for an individual kit when litter size was higher than 7, as previously described for this population (Zerrouki *et al.*, 2005b).

Doe's parity effect (Table 4)

Kit's birth weight was affected by their dam parity order ($P<0.01$) as was weight at 1 and 2 weeks of age. The weights increased with the parity number, but only kits born from primiparous does were significantly lighter ($P<0.01$) than the others.

At 21 and 28 days these effects were no longer significant and the birth to weaning average daily gain was not significantly affected by parity. Khalil and Khalil (1991) also found a strong effect ($P<0.05$) of parity on the birth weight in the Bouscat and Giza White breeds.

Table 3: Effect of the average number of suckled kits on growth performance between birth and weaning (Mean ± standard error)

No. of suckled young/litter	1 to 4	5 to 6	7 to 8	9 & more	P-value
No. of litters observed	60	54	68	34	
Average weight (g) at Birth	62.1±1.7 ^a	51.8±1.8 ^b	48.1±1.5 ^c	43.0±2.2 ^d	<0.001
7 th day	147.1±4.7 ^a	116.8±5.0 ^b	113.6±4.1 ^b	100.0±6.0 ^c	<0.001
14 th day	267.4±8.4 ^a	214.7±9.0 ^b	207.0±7.4 ^b	175.4±10.8 ^c	<0.001
21 th day	399.3±12.0 ^a	308.5±12.9 ^b	280.3±10.7 ^b	236.7±15.5 ^c	<0.001
28 th day	573.3±14.0 ^a	497.1±14.6 ^b	434.0±12.4 ^c	375.6±17.7 ^d	<0.001
Average daily gain (g/d)	18.8±1.0 ^a	16.6±1.0 ^b	14.3±0.9 ^c	12.1±1.4 ^d	<0.001

^{a,b} Means within a row with unlike superscripts differ ($P<0.05$)

Table 4: Effect of dam's parity on the average weights of suckling kits (Mean \pm standard error).

Parity	1	2	3	4 or more	P-value
No. observations	72	58	46	40	
Average weight (g) at Birth	44.2 \pm 1.7 ^a	51.0 \pm 3.5 ^b	54.0 \pm 2.0 ^b	56.0 \pm 2.9 ^b	<0.01
7 th day	107.0 \pm 4.7 ^a	122.7 \pm 5.0 ^b	126.2 \pm 5.6 ^b	127.0 \pm 6.9 ^b	<0.01
14 th day	198.0 \pm 8.3 ^a	224.6 \pm 8.7 ^b	226.7 \pm 10.1 ^b	227.0 \pm 12.2 ^b	<0.01
21 th day	273.5 \pm 22.0	315.5 \pm 12.5	318.9 \pm 14.5	319.0 \pm 20.4	ns
28 th day	438.0 \pm 13.8	467.0 \pm 14.3	479.4 \pm 17.4	495.7 \pm 24.0	ns
Average daily gain (g/d)	14.5 \pm 1.0	14.8 \pm 1.0	15.0 \pm 1.3	16.5 \pm 1.8	ns

^{a,b} Means within a row with unlike superscripts differ ($P < 0.05$). ns= non significant

CONCLUSIONS

These first results on the young rabbit's growth revealed a modest growth rate during the birth to weaning period (16 g/d). This may be directly related with the low adult weight of 2.9-3.1 kg of this population (Zerrouki *et al.*, 2004). Up to 21 days, growth rate is quite similar to that of heavier rabbits such as the French Fauve de Bourgogne and clearly higher than that of the local Egyptian populations such as the Giza White. That means a relatively good milk production for the Kabylean does. The weight at weaning is only moderate when compared to selected European rabbit lines. It means that the slow growth rate mentioned in the introduction is a characteristic of this Kabylean population most probably as a consequence of moderate feed intake and food transformation capacities, but not to a low milk production of the does.

In addition this experiment has demonstrated that the parity of the doe significantly influences the young rabbit weights only during the first two weeks after kindling. The season of kindling, especially the hot summer, negatively influences the growth only during the end of the birth to weaning period when solid feeding replaces the doe's milk. Litter size influences weights and growth rate at all ages, the smallest litters being associated with the highest growth rates.

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