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Résumé français

Croissance pré-sevrage des lapereaux en fonction de la couleur de la robe de la mère et de la saison de mise bas, dans une population locale algérienne de lapins

Afin d'étudier la croissance des lapereaux allaités dans une population de lapins algérienne locale, le poids de 590 portées (3965 lapereaux) a été mesuré à la naissance, 7, 14, 21 et 28 jours. Les animaux ont été élevés dans des cages grillagées placées dans un bâtiment avec un éclairage naturel et l'absence de régulation de la température. Cette population se caractérise par un poids moyen individuel de 54 g à la naissance et un poids de 404 g à 30 jours. Les lapereaux ont eu une vitesse de croissance régulière de 10,24 g/j entre la naissance et 24 jours puis de 19,02 g/j entre 24 et 30 jours. L'influence du phénotype de la mère (fourrure albinos ou colorée) et de la saison de naissance (3 saisons de l'année: Feb-Mai, juin-septembre et octobre-janvier), sur l'évolution de la taille des portées et le poids des lapins sevrés a été établi. Les femelles de couleur ont été plus prolifique que les femelle albinos: 5,76 vs 5,33 sevrés/portée ($P = 0,013$). Les lapereaux nés de femelles albinos ont tendance à avoir un poids individuel au sevrage plus élevé : 379 vs 357 g ($P = 0,064$). La saison de naissance a principalement influencé ($P < 0,001$) la taille de la portée de la naissance jusqu'au sevrage, en faveur de la saison printanière: 5,94 sevrés/portée contre 5,42 au cours de la saison chaude (juin-septembre) et 4,85 après l'été. À la naissance, le poids de la portée était plus élevé pour la saison de février à mai ($P = 0,013$) et l'avantage devient hautement significative ($P < 0,001$) au sevrage. Le poids le plus faible a été observé pour les mises bas d'octobre-janvier. La saison de naissance n'a aucun effet significatif sur le poids moyen des lapereaux au sevrage.

PRE-WEANING GROWTH OF KITS BASED ON MOTHER'S COAT COLOR AND KINDLING SEASON IN ALGERIAN RABBITS POPULATION

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ABSTRACT

In order to study the growth of suckling kits of a local Algerian rabbit population, weights of 590 litters (3965 kits) were measured at birth, 7, 14, 21 and 28 days. Rabbits were reared in wire mesh cages placed in a building with natural lighting and absence of temperature regulation. This population is characterized by an average individual birth weight of 54 g and the weight at 30 days is 404 g. Kits grew with a regular average growth rate of 10.24 g/d between birth and 24 days and of 19.02 g/d between 24 and 30 days. The influence of mother's phenotype (albino or colored coat) and of the kindling season (3 seasons in a year : Feb-May, June-Sept and Oct-Jan), on the evolution of litter size and weight of the suckling rabbits was established. The colored females were more prolific than the albino ones : 5.76 vs 5.33 weaned/litter (P=0.013). The young rabbits born from albino females tended to have the larger individual weight at weaning: 379 vs 357g (P<0.064). The birth season influenced mainly (P<0.001) litter size from birth until weaning in favor of the spring season : 5.94 weaned/litter vs 5.42 during the hot season (Jun-Sept) and 4.85 after summer. At birth, the litter weight was larger for the Feb-May season (P=0.013) and the advantage becomes highly significant (P<0.001) till weaning. The weakest litter weight was observed during Oct-Jan season. Season has no significant effect on kits individual weight at weaning.

Keywords: Young rabbit, weight, coat color, season, local Algerian population.

INTRODUCTION

In Algeria, rabbit rearing is mainly based on the use of a local rabbit population which needs a better knowledge of its biological possibilities and its adaptability to the rearing conditions as well. Various studies were conducted in the goal to characterize and preserve the genetic wealth. A work was achieved in this way by Daoud-Zerrouki (2006) on the population described by Berchiche and Kadi (2002). A few works are available on the growth abilities of very young rabbits of this local population under Algerian local conditions. The late are related to some factors such as the mother capacities, the environment and the rearing conditions.

The aim of the present work was to study the relations between the female phenotype (limited to the fur coat color) and the breeding season in one hand, and the growth of young rabbits during the birth to weaning period on the other hand.

MATERIALS AND METHODS

Animals and management

The study began in September 2006 and finished in July 2010 with local Algerian population rabbits reared at the Institut Technologique Moyen Agricole Spécialisé (ITMAS) in Tizi Ouzou; Algeria. The

maternity building contained 80 single level mother cages. It was naturally ventilated and lit by natural day light. Temperature and hygrometry were not mastered. The animals were fed *ad libitum* with pelleted rabbit feeds (15% protein and 27% NDF) produced by the UAB SARL "Local production" company situated in Bouzaréah Algiers. *Ad libitum* drinking was made with automatic nipple drinkers. Weight at different times between birth and weaning was measured for 590 litters corresponding to 3965 kits born alive. The females were classified according to only 2 phenotypes: "albino" (true albino and himalayan coats) and all other coats classified as "colored" (figure 1). The females were mated the first time generally when 22 weeks old. The females whose pregnancy diagnostic was negative were presented to a male 12 days after the unfertile mating. The nest boxes were placed three days before the estimated date of kindling. The numbers of kits born alive and present until weaning were recorded. Litter weight at birth (kits born alive) was recorded for only some litter. Thereafter all litters were weighted twice a week at minimum between birth and weaning (at 28-30 days).



Figure 1 : Examples of rabbit colors

Statistical analysis

Individual kits weight was calculated by division of litter weight by the actual litter size. Different regressions were calculated between the average individual kits weight and the actual age at the time of weighing. The two best linear regressions obtained (0-23 days and 24-30 days) were used to describe individual and litter weights at standard ages (7- 14 - 21 and 28 days). For birth weight, only litters effectively weighed the day of dam kindling were used in calculation.

The analysis of the data was achieved thanks to SAS program (2001 version) and by using GLM procedure. The fixed effects were birth season, female phenotype and their interaction. Birth season had 3 levels: before summer (birth months: February, March, April and May); summer (June, July, August and September) and after summer (October, November, December and January). The female phenotype had two levels (albino and colored – see figure 1). In case of significant effect, means were ranked with a Duncan test.

RESULTS AND DISCUSSIONS

Evolution of the average weight (Figure 2)

The average birth weight was 54.4 g. this result was close to the 51g obtained by Zerrouki *et al.* (2007) on 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 63.5g recorded by Delaveau (1982) or Szendrő and Barna (1984) for European commercial rabbits.

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

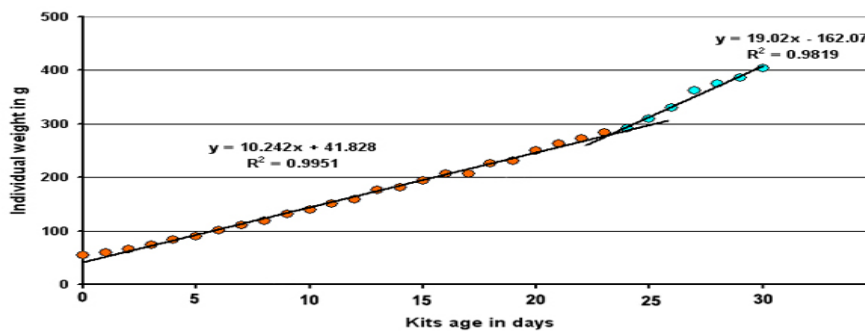


Figure 2 : Evolution of kits average individual weight between birth and weaning

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

From the 24th day, the growth speeds to reach daily average gain of 19.0g/d due to the fact that young rabbits beside the milky food during the three first weeks start to eat solid food (Lebas, 2002).

At weaning time (30 days), the average weight obtained was 404g. This value was weak compared to that obtained with lines selected for their growth performances. Poujardieu and Theau-Clement (1995) recorded an average weight at weaning of 629g and Lazzaroni *et al.* (1999) who studied the local population of Grey rabbits of Carmagnola a weight at weaning of 946g. Bolet *et al.* (2001) reported a weight at weaning of 826g and 925g respectively for the C77 line and Champagne d'Argent.

None of the interactions calculated between phenotype and season reached the significance level (P=0.05). Thus the 2 factors are presented separately.

Effect of the female phenotype

The female phenotype had no significant effect on the litter or individual weight at birth nor on the number of kits born alive per litter. But these results were obtained on only 20% of all studied litters (Table 1). It must be noted that on the same population the study presented by Mazouzi-Hadid *et al.* (2012) in the present congress, had demonstrated a significant higher prolificacy at birth for the colored females.

From 7 days until 28 days , the effect of the phenotype became significant (P<0.05) for the number of kits per litter in favor of colored females in agreement with Mazouzi-Hadid *et al.* (2012). Overall; litter or individual weights were not significantly affected by the female phenotype. Nevertheless, kits from the albino females seemed to have a higher individual weight at weaning: 379 vs 357 (P=0.064). This agrees with Affifi and Khalil (1992) observation of genetic differences that were significant at weaning but not at birth.

Table 1: Evolution of the average weight of the young rabbits regarding the female phenotype

Age in days	Average weights and litter size	Female Phenotype				Residual coef. variation	Probability
		N°	Albino	N°	Colored		
0	Litter weight (born alive) g		398.9		390.6	34.3%	0.847
	Individual birth weight g	75	56.2	47	51.6	19.9%	0.163
	Kits alive / litter		7.24		7.60	32.8%	0.656
7	Litter weight (g)		629		661	35.1%	0.037
	Individual weight (g)	359	111.3	231	111.5	35.7%	0.738
	Litter size		5.90		6.32	37.6%	0.017
14	Litter weight (g)		980		998	31.9%	0.249
	Individual weight (g)	313	186.0	211	175.1	29.7%	0.059
	Litter size		5.64		6.09	38.0%	0.013
21	Litter weight (g)		1326		1373	30.2%	0.070
	Individual weight (g)	303	262.1	204	251.2	31.0%	0.275
	Litter size		5.51		5.94	38.4%	0.016
28	Litter weight (g)		1852		1907	31.1%	0.132
	Individual weight (g)	295	379.0	203	357.0	30.4%	0.064
	Litter size		5.33		5.76	38.4%	0.013

N° : number of observed litters

Effects of kindling season

Table 2: Evolution of the average weight of the young rabbits regarding the season of kindling

	Kindling season						Residual coefficient variation	Proba. Season effect
	Before summer	N°	Summer	N°	After Summer	N°		
Kindling								
Litter weight g	432 a	64	357 b	23	354 b	35	34.3%	0.013
Individual birth weight g	55.6	64	54.0	23	52.5	35	19.9%	0.616
Kits / litter	7.92 a	64	6.78 b	23	6.77 b	35	32.8%	0.024
7 days								
Litter weight (g)	693 a	255	610.24 b	158	594.85 b	177	35.1%	< 0.001
Individual weight (g)	111,8	255	110.5	158	111.6	177	35.7%	0.950
Litter size	6.49 a	255	5.76 b	158	5.71 b	177	37.6%	0.001
14 days								
Litter weight (g)	1083 a	236	965.4 b	143	853.6 c	145	31.9%	<0.001
Individual weight (g)	186.2 a	236	183.8 a	143	171.9 b	145	29.7%	0.055
Litter size	6.22 a	236	5.65 b	143	5.34 b	145	38.0%	0.001
21 days								
Litter weight (g)	1488 a	233	1330 b	135	1124 c	140	30.2%	<0.001
Individual weight (g)	263.4	233	263.1	135	243.3	140	31.0%	0.070
Litter size	6.15 a ^a	233	5.54 b	135	5.04 c	140	38.4%	<0.001
28 days								
Litter weight (g)	2058 a	232	1872 b	128	1566 c	137	31.1%	<0.001
Individual weight (g)	375.7	232	379.8	128	351.3	137	30.4%	0.106
Litter size	5.94 a	232	5.42 b	128	4.85 c	137	38.4%	<0.001

Different letters in the same raw indicate significant differences between means (P<0.05)

First of all it must be noticed (Table 2) that the largest number of observations was performed during the 4 months preceding summer: 43% of the total litter's number were observed during only 1/3 of the year. For the 2 other seasons, litter number was similar, just a little bit larger for the "after summer" season (October to January).

At birth, the season had a significant effect ($P < 0.05$) on litter size and litter weight as well, with the best results for kindlings of the February-to-May season. On the contrary season doesn't significantly influence the individual kits birth weight; even the numerically larger values were associated with the largest litter sizes.

From the age of 7 days, litter size and litter weight were significantly ($P < 0.001$) larger for the "before summer" season without deterioration of kits individual weight. This result meets that obtained by Affifi *et al.* (1985 and 1987) or by Khalil and Khalil (1991) in Egyptian conditions. However, Ayyat *et al.* (1995) also in Egypt haven't observed any significant season effect on the growth of suckling rabbits. In Algeria Daoud-Zerrouki (2006) observed on the same population but not in the same rabbitry a season effect; in this 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)

CONCLUSION

At the end of this study, it could be concluded that within the local population, the "albino" females were less prolific than the colored ones. The pre-weaning growth was not affected by the female phenotype except at the age of 28 days when the individual weight was larger for kits born from "albino" females. For the season parameter, the "before summer" season was significantly the best for litter size without degradation of individual kits weight at any time. If this season was the best, the "after summer" season was the worst mainly for litter size and whole litter weight

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