CHARACTERISATION OF LOCAL RABBIT PERFORMANCES IN ALGERIA: ENVIRONMENTAL VARIATION OF LITTER SIZE AND WEIGHTS

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ABSTRACT

An analysis of non genetic factors having influence (rabbit doe weight at positive mating, year-season, physiological state and born alive) on litter size (TB, BA) and mortalities from birth to 70 days of age (SB, PrM, PM) and on litter weights at weaning and at 70d (LW30, LW70) was carried out. Seventy-two does of a local population were controlled during 14 months in a commercial unit. Results showed no significant effect of does body weight on litter size and mortalities from birth to 70 d. The general trend of year-season effect was favourable for both litter size and weights during preweaning period with a positive effect of spring kindlings on litter sizes from birth to weaning in relation to autumn of the same year (2.12, 1.0 and 1.83 young more respectively for TB, BA and LS30). Again, a high effect of winter and autumn on mean weight at weaning (646.7 g, 611.7 g) was observed. Except stillbirth with low value in winter, mortalities were not affected by this factor. In winter also, we had the heaviest young during post weaning period with no differences. Primiparous no lactating does gave the best values of litter sizes (9.12, 7.8, 6.9 and 6.3 young from birth to 70 d). However, the highest mortalities were from these later, primiparous lactating and multiparous no lactating females respectively at birth, during lactation and after weaning (14.7, 12.8 and 24.2%). The increase of number of born alive mainly diminished mean weights at weaning and also, but less, mean weight at 70 d and not significantly post weaning daily gain (DG).

Keys words: local population of rabbit, litter traits, non genetic effects.

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INTRODUCTION

Rabbit production could be a good source of meat in Algeria since it is a prolific animal, fast growing and with a high fecundity. However, under Algerian conditions, these advantages are affected by several factors such as the environment and management conditions. In rabbit, litter size and litter weight are important economic components. These traits are important objectives for genetic improvement and their study is important to evaluate the potentiality of our local populations. Nevertheless, the knowledge in these populations for those traits is scarce (BELHADI *et al*., 2002; ZERROUKI *et al*., 2003). It is so necessary to continue the study of the factors affecting litter sizes and weights and related traits under Algerian conditions.

MATERIAL AND METHODS

Animals came from a local population of rabbit reared in a commercial farm, with naturally light and ventilated. They are a sample of rabbit commonly raised in Algeria with some influence of New Zealand White and California. Humidity went to 80% in winter and reached 50% in summer.
A total of 72 does were used for the experiment carried out along four seasons (October 2000-December 2001). Reproduction was stopped during hot months (from 10 July to 31 August 2001) and so summer was not taken into account. When females were first mated (15-22 weeks), their weight was taken and the minimum of body weight was 2000 g; the maximum was 3300 g. They were usually remated 10-14 days after kindling, and after 14 days palpation was made. Young does replacements were added as needed. Rabbits were fed ad–libitum with a commercial standard feed: 17.65% crude protein, 10.8% crude fibre, 3.4% ether extract. Fresh water was supplied ad-libitum. Traits recorded were litter size at birth (total born TB, born alive BA), litter size at weaning and at 70d of age (LS30, LS70), stillbirth (SB), preweaning and post weaning mortalities (PrM, PM). Litter weights at weaning and at 70d (LW30, LW70) were considered and so mean weights at 30d and at 70d (MW30, MW70) and daily gain (DG) were deduced. General linear models procedures (SAS, 1991) were used because of unbalanced data. The main factors in the analyses were body weight of the doe (BW) at the first positive mating with two levels (< 3000 g; ≥ 3000 g) on litter sizes (TB, BA, LS30, LS70) and on mortalities (SB, PrM, PM); year-season of kindling with four levels on TB, BA, LS30, LW30, MW30 and mortalities. Only three levels of year-season were tested on LS70, LW70, MW70. Physiological state (PS) combined parity order and lactation state and five levels were compared (nulliparous, primiparous lactating and no lactating, multiparous lactating and no lactating females). It was tested on litter sizes and mortalities. Number of born alive classes (CBA) was also considered on LW30, MW30, LW70, MW70 and DG.

RESULTS AND DISCUSSION

Doe weight effect.

For all the traits, the effect of doe weight was not significant (p=0.05). Some authors reported an increase of litter size with the increase of doe weight at mating or parturition only when the weight was above 4000 g (YAMANI et *al.*,1991). These authors noted also a slight increase in litter size at weaning. However, ATTILA BALLEY et *al.* (1988) gave no significant effect on stillbirth and on preweaning mortality which agreed with our result. On ovulation rate, PLA et *al* (1984), did not obtain differences according to weight of does at first mating. On the other hand, IBRAHIM (1985) indicated that the best milk production came from does weighing below 3000 g. All the does used in our experiment came from large size litters and so showed small weights (2950 g), especially that mature weight of local population is about 3000 g. This could be the reason for the non significant effect of does weight on subsequent performances.

Year season effect.

High differences among year-season for TB comparing to other sizes (BA, LS30) were observed (Table 1). The effect did not appear for litter size at 70d of age. Besides, only stillbirths showed differences, and not other mortalities, with low values during cold periods comparing to spring and autumn (5% vs 12.5%). Year-season effect on litter size and on mortalities was reported by numerous authors especially the decline during the hot periods (TORRES et *al*., 1992; BEKYREWRECK, 1998; GOMEZ et *al*., 1998). GOMEZ et *al* (1998), CIFRE et *al* (1999) observed a high significant effect on litter size in a maternal line from birth (total born TB, born alive BA) to slaughter with the greatest values in spring. In same conditions, BELHADI et *al* (2002) gave differences only on number of weaned with high values in autumn and spring because of less preweaning mortality during these periods. The highest percentages of stillborn were during spring and autumn correspoding to best values of total born. These results agreed with those obtained by YAMANI et *al* (1991). Preweaning and post weaning mortalities did not vary and the results were different from those noticed by ZERROUKI et *al* (2003) in local population in favour of autumn (21.5% vs 9.9%) with respect to spring during suckling period and also high percentage for stillborn in autumn (19.7%) in relation to winter (16.7%).

Table 1: Year-season effect (YS) on litter size and weight (g) from birth to 70 days of age

YS/Traits	TB n	BA n	LS30 n	LS70 n	LW30 G	LW70 g
1	8.1±0.4ab	7.0±0.4ab	6.4±0.4 a	5.1±0.3	3251±157 ab	9087±599
2	7.4±0.2 b	7.0±0.3 a	6.3±0.2 a	5.3±0.2	3586±107 a	9441 ±410
3	8.7±0.3 a	7.6±0.3 a	6.8±0.3 a	5.3±0.2	3452±127ab	8813±460
4	6.6±0.5 b	5.7±0.6 b	5.0±0.5 b	__	2979±213 b	__

1, Autumn 2000; 2, Winter 2001; 3, Spring 2001; 4, Autumn 2001. Effects, within columns, not sharing letters are significantly different ($p < 0.05$).

At weaning, a positive effect of winter in relation to autumns was obtained on the total and individual litter weight (LW30, MW30) with 607 g and 63.7 g more. No differences were detected for post weaning weight (LW70, MW70, and DG). Several authors cited the favourable effect of winter and autumn kindling on individual weights (GOMEZ et *al*., 1998; GARREAU et *al*., 2000; BELHADI et BASELGA, 2003). Some high values were observed in spring (FÉKI et *al*., 1996; CIFRE et *al*., 1999).The majority of results were assigned to the best feed intake of young born during low temperatures (BASELGA, 1978; DALLE ZOTTE, 2000). GARCIA et *al*. (1984) noted high litter weight at 28d in spring and summer kindlings but the same values at slaughter ($p=0.05$) were observed. In the same environment, BELHADI et *al*. (2002) did not notice any effect of year-season on litter weight at 70d in comparison to mean weight at the same age ($p \leq 0.05$). Results for litter weights were surely related to litter sizes and mortalities obtained in these periods.

Physiological state (Table 2)

The effect of physiological state on TB were highly different. Primiparous no lactating does had higher values than others for TB as does were simultaneously young and not stressed by suckling; it might be also in relation with best conditions for this state. Signification was also observed on BA, on LS30 and LS70. The lower values were showed by primiparous lactating.
Mortality from birth to 70d did not vary. Results in literature are contradictory (ESTANY et *al*., 1989; ORENGO et *al*., 2003). Some authors showed a main effect due to parity (THEAU-CLÉMENT, 1994; POUJARDIEU et THEAU-CLÉMENT, 1995) whereas other authors underlined the effect of lactation (FORTUN et BOLET, 1995; MOCÉ, 2003).
ORENGO et *al* (2003) reported an increase of litter size (TB, BA, LS30) from nulliparous to multiparous no lactating does (1 young more). The same observations were done by THEAU-CLÉMENT et *al* (2003) with differences between nulliparous and primiparous lactating and no lactating and multiparous does. All these results do not entirely corroborate our findings and the differences obtained at weaning and 70d for litter size were surely due to differences recorded in TB. Several studies suggested a negative effect of lactation on prenatal mortality in comparison to mortalities after birth (FORTUN et BOLET, 1995; MOCÉ, 2003).

Table 2: Effect of physiological state (PS) on litter sizes and mortalities from birth to 70 days.

	TB	SB	BA	PrM	LS30d	PM	LS70
		%	n	%	n	%	n
1	7.2±0.3a	8.6±2.7	6.5±0.3 a	11.6±2.4	5.8±0.3a	20.2±3.0	5.0±0.3 a
2	6.8±0.3a	8.5±3.2	6.3±0.4a	12.8±2.9	5.6±0.3a	22.2±3.5	4.8±0.3a
3	9.1±0.4b	14.7±3.6	7.8±0.5b	11.8±3.3	6.9±0.4b	14.9±4.2	6.3±0.3b
4	7.6±0.3a	8.9±2.9	7.0±0.4ab	12.1±2.6	6.2±0.3ab	22.8±2.8	5.2±0.2ab
5	7.8±0.5a	12.2±4.6	6.6±0.5 ab	6.0±3.9	6.2±0.5 ab	24.2±4.5	5.0±0.4ab

1. Nulliparous; 2, Primiparous-lactating; 3, Primiparous-no lactating; 4, Multiparous-lactating; 5, Multiparous-no lactating. Effects, within columns, not sharing letters are significantly different ($p < 0.05$).

Effect of number of born alive (Table 3)

The means given in Table 3 showed the heaviest litters at 30 and 70d from the highest value of BA (>8) while MW30 was greater in litters with less than 5 young ($P = 0.001$). Differences ranged from 2080 g for LW30 to 4255 g for LW70 between the two extremes and 202 g for MW30.

DG was not affected by litter size whereas, as expected, all the other traits showed a reduction of individual mean weight in the higher litter size classes. Similar negative effects of BA on growth have been found by others, more important at weaning than on subsequent growth traits (TESTIK et *al*., 1998; CIFRE et *al*., 1999). Although rabbits exhibited a compensatory growth during post-weaning period (TESTIK et *al*., 1998) the results could be expected because daily gain is relatively free of maternal effects (ESTANY et *al*., 1989; CIFRE et *al*., 1999).

Table 3: Effect of born alive (CBA) on litter and mean weights at 30, 70d and daily gain (DG).

CBA/Traits	LW30 G	MW30 g	LW70 g	MW70 g	DG g/d
< 5	2187±165 a	728±17 a	6988±730	1962±57 a	30.5±1.4
5-8	3497±86,2 b	569±9 b	9110±290 b	1812±22 b	31.2±0.5
>8	4267±128 c	526±12 c	11243±416 c	1787±32 b	31.7±0.8

Effects, within columns, not sharing letters are significantly different (p <0.05).

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