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REPRODUCTION PERFORMANCES OF A SYNTHETIC RABBIT LINE AND RABBITS OF LOCAL POPULATIONS IN ALGERIA, IN 2 BREEDING LOCATIONS

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Abstract: The aim of this study was to compare the production of a synthetic line (Syn) of rabbits to that of 2 local Algerian populations (W and Loc). The Syn line was obtained from the crossbreeding of a well adapted local population frequently used in Algerian familial farms (Loc) with a more productive French strain. The W population is maintained by a public cooperative and is used mainly in Kabylia region; it is called "white" because of its albino phenotype. Rabbits were placed under the same experimental conditions in 2 rabbitries of a state technical institute. In Baba Ali (Algiers), 50 does of each genotype were raised during 2 yr. In Lamtar (Sidi Bel Abbes), 30 does of the Syn line and 30 of Loc population were compared during 16 mo of production. Natural mating was used 10-11 d after parturition. Kits were weaned at 33-35 d. Litter size and litter weights were measured at birth and weaning. In both locations Syn dams were heavier than those of the other genotypes: (3616, 3464 and 3305 g for Syn, W and Loc in Baba Ali, and 3592 and 3173 for Syn and Loc in Lamtar; $P<0.001$). The observed litter sizes showed a superiority ($P<0.001$) of the Syn line compared to W and Loc does at birth time (8.76, 6.78 and 6.19 for Syn, W and Loc in Baba Ali, and 8.02 and 5.90 for Syn and Loc in Lamtar) and at weaning (6.85, 5.83 and 5.44 for Syn, W and Loc in Baba Ali, and 6.61 and 5.15 for Syn and Loc in Lamtar; $P<0.001$). Most probably as a consequence of the important difference in litter sizes, average individual weight at weaning was weaker for the synthetic line than for the Loc population: 543 *vs.* 563 g in Baba Ali and 561 *vs.* 621 g in Lamtar. For the W population in Baba Ali, the weaning weight was similar to that of the Loc population: 565 *vs.* 563 g. There were no genotype×season interactions which changed the genotypes ranking, and the Syn line performances were more regular from one season to the other than those of the 2 other genotypes. This means that the synthetic line is well adapted to local climatic conditions. Thus, this comparison confirms the interest of this more prolific and more regular synthetic line to develop rabbit production in Algeria.

Key Words: synthetic rabbit line, local population, reproduction, adaptation, hot climate, Algeria.

INTRODUCTION

In Algeria, a local population of rabbit has long been used for family production (Gacem and Lebas, 2000). This population is well adapted to the local conditions, especially with a good aptitude to produce in hot conditions, but its adult weight and average productivity are too low (Zerrouki *et al.*, 2005). To try to promote rabbit production in the country, the authors have created a synthetic rabbit line (Syn) since 2003 with the invaluable support of the Algerian Technical Institute for Animal Production (Itelv). This line was created at the Itelv facilities in Baba Ali near Algiers with females from the local population (Loc) adapted to produce all year round in the local conditions, and males from a French INRA line, heavier and more productive (Gacem and Bolet, 2005; Gacem *et al.*, 2008).

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At the end of the 5 generations of homogenisation and before beginning the selection of this new line, it was necessary to determine its real advantages, if any, in comparison with the rabbit populations available in the country. For this reason, a comparison of productivity of the synthetic line with that of the local populations was conducted for over a year at the breeding facilities of Itelv in 2 locations: Baba Ali (near Algiers, altitude 100 m) and Lamtar (near Sidi Bel Abbes, altitude 500 m). In addition, in the Baba Ali centre, rabbits from the so-called white population (W), also commercially available in the Tizi Ouzou area, were added to the comparison. This W population is composed of albino rabbits and was described by Zerrouki *et al.* in 2007. It was issued from French commercial hybrid rabbits imported 35 yr ago and maintained in a cooperative state with occasional use of males from the Loc population and conservation only of the albino subjects for reproduction.

The main objective of this paper is to determine if the synthetic line is effectively heavier and more prolific, and is able to produce all year around.

MATERIAL AND METHODS

The experiments were conducted from November 2007 (first mating) until December 2009 (last weaning) in Baba Ali (23 mo of production) and from June 2008 (first mating) to December 2009 (last weaning) in Lamtar (16 mo of production)

The animals

Rabbits of the Syn line were issued from generation 0 of selection obtained after 5 generations of intermingling corresponding to creation of the line (Gacem *et al.*, 2008). Rabbits of the W population were purchased from the production of the Djebla cooperative (Tizi Ouzou) and rabbits of the local population were collected from family farms around the cooperative. All rabbits were raised in 2 rabbitries of ITELV:

Baba Ali: 50 does and 12 males of each of the 3 genotypes (Syn, Loc and W) were maintained in production throughout the experiment. Culled or dead breeding rabbits were replaced by rabbits of the same genotypes.

Lamtar: 30 does and 8 males of the Syn line and the same number for the Loc population were kept in production in the same conditions as in Baba Ali.

Housing and feeding conditions

In the 2 experimental sites, both sexes were housed in wire mesh cages placed in conventional breeding buildings (mechanical ventilation, pad-cooling system in summer, artificial lighting 16/24 h). Does were fed and watered *ad libitum*, but males received only 110 g of pelleted feed per day. Two buildings were used in Baba Ali and only one in Lamtar, but in all cases, the number of reproducing animals of each genotype was identical in each building. All rabbits received the same commercial pelleted feed (16.5% proteins, 10.5% crude fibre, 0.6% calcium and 0.6% of phosphorus, SARL "La production locale" Bouzaréah, Algiers).

Breeding management

Natural mating was performed only one day each week. Does were first mated when 4.5 to 5 mo old and then 10-11 d after each parturition (42 d of minimum interval between 2 consecutive fertile matings).

At the Baba Ali site, if a doe refused the mating within the 5 min following its introduction to the male's cage, it was declared non receptive, but remained in the cage with the male until the next morning. In consequence, to calculate the results for this site, the parturition proportion was calculated as the number of does that gave birth to a litter in the percentage of all does presented to a male (immediately mated or left in male's cage overnight). The classical percentage of fertility could not be calculated. On the contrary, in the Lamtar unit if a doe refused mating, it was returned to its cage and presented again to a male 1 wk later. Thus for Lamtar results, the classical percentage of fecundation (or proportion of fertile matings) was calculated as the percentage of effectively mated does; but kindling proportion was also calculated as in Baba Ali to facilitate the comparison between the 2 sites. Whatever the presentation and mating system used, rabbit does were weighed at the occasion of each presentation to a male.

In both locations, in cases of negative pregnancy diagnostic at palpation, does were mated again 14 d after the infertile mating or presentation. Does were eliminated after 3 consecutive infertile presentations or matings in the above described conditions for each site. Litter size was determined on the day of parturition (born alive and stillborn). Whole litter weight was determined for kits born alive. Average individual kit weight was calculated by division of total weight of kits born alive by their number. After birth data registration, the number of kits was limited to 9 maximum whatever the genotype, as this was the classical methodology applied for Loc population previously raised in the 2 experimental locations, as is the case in familial farms. Litters were weaned when 33-36 d old, and kits weighed individually at that time. Litter weight at weaning was obtained by addition of individual weights.

Definition of seasons

Three seasons of 4 mo each were defined according to the temperatures observed during these periods. The objective in the definition of seasons was to frame the 4 warmest months (June to September). The average temperature for each season in both locations is summarised in Table 1. For reproduction criteria until kindling, the mating season was considered. But for criteria measured at weaning, the season taken into account was that observed at the moment of the weaning.

Statistical analysis

Performance criteria were analysed by variance analysis with SAS statistical software, GLM procedure. Individual weaning weights were corrected for a standard weaning at 34 d. Proportions of receptive or kindling does were treated as Boolean 0-1 data. Data obtained in Baba Ali were analysed with the fixed effects of genotype (n=3), year (n=2), season (n=3), building (n=2) and does' parity (8 levels: 1 to 7 and more than 7) with genotype×season interaction. Data obtained in Lamtar were analysed with fixed effects of genotype (n=2), seasons (4 consecutive seasons) and does' parity (6 levels: 1, 2, 3, 4, 5, 6 and more), with interaction genotype×season. Nevertheless, only effects of genotype and seasons are presented in this paper, with the interactions between genotype and season. Results are presented as least square means±standard error.

RESULTS AND DISCUSSION

Comparison of Syn, W and Loc genotypes in Baba Ali

As previously mentioned, only effects of genotype and season are presented. The effects of raising building, year or parity were frequently significant, but a preliminary study demonstrated that interactions with genotype were never significant. This means that results were repeatable in the 2 buildings during the 2 yr of the experiment and that the effect of the doe's parity was not affected by the genotype in this study.

Doe characteristics and fertility

Females of the Syn line were significantly heavier than those of the 2 other genotypes (Table 2): +311 g and +155 g in comparison with Loc and W populations ($P<0.001$). Nevertheless, the difference between Syn and Loc genotypes in this study with contemporary observations was smaller than the 500 g reported some years ago by Gacem *et al.* (2008) for non contemporary does. This reduced difference was a consequence of a heavier weight of Loc population does in the present study than in previous ones. Indeed, in previous studies performed with this local population, the doe's adult weight was always weaker than in our study: 2680 g at 15 d. of gestation (Cherfaoui and Berchiche,

Table 1: Average minimum and maximum outdoor temperatures registered in the 2 experimental sites, during the three 4-mo seasons.

		Baba Ali		Lamtar	
Season	Month	Minimum	Maximum	Minimum	Maximum
Beginning of the year	Feb.-May	6.5°C	18.5°C	6.5°C	18.5°C
Hot season	June-Sept.	17.0°C	32.0°C	18.3°C	32.5°C
End of the year	Oct.-Jan.	6.3°C	16.5°C	5.5°C	15.3°C

Table 2: Effect of genotype and season on does mean weight (g) and fertility observed in Baba Ali. Least square means±mean standard error.

	Does weight at presentation	Acceptance % presentation	Kindlings % presentations
No. of data	3169	3169	3169
Genotype			
Synthetic	3616±13[c]	57.5±1.6	51.7±1.6
White	3461±13[b]	58.6±1.5	52.7±1.5
Local	3305±12[a]	57.1±1.4	49.1±1.5
P-value	0.0001	0.7762	0.2195
Season			
Beginning of the year	3507±12[b]	56.7±1.5	51.5±1.5
Hot	3530±12[b]	59.4±1.5	50.9±1.5
End of the year	3346±13[a]	57.1±1.6	51.3±1.6
P-value	0.0001	0.3948	0.9040
P-value Genot.×Season	0.0014	0.2854	0.3320

[a,b,c] in the same column for each controlled factor, values with different letters differ at $P<0.05$.

2012) or 2871 g after parturition (Moumen *et al.*, 2009), *vs.* 3305 g at mating in our study. This situation could be considered as a proof that in our study the local population was in good raising conditions.

The doe's weight at mating was significantly lower during the End of the year than during the 2 other seasons (Table 2). This effect was mainly observed for the W and Loc populations, but was not significant for the synthetic line (Figure 1). This implies that for its weight, the synthetic line was less affected by the season than the other 2 genotypes.

The doe's receptivity to mating and the proportion of parturitions observed for 100 presentations to a male were similar whatever the genotype (Table 2). Contrary to the evolution of the doe's weight, no significant interaction was observed between genotype and season.

In addition, it should be pointed out that the proportion of parturitions was better for does which had accepted to mate within the 5 min after presentation, i.e. 74% of fertile mating. There was no interaction between genotype and season.

On average, results of receptivity to mating were worse than those previously registered by Zerrouki *et al.* (2005) for the local population (57.7 *vs.* 74.3%), but the proportion of fertile mating was the same (74.0 and 73.1%). The difference between the 2 experiments for receptivity was most likely related to the methodology used to present a doe to a male after mating refusal: the next day in the work of Zerrouki *et al.* (2005), but only 14 d later, after a negative pregnancy diagnostic in the present study.

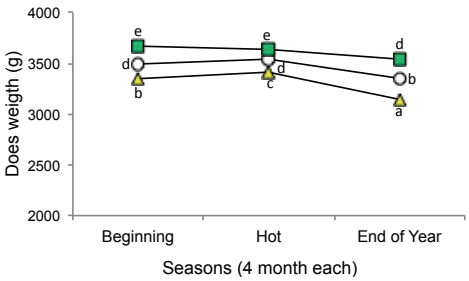

Figure 1: Effect of season on does weight at time of presentation to a male for the 3 genotypes in Baba Ali. –○– White; –□– Synthetic, –△– Local.

The absence of significant "season" effect on does' reproduction observed in the present study may be related to the summer temperature control through the pad cooling systems. Effectively a pad cooling system is able to reduce the maximum daily temperature by 4 to 7°C (Dağtekin *et al.*, 2009; Lebas, 2009), a reduction that seems able to maintain a range of temperature acceptable for rabbits inside the rearing building.

Litter size

Prolificacy of Syn does was significantly higher than that of the 2 local populations at all stages of control: +2.1 and +2.8 total born, +2.1 and +2.6 born alive, +1.0 and +1.4 weaned in comparison with W and Loc

Table 3: Effect of genotype and season on litter size observed in Baba Ali. Least square means±mean standard error.

	All kindlings			Litters with 1 kit alive at least	
	Total born	Born alive	Dead born	At Birth	At Weaning
No. of data	1613	1613	1613	1552	1419
Genotype					
Synthetic	9.55±0.12^{c}	8.57±0.14^{c}	0.98±0.09	8.76±0.13^{c}	6.85±0.10^{c}
White	7.50±0.12^{b}	6.44±0.13^{b}	1.06±0.08	6.78±0.12^{b}	5.83±0.10^{b}
Local	6.78±0.12^{a}	5.93±0.13^{a}	0.85±0.08	6.19±0.12^{a}	5.44±0.10^{a}
P-value	0.0001	0.0001	0.1553	0.0001	0.0001
Season					
Beginning of the year	8.20±0.12^{b}	7.15±0.13	1.04±0.08	7.35±0.12	6.15±0.10
Hot	7.79±0.12^{a}	6.93±0.13	0.86±0.09	7.08±0.12	5.98±0.10
End of the year	7.84±0.13^{a}	6.86±0.14	0.98±0.09	7.30±0.14	6.00±0.12
P-value	0.0281	0.2625	0.2715	0.2681	0.4350
P-value Genot.×Season	0.0824	0.1479	0.2691	0.0344	0.0289

^{a,b,c} in the same column for each controlled factor, values with different letters differ at $P<0.05$.

populations, respectively. Superiority of Syn does was smaller at weaning than at birth as a consequence of 2 additional factors: a higher mortality between birth and weaning (17 *vs.* 10-11%) and higher culling of supernumerary kits at birth for Syn litters (1.04/litter) than for W and Loc litters (0.13 and 0.23 respectively). The same rule of limitation of litter size to 9 kits after parturition was used whatever the genotype. At the end of the experiment, the authors admit that this classic rule for breeding management of Loc and W populations should have been removed from the experimental protocol, but it was too late. It should be noted that the rate of mortality between birth and weaning in W population (10%) was slightly higher but in the same range as the 7% described by Zerrouki *et al.* (2008a) for the same population raised in the Djelba cooperative some years before.

The prolificacy estimated through the total number of kits born was higher at the beginning of year than during the 2 other seasons. But for the other prolificacy criteria, the season effect was not significant even if the beginning season remained that during which the prolificacy was numerically the highest. The interaction between genotype and season was significant ($P<0.05$) for litters with at least one kit alive. This corresponds to the absence of effect of season on synthetic line for litter size, while from one season to the next for the white population this criterion tended to decrease, and to increase for the local population, (Figure 2).

Litters and kits weight

At birth and at weaning, litters of the Syn line were significantly heavier than those of the other 2 genotypes ($P<0.001$; Table 4). This is a direct consequence of the greater litter size of this genotype, as was previously demonstrated (Lebas and Sardi, 1969). Correlatively, individual weights of kits of the synthetic line were lighter than those of the kits of the 2 other populations at birth and at weaning, as is classic for rabbits in general in larger litters (Vicente *et al.,* 1995; Breuer & Clausen, 1977). As an exception to this classic relation, it may be pointed out that at birth and at weaning, kits of the W population had the same individual weight as those of the local population despite the significantly larger size of their litters (Table 3).

Individual or litter weights were heavier during End of the year season than during the hot season. Data obtained during the Beginning of the year were intermediary with or without significant difference from the 2 other seasons.

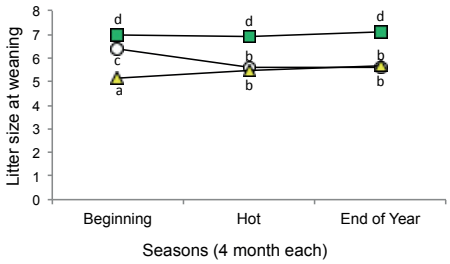

Figure 2: Effect of season on litter size at weaning of the 3 genotypes in Baba Ali. –○– White; –□– Synthetic, –△– Local.

Table 4: Effect of genotype and season on mean weight of young at birth and weaning, in Baba Ali. Least square means±mean standard error (g).

	Birth		Weaning (34 d)	
	Litter weight	Average individual weight	Litter weight	Individual weight
No. of data	1552	1552	1419	8468
Genotype				
Synthetic	452.4±6.2[c]	53.18±0.56[a]	3720±52[c]	542.8±2.4[a]
White	399.3±6.0[b]	61.02±0.54[b]	3282±51[b]	564.9±2.6[b]
Local	350.9±5.9[a]	60.02±0.53[b]	3056±51[a]	562.6±2.6[b]
P-value	0.0001	0.0001	0.0001	0.0001
Season	Mating season		Weaning season	
Beginning of the year	403.5±6.0[b]	57.35±0.54[a]	3393±55[b]	553.9±2.7[b]
Hot	382.7±6.2[a]	56.91±0.55[a]	3210±51[a]	538.5±2.5[a]
End of the year	416.3±6.7[b]	59.97±0.60[b]	3455±51[b]	577.8±2.5[c]
P-value	0.0013	0.0005	0.0020	0.0001
P-value Genot.×Season	0.0085	0.9910	0.1559	0.0001

[a,b,c] in the same column for each controlled factor, values with different letters differ at $P<0.05$.

The lower weight performance observed during the hot season without simultaneous significant variations of litter size was most likely related with a reduction of the doe's feed intake with the higher temperatures (Szendrő *et al.*, 1999). If this hypothesis is accepted, it means that the temperature reduction obtained during the hot season with the pad cooling systems was not able to eliminate completely the negative effect of temperature during the hot season on feed intake, whereas, as previously mentioned, it was able to alleviate completely the negative effect of the high temperature on prolificacy.

The interaction between genotype and season was significant ($P<0.001$) only for individual weight of kits at weaning. The explanation of this interaction was a weaning weight quite identical for the 3 genotypes during the Beginning of the year and the hot seasons, while during the following season the kits of the W population had a significantly higher weaning weight than those of the synthetic line (Figure 3).

As a partial conclusion of the experiment conducted in Baba Ali, 2 main points about the interest of the synthetic line can be retained: i) The prolificacy was the highest for the Syn line whatever the period taken in consideration. ii) The productivity and weights of the Syn line were more regular than those of the other 2 genotypes from one season to the other.

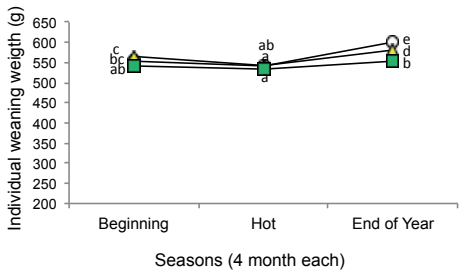

Figure 3: Effect of season on individual weight of kits at weaning for the 3 genotypes in Baba Ali. –○– White; –□– Synthetic, –△– Local.

Comparison of Syn and Loc genotypes in Lamtar

According to the 16 mo duration of the experiment, analysis of the season effect in Lamtar was performed with 4 consecutive seasons of 4 mo, i.e. a hot season 1, an End of the year season, a Beginning of the year season and a hot season 2.

Doe characteristics and fertility

In Lamtar, as observed in Baba Ali, the weight of does from the synthetic line was greater than that of the does of the local population (Table 5). But the superiority of the synthetic line was slightly greater than in Baba Ali: +419 *vs.* +311 g. The greater difference in Lamtar compared to Baba Ali was mainly a consequence of a lower liveweight of the local population females in Lamtar

Table 5: Effect of genotype and season on mean does weight (g) and fertility observed in Lamtar. Least square means±mean standard error.

	Does presented to a male			Mated does	
	Does weight	Acceptance %	Kindling rate%	Does Weight	Fecundation %
No. of data	501	501	501	334	334
Genotype					
Synthetic	3592±25	68.8±3.0	63.4±3.1	3640±36	92.0±2.7
Local	3173±26	64.3±3.1	51.1±3.2	3154±32	79.4±3.0
P-value	0.0001	0.298	0.0070	0.0001	0.0019
Season					
Hot 1	3355±36^{a}	82.0 ±3.8^{c}	70.1±4.6^{b}	3353±37^{a}	85.4±3.1
End of the year	3292±31^{a}	55.8±3.7^{a}	46.8±3.9^{a}	3349±44^{a}	83.8±3.7
Beginning of the year	3322±36^{a}	61.4±4.3^{ab}	52.9±4.6^{a}	3336±49^{a}	86.2±4.1
Hot 2	3561±44^{b}	66.9±5.2^{b}	59.3±5.5^{ab}	3548±57^{b}	87.4±4.8
P-value	0.0001	0.0001	0.0004	0.0162	0.9420
P-value Genot.×Season	0.0137	0.4163	0.3100	0.1871	0.8418

^{a,b,c} in the same column values with different letters differ at $P<0.05$.

than in Baba Ali: 3173 *vs.* 3305 g, while Syn line females had a similar liveweight in both locations: 3592 and 3616 g in the same order. It should also be pointed out that for both genotypes the average weight of does effectively mated was similar to that of the whole group of does presented to a male.

As in Baba Ali, the percentage of females accepting to mate when they were presented to a male was not significantly different between the 2 genotypes. On the contrary, the proportion of mated females from the synthetic line giving birth to a litter was significantly higher than the similar proportion for the local population. This resulted in a significantly higher proportion of Syn females presented to a male which effectively kindled, when compared to females of the local population: 63.4 *vs.* 51.1%. This significant superiority of the synthetic line was not observed in Baba Ali.

The season effect was significant for the doe's weight as for the acceptation of mating. In fact the second hot season resulted in heavier weight than the 3 other seasons, but was not associated with the best global fertility results (kindling percentage). The significant interaction between season and genotype for the females' weight at presentation (P=0.014) corresponded to a decrease of the Syn females' weight during the first 3 seasons, then followed by an increase during the last hot season. In the meantime, the weight of the local population females had regularly increased from one season to the other (Figure 4).

The proportion of mating acceptation was the best during the first hot season, but proportion of fertilisation after mating was not significantly affected by season. As a consequence, the kindling rate (proportion of does giving birth to a litter/all does presented to a male) was better during the first hot season than during the 2 consecutive cooler seasons: 70.1 *vs.* 46.8 and 52.9%. These effects were observed for both genotypes, since the interaction was not significant.

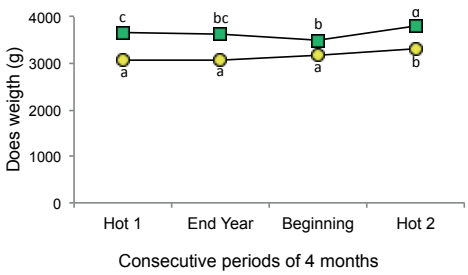

Figure 4: Effect of season on does weight at time of presentation to a male for the 2 genotypes in Lamtar. —○— Local; —□— Synthetic.

Litter size

As observed in Baba Ali, in the Lamtar conditions prolificacy of the Syn line was greater at birth and at weaning when compared to that the local population. This numerical advantage was similar in the 2 experimental locations. In Lamtar, the numerical advantage was also reduced at weaning when compared to the advantage at birth +1.46 kits weaned per litter *vs.* +2.12 born alive per litter. The explanations for this situation in Lamtar

Table 6: Effect of genotype and season on litter size observed in Lamtar. Least square means±mean standard error.

	All kindlings			Litters with 1 kit alive at least	
	Total born	Born alive	Dead born	At Birth	At Weaning
N° of data	275	275	275	250	193
Genotype					
Synthetic	8.95±0.25	7.49±0.28	1.46±0.19	8.02±0.24	6.61±0.32
Local	6.36±0.31	5.31±0.36	1.05±0.24	5.90±0.30	5.15±0.25
P-value	0.0001	0.0001	1520	0.0001	0.0001
Season					
Hot 1	7.46±0.38^{ab}	5.64±0.44	1.82 ±0.29^{b}	6.45±0.37^{a}	5.47±0.24
End of the year	8.51±0.38^{b}	6.46±0.44	2.05±0.29^{b}	7.12±0.37^{ab}	5.60±0.33
Beginning of the year	7.81±0.40^{ab}	7.08±0.46	0.73±0.30^{a}	7.78±0.40^{b}	6.50±0.30
Hot 2	6.84±0.47^{a}	6.41±0.54	0.43±0.36^{a}	6.47±0.45^{a}	5.95±0.33
P-value	0.0499	0.1005	0.0004	0.0349	0.0700
P-value Genot.×Season	0.4154	0.8717	0.5026	0.6945	0.1305

^{a,b} in the same column values with different letters differ at $P<0.05$.

were the same as in Baba Ali: cumulative effect of litter size limitation at birth (maximum 9 live kits/litter) and higher birth to weaning mortality in the Syn line than in the local population.

Contrary to the observation made in Baba Ali, prolificacy was significantly affected by the season for the number of total and stillborn kits or for the size of litters with at least one kit born alive. The best season was the end of the year (October to January period) for the total number of kits per litter, but the beginning of the year (February to May) was the best season for litter size in litters with at least one kit born alive. However, there were no differences between the 2 genotypes, as the interactions were not significant. At weaning, the prolificacy advantage of the beginning of the year season was only a tendency: P=0.0700.

Litters and kits weight

As in Baba Ali, the litter weight at birth was greater for the Syn Line than for the local population, mainly in relation to the greater litter size (Table 7). But contrary to the observation made in the other experimental location, in Lamtar the average individual weight of kits born alive was also heavier for the Syn line than for the Loc population (P=0.05), despite a greater number of young per litter. Average kits' birth weights were similar for the Syn line in Lamtar and

Table 7: Effect of genotype and season on mean weight of young at birth and weaning in Lamtar. Least square means±mean standard error (g).

	Birth		Weaning (34 d)	
	Litter weight	Average individual weight	Litter weight	Individual weight
No. of data	250	250	193	1837
Genotype				
Synthetic	395±12	50.6±0.9	3599±121	560.6±5.4
Local	285±15	48.1±1.1	3234±155	620.8±7.7
P-value	0.0001	0.0546	0.0374	0.0001
Season	Mating season		Weaning season	
Hot 1	310±19^{a}	47.9±1.4^{ab}	2855±208^{a}	526.1±10.4^{a}
End-of -the-year	322±19^{a}	45.1±1.4^{a}	2710±210^{a}	511.8±10.3^{a}
Beginning of the year	380±19^{b}	49.6±1.4^{b}	3826±181^{b}	617.8±8.0^{b}
Hot 2	348±21^{ab}	54.9±1.6^{c}	4273±203^{c}	707.1±9.6^{c}
P-value	0.0177	0.0001	0.0001	0.0001
P-value Genot.×Season	0.8830	0.1555	0.1386	0.0007

^{a,b,c} in the same column values with different letters differ at $P<0.05$.

Baba Ali: 50.6 and 53.2 g/kit. But without an available explanation for the local population, the average weight of kits was clearly lighter in Lamtar than in Baba Ali: 48.1 *vs.* 60.2 g/kit (–20%). Nevertheless, the (unknown) origin of the lower kits' weight may be the same as that which had reduced the mother does' weight previously underlined for the local population

At weaning, in Lamtar as was observed in Baba Ali, litters from Syn line were heavier (P=0.037) and the individual weight was lighter (–10%; P<0.001) compared with the local population.

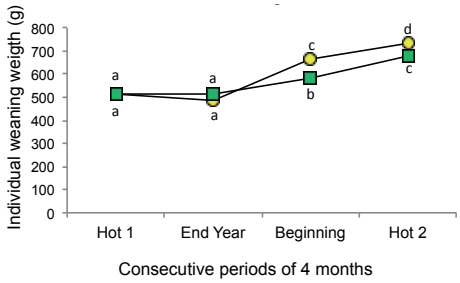

Figure 5: Effect of season on individual weight of kits at weaning for the 2 genotypes in Lamtar. –○– Local; –■– Synthetic.

The kits or litter weights were systematically heavier during the 2 last studied seasons than during the 2 first ones (Table 7). At birth or for litter weight at weaning there was no significant interaction between season and genotype. However, for the individual weight of kits at weaning the interaction was highly significant (P<0.001, Figure 5). The weaning weight of kits was similar for the 2 genotypes during the first 2 seasons, but it was heavier for the local population compared to Syn line during the other 2 seasons. In consequence, the range of variation of the individual weight of kits at weaning was more homogenous, compared to that of the Loc population.

CONCLUSION

These 2 experiments confirmed the interest of the synthetic line for rabbit production in Algeria. The target of the creation of a new rabbit line able to breed all year long in Algeria and to be more productive than the populations locally available was clearly reached. In addition, the synthetic line demonstrated a more regular productivity from one season to the other than the 2 other genotypes. Thus selection and diffusion of the Syn line could now be recommended.

In the Lamtar conditions, the parturition percentage was better than in Baba Ali for the synthetic line but not for the local population. This demonstrates that some improvement of different criteria is possible by control of the environment. It is not certain that the synthetic line had expressed all its possibilities due to non optimum experimental and environmental conditions. For example, in both situations the number of kits left to the mother after birth was reduced artificially. In the future, it could be interesting to increase the acceptable litter size above which the supernumerary kits should be culled or adopted by another doe. Nevertheless, an improvement in results could be expected only if the general environment of rabbit does and kits could also be improved. One of the first improvements could be sought in the use of better balanced pellet feeds without calcium or fibre deficiency, as was observed in the commercial diet available during this study (Zerrouki *et al.*, 2008b).

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