EVALUATION OF SOME PRODUCTION PARAMETERS IN RABBIT. COMPARATIVE STUDY OF LOCAL MOROCCAN RABBIT AND CALIFORNIAN BREED IN PURE AND CROSS BREEDING

JAOUZI T. [1] **, BARKOK A.** [2] **,BOUZEKRAOUI A.** [3] **ET BOUYMAJJANE Z.** [1]

1: Département de Pathologie Aviaire I.A.V. Hassan II
BP 6230 Rabat-Instituts, 10101 Rabat Maroc
t.jaouzi@iav.ac.ma
2 : Station Avicole de Skikima, Témara
3 : Institut Technique Agricole de Ben Khlil Khénifra

ABSTRACT

The present study was intended to evaluate production performances of local population of rabbit and Californian breed, both in pure and cross-breeding in Moroccan conditions. The breeding experiments studied were: *Local male x local does (group 1). *Californian male x local does (group 2). *Californian male x Californian does (group 3). *Local male x Californian does (group 4). Data reported here showed a positive improvement of performances of local rabbit population such as litter size at birth (6.2), number born alive (5.7), litter size at weaning (5.2), daily weight gain (33.6 g/day), live weight at slaughter (2117.5 grs), feed efficiency index (2.16) and a decrease in mortality rate from birth through slaughter (- 13.56%), when bred with Californian male rabbit. These findings support the benefit use of exotic breed with local rabbit female to better improve performances.

Key words: local, rabbit Californian, breed-cross, breeding-Zoo, technical performances, growth, efficiency index.

INTRODUCTION

The world rabbit meat production is estimated to 1.8 million tons of carcasses LEBAS F. 2003. This production still however limited to some countries such as Italy, France, Spain, Ukraine and China. Beside that, it represents a non negligible part of some developing countries economy (Nigeria, Egypt, Ghana and Morocco).

Rabbit breeding can provide proteins of animal origin in developing countries. One female rabbit may produce as many as 2900 to 3000 % of its own live weight per year (FAO 2001). It is well known that rabbit can supply population with meat of high level protein content (21.3%), less fat content (6.8%) and cholesterol (45 mg/kg), DALL ZOTTE A. 2000.

In Morocco, meat production is estimated to 20.000 tons per year (BARKOK 1992), which still below the real potentialities of the country. Per capita consumption remain very low

(0,779 kg/hat, Collin and al. 1996), because 98.5 % of Moroccan rabbiteries are of traditional types (unpublished data), this situation make the estimation of rabbit meat consumption to its real value, difficult to determine.

Morocco seems to produce more rabbit meat than in Maghreb countries, and is ranking 15th among country producing rabbit meat in the world. The estimated production reported (LEBAS 1997) are to be confirmed by more accurate field investigations (unpublished data).

Morocco small scale rabbit farmers began to show more interest on the use of cross breeding of local rabbit with pure breed with high genetic potential in order to improve the production parameters of the local stock of rabbit. The pure breed (Californian and New -zeland white) for such purpose are purchased from government rabbit stations and rational farms. However, the pure breeds some times cannot express their genetic potential, unless they are grown in comfortable environmental conditions. Such farming practices still out of reach in Moroccan rabbit units. It is then advised to adapt genetic stock to our conditions. Some rabbit populations of morocco show good adaptation, resistance and efficient production potential, but their real performances are to be studied and investigated.

The main objective of the present study is to evaluate zoo technical performances of Moroccan rabbit population “Zemmouri” in pure and cross breeding with Californian breed. The parameters to be studied are litter size, growth performances, live weight at slaughter, mortality rate and feed conversion efficiency.

MATERIAL AND METHODS

The experiment was carried out in Rabat region at Skikima Poultry Station facilities from October 1996 through June 1997. A total of 96 females and 16 males rabbit were used (half local rabbit and half Californian rabbit breed). The improved Californian breed came from government station, and the locale “Zemmouri” rabbit population was purchased from rural markets of Rabat area. Experimental animals (local population) were adapted to wire cages and rabbit commercial feed over a year period before the study began. Experimental rabbit breeders and fattening rabbits were housed respectively in two breeding and one fattening houses provided with isolated roofs, and static ventilation.

Experimental rabbits were subdivided in four groups of 24 females and 4 males each. The experimental design was as follows:

Group 1 Local male x local female
Group 2 Californian male x local female
Group 3 Californian male x Californian female
Group 4 Local male x Californian female

All groups were fed pelleted feed (Table 1). Fresh and clean water was supplied continuously, and 16 hours per day photoperiod was provided for breeding rabbits throughout the experimental period. Experimental animal were fed according to their

physiological state. The feed was distributed for breeding animals once a day (at 10 a.m. in the morning), and given *ad libitum* for fattening animals. For either breeders or growing rabbits, feed is weighed before distribution.

Table 1. Chemical composition of experimental feed * (mixte)

Components of feed	Chemical composition (%)
Metabolised energy	2170 kcal/kg
Proteins	15,3
Crud fiber	13
Calcium	0,9
Total phosphorus	0,7
Sodium	0,25
Méthionin + Cystin	0,54
Lysin	0,3
Arginin	0,81
Tryptophan	0,18
Histidin	0,36
Leucin	1
Anticoccidisis (ppm)	Robénidin (66 ppm)

*** "Mixte" :** The same feed is given for both breeders and growing rabbit.

All animals were vaccinated against enterotoxemia (enterovac 1ml/animal subcutaneously and boosted three weeks later), viral hemorrhagic disease (0.5 ml/animal subcutaneously and boosted 5 weeks later). Preventive measures were taken for scrabies (0.02 mg/kg live weight of Doramectin).

For breeding purpose, a semi intensive mating rhythm of reproduction was adopted, and the diagnostic of pregnancy done 10 to 12 days post mating. Before kindling, nest boxes were provided with cotton, wood shavings or straw materiel in order to prevent early mortality of kids. After weaning (28 days post kindling), and during the fattening period, all rabbits were given weighed feed *ad libitum* and the growth control carried out at weekly interval. Each breeding and fattening cage is provided with individual sheet, where the whole information and data collected are recorded.

For the analysis of data, we used Excel, statistical analysis system (SAS) and ANOVA1. Student Newman-Keuls test was used in the mean comparison at 5% probability level.

RESULTS AND DISCUSSION

1- Zoo technical parameters

Table 2. Overall zoo technical parameters obtained for local rabbit population and Californian breed in pure and cross breeding experiment

Zoo technical parameters	Local x local (G 1)	California n x local (G 2)	California n x californian (G 3)	Local x californian (G 4)
Litter size at birth	6 a*	6.2 b	8.9 b	9.5 b
Born alive/litter	4,75	5.7	8.5	8.9
Dead born/litter	1.25	0.5	0.4	0.6
Mean live weight at birth (gr)	75.37 a	88.41 a	99.22 a	91.31 a
Mean live weight at 21 days (gr)	323.83 a	332.82 a	366.33 a	354.62 a
Mean live weight at weaning (gr)	454.4 a	571.09 a	527.92 a	538.9 a
Mortality birth weaning	0.5	0.5	1.7	0.8
Litter size at weaning	4.25 a	5.2 b	6.8 b	8.1 b
Litter size at slaughter (77 days)	3.9	4.8	6.5	7.7
Mean live weight at slaughter in gr (77 days)	1757.7 a	2117.5 b	2257.8 b	2211.1 b
Mortality rate (%)				
• Birth – weaning	29.16	16.13	23.6	14.74
• Weaning – slaughter	8.23	7.7	4.41	4.94
Feed conversion Index Weaning slaughter (77 days)	2.91	2.16	2.06	2.09
Average daily weight gain (weaning slaughter (gr)	24.5 a	33.6 b	35.1 b	33.9 b
Number of litters	**26**	**28**	**22**	**16**

*** Numbers with different indices (a , b) are significantly different**

Regarding the results shown in table 2, we must mention that only litters with completed fattening period were included in the study. The lowest number of litters in group 4 (16 only) resulted from the mating problems of some Californian females with local male rabbit due to the body size difference between the two breeds (lower body size in the male local rabbit). It is clear from table, that the litter size at birth is significantly different when comparing group 1 with the other groups (2, 3 and 4). When we consider the improvement of local “Zemmouri” rabbit population (G 2) with exotic Californian pure breed we must point out the beneficial effect on some parameters such as litter size at weaning (28 days), litter size at slaughter (77 days), the mean live weight at slaughter, mortality rate from birth through weaning and from weaning through slaughter. In addition, the feed efficiency index and the daily weight gain (+ 30% between G 1 and G 2) were better in groups 2, 3 and 4.

In both group 1 and 2, the results concerning litter size at birth were lower than those reported by KENNOU and LEBAS 1990 when they studied reproductive parameters in Tunisian local rabbit population. The reduction of litter size in the present study may be due to the fact that the local females used were randomly chosen, and considered as a local population which has never been submitted to any selection. Added to that, the post kindling mating applied to the females with less than 6 kids at birth may have contributed to litter size reduction at birth (MATHERON 1980, KENNOU and LEBAS 1990).

The data analysis for Litter size at birth, litter size at weaning, the mean live weight at slaughter and daily weight gain from weaning through slaughter, showed highly significant difference between group 1, group 2 and the two other remaining groups (3 and 4). The use of exotic pure breed did show a positive increase (20.45%) in the body weight at slaughter, compared with only 6.62% increase of body weight when comparing groups 3 and 4. These findings support greatly the benefit of using exotic pure breed for improvement purpose of local rabbit population performances which indicates either hybrid vigour, and increased growth potential of the cross breed. However, we obtained a high mortality rate from birth to weaning (29.16%) for local x local cross, which could be a result of low milk production and/or female careless behaviour.

2- Body weight parameters at different ages (birth – weaning)

Table 3. Individual live weight of kids (Birth- weaning).

	Local x locale (G 1)	Californian X locale (G 2)	Californian X Californian (G 3)	Local x Californian (G 4)
Mean weight at birth (gr)	75.37 a*	88.41a	92.22 a	91.31a
SD	7.28	3.00	3.08	3.79
CV (%)	9.66	4.52	3.32	4.16
Mean weight at 21 day (gr)	323.83 a	332.82 a	366.33 a	354.62 a
SD	22.85	5.94	7.25	5.24
CV (%)	7.06	1.79	1.98	1.48
Mean weight at 28 day (gr)	**454.4 a**	**571.09 a**	**527.92 a**	**538.90 a**
SD	8.23	7.09	5.37	8.09
CV (%)	1.81	1.24	1.02	1.50

*** Numbers with same indices are not significantly different.**

The individual mean weight of kids at birth, at 21 days and 28 days for all crosses are shown in Table 3. The variance analysis did not show any significant difference between the different crosses when comparing live weights at these ages (birth, 21 day and 28 day). The lack of significant difference in live individual weight between crosses at 21 days suggests the effect of the litter size at birth. In fact, the litter size at birth is higher for Californian in pure and cross breeding than in local pure and cross breeding. These

findings confirm, on one hand, the maternal capacities of pure breeds to milk greater number of kids, which is supported by the low mortality rate observed, and on the other hand, the low litter size in pure local rabbit population, may have contributed to relatively good growth rate. The live weight at weaning depends greatly from that at 21 days (pic milk production). And the lack of significant difference in live weight at 21 days between groups confirms that between them at weaning (28 days). An increase of the benefit of cross breeding (+ 17% in group 2) was recorded.

3- Daily weight gain

Table 4. Mean daily weight gain (weaning – slaughter)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Mean
L x L (G1)	18.58 b	17.81 b	21.39 b	26.09 b	30.23 b	22.29 b	35.00 b	24.48 b
L x C (G2)	33.22 a	31.04 a	26.80 b	37.40 a	36.02 a	32.94 a	41.90 a	35.59 a
C x C (G3)	22.35 a	39.26 a	35.57 a	39.13 a	36.70 a	35.16 a	37.38 a	35.08 a
L x C (G4)	-	38.28 a	24.46 b	37.12 a	31.86 a	27.22 a	38.59 a	33.88 a
Mean	24.72	31.85	27.06	34.94	33.70	29.40	38.22	31.76
SD	7.6	10.13	6.09	5.96	3.15	5.80	2.87	4.89
CV (%)	30.75	31.81	22.52	17.07	9.35	1974	7.52	15.41

*** For the same age, numbers with different letters are significantly different.**

The analysis of variance and the mean comparison (Table 4) revealed a significant difference between the daily weight gain (DWG) of local population in pure breeding (group 1) and other crosses (groups 2, 3 and 4) during the fattening period (7 weeks). The exceptional drop in daily weight gain at three weeks post fattening seems to be due to elevated ambient temperature at that time, for which only the group 1 (local x local cross) has showed resistance when compared with other crosses. This finding point out the possible adaptation of local population to the local conditions than any other exotic breed. Our findings reported here are in accordance with those found by BEN HAMMOUDA and KENNOU 1990, and those reported by BARKOK in 1992 for the Californian breed at Skikima Poultry Station in Morocco. The cross breeding of the Californian male and the local female rabbit has increased the daily weight gain with 37.2% in the offspring.

4- Feed efficiency index:

This parameter was studied from weaning (28 days) through slaughter (77 days).

The results shown in Table 5 are in accordance with those reported by BEN HAMMOUDA and KENNOU. 1990. The analysis of variance showed that the feed efficiency index depends significantly from the genotype considered, this suggests that cross breeding offspring's seems to improve better the feed efficiency index.

Table 5. Feed efficiency index (weaning – slaughter).

Breeding	Local x locale (G 1)	Californian x locale (G 2)	Californian x Californian (G 3)	Local x Californian (G 4)
F.E.I. (mean)	2.91 b*	2.16 a	2.09 a	2.06 a
Range	2.2 – 3.28	1.8 – 2.3	2.7 – 2.36	1.76 – 2.3

*** Numbers with the same letter are not significantly different.**

CONCLUSION

This first contribution to study Moroccan local population of rabbit "Zemmouri", showed encouraging results concerning improvement of zoo technical parameters when cross bred with pure Californian male rabbit, and the easy adaptation of local rabbit to either wire cages and rabbit commercial feed. - The performances of local population of rabbit are relatively limited even when the rabbit unit is managed with more care and the nutritive requirements of the diet were met. However, the results performances obtained are more greater when compared with those obtained in traditional rabbit farming.
Pure Californian male breed has improved significantly all the parameters studied, such as litter size at birth, litter size at weaning. The number of kids born alive depends significantly of the genetic type used.
The growth rate (daily weight gain) improvement (+ 37.22%), indicates either hybrid vigour, and increased growth potential of the cross bred. A 20.45% increase in body weight at slaughter was evident when local female was cross bred by the Californian male, and a 36.27% decrease in mortality rate, which can have a positive effect on litter size at slaughter.
- The feed efficiency index has improved greatly in cross breeding offspring (2.91 against 2.16).
- The improvement of local rabbit populations is made possible, when the male breed used can help increase production parameters together with the good adaptation capabilities to local environmental conditions.

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REFERENCES

BARKOK A., 1992**:** Quelques aspects de l'élevage du lapin au Maroc. Options Méditerranéennes. Série séminaires, 17, 19-22.

BEN HAMMOUDA M., KENNOU S., 1990 **:** Croisement de lapins locaux avec la souche Hyla : Résultats des performances de reproduction et de croissance en première génération. Options Méditerranéennes. Série séminaires N° 8, 103-108.

COLLIN M., EBAS F. 1996 : Rabbit meat production in the world. A proposal for every country. 6th World Rabbit Congress. Toulouse 1996, vol. 3, 323-330.

DALLE ZOTTE A. , 2000 **:** Propriétés spécifiques de la viande de lapin. Jornadas internacionales de cunicultura.

FAO, 2001**:** Communiqué de presse (PR 01/57 f). La FAO reconnaît le rôle important et croissant de la cuniculture. La production de lapin dépasse le million de tonnes. L'élevage du lapin procure aliments et revenus.

KENNOU S., 1990 : Etude de la prolificité et de ses composantes des lapines locales tunisiennes. Options Méditérranéennes. Série séminaires N° 8, 97-101.

KENNOU S.,LEBAS F. 1990 : Résultats de reproduction des lapines locales tunisiennes élevées en colonies au sol. Options Méditerranéennes. Série séminaires, N° 8, 26-93.

LEBAS F., 1997: Sistemas de producción de carne se conejo. CIHEAM, IAMZ, Zaragoza, España 13-24 de Enero 1997.

LEBAS F., 2003 **:** Sistemas de producción de carne de conejos. CIHEAM, IAMZ, Zragoza España 13 – 24 de Enero 2003.

MATHERON **G. 1980** : Etude comparative à priori de deux rythmes de reproduction chez le lapin. 2ème Congrès Mondial de Cuniculture. Barcelone, Avril.