UTILIZATION OF HOME MADE DIETS. EFFECTS ON GROWTH PERFORMANCE AND SLAUGHTER YIELD OF ALGERIAN LOCAL RABBITS

BERCHICHE M.[1], LEBAS F.[2], LAKABI D.[1]

[1] Institut d'Agronomie, Université de TIZI-OUZOU, Algérie
[2] INRA, Station de Recherches Cunicoles, BP 27, 31326 CASTANET TOLOSAN Cedex, France

Abstract - The growth and slaughter performance of Algerian local rabbits were studied when fed *ad libitum* with home made or commercial pelleted diets. The 3 diets studied were not pelleted and without any minerals or vitamins addition. The composition was in percentage of the total: diet 1 : barley 30, horse-beans grains 30, wheat bran 40; diet 2 : barley 30, horse-bean grains 20, brewer's grains 10, wheat bran 40; diet 3 : barley 30, horse-bean grains 10, brewer's grain 10 and sulla hay 50. Diets 1 and 2 were studied in trial 1; diet 3 and commercial pellets + straw were studied in trial 2. For each diet, 30 rabbits local population (3 kg adult) 5 weeks old were caged by 3, and fattened 10 weeks (trial 1) or 9 weeks (trial 2).
Diets 1 and 2 induced an average growth rate of 14.8 g/day and a feed conversion ratio of 3.64. Performance were a little bit better with diet 2. In trial 2, the average growth rate was 20.9 g/day, not different from diet 3 to the commercial pelleted diet. Feed intake was higher with diet 3 (81.6 *vs* 72.3 g/ rabbit & /day). Slaughter yield at 14 weeks of age was significantly lower with diet 3 than with commercial pellets (67.2 *vs* 69.8%, hot carcass) due to heavier skin and full digestive tract.

INTRODUCTION

In Algeria, traditional rabbit raising is growing up, situation in opposition to modern rabbit raising which is declining (BERCHICHE and LEBAS, 1994). This new development of traditional rabbit raising is effective in rural areas and is a consequence of the present economical situation. The general aim of this study was to estimate the potential of this type of production as source of protein and financial income for small farmers. The first part of this study was devoted to the evaluation of feed resources because of the great importance of feeding practices from a technical and an economical point of view.

Two consecutive studies were conducted to compare a total of 4 feed compositions : 3 home made non pelleted diets and one commercial pelleted diet. The formulation of the 3 home made diets was made with potentially available feed ingredients mixed to approach as near as possible the nutrients recommendations (LEBAS, 1992). The main ingredients employed were wheat bran, barley grains, brewer's grains, horse-bean, and sulla hay (*Hedysarum coronarium*). The results are presented thereafter.

MATERIAL AND METHODS

The 2 experiments were conducted in the experimental rabbitry of the University of Tizi-Ouzou (Algeria) from January to April 1995 (trial 1), and from June to August 1995 (trial 2).

Experimental diets

The 3 home made diets were formulated with local products (horse bean, barley and sulla hay) and by-products (wheat bran, brewer's grains). The composition of the 3 diets named "Horse-bean diet", "Brewer's grains diet" and "Sulla diet" is described on table 1.
Before utilization, wheat bran was moistened, rolled and dried. The sulla forage was the first cut of the year and was sun dried in the University Campus. The brewer's grains were also sun dried in the University. Horse-bean grains were crushed and the barley grains were employed without treatment.
The 2 first diets "Horse-bean diet" and "Brewer's grains diet" (table 1) were employed in the first experiment and distributed together with straw: the concentrate in a feeder and the straw in a separate rack. In the second

experiment, the third home made diet "Sulla diet" was compared to a commercial pelleted low fibre diet (BERCHICHE and LEBAS, 1990). As for the first experiment, the concentrate was distributed in a feeder and the forage in a rack: sulla hay for the "Sulla diet" and straw for the pelleted diet. All feeds were offered *ad libitum*.

Table 1 : Composition of the 4 experimental diets

DIETS	Horse-bean Diet	Brewer's grains Diet	Sulla Diet	Commercial Pellets
***Ingredients* (%)**				
- Brewer's grains	-	10	10	-
- Horse-bean grains	30	20	10	-
- Soya meal	-	-	-	10
- Barley grains	30	30	30	-
- Maize grains	-	-	-	31
- Wheat bran	40	40	-	51.5
- Remilling	-	-	-	5
- Sulla hay	-	-	50	-
- Mineral & Vitamins	-	-	-	2.5
Chemical composition (% as fed)				
- Dry matter	88.4	88.0	90.5	89.0
- Crude protein	17.2	16.8	17.6	16.1
- Crude fibre	8.9	9.8	15.9	4.7
- Minerals	3.4	3.4	6.0	7.0
- Lipids	2.1	2.4	2.6	2.4

Animals

All the rabbits employed were purchased at weaning from local breeders of Tizi-Ouzou area.
For each of the 2 successive trials, 60 rabbits were separated in 2 x 10 homogenous blocks of 3 rabbits in relation with litters of birth and live weight. Average age was 35 days at the beginning of the experiments. Rabbits of the same block were placed in 2 contiguous small boxes about one square meter with concrete floor, reproducing local conditions of raising. The feeders, racks and watering troughs were fixed on the box's doors.

Parameters measured

Trial 1 length was 15 weeks and trial 2 length was 14 weeks. In the first trial, the feed intake was controlled every day because of big wasting problems. The control of straw intake was not possible because of the dispersion of the wasted straw on the box's floor. In the second trial, feed intake was measured every week.
During the 2 trials, individual live weight of rabbits was measured every week. At the end of the second trial some representative rabbits were slaughtered in controlled conditions: 19 in each group. The weights measured were slaughter live weight, skin, full digestive tract and hot carcass.

Statistical analysis

The data were analysed with a factorial variance analysis performed with the SAS package GLM (SAS, 1987) in the INRA Centre of Toulouse. For growth performance the initial live weight was employed as covariate and the final live weight for the slaughter data as well. The controlled factors were diets and blocks.

RESULTS AND DISCUSSION

Composition of experimental diets

The nitrogen content of the 4 experimental diets was in the same range: 16.1 to 17.6%. As it is well known (BERCHICHE and LEBAS, 1990), the commercial pelleted diet had a very low fibre level: less than 5%; the fibre level of the "Sulla diet", 15.9%, was within the values recommended for growing rabbits (LEBAS, 1992). The fibre level of the 2 diets of the 1rst trial was intermediary, but the straw eaten by the rabbits was not included in the calculation of the total fibre brought in.

Daily weight gain and feed intake

The whole fattening period was separated in 2 parts: the first 6 weeks (5 to 11th weeks of age) and the remaining part : 4 weeks in trail 1, and 3 weeks in trial 2. This separation was made to make possible a comparison with other published data with slaughter of the animals at 11 weeks. The total duration of the trials was established to reach an acceptable slaughter weight representing more than 50% of the adults weight of the local population rabbits (i.e. 3 kg)

First trial - During the whole experiment 2 rabbits died in each experimental group, at the beginning of the experiment.
The average daily growth rate was moderate: 14.8 g/day on the whole period. It was significantly better with the "Brewer's grains diet" than with the "Horse-bean diet" (table 2). The advantage of the "Brewer's grains diet" was observed since the first experimental period and maintained during the second.
The daily feed intake was not significantly different between the 2 experimental groups, and the same for the feed conversion ratio (based on concentrate intake only). The low level of intake (52.9 g/day, i.e. 53 g/ kg live weight) may be related to some imbalance within the nutrients. The energy content or protein level and quality are probably not responsible because the values are not fare from the recommendations (LEBAS, 1992). On the contrary the calcium content seems very low (0.10 to 0.12% as fed) and no salt (NaCl) was added to the diets.
The great proportion of wasting (25% with the "Horse-bean diet" and 17% on average with the "Brewer's grains diet") was also a sign that something was wrong in the diets quality. Sometimes during the experiment, drying of wheat bran was not sufficient and may have induced the development of some mould. This can explain an high level of wasting at this moment but not during the whole experiment.

Table 2 : Growth performance of the rabbits during the first trial.

	DIETS		Residual coef. of variation (%)	Statistical probability P
	Horse-bean	**Brewer's grains**		
First period (5 - 11 weeks)				
- Weight at 5 weeks (g)	**477**	**493**	27.4	ns
- Daily gain 5-11 (g/d)	**15.7**	**16.9**	14.7	0.076
- Feed intake 5-11 (g/d)	**46.0**	**47.7**	6.8	ns
- Feed Convers. ratio	**2.96**	**2.95**	6.4	ns
Second period (11 - 15 weeks)				
- Weight at 11 weeks (g)	**1138**	**1203**	8.6	0.020
- Daily gain 11-15 (g/d)	**11.8**	**13.5**	34.4	0.151
- Feed intake 11-15 (g/d)	**60.3**	**63.5**	9.8	ns
- Feed Convers. ratio	**6.15**	**5.11**	50.8	ns
Whole period (5 - 15 weeks)				
- Weight at 15 weeks (g)	**1467**	**1580**	9.6	0.015
- Daily gain 5-15 (g/d)	**14.1**	**15.5**	15.9	0.034
- Feed intake 5-15 (g/d)	**51.7**	**54.0**	6.6	ns
- Feed Convers. ratio	**3.71**	**3.57**	11.4	ns

ns : $P > 0.20$

Second trial - As during the first trial, during the whole experiment 2 rabbits died in each experimental group. Rabbit's live weight was not significantly different between the experimental diets (table 3). The average growth rate was greater than in the previous trial : 20.9 *vs* 14.8 g/day.
The feed intake (concentrate + forage) was significantly greater with the "Sulla diet" than with the commercial pellets. The proportion of sulla hay in the total feed intake was 44.2% on average : 44.9% during the first period and 43.7% during the second. During the same time, the straw intake represent about 15% of the total daily intake.
It may be noticed also that the daily intake per kg body weight was greater with the "Sulla diet" (66 g/kg live weight) than with the 2 other diets studied in the first trial (53 g/kg live weight). The protein or energy balance were not better in the "Sulla diet" than in the 2 previous home made diets and no NaCl was added. On the contrary the calcium content of the sulla hay (about 1.1% ; GÖHL, 1981) was clearly higher than of the other ingredients; accordingly, the calculated content of the "Sulla diet" was about 0.7% calcium and 0.3% phosphorus, values which are near of the recommendations for growing rabbits (LEBAS, 1992). The idea that the "Sulla diet" nutrients balance was close to the rabbits requirements is also supported by very small difference in feed intake observed with this diet and that observed with the same type of rabbits fed a pelleted balanced diet (BERCHICHE *et al.*, 1996).
Because of greater feed intake of the "Sulla diet" rabbits, and similar growth rate, the feed conversion ratio was higher with the "Sulla diet" than with the commercial pellets + straw. The differences are significant on the whole period and during the last experimental period (table 3).

Table 3 : Growth performance of the rabbits during the second trial

	DIETS		Residual coef. of variation (%)	Statistical probability P
	Commerc. Pellets + straw	**Sulla**		
First period (5 - 11 weeks)				
- Weight at 5 weeks (g)	**428**	**429**	24.2	ns
- Daily gain 5-11 (g/d)	**21.9**	**22.9**	17.1	ns
- Feed intake 5-11 (g/d)	**68.7**	**74.5**	8.9	0.078
- Feed Convers. ratio	**3.16**	**3.33**	18.4	ns
Second period (11 - 14 weeks)				
- Weight at 11 weeks (g)	**1438**	**1391**	11.7	ns
- Daily gain 11-14 (g/d)	**19.0**	**16.7**	35.0	0.177
- Feed intake 11-14 (g/d)	**79.5**	**96.0**	7.8	0.001
- Feed Convers. ratio	**4.25**	**5.89**	24.4	0.018
Whole period (5 - 14 weeks)				
- Weight at 15 weeks (g)	**1748**	**1742**	10.7	ns
- Daily gain 5-14 (g/d)	**20.9**	**20.8**	14.2	ns
- Feed intake 5-14 (g/d)	**72.3**	**81.6**	6.7	0.004
- Feed Convers. ratio	**3.46**	**3.94**	11.9	0.041

ns : P > 0.20

Slaughter performance in the second trial

Only 19 rabbits per experimental group were slaughtered in controlled conditions. The average slaughter weight (1732 g) represents about 58% of the adult weight of rabbits of the local population.
As for the complete group of rabbits, there is no significant difference between slaughter live weights (Table 4). The skin and the full digestive tract were significantly heavier in the "Sulla diet" group than in the "Commercial pellets" group. This induced a significantly lower slaughter yield in the "Sulla diet" group. But the difference in carcass weight is small (48 g) and the hot carcasses weights are not significantly different. The high mean slaughter yield (68.5%) may be related to the high percentage of adult weight (58%) observed at slaughter time (GIACCONE, 1989).

Table 4 : Slaughter performance of the rabbits at the end of the second trial: live weight and least square means for a common live weight of 1732 g

	DIETS		Residual coef. of variation (%)	Statistical probability P
	Commerc. Pellets + straw	Sulla		
- Live weight (g)	1710	1754	6.5	ns
- Skin (g)	148	165	10.1	0.001
- Full digestive tract (g)	288	315	11.0	0.003
- Hot carcass (g)	1210	1163	3.21	0.168
- Slaughter yield (%)	69.8	67.2	3.16	0.001

ns : P > 0.20

CONCLUSION

The two home made formulas studied in the first trial were not correctly balanced to permit optimum growth performance. Nevertheless the feed expense to obtain ready to slaughter rabbits was only 3.57 kg feed per kg live weight gain with the "Brewer's grains diet". The only real problem was the total length of the fattening period : 10 weeks to obtain rabbits weighting only 51% of the adult weight of the population.

When sulla hay may be available, the formula proposed in the second trial seems as correct as the commercial pelleted diet available on the local market, if the later is distributed together with straw (BERCHICHE *et al.*, 1996). The length of the experimental fattening period was 9 weeks; but for practical utilization it may be reduced to 8 weeks only if a percentage of 53-54% of adult weight is accepted.

It has been supposed that the very low calcium level of the 2 home made diets was at minimum partly responsible of the low feed intake. This hypothesis must be studied because calcium carbonate is very cheap, and it may be a nice way to improve some home made diets for Algerian rabbit breeders.

Acknowledgements - The authors thanks R. BELKHEIR, S. BENCHABANE, S. BOUHEDDA and N. DJEDID for their technical assistance.

REFERENCES

BERCHICHE M., LEBAS F., 1990. Essai chez le lapin de complémentation d'un aliment pauvre en cellulose par un fourrage distribué en quantité limitée : digestibilité et croissance. *Communication aux 5ème Journées de la Recherche Cunicole, Paris 12-13 Décembre 1990, Itavi éditeur.*

BERCHICHE M., LEBAS F., 1994. Rabbit rearing in Algeria: family farms in the Tizi-Ouzou area. *1rst International Conference on rabbit production in hot climates, 6-8 sept. 1994 Cairo, Cahiers option méditéranéennes, 8,*

BERCHICHE M., LEBAS F., LOUNAOUCI G., KADI S.A., 1996. Feeding of local population rabbits : effect of straw addition to low fibre pelleted diets, on digestibility, growth performance and slaughter yield. *Communication to the 6th World Rabbit Congress, Toulouse 9-12 July 1996.*

GIACCONE V., 1989. La resa in carne migliora con l'età. *Professioneallevatore, 16 (4), 46.*

GÖHL B., 1981. Tropical feeds. Feed information summaries and nutritive values. *FAO edit., Rome Italy, 529 p.*

LEBAS F., 1992. Alimentation pratique des lapins en engraissement. *Cuniculture, 19, 83-90.*

SAS, 1987. SAS/STAT Guide for personal computer, (release 6.0), *SAS Inst. Inc., Cary NC, USA.*