

RABBIT BREEDING IN TROPICAL CONDITIONS, COMPARATIVE STUDY BETWEEN A LOCAL STRAIN AND AN EUROPEAN STRAIN I - GROWTH OF SUCKLINGS

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Abstract - A total of 80 two-day-old suckling rabbits of a selected NZW strain imported from a temperate country (France) were suckled in a tropical country (Benin) by does of the local strain. The growth performance of the imported rabbits and of 81 native rabbits suckled by the same does was compared. No morbidity was observed in both groups. Growth was identical in both groups up to 21 days *i.e.* the end of the exclusive milk feeding: 233 and 232 for imported and native rabbits. During the last period before weaning (21 to 31 days) the group of imported sucklings had a lower weight gain. (13.0 vs 17.1 g/day) This period corresponds to the beginning of solid food consumption. A genetic adaptation of the local strain to the local feed and/or climate, or the potential effect of the early chemosensory experience (during both gestation and first suckling) of the imported strain are discussed.

INTRODUCTION

Most of the reports concerning rabbit raising in hot climates reveal lower performances than in European countries. (OWEN 1978, SAMOGGIA *et al.*, 1987).

At least four main reasons could explain these differences : the climate, the local conditions of breeding (equipment, professional knowledge, ...), the strains and the quality of feed. In order to attempt to analyse the relative contribution of these factors we planned a trial in the experimental rabbitry of *Centre Cunicole de Recherche et d'Information* (CECURI) in Benin (Africa) (KPODEKON and COUDERT, 1993).

The general aim of the study was to compare the growth performance of a local African rabbit strain with an European selected rabbit strain, receiving the local feed or an imported European pelleted feed. This report presents the first part of the trial and compares in the same environment, the before weaning growth performance of newborn rabbits imported from France with the performance of native rabbits.

MATERIAL AND METHODS

Animals

- CECURI : the African rabbit strain was initially constituted by collecting females and males in different regions of Benin. Later, some new genes were introduced in this strain by the means of artificial insemination with sperm from a NZW strain raised in Toulouse. The experiment reported in the present paper occurred three years after the last introduction of external genetic resources, *i.e.* with female of the second or third generation..
- TOULOUSE: the rabbit strain (INRA 1077 - issued from New Zealand White rabbits) was selected at the INRA Centre of Toulouse for reproduction traits (ROCHAMBEAU *et al.*, 1994).

Breeding

- CECURI : the breeding unit is open-sided, and equipped with 80 wire mesh cages in flat deck. Each cage has a metal feeder, a nest-box and an automatic watering system. The weanlings are bred in a separate room. Hygienic prescriptions are strictly respected (KPODEKON, 1988) and prophylactic treatments are regularly

used against coccidia (ADEHAN *et al.*, 1992) and intestinal worms. The does are mated 10 days after kindling and the young rabbits weaned at 30 - 31 days of age.

- TOULOUSE: the general engineering and management are quite similar but the rooms are closed and air conditioned and the access are strictly controlled.

Feeding

- CECURI: animals were fed *ad libitum* with coarse ground concentrate raw materials (table 1) and fresh forage renewed every day (palm tree leaves : *Elaeis guineensis*)
- TOULOUSE : Rabbit does received *ad libitum* a commercial complete pelleted feed (table 2).

Table 1 : Ingredients and gross composition of the coarse meal concentrate employed in the CECURI.

| List of ingredients | | Chemical composition (% as fed) | |
|---------------------|--------|---------------------------------|------|
| - Maize | 14.0 % | - Dry matter | 94.2 |
| - Wheat bran | 50.0 % | - Crude protein | 17.6 |
| - Brewer's grains | 30.0 % | - Crude fibre | 9.5 |
| - Soya meal | 4.0% | - ADF | 11.5 |
| - Oysters shells | 1.6 % | - NDF | 33.2 |
| - Salt | 0.4 % | - Ether extract | 4.2 |

Table 2 : Ingredients and gross composition of the complete pelleted feed employed in Toulouse

| List of ingredients | | Chemical composition (% as fed) | |
|-----------------------|---------|---------------------------------|------|
| - Wheat | 10.00 % | - Dry matter | 87.8 |
| - Barley | 1.65 % | - Crude proteins | 16.2 |
| - Wheat bran | 21.45 % | - Crude fibre | 15.1 |
| - Alfalfa dehydrated | 34.98 % | - ADF | 18.0 |
| - Sunflower meal | 12.10 % | - NDF | 31.8 |
| - Spring smooth peas | 4.00 % | - Ether extract | 4.0 |
| - Sunflower seeds | 3.50 % | - Minerals | 9.0 |
| - Wheat straw | 4.80 % | - Calcium | 1.6 |
| - Cane molasses | 5.00 % | - Phosphorus | 0.6 |
| - Minerals & Vitamins | 2.52 % | | |

Experimental design

- Does were mated (Toulouse) or inseminated (CECURI) on the same day (Nov. 16th, 1994).
- In Toulouse, the suckling was controlled (nest-boxes were opened only 15 minutes in the early morning). A total of 80 newborns were selected from 17 litters on day 2 after birth, identified with a mark in the ear and then shipped by plane to the CECURI.
- In the CECURI the litters were equalised at birth to 6 newborns and the suckling was also controlled.
- When the European newborns arrived in Benin on the early morning of their third day, three native sucklings were eliminated from 27 litters and replaced by Toulouse youngs. The nest-boxes were opened two hours after the mixing with the native newborns and the effective suckling was controlled. The interval between the last suckling in Toulouse and the first suckling in CECURI was exactly 24 hours, *i.e.* the normal interval between two consecutive sucklings for the Rabbit.

The 161 sucklings were identified on day 6 and individually weighed at the ages of 6, 21 and 31 days.

Statistical analysis

The weights and average daily gains were studied according to a variance analysis with 2 fixed factors (suckling's origin : 2 levels, and fostering doe : 27 levels) with interaction (SAS, 1988).

RESULTS AND DISCUSSION

Morbidity

No disease occurred on does during this period. This situation is usual in CECURI during the whole dry season (November to April). Controls of coccidia were regularly done on faecal samples. The oocyst outputs were always low and no treatment was undergone.

Two sucklings from Toulouse displayed a diarrhoea when 13 days old. They were individually treated with sulphonamide and recovered rapidly. Two others died when 17 days old. On the same day one rabbit from CECURI died also.

Weight and weight gain (Table 3)

When 6 days old, *i.e.* 3 days after their arrival in CECURI, the fostered sucklings were significantly heavier ($P < 0.001$) than the natives. Their mean weight (≈ 80 g), indicated that the adoption was successful.

Between days 6 and 21 no significant difference on weight gain was evident ($P = 0.43$). During this period, the quasi exclusive source of feed was milk. So both the adopted and native rabbits consumed an equivalent amount of milk. It can be pointed out that the average 21-days weight observed in this case (333 g) is similar to that observed for young rabbits of the same age raised in Toulouse : 294 to 333g according to the mother diet, for litters of 8 or 9 young (LEBAS and FORTUN LAMOTHE, 1996).

The most remarkable result concerns the weight gain of the young between days 21 and 31. The native rabbits had a growth rate 30% higher than the fostered ones (17.1 *vs* 13.0 g/day) ($P < 0.001$). Taking into account the mode of distribution of the newborns, this difference could not be caused by a maternal effect of the lactating mothers. The weight gain up to 21 days suggests a good acclimatisation of the « Toulouse young » to the African environmental conditions. But the fourth week of young's life corresponds to natural weaning which implies an increasing consumption of solid food. So either the young rabbits from Toulouse ate less food or they digested it less efficiently. Two hypotheses could be put forward to explain this lowered growth in the European rabbits fostered by African does.

- First, both strains may differ in terms of digestive adaptation and perhaps in the genetic make-up that controls these characters. We can imagine that the native strain is adapted to the coarse meal. This would mean that the genetically-driven adaptation to feed is a rapid process. Before the development of a rational breeding system in CECURI, the animals were only fed with forages generally without adjunction of concentrates. In addition, the African strain results from crossings with the Toulouse strain and the present experiment was performed only 3 generations after this genetic mixing. Then, this hypothesis is highly improbable.
- A second cause of the lower growth rate of the Toulouse pups fostered with African does consuming the local feed could be related to a chemosensory disturbance during the weaning process. Food selection at weaning has been shown to be very sensitive to earlier experience with food odours (GALEF *et al.*, 1994). It has been shown that mammalian foetuses and neonates are highly sensitive to their odour environment (SCHAAL and ORGEUR, 1992). Specifically in the rabbit, odours present in the foetal environment can determine locational preferences within the first postnatal week (BILKO *et al.*, 1994). This prenatal learning remains active in the long-term, as it can exert an influence on food choice at weaning: of young born of does fed juniper berries during pregnancy (and then exposed or not to juniper odour through milk) evince a clear preference for the juniper odour 28 days after birth (HUDSON and ALTBÄCKER, 1994). A similar effect could have been at work in the present experiment where the Toulouse sucklings were exposed both prenatally and during the first sucklings to the flavours of the Toulouse feed. This early Toulouse feed odour learning might have interfered with the CECURI food acceptance during spontaneous weaning, therefore impeding growth in the Toulouse weanlings adopted by CECURI does. This hypothesis is currently being experimentally examined.

In the second part of this trial (LEBAS *et al.*, 1996) this lower weight gain of the imported rabbits fed with the CECURI food was also observed during the fattening period.

Table 3: Growth of suckling rabbits in tropical climate: comparison of native sucklings with sucklings imported from a temperate country at two days of age.

| Type of strain | Initial No | weight (g) at | | | weight gain (g/day) from | |
|---|------------|-----------------|------------|-----------------|--------------------------|-----------------|
| | | 6 days | 21 days | 31 days | days 6 to 21 | days 21 to 31 |
| Local (CECURI) | n=81 | 73.6 | 231.5 | 408.2 | 10.51 | 17.10 |
| Imported (INRA 1077) | n=80 | 79.9 | 233.8 | 365.4 | 10.20 | 13.04 |
| Residual coef. of Variation Probability | (%) | 15.5 P<0.001 | 11.2 NS | 12.8 P<0.001 | 14.5 NS | 24.9 P<0.001 |

CONCLUSION

This trial confirms that by using an appropriate method the transfer of 1- or 2-day-old newborn rabbits towards hot climate countries is possible without loss. Moreover the adaptation of the sucklings was fully satisfying up to weaning. A slight but significant decrease of growth was noted when the sucklings began to eat the local feed. This lower weight gain of imported young is supposed to be a consequence of lower feed acceptance or assimilation. Several hypotheses have been proposed to explain the differential zootechnical performance of the rabbits in both treatments. These alternatives will be tested in future experiments.

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Elevage du lapin en zone tropicale, comparaison d'une souche locale avec une souche Européenne; 1/ Croissance pendant l'allaitement - Un total de 80 lapereaux de 2 jours provenant d'une souche de lapins Néo Zélandais Blancs sélectionnée dans un pays tempéré (France), ont été transportés et adoptés dans un pays à climat tropical (Bénin) par des mères d'une souche locale. La croissance des lapereaux importés et des lapereaux autochtones a été comparée. Aucune morbidité particulière n'a été observée dans aucun des deux groupes. La croissance fut identique pour les deux groupes jusqu'à l'âge de 21 jours, soit jusqu'à la fin de l'alimentation exclusivement lactée des lapereaux.: 333 et 332 g à 21 jours pour les lapereaux importés et locaux respectivement. Entre 21 et 31 jours (sevrage) les lapereaux importés ont eu une croissance plus faible : 13,0 contre 17,1 g/jour pour les lapereaux nés sur place. Cette période correspond au début normal de la consommation d'aliment solide. Deux hypothèses explicatives sont évoquées par les auteurs : soit une adaptation génétique de la souche locale à l'alimentation locale et/ou au climat, soit un effet chimiosensoriel de la mère génétique des lapereaux importés, se manifestant pendant leur vie *in utero* et lors de la première tétée..