PRODUCTIVE PERFORMANCE OF EIGHT FAMILY GROUPS OF NEW ZEALAND WHITE RABBITS FED TWO COMMERCIAL DIETS FOR FATTENING IN MEXICO

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Abstract - Thirty nine New Zealand White weanling rabbits with an average initial weight of 525 ± 72 g, representing eight families and weaned at four weeks of age, were utilised in a 7-weeks experimental period, in order to evaluate their productive performance, on an individual and family basis. Four rabbits were randomly allocated per cage, except one cage that included only three animals. Average daily gain (ADG) and final weight (FW), response variables measured per individual, were analysed with the effects of family group (eight groups), diet (commercial diet A, with 18.2 % crude protein *vs* commercial diet B, with 17.2 % crude protein) and initial weight (IW, as a covariable) as fixed independent variables. Feed intake (FI), weight gain (WG) and feed conversion (FC), response variables measured as an average per cage, were analysed with the effects of diet (diet A *vs* diet B) and IW (as a covariable) as fixed independent variables. Statistical analyses were performed using the SAS software. Overall least-squares means for ADG and FW were 28.3 ± 4.2 g and 1911 ± 205 g, respectively. Family group was a significant source of variation ($P<0.05$) on ADG; groups that performed the best were No. 3 and 1 with values of 33.2 ± 2.1 g and 32.2 ± 2.0 g, respectively. Family group and initial weight were significant sources of variation ($P<0.05$) on FW; groups that performed the best were No. 3, 1, 2 and 7, with values of 2149 ± 105 g - 2091 ± 97 g - 1943 ± 88 and 1905 ± 125 g, respectively. According to the regression coefficient, an increase of 1 g in IW resulted in an increase of 1.4 ± 0.6 g in FW. Overall least-squares means for FI, WG and FC were 3974 ± 367 g, 1401 ± 137 g and 2.8 ± 0.1 kg of feed per kg of body weight, respectively. Diet and IW were significant sources of variation ($P<0.05$) on FI. Rabbits consumed more feed of diet B than A (4289 *vs* 3658 g respectively). According to the regression coefficient, an increase of 1 g in IW resulted in an increase of 8.2 ± 3.4 g in FI. According to the differences observed among family groups, it may be possible to select rabbits for growth rate in order to establish genetic lines.

INTRODUCTION

After the outbreak of the Rabbit Viral Haemorrhagic Disease in Mexico in the late part of 1988 that caused mortality of the whole rabbit population, farmers have gradually come back to rabbit production in an attempt to produce an important source of animal protein for human consumption. The New Zealand White is one of the most numerous breeds of rabbits that has been introduced to Mexico to be raised in both intensive and extensive systems, as a means to improve rabbit production. However, it is well known that two of the problems that limit rabbit production in Mexico are the high cost of commercial feeds, as well as its doubtful quality (NIEVES DELGADO *et al.*, 1992). Therefore, producers are constantly looking for alternatives concerning rabbit feeding.

The objectives of the experiment reported herein were: 1) to evaluate the productive performance of New Zealand White rabbits fed two commercial diets for fattening, and 2) to determine if eight family groups utilised in that evaluation differed in their performance.

MATERIAL AND METHODS

Thirty-nine New Zealand White weaning rabbits with an average initial weight of 525 ± 72 g, and weaned at four weeks of age, were utilised in a 7-weeks experimental period. They came from eight families which in turn were established from 20 New Zealand White bucks imported from Oregon (USA) in 1992 and approximately 60 does of the same breed, pertaining to a line developed in Mexico. It is illustrative to point out that those eight families were among the survivors of an outbreak of enteric diseases occurred during the summer and fall of 1993, a problem generalised in regions of central Mexico probably due to an aflatoxin contamination of

commercial feeds, even though it was not recognised by the sanitary authorities in this country. The problem was overcame by the spring of 1994, mainly due to naturally resistant animals, aside of their capacity to perform successfully well.

Table 1 : Proximate analysis of the experimental diets (%)

Nutrients	Diet A	Diet B
Crude protein	18.2	17.2
Ether extract	4.1	2.4
Ash	9.8	9.7
Calcium	1.4	1.1
Phosphorus	0.79	0.48
Neutral Detergent Fibre	31.7	35.6
Acid Detergent Fibre	22.5	22.3
Lignin	6.4	5.8

(A.O.A.C., 1980; Goering and Van Soest, 1970).

Rabbits were firstly distributed in homogeneous groups according to the origin of their family. Secondly, they were randomly assigned to all-wire elevated cages. Four rabbits were allocated in each cage, except one that included three rabbits, thus totalling 10 cages. All of the rabbits were subjected to the same general management. Two commercial pelleted diets (diets A and B) were utilised; diet A had a crude protein content of 18.2 %, while the corresponding value for diet B was 17.2 % (Table 1). Feed and water were provided *ad libitum*. Three rabbits died randomly during the experiment; however, these deaths were not considered to be an effect of diet.

The statistical analyses were performed utilising the general linear models procedure from SAS software (SAS, 1985) . The statistical model for the dependent variables average daily gain (ADG) and final weight (FW), data that were obtained per individual animal, was:

$$Y_{ijk} = \mu + F_i + D_j + b(IW)_{ijk} + E_{ijk}$$

where:

Y_{ijk} : dependent variable (ADG, FW)
μ : overall mean
F_i: fixed effect due to the i^{th} family group (i = 1, 2, ... , 8)
D_j: fixed effect due to the j^{th} diet (j = 1, 2)
IW: initial weight (as a covariable)
b: partial regression coefficient associated to IW
E_{ijk} : residual random effect.

The statistical model for the dependent variables feed intake (FI), weight gain (WG) and feed conversion (FC), data that were obtained per cage, was exactly as above, with the exception that the effect of family group was not included. Where appropriate, Tukey's test was used to determine significant differences between means (SAS, 1985).

RESULTS AND DISCUSSION

Traits measured per individual

Table 2 shows the least-squares means for family group, an effect that significantly influenced the variation ($P<0.05$) of ADG and FW. Overall least-squares means for ADG and FW were 28.3 ± 4.2 g/day and 1911 ± 205 g, respectively. Family groups that performed the best for ADG were No, 1 and 3 with values of 32.0 ± 2.0 and 33.2 ± 2.1, respectively. No significant differences were attributed to the effect of diet. Family group and initial weight (as a covariable) were significant sources of variation ($P<0.05$) on FW; groups that performed the best were No. 3, 1 and 2 with values of 2148 ± 105, 2091 ± 97 and 1943 ± 88 g, respectively. According to the regression coefficient, an increase of 1g in IW resulted in an increase of 1.4 ± 0.6 g in FW. The mean of 28.3 g for ADG in this study is in close agreement with the results of ESPINOZA-VELAZQUEZ *et al.* (1992), who found a value of 29.7 ± 4.6 g in two genetic groups in México; however, is lower than 31.7 g, a value found in summer by LEBAS and OUHAYOUN (1987) in rabbits fed diets with a different content of protein. SCHLOLAUT (1981) has indicated that rabbits in the fattening period should gain an average of 36 daily grams. Concerning FW, slaughter weights above 2000 g have been found in different studies conducted under temperate climates in approximately the same fattening period (ALICATA *et al.*, 1992; GARCIA *et al.*, 1992;

NIEVES-DELGADO *et al,* 1992). Under more unfavourable conditions, however, lower averages are obtained, since GUPTA *et al.* (1992) indicated an average of 1610 g at 12 weeks of age in the semi-arid tropical conditions of India.

Table 2 : Least-squares means (Mean ± S.E.) for average daily gain (ADG) and final weight (FW), according to family group.

Family Group	No of Rabbits /family	ADG (g/day)	Final Weight (g)
Overall mean (Mean ± S.D.)		28.3 ± 4.2	1911 ± 205
1	6	32.0 ± 2.0a	2091 ± 97a
2	6	29.0 ± 1.8b	1943 ± 88a
3	4	33.2 ± 2.la	2148 ± l05a
4	2	24.4 ± 3.0c	1716 ± 147b
5	5	26.9 ± 2.0c	1841 ± 98b
6	7	26.2 ± 1.7c	1804 ± 82b
7	3	28.2 ± 2.5b	1905 ± 125a
8	3	20.2 ± 3.0d	1511 ± 150c

Means with different letters within the same column indicate statistical differences (P<0.05).

Traits measured per cage

Table 3 shows the least-squares means for diets, an effect that significantly influenced the variation (P<0. 05) of FI. No significant sources of variation were detected for WG and FC. Overall least-squares means for FI, WG and FC were 3974 ± 367 g, 1401 ± 137 g and 2.8 ± 0.1 kg of feed per kg of body gain, respectively. Rabbits consumed more feed of diet B than A (4289 *vs* 3658 g, respectively), an effect probably due to a lower energy content of diet B (a value not calculated in the diets), as reflected by both its higher neutral detergent fibre and lower ether extract contents. IW also affected (P<0.05) FI; according to the regression coefficient, an increase of 1 g in IW resulted in an increase of 8.2 ± 3.4 g in FI. Based on the average FI and total fattening period (7 wk), an average daily feed intake of 81 g was obtained; PETERSEN *et al.* (1992) calculated an average daily feed intake of 90 g for young rabbits of a similar age and weaning age. Even though the number of rabbits utilised in the experiment was not large, the average of 2.8 for FC found in this study is in close agreement (in the range of 2.6 to 3.8) with the results of several authors (ESPINOZA-VELAZQUEZ *et al.*, 1992; NIEVES-DELGADO *et al.*, 1992; PETERSEN *et al.*, 1992.

Table 3. Least-squares means (Mean ± S.E.) for feed intake, weight gain and feed conversion ratio, according to diet during the 7 weeks experiment.

Diet	Feed Intake (g/rabbit)	Weight Gain (g/rabbit)	Feed Conversion (g/g)
Overall mean (Mean ± S.D.):	3974 ± 367	1401 ± 137	2.8 ± 0.1
- Diet A	3658 ± 181a	1308 ± 68a	2.8 ± 0.la
- Diet B	4289 ± 181b	1510 ± 68a	2.8 ± 0.la

Means with different letters within the same column indicate statistical differences (P<0.05).

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