PRODUCTIVE PERFORMANCE OF SIX GENOTYPES OF FATTENING RABBITS FED WITH SEVEN COMMERCIAL FEEDS

Suárez-López J.R.[1]*, Becerril-Pérez C.M.[2], Pro-Martínez A.[1], Cuca-García J.M.[1], Torres-Hernández G.[1], Sosa-Montes E.[3]

[1]Orientación en Ganadería, Colegio de Postgraduados, km 36.5 Carr. Fed. México–Texcoco, 56230 Montecillo, Texcoco, Mexico
[2]Campus Campeche, Colegio de Postgraduados, Calle Nicaragua No. 91 3er Piso, Col. Santa Ana, 24050 Campeche, Mexico
[3]Departamento de Zootecnia, Universidad Autónoma Chapingo, 56230 Chapingo, Texcoco, Mexico
*Corresponding author: jesus@colpos.mx

ABSTRACT

Thirty-five-day old weanling rabbits from three breeds, New Zealand White (NZ), Californian (CA), and Chinchilla (CH), and their F1 crosses were used to evaluate body weight (BW) and average daily gain (ADG) from 35 to 70 days of age when they were fed with seven commercial feeds. Four hundred and thirty eight rabbits of both sexes were used in a 6x7 factorial (genotypesxfeeds) repeated measurement (week) experiment. The effects of genotypes and feeds were significant on BW and ADG, with a superior performance of genotypes involving the NZ breed and feed 3. Means for BW at 70 days of age for genotypes were 2199±13[a], 2163±12[b], 2107±13[c], 2088±14[c], 1895±16[d], and 1882±15[d] g, for NZ, NZxCA (NCA), NZxCH (NCH), CAxCH (CCH), CH and CA, and were, 2159±13[a], 2080±15[b], 2068±19[bc], 2046±15[cd], 2024±14[d], 2023±15[d], 1991±14[e] g for feeds 3, 1, 5, 6, 4, 7, and 2. Performance through the fattening period varied according to genotype, feed, and week age.

Key words: Rabbit local resources, Commercial feed industry, Mexico.

INTRODUCTION

The most important commercial rabbit breeds for meat production in Mexico are the New Zealand White (NZ), Californian (CA), and Chinchilla (CH). These breeds have been distributed in many regions of the country, among others by the National Center of Rabbit Breeding, located in Irapuato, Mexico, who established and has kept them for several decades. Although, some attempts have been made to establish selection genetic nucleus that can produce commercial genetic lines that use genetic improvement programs scientifically developed and known (Becerril-Pérez, 1998), today those enterprises are absent in the country. Therefore, there is a need to know the current status and potential productivity of the most important genotypes available in Mexico, since there is a great demand of well-known genetic quality animals and the import of rabbits and compatible products is legally prohibited by health barriers, that have to stay for several years to prevent disastrous events that have happened in the past, and that have damaged severely the national rabbit industry, and until national companies have settled down and can count on the sufficient experience to be national and internationally competitive (Becerril-Pérez, 2006). Growth related traits from weaning to slaughter, such as live weight and daily gain, are some of the most economically important in meat rabbit production; so, knowledge of these traits, among others, are a milestone to initiate genetic selection programs to improve the Mexican meat rabbit population.

On the other hand, in Mexico as in many other countries, most commercial rabbit breeders use balanced granulated feeds exclusively. By its size, the Mexican manufactured feed industry occupies the sixth place world-wide and the second in Latin America, with four hundred installed factories. In the country there are at least seven companies that produce and distribute rabbit feed, they are national and transnational. However, studies on quality and costs of different commercial feeds are scarce, and would have to be implemented to provide pertinent information to commercial producers and the feed industry (Becerril-Pérez, 2006). Nowadays, scientific evaluation of commercial rabbit feeds using live animals is almost absent in the country. The information presented in this paper is part of a more comprehensive study, that includes also feed, carcass, and health related traits, production costs and two different seasons of rabbit's birth.

This study was carried out to evaluate three of the most common breeds and their F1 crosses and seven commercial feeds during the hot season (May-June) for live weight and daily gain during the fattening period.

MATERIALS AND METHODS

Location

The study was realized in the highlands of Mexico, in an experimental rabbitry located at 19° 29' N and 98° 53' W and 2240 m above sea level. Annual average temperature is 15.9°C and rainfall 710 mm. During the current hot season average temperature was 18.6°C.

Experimental animals and diets

Four hundred and thirty eight rabbits of 35 days old of both sexes from three breeds, New Zealand White (NZ), Californian (CA), and Chinchilla (CH), and their F1 crosses were used. Rabbit came from the National Center of Rabbit Breeding and were born in April. Also, seven commercial feeds from different feed manufacturers were compared. Chemical feed composition information varied for each brand and was collected from tags. For all feeds, minimum contents ranged from 15.5 to 18.0% for crude protein and 2.0 to 4.2% for ether extract, maximum contents were from 11 to 16% for crude fiber and 8 to 13% for ash. So, effects of feeds on performance must come from different chemical composition; chemical analyses of all feeds are warranted. Rabbits were given *ad libitum* access to feed and water.

Experimental design and statistical analysis

The experiment was carried out for 6 weeks from 35 to 70 days of age, when they were slaughtered. Only body weight (BW) and average daily gain (ADG) are analyzed in this paper. Measurements were taken weekly for both traits. Three to four rabbits were assigned randomly per cage. A repeated measurement experimental design with a factorial arrangement was used, considering week as a repeated effect and genotype (six levels) and feed (seven levels) as factors. The statistical model was:

$$Y_{ijklm} = \mu + G_i + D_j + (G*D)_{ij} + C_{k(ij)} + R_{l(ijk)} + E_m + (G*E)_{im} + (D*E)_{jm} + (G*D*E)_{ijm} + \varepsilon_{ijklm}$$

where:

Y_{ijklm} is the observation of the i^{th} genotype in the j^{th} diet, k^{th} cage of the l^{th} rabbit and m^{th} week.
μ is the general constant
G_i is the fixed effect of the i^{th} genotype. i = 1, 2, 3, 4, 5, 6.
D_j is the fixed effect of the j^{th} feed. j = 1, 2, 3, 4, 5, 6, 7.
$(G*D)_{ij}$ is the fixed effect of the interaction genotype by feed.
$C_{k(ij)}$ is the random effect of the k^{th} cage nested in the i^{th} genotype of the j^{th} feed. k = 1, 2, 3.
$R_{l(ijk)}$ is the random effect of the l^{th} rabbit nested in the k^{th} cage the i^{th} genotype in the j^{th} feed. l = 1,2, 3, 4. $R_{l(ijk)} \sim NIID(0, \sigma^2)$.
E_m is the fixed effect of the m^{th} week age. m = 1, 2, 3, 4, 5, 6.
$(G*E)_{im}$ is the fixed effect of the interaction genotype by week age.
$(D*E)_{jm}$ is the fixed effect of the interaction diet by week age.
$(G*D*E)_{ijm}$ is the fixed effect of the interaction genotype by feed by week age.
$\boldsymbol{\varepsilon}_{ijklm}$ is the random residual effect. $\boldsymbol{\varepsilon}_{ijklm} \sim NIID(0, \sigma^2)$.

Data analyses were performed using the GLM procedure of SAS (SAS Institute, 1998).

RESULTS AND DISCUSSION

For both, BW (g) and ADG (g) the effects of genotype, feed, age, genotype*age, feed*age and genotype*feed*age were all significant (P≤0.01). At 70 days old, BW means (g) were 2199 ± 13^{a}, 2163 ± 12^{b}, 2107 ± 13^{c}, 2088 ± 14^{c}, 1895 ± 16^{d}, and 1882 ± 15^{d}, for NZ, NZxCA (NCA), NZxCH (NCH), CAxCH (CCH), CH and CA. Genotypes involving the NZ were superior in general. The demand in the local marked is for rabbits weighting 2200 g, so, the NZ breed should be used for the production of meat rabbits if that body weight should be accomplished. For feeds 3, 1, 5, 6, 4, 7, and 2, BW means (g) at 70 days were, 2159 ± 13^{a}, 2080 ± 15^{b}, 2068 ± 19^{bc}, 2046 ± 15^{cd}, 2024 ± 14^{d}, 2023 ± 15^{d}, 1991 ± 14^{e}. Only one feed surpassed the 2100, and one was under 2000. Espinoza-Flores *et al.* (1997) found lower BWs less than 2000 g for the fattening period, for a commercial feed and two NZ lines and their reciprocal crosses, with differences among genotypes. Results for the triple interaction are shown in Figure 1. Effects on BW of feeds and genotypes varied through week's age. From 35 to 49 days old, rabbits behaved similar among feeds, observing important differences when rabbits were close to 70 days old;

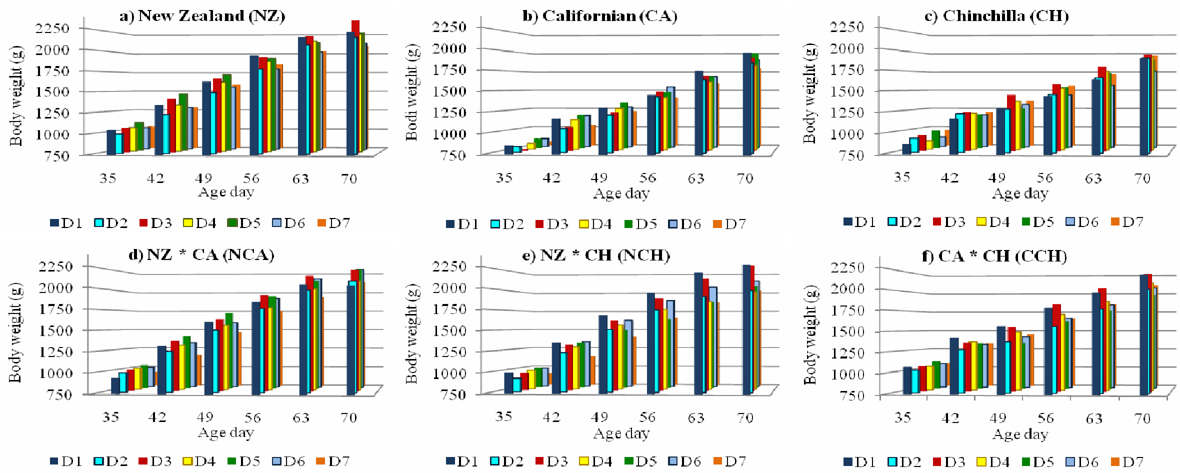

Figure 1: Body weight of six genotypes (a-f) of fattening rabbits from 35 to 70 days of age fed with seven commercial diets (D1-D7)

genotypes had different BW values through ages.

For ADG, genotypes behaved similar than for BW, having 33 ± 1^{a}, 33 ± 1^{a}, 32 ± 1^{a}, 28 ± 1^{b}, 28 ± 1^{b}, and 23 ± 1^{c}, for NCA, NCH, NZ, CCH, CA, and CH; where again genotypes involving NZ showed the best gains. These relative low ADG, compared to European standards, show that there is a big potential to increase ADG in local rabbit breeds by means of selection. For feeds 3, 4, 1, 6, 7, 2, and 5, ADG were 34 ± 1^{a}, 30 ± 1^{b}, 29 ± 1^{b}, 29 ± 1^{b}, 29 ± 1^{b}, 29 ± 1^{b}, and 26 ± 1^{c}. Feed 3 had the highest level of crude fiver (16%), but a good level of crude protein (16%). Espinoza-Flores *et al.* (1997) found a similar ADG of 32+2 for a commercial diet. Results for the triple interaction are shown in Figure 2.

Effects on ADG of diets and genotypes varied through week's age, also. The lowest and negative ADG was for feed 5 for 42–49 days old, and genotypes CH and CCH. Maximum ADGs were observed the first week of fattening, though for different genotypes, with the NZ and NCA showing the best performance.

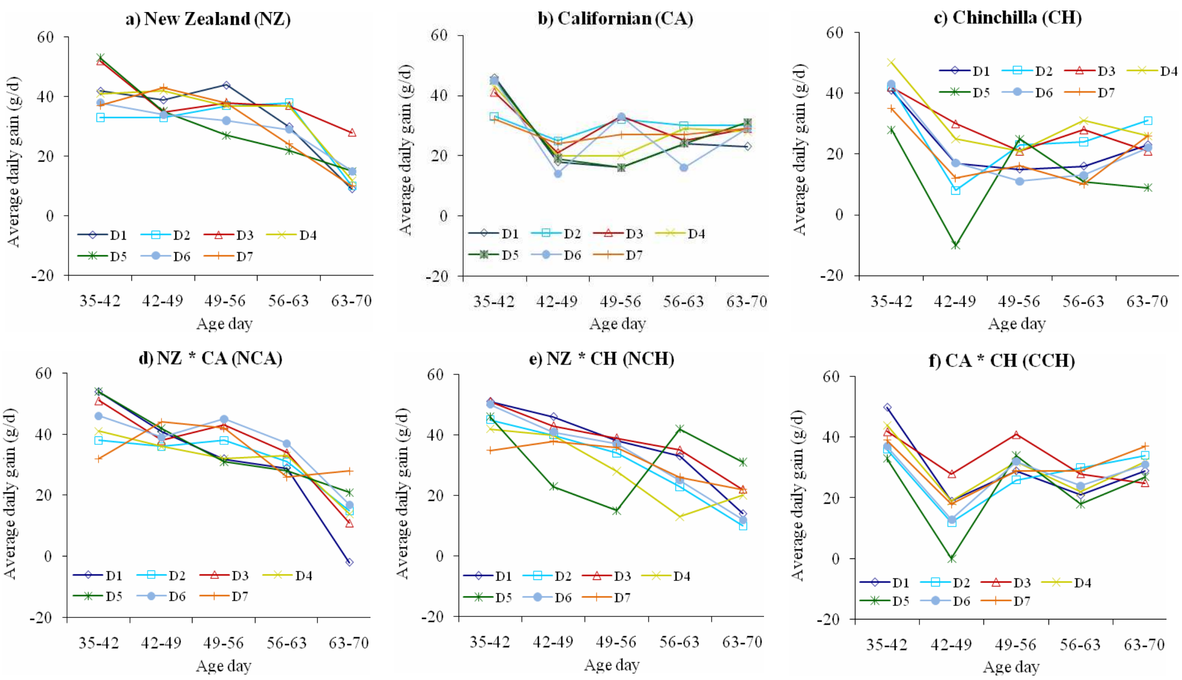

Figure 2: Average daily gain of six genotypes (a-f) of fattening rabbits from 35 to 70 days of age fed with seven commercial diets (D1-D7)

CONCLUSIONS

Preliminary analyses showed that during the fattening period genotypes involving the New Zealand White breed had the heaviest body weights at slaughter age and that they were more capable to gain weight in a daily basis; also, for feed 3 rabbits showed the best growing performance, differences among feeds must be taken into account for growers in order to achieve the best results. However, performance trough the fattening period was variable according to genotype, feed, and week age.

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