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# EFFECT OF WEIGHT DAILY GAIN SELECTION ON GROSS FEED EFFICIENCY IN RABBITS

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## Abstract

An experiment is performed to compare the gross feed efficiency of three lines of rabbits (A, V and R). A and V lines are being selected for litter size since 1980 and 1984 respectively, but R line is being selected for postweaning weight daily gain. Global gross feed efficiency is recorded in twenty four batches of rabbits (2 batches for each line and 1991's season combination). The control of post-weaning growth and feed consumption was from 28 days to 63 days after birth.

Gross feed efficiency has been analyzed through an analysis of variance using weight at 63 days as a covariate. The results of this analysis showed statistical significance for line, and line-season interaction effects, and for regression coefficient of weight at 63 days. The R line express a gross feed efficiency of 2.466, significatively lower to the values corresponding to A and V lines (3.264 and 3.153), These values are computed for a constant final weight of 2022.4 gr. The conclusion is that postweaning weight daily gain selection is a useful method to improve genetically feed efficiency.

## Introduction

Feed efficiency is a major factor in rabbit meat production. Postweaning feeding accounts around 40% of total costs (Baselga & Blasco, 1989). However, measures of feed efficiency such as feed conversion ratio are not usually considered as selection criterion when selecting sire lines for terminal crosses. Initially, it was considered in a sire progeny test (Vrillon *et al*, 1979), but finally it was not recorded because of its cost and its favourable genetic correlation with post-weaning growth rate (reviews of Ouhayoun, 1978; Masoero, 1982; Blasco, 1989). This trait is very cheep to record and it has become the main criterion to select sire terminal lines (Rochambeau *et al*, 1989; Camacho & Baselga, 1990) under the expectation of getting a favourable correlated response on feed efficiency.

The aim of this paper is to find out the present differences in feed efficiency between three lines of rabbits selected, either for litter size at weaning or for post-weaning weight daily gain, in Valencia (Departamento de Ciencia Animal).

## Material and Methods

Post-weaning gross feed efficiency was recorded on twenty four batches of rabbits pertaining to lines A, V and R during winter, spring, summer and autumn of 1991 (Table 1). Each batch consisted of all rabbits weaned by line and season in a given week. The weeks chosen to determine the batches were the first two of january, april, july and october.

Line A and V are being selected for litter size at weaning since 1980 and 1984 respectively, and Line R for post-weaning weight daily gain since 1980. They are housed in a farm, reared following a semiintensive production system and the husbandry is scheduled on a weekly basis. Mating is carried out on friday and saturday; weaning on tuesdady ( 27-29 days after birth), and postweaning growth extends for five weeks. The rabbits

are identified and weighted at weaning and housed in cages of eight. The rabbits are weighted again at the end of the growing period (62-64 days old).

TABLE 1 - NUMBER OF RABBITS INVOLVED IN THE EXPERIMENT BY SEASON, LINE AND BATCH (B) AT 28 (N28) AND 63 DAYS (N63)

| | | Line A | | Line V | | Line R | |
|---|---|---|---|---|---|---|---|
| Season | B | N28 | N63 | N28 | N63 | N28 | N63 |
| WINTER | 1 | 51 | 49 | 134 | 128 | 45 | 44 |
| | 2 | 104 | 103 | 125 | 122 | 70 | 69 |
| SPRING | 1 | 35 | 35 | 159 | 154 | 70 | 67 |
| | 2 | 71 | 71 | 140 | 135 | 49 | 46 |
| SUMMER | 1 | 101 | 96 | 138 | 131 | 41 | 32 |
| | 2 | 108 | 103 | 103 | 96 | 74 | 66 |
| AUTUMN | 1 | 160 | 151 | 141 | 134 | 79 | 75 |
| | 2 | 120 | 114 | 76 | 73 | 36 | 34 |

This experiment has been performed in the same farm where the selection takes place, keeping all tasks in the farm as pointed out before, adding only the global consumption of feed by batch, and the date and weight of rabbits dying before finishing growth. Rabbits dying, just after weaning without increasing weight were excluded. All the other rabbits were considered to compute the gros feed efficiency by batch as the ratio between total consuption of food and total weight gain after weaning.

The statistical analysis of gross feed efficiency by batch was an analysis of variance with line and season as main effects. Their interactions were also considered and mean individual weight at 63 days by batch was taken into account as a covariate. The covariate allowed to estimate line, season and interaction effects on a age-constant weight basis (Rochambeau, 1988). Results of experiments computing feed efficiency always show an increased feed consuption ratio with age and final weight (Maitre *et al*, 1990a, 1990b; Battaglini & Grandi, 1988; Grandi & Battaglini, 1988; Szendro *et al*, 1988; Szaló-Lacza *et al*, 1988; Fekete *et al*, 1988).

The feed used in the experiment was a commercial pelleted feed with the following composition: dry matter, 13%; crude protein, 15%; crude fat, 3.4%; crude fibre, 15.5% and ashes, 10%.

## Results and Discussion

Table 1 shows that mortality of rabbits growing after weaning and dying before 63 days of age was low ion general, 4.57% as average. The highest mortalities correspond to summer batches of R line.

TABLE 2 - LITTER SIZE AT 28 AND 63 DAYS (LS28, LS63) AND WEIGHTS (gr.) AT 28 AND 63 DAYS (W28, W63) BY SEASON, LINE AND BATCH (B)

| | | Line A | | | | Line V | | | | Line R | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Season | B | LS28 | W28 | LS63 | W63 | LS28 | W28 | LS63 | W63 | LS28 | W28 | LS63 | W63 |
| WINTER | 1 | 7.29 | 567 | 7.00 | 1988 | 7.88 | 555 | 7.53 | 2018 | 7.50 | 624 | 7.33 | 2337 |
| | 2 | 6.93 | 585 | 6.87 | 2038 | 8.33 | 567 | 8.13 | 2045 | 5.38 | 669 | 5.31 | 2413 |
| SPRING | 1 | 7.00 | 599 | 7.00 | 2010 | 7.95 | 549 | 7.70 | 2019 | 7.00 | 694 | 6.70 | 2368 |
| | 2 | 5.92 | 565 | 5.92 | 1891 | 8.75 | 579 | 8.44 | 2035 | 7.00 | 669 | 6.57 | 2329 |
| SUMMER | 1 | 8.42 | 539 | 8.00 | 1701 | 8.63 | 540 | 8.19 | 1669 | 5.86 | 659 | 4.57 | 2093 |
| | 2 | 7.20 | 566 | 6.87 | 1723 | 9.36 | 486 | 8.73 | 1636 | 7.40 | 582 | 6.60 | 1979 |
| AUTUMN | 1 | 7.27 | 523 | 6.86 | 1841 | 6.41 | 562 | 6.09 | 1902 | 7.18 | 522 | 6.82 | 2121 |
| | 2 | 7.06 | 531 | 6.71 | 1901 | 5.43 | 645 | 5.21 | 2056 | 6.00 | 656 | 5.67 | 2423 |

Litter sizes and weights at weaning and 63 days are given in Table 2. It is possible to note some differences between lines. The V line has the highest prolificacy, similar weights at weaning than A line but lower than R line. This line reveals itself with the highest weights at 63 days, and summer as the season with the lowest (Battaglini & Grandi, 1988).

Weight daily gains between 28 and 63 days and gross efficiencies for the same age interval are given in Table 3 for line, season and batch. Line R has daily gains that exceed in 5-10 gr/day to the daily gains corresponding to A and V lines.

TABLE 3 - UNCORRECTED GROSS FEED EFFICIENCY (FE) AND WEIGHT DAILY GAIN (DG)(gr/day) BY SEASON, LINE AND BATCH (B)

| | | Line A | | Line V | | Line R | |
|---|---|---|---|---|---|---|---|
| Season | B | DG | FE | DG | FE | DG | FE |
| WINTER | 1 | 40.59 | 3.178 | 41.79 | 2.969 | 48.95 | 3.075 |
| | 2 | 41.52 | 3.184 | 42.23 | 3.270 | 49.80 | 3.103 |
| SPRING | 1 | 40.32 | 3.592 | 42.01 | 3.262 | 47.86 | 3.087 |
| | 2 | 37.90 | 3.195 | 41.60 | 2.770 | 47.43 | 3.061 |
| SUMMER | 1 | 33.18 | 2.654 | 32.26 | 2.707 | 40.97 | 2.866 |
| | 2 | 33.05 | 2.701 | 32.86 | 2.679 | 39.92 | 2.663 |
| AUTUMN | 1 | 37.67 | 2.740 | 38.26 | 2.893 | 45.70 | 2.352 |
| | 2 | 39.13 | 3.043 | 40.30 | 3.329 | 50.49 | 2.699 |

It is also obvious the dramatic effect of summer on growth rate (4-9 gr/day) and, apparently, an important effect of this season on gross feed efficiency associated with the lowest weight at 63 days (Battaglini & Grandi, 1988).

The results of analysis of variance of gross feed efficiency, using weight at 63 days as covariate are in Table 4. Statistical significative effects are line, line-season interaction and the regression coefficient. It is important to remark that correcting line and season means of gross feed efficiency to a constant weight of 2022.4 gr, line R has the best gross feed efficiency but there are not statistical significative differences between seasons (Table 5). The line effect show the negative correlation between daily gain and gross feed efficiency, especially on a constant final weight basis (Prud'hon *et al*, 1970; Ouhayoun, 1978).

TABLE 4 - ANALYSIS OF VARIANCE OF GROSS FEED EFFICIENCY

| Source of variation | d.f | M.S. | S.L |
|---|---|---|---|
| Main effects | | | |
| line | 2 | .1456 | .0134* |
| season | 3 | .0599 | .0975 |
| Interaction | 6 | .0728 | .0424* |
| Covariate (W63) | 1 | .1302 | .0341* |
| Residual | 11 | .0222 | |

Coefficient = 0.00168 ± 0.00053

* significative at 5% level

The corrected line-season gross feed efficiencies (Table 5) point out the meaning of the significative line-season interaction. Autumn is the season with the highest difference between R line and the others;

and V line behaves in summer, intermediate between A and R line.

TABLE 5 - FITTED GROSS FEED EFFICIENCY BY LINE, SEASON AND LINE x SEASON

| | Season | | | | |
|---|---|---|---|---|---|
| Line | WINTER | SPRING | SUMMER | AUTUMN | Mean |
| A | 3.197(.106) | 3.514(.112) | 3.201(.196) | 3.146(.133) | 3.264(.089) |
| V | 3.104(.106) | 3.008(.105) | 3.317(.223) | 3.184(.108) | 3,153(.075) |
| R | 2.495(.215) | 2.524(.203) | 2.742(.106) | 2.105(.170) | 2.466(.136) |
| Mean | 2.932(.087) | 3.015(.076) | 3.086(.133) | 2.812(.062) | 2.961(.030) |

The final conclusion is that selection on weight daily gain is an useful method to improve feed efficiency such as it was theoretically presumed, although when this selection is carried out on a age-age basis

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