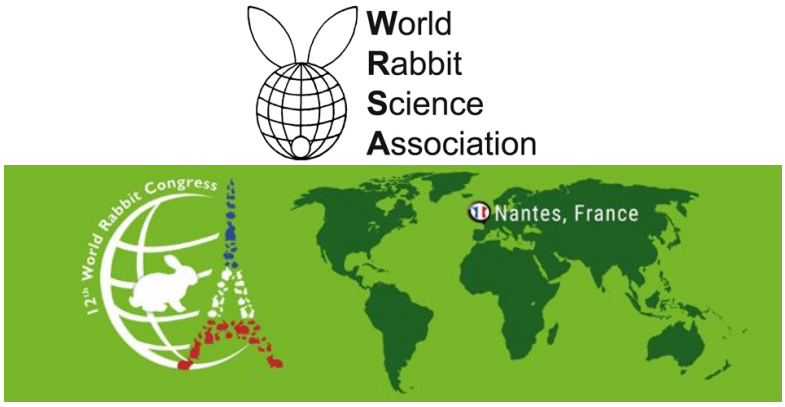

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Saiz del Barrio A., Perea-Goya L., Martín-Chaves E., Alfonso-Carrillo C., Marco M., Fernández B., Terreros E., García-Ruiz A.I.

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Full text of the communication

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EVOLUTION OF GROWTH PERFORMANCE AND WEIGHT UNIFORMITY OF GROWING RABBITS UNDER FEED RESTRICTION

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ABSTRACT

The aim of this study was to test the evolution of performance and weight uniformity of growing rabbits fed following a feed restriction program. The experiment was carried out with a total of 665 crossbreeds (New Zealand x Californian) growing rabbits assigned to five treatments, with 19 replicates per treatment. At weaning, animals were individually weighed and three weight ranges were established as follows: small: 519-680 g; mid: 681-749 g; big: 750-911 g. Treatments varied in the range of weight at weaning; Treatment 1: 7 animals from the mid weigh range; Treatment 2: 1 small + 2 mid+4 big animals; Treatment 3: 3 small + 1 mid+3 big animals; Treatment 4: 4 small + 2 mid+1 big animals; and Treatment 5: 7 animals from the small weigh range. All animals were fed with the same commercial feed following a feed restriction program with a feed intake of 75 and 80 % of the ad libitum feed intake in the first two weeks. Animal performance and body weight uniformity was measured during the growing period. The weight differences established at weaning were maintained throughout the whole study. Treatment 5, where smaller animals were allocated shown a higher feed conversion ratio (P=0.014) than the other treatments. Groups with more homogeneus animals maintained the homogeneity established at the beginning of the study. Treatment 2, were heavier animals were allocated, an improvement in body uniformity with age, while a decrease of weight uniformity of these parameters was observed in treatment 5 which started with an homogenous but lighter flock. From these results it can be concluded that the homogeneity of the flock at weaning is important in animals under feed restriction programs.

Key words: Rabbit breeding, rabbit kits, weaning, feed efficiency, body weight homogeneity.

INTRODUCTION

The use of feed restriction is being widely used as a strategy to reduce rabbits mortality and morbidity (Romero *et al*., 2010). This method also allows to optimize the use of feed by the animals, improving feed conversion rate (Gidenne *et al*., 2012).

However, the limited supply to feed can lead to competency among animals (Aubret and Duperray, 1993), impairing animal performance (Ferreira and Santiago, 1999). Rabbits are hierarchical animals, and the limitation on the feed amount provided could produce heterogeneity within animals placed in the same cage, as dominant (heavier) animals could have limit the access to the feed of the dominated ones.

The aim of this study was to test the evolution of performance and weight uniformity of growing rabbits fed following a feed restriction program.

MATERIALS AND METHODS

Animals and experimental design

The study was carried out in the Nutreco Trouw Nutrition Poultry Research Centre, located in Casarrubios del Monte (Spain). Performance study was carried out with a total of 665 crossbreeds (New Zealand x Californian) growing rabbits. At weaning (34 days), animals were housed in polivalent cages (38 x 100 cm), including 7 animals in each cage. The experiment was conducted during the growing period (34-61 days of age) as a completely randomized block design with five treatments, with 19 replicates per treatment. At weaning, individual animals were weighed and three weight ranges were established as follows: small: 519-680 g; mid: 681-749 g; big: 750-911 g. Treatments varied in the range of weight at weaning; Treatment 1: 7 animals from the mid weigh range; Treatment 2: 1 small + 2 mid+4 big animals; Treatment 3: 3 small + 1 mid+3 big animals; Treatment 4: 4 small + 2 mid+1 big animals; and Treatment 5: 7 animals from the small weigh range.

All animals were fed with the same commercial feed (Cunicebial; NANTA; Spain) with 2450 Kcal/kg of digestible energy, 16 % of crude protein and 34 % of neutral detergent fibre. A feed restriction-feeding program was followed, supplying the animals with 75 and 80 % of the Ad Libitum feed amount during the first and second week of the study, respectively, after which all rabbits were fed Ad Libitum.

Performance and weight uniformity test

At 34, 41, 48, 55 and 61 d of life average mean live body weight and feed intake of animals was measured. Individual weight of animals was determined at 34, 48 and 61 d to calculate Coefficient of Variation (%) and Standard Deviation (g) of body weight within cage, factors used to evaluate weight uniformity. Uniformity was evaluated as well as the percentage of animals within the range of 0.9-1.1 multiplied by the mean weight of cage. Mortality and morbidity was monitored daily.

Statistical Analysis

All data was analysed as a mixed model, by using the MIXED procedure of SAS (Statistical Systems Institute Inc., 2002), in order to evaluate the effect of treatment on performance and uniformity traits. Treatments was included as fixed effect and the location within the facility as blocking random factor. Mortality was analysed as a Binomial variable by using the GLIMMIX procedure. Comparison between treatments means was compared by using a Tukey´s Test.

RESULTS AND DISCUSSION

In table 1, performance results by period (34-41, 41-48, 48-55, 55-61 and overall period 34-61 d) are shown. Significant differences ($P<0.05$) between treatments were found on Body Weight (BW), Daily Weight Gain (DWG), Daily Feed Intake (DFI), although in 48-55 d period only a tendency ($P<0.10$) on DWG was observed. FCR was significantly different ($P<0.05$) between treatments at the 34-41, 48-55, and overall 34-61 period.

The weight differences established at the weaning were maintained throughout the whole study, leading to higher DWG and DFI on the treatments were average weight was higher. Smaller animals were not able to equalize their BW at the end of the study, as observed in the treatment 5. During the whole study, FCR was lower for the treatment 5. However when a correction of the overall FCR at a weight of 2150 (FCR corrected =FCR + ((2150-BW61d) x 0.083)/100)) was done, this treatment, where smaller animals were allocated shown to be less efficient than treatments 2 and 3 where heavier animals where allocated. No effect of treatments on mortality was observed. Ferreira and Santiago (1999) found differences in weight gain and feed intake between animals allocated in different animal densities, but the animal density of our study was similar between treatments, so differences in performance are caused by the different weights at weaning.

Table 1. Performance results per period

	Treatment						
	1	2	3	4	5	SEM(n=19)	Probability
34-41 d							
BW 34 d, g	719b	759a	718b	677c	618d	3.453	<0.0001
BW 41 d, g	927.4b	971a	928b	880c	820d	3.591	<0.0001
DWG, g/d	29.7abc	30.7a	29.9ab	29.0bc	28.8c	0.347	<0.0001
DFI, g/d	62.2b	64.2a	61.6b	59.1c	56.2d	0.321	<0.0001
FCR	2.09a	2.10a	2.06a	2.04a	1.95b	0.024	<0.0001
41-48 d							
BW 48 d, g	1212b	1259a	1212b	1158c	1084d	4.211	<0.0001
DWG, g/d	40.6a	40.9a	40.4a	39.8a	37.7b	0.375	<0.0001
DFI, g/d	78.4b	80.3a	78.5b	76.4c	73.1d	0.164	<0.0001
FCR	1.93	1.97	1.94	1.92	1.94	0.017	0.2848
48-55 d							
BW 55 d, g	1577b	1638a	1585b	1522c	1444d	7.686	<0.0001
DWG, g/d	52.3	54.3	52.5	51.9	51.4	0.858	0.0929
DFI, g/d	113.4ab	116.4a	112.7b	111.8b	106.2c	0.901	<0.0001
FCR	2.18a	2.15ab	2.15ab	2.16ab	2.08b	0.027	0.0485
55-61 d							
BW 61 d, g	1899b	1969a	1910b	1847c	1741d	12.26	<0.0001
DWG, g/d	53.6a	53.7a	54.2a	53.4a	49.2b	1.225	0.0052
DFI, g/d	147ab	150a	148ab	143b	135c	1.719	<0.0001
FCR	2.78	2.80	2.76	2.70	2.74	0.056	0.5079
34-61 d							
DWG, g/d	43.7a	44.8a	44.2a	43.3a	41.6b	0.431	<0.0001
DFI, g/d	98.2b	101a	97.9b	95.9c	90.8d	0.531	<0.0001
FCR	2.25ab	2.26a	2.22ab	2.21ab	2.18b	0.018	0.0239
FCRcorrected	2.46ab	2.41b	2.42b	2.47ab	2.52a	0.027	0.0144
Mortality, %	4.51	1.50	5.26	3.01	4.51	0.488	0.6839

BW: Body Weight; DWG: Daily Weight Gain; DFI: Daily Feed Intake; FCR: Feed Conversion Rate; FCR corrected at a standard weight of 2150 g=FCR3561 + ((2150-BW61d) x 0.083)/100; Means with different letters on the same row differ significantly (Tukey´s test).

In Table 2, weight uniformity results are shown. At all ages, treatments have a significant effect on Coefficient of Variation (CV, %), and Standard Deviation (SD, g) and Uniformity (%) of body weight.

Table 2. Weight uniformity results

	Treatment						
	1	2	3	4	5	SEM(n=19)	Probability
34 d							
Uniformity, %	100a	65.4b	45.1c	69.2b	88.7a	3.112	<0.0001
CV, %	2.92d	10.5b	14.1a	11.1b	6.64c	0.481	<0.0001
SD, g	21.0d	79.5b	101a	74.9b	40.9c	3.272	<0.0001
48 d							
Uniformity, %	95.1a	66.7b	51.9c	69.0bc	70.5b	3.665	<0.0001
CV, %	5.55c	9.93b	13.5a	11.7ab	9.55b	0.692	<0.0001
SD, g	67.2c	125b	164a	135ab	103b	8.110	<0.0001
61 d							
Uniformity, %	93.6a	85.6ab	58.6c	76.0b	78.4b	3.317	<0.0001
CV, %	6.08c	7.53bc	11.7a	9.92ab	9.35ab	0.706	<0.0001
SD, g	115c	148bc	224a	183ab	162bc	12.85	<0.0001

Uniformity: percentage of animals included in the range of 0.9-1.1 the mean weight of animals; CV: Coefficient of variation of Body Weight; SD: Standard Deviation of Body Weight; Means with different letters on the same row differ significantly (Tukey´s test).

Groups with less weight heterogeneity at weaning (treatment 1) presented the lowest values of CV and SD, and the highest uniformity at all ages, maintaining the uniformity established at the beginning of the study. Groups with heavier animals (treatment 2) showed an improvement in homogeneity with age, while a decrease of weight uniformity of these parameters was observed in treatment which

started with a homogenous but lighter flock (treatment 5), which reflect that lighter animals submitted to feed restriction compete more within the group. Tudela and Lebas (2003) detected that no real competency between animals was found when the feed restriction levels was up to 80-85 % of Ad Libitum feed intake, slightly higher than the levels established in our study (75-80 %). Values of CV were similar than those found by previously mentioned authors.

CONCLUSIONS

From these results, it can be concluded that the body weight homogeneity of the flock at weaning is important in animals under feed restriction programs, as this uniformity is maintained during the while growing period and could affect feed efficiency.

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Effect of litter homogeneity on restricted growing rabbits performance and litter homogeneity

Saiz A., Martin E., Fernández B., Alfonso C., Marco M.,
Terreros E., García Ruiz A.I.

Nantes, 5th of November 2021

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Introduction

- Feed restriction has been proved to be a good strategy to guarantee rabbits health status. However, as rabbits are hierarchical animals, the limitation on the feed amount could produce heterogeneity within animals placed in the same cage, as dominant (bigger) animals could limit the access to the feed to weaker animals

- So, in this study the effect of litter homogeneity and weight at weaning on growing rabbit performance and weight homogeneity were tested

Study design

- 5 treatments x 19 cages x 7 animals

Range	Maximum weight, g	Minimum weight, g
Small (S)	519	680
Mid (M)	681	749
Big (B)	750	911

# Treatment	Treatment name	Description[1]	Name
1	Homogeneus	7 animals mid weighed	7M
2	Heterogeneus 1	1 small animal +2 mid+ 4 big animals	1S+2M+4B
3	Heterogeneus 2	3 small animals +1 mid+ 3 big animals	3S+1M+3B
4	Heterogeneus 3	4 small animal + 2 mid+ 1 big animals	4S+2M+1B
5	Homogeneus small	7 small animals	7S

- Standard feed: 2400 Kcal/kg DE-36 % NDF-16 % CP
  - Restriction level: 75 % of DFI ad libitum (34-48 d)- Ad Libitum (48-61 d)
- Measurements
  - Feed weight: 34, 41, 48, 55, 61 d
  - Collective weight: 41, 55 d
  - Individual weight: 34, 48, 61 d

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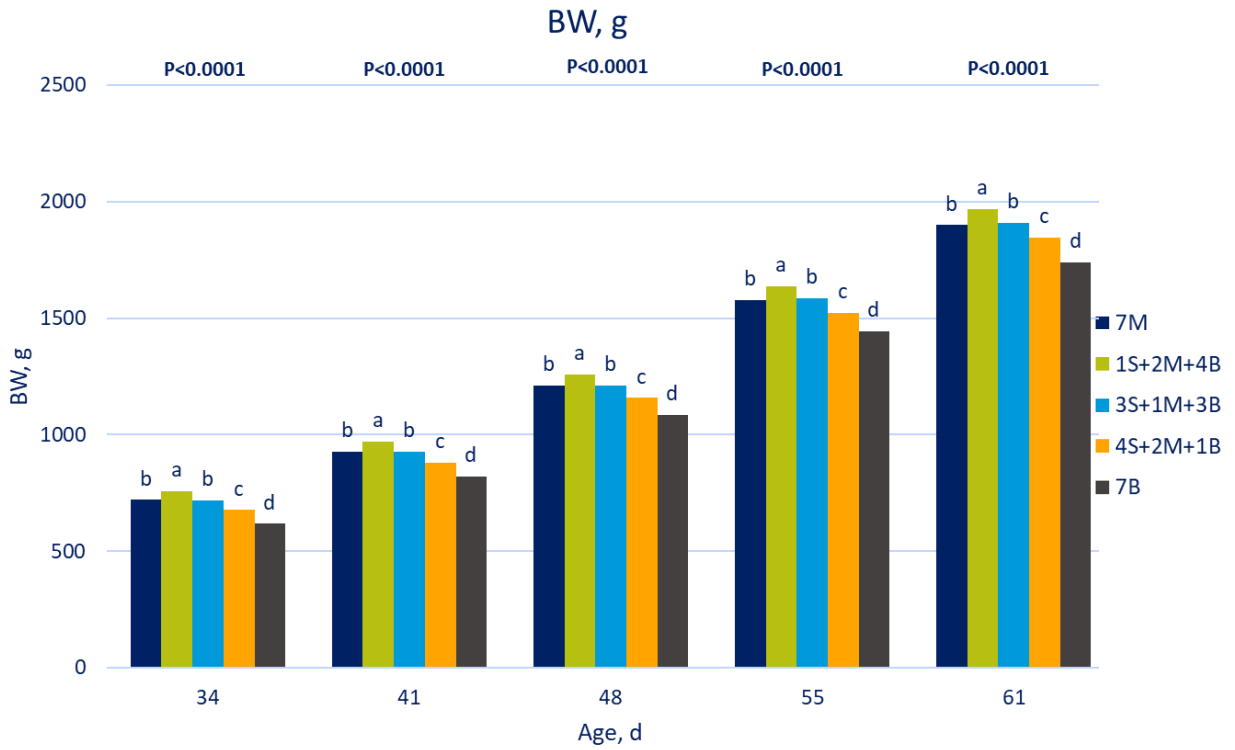
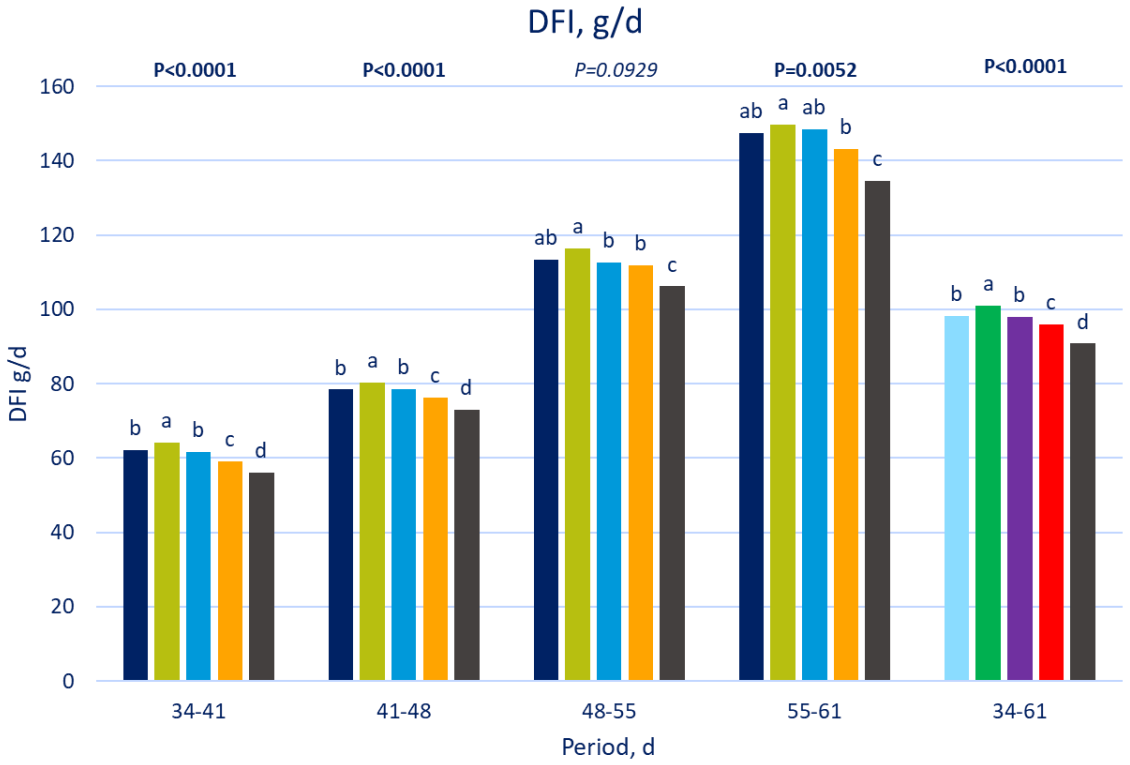
Study results: BW & DFI





Initial differences of BW are maintained across all ages. DFI followed same pattern due to animal weight

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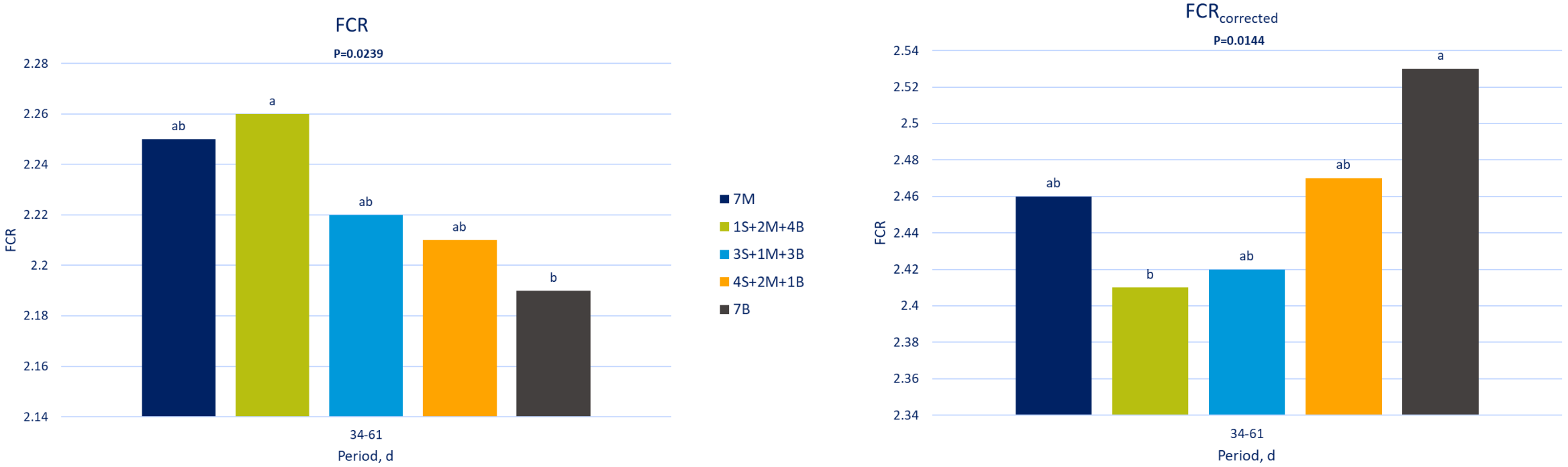
Study results: FCR vs FCR corrected



Animals with lower BW shown higher FCR levels when corrected (to 2150 g)

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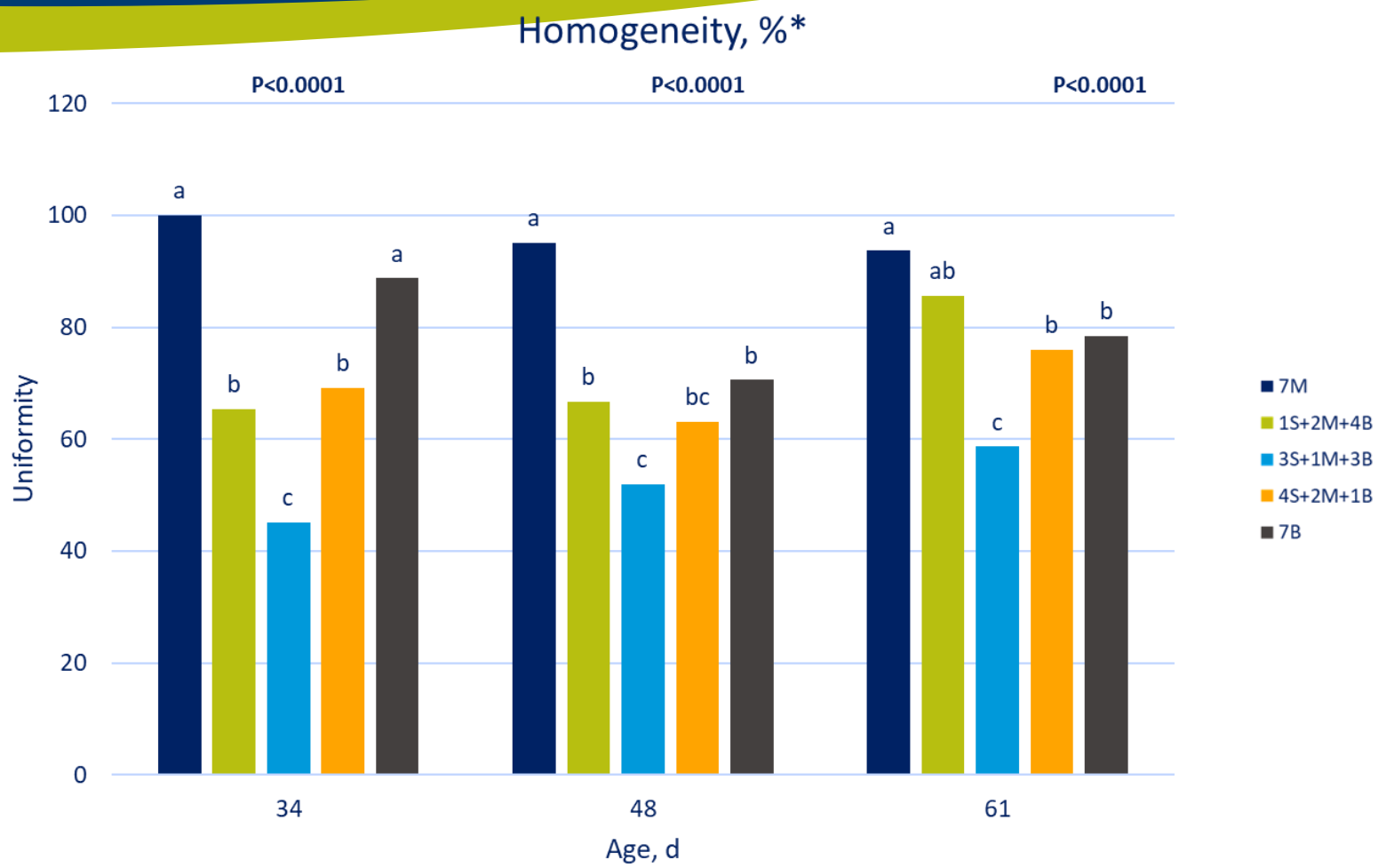
Homogeneity



* Calculated as the percentage of animals included in the average weight +/-10 %

Groups with bigger animals (treatment 2) shown an improvement in homogeneity, while an impairment of this parameters was observed in treatment which started with an homogenous but lighter flock (treatment 5).

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Conclusions

- From this results it can be concluded that, with the aim of getting homogeneous flocks under feed restriction programs, a proper weight and homogeneity at weaning is crucial

Merci Beacoup
Thank you very much

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