

**Effect of feed restriction level and period on performance
and health of growing rabbits**

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ABSTRACT: The present study aimed to evaluate the effect of the level (100%, 90% and 80% of *ad libitum*) and period (2 and 3 weeks) of post-weaning feed restriction on growth performance and health status of 246 growing rabbits controlled from weaning until commercial slaughter (33-75 d of age). Despite significant effects of restriction program during the restriction period itself and soon after, the differences in final live weights of non-restricted and restricted rabbits were not significant, whereas rabbits submitted to the strongest restriction (80%) still tended to be lighter compared to R90 rabbits (P=0.06). Therefore, daily weight gain from 33 to 75 d of age was lower in R80 compared to R90 rabbits (P=0.04); feed intake was lower in restricted vs. not restricted rabbits and in R80 vs. R90 rabbits. Feed conversion was lower (P=0.04) in restricted rabbits without differences between the two restriction levels (R90 vs. R80). The restriction program, level and period did not affect rabbit health in the entire trial.

Key words: Feed restriction, Growth performance, Health status.

INTRODUCTION – In commercial farms, growing rabbits are usually fed *ad libitum* (Maertens, 2009). However, feeding can be restricted during the post-weaning period to improve feed efficiency and standardize growth curves in rabbits with a different feed ingestion level (Ouhayoun *et al.*, 1986; Cavani *et al.*, 1991) or to control the appearance of digestive disorders (Gidenne *et al.*, 2009 and 2011). The present trial aimed to evaluate if and how the level (100%, 90% or 80% of *ad libitum*) and the period (2 or 3 weeks after weaning) of feed restriction might affect health status and performance of growing rabbits.

MATERIALS AND METHODS – At 33 d, 246 rabbits of both genders of Hyplus crossbred line (Hypharm, Groupe Grimaud, Roussay, France) were selected from the litters of multiparous does (3-6 kindling). The rabbits were divided into six experimental groups, homogeneous in average live weight and variability, and submitted to different feed restriction programs according to a bi-factorial arrangement, with three feed restriction levels (100%, 90% or 80% of *ad libitum*) during two periods (2 weeks or 3 weeks after weaning). The trial lasted six weeks and was divided into two periods: a) post-weaning period during which rabbits were fed a weaning diet (CP:

16.8%; ADF: 19.8%, coccidiostatic diclazuril, 1 mg a.p./kg) *ad libitum* (R100) or restricted at 90% (R90) or 80% (R80) of *ad libitum* during 2 weeks (T2) or 3 weeks (T3); b) fattening period, during which all rabbits were fed *ad libitum* a fattening diet (CP: 15.6%; ADF: 18.1%) for 4 weeks (T2 groups) or 3 weeks (T3 groups). Individual feed intake was controlled daily during the first three weeks to calculate the feeding level of restricted groups. Individual live weight was recorded three times a week. Health status was controlled daily to detect the occurrence of digestive disorders: rabbits were considered ill in case of diarrhoea, evident and lasting reduction of feed consumption (30% lower than the previous recording), or reduction in live weight (weight loss for more than two days). To calculate morbidity, each sick animal was considered only once, while dead animals were included only in the calculation of mortality. Sanitary risk was calculated as the sum of morbidity and mortality. The recorded data was analysed by a two-way ANOVA (restriction level and restriction period) with interaction. The GLM procedure of SAS (SAS Institute Inc., Cary, NC, USA) was used for all analyses. Orthogonal contrasts were used to test the effects of the restriction (R100 vs. R90+R80 groups), the restriction level (R90 vs. R80 groups) and, within restricted groups, the restriction period (T2 vs. T3 groups). Mortality, morbidity and sanitary risk were analysed by the CATMOD procedure (χ^2 test).

RESULTS AND CONCLUSIONS – Feed restriction significantly affected growth performance during the restriction period, but differences become weaker soon after the rabbits had free access to feed and disappeared at the end of the trial. The live weights of rabbits were significantly lower in the restricted rabbits compared to rabbits fed *ad libitum* and in the R80 groups, submitted to the most severe restriction, compared to the R90 group, both after two weeks of restriction (at 47 d of age) and after three weeks (at 54 d) ($P < 0.01$) (Table 1). At the end of the trial however, the differences in live weights between non-restricted and restricted rabbits were no more significant, whereas R80 rabbits still tended to be lighter compared to R90 rabbits ($P = 0.06$). Therefore, daily weight gain from 33 to 75 d of age was lower in R80 compared to R90 rabbits ($P = 0.04$); feed intake was lower in restricted vs. not restricted rabbits and in R80 vs. R90 rabbits.

Table 1 – Performance and health status of growing rabbits

Restriction level (L)	R100	R90	R80	R100	R90	R80	Probability			RSD
Restriction period (P)	T2	T2	T2	T3	T3	T3	R ¹	L ²	P ³	
Group (G)	R100-T2	R90-T2	R80-T2	R100-T3	R90-T3	R80-T3				
Rabbits, no.	40	38	38	35	35	36				
Live weight, g										
at 33 d of age	912	910	910	917	914	912	0.83	0.96	0.89	100
at 47 d of age	1640	1595	1503	1651	1589	1511	<0.001	<0.01	0.96	165
at 54 d of age ¹	1961	2026	1945	2043	1933	1820	0.01	<0.01	<0.001	193
at 75 d of age ²	2739	2844	2764	2895	2814	2719	0.43	0.06	0.41	277
Performance (33 to 75 d)										
Daily growth, g/d	43.5	46.0	44.1	47.1	45.3	43.0	0.43	0.04	0.33	6.0
Feed intake, g/d	138	142	137	151	143	134	0.03	0.01	0.71	17
Feed conversion	3.19	3.10	3.13	3.24	3.18	3.14	0.04	0.93	0.28	0.27
Health status ⁴										-
Mortality, %	2.44	7.32	7.32	14.6	14.6	12.2	0.65	0.80	0.21	-
Morbidity, %	43.9	36.7	52.2	51.2	46.3	36.7	0.47	0.75	0.75	-
Sanitary risk, %	46.3	43.9	58.5	65.9	61.9	48.8	0.65	0.88	0.64	-

RSD: residual standard deviation. ¹R: Probability of the effect of the restriction obtained as contrast “R100-T2+R100-T3 vs. R90-T2+R90-T3+R80-T2+R80-T3”. ²L: Probability of the effect of the restriction level obtained as contrast “R90-T2+R90-T3 vs. R80-T2+R80-T3”. ³P: Probability of the effect of the restriction period obtained as contrast “R90-T2+R80-T2 vs. R90-T3+R80-T3”. ⁴Data analysed with the χ^2 test.

Feed conversion was more favourable ($P=0.04$) in restricted rabbits without differences between the two restriction levels (R90 vs. R80). The restriction period did not affect growth performance from weaning until slaughter, apart from the lower live weight ($P<0.001$) measured at 54 d of age in the T3 rabbits, restricted for a longer period (Table 1). During the second and third week of trial, diarrhoeas and mucus occurred in several rabbits. An antibiotic treatment (Tiamuline 12.5%, 100 mL/100 L, Tiamvet, CEVA Santé Animale, France, and Colistine 12%, 150 mL/100 L, Colistine-solphate, Doxal, Italy) was offered in water from 41 d of age, and during 7 d, which permitted to recover health status during the third week. The restriction program, level and period did not affect rabbit health in the entire trial (Table 1). However, when the occurrence of digestive diseases was described day by day, rabbits submitted to the most severe restriction level (R80) fell ill less compared to other groups during the second week of the trial and, also, recovered better during the third week (Figure 1.a). During the fourth week, all groups showed a new peak of morbidity, which was however more evident (almost +20%) in R80 rabbits, previously submitted to the most severe feed restriction level. As what concerns the effect of the length of the restriction period, during the third week (47 to 54 days of age), the percentage of ill rabbits was higher in rabbits which were receiving the diet *ad libitum* (group T2), while during the fourth week the T3 group, now free of eating, showed more problems (Figure 1.b). In conclusion, feed restriction contributed to control the digestive problems during the restriction period itself, but re-alimentation impaired the health of the rabbits previously restricted.

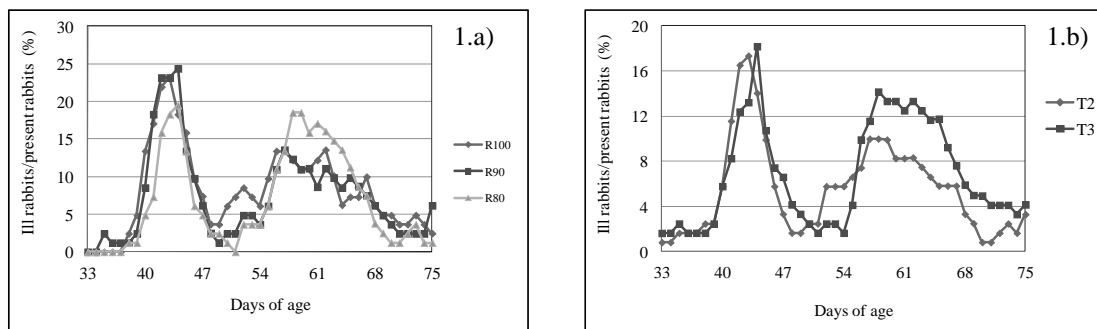


Figure 1 – Daily change of ill rabbits (% total animals) according to the restriction level (1.a) and the restriction period (1.b)

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