

EFFECT OF WATER RESTRICTION TIMES OF 2 AND 4 HOURS PER DAY ON PERFORMANCES OF GROWING RABBITS

Ben Rayana A.^{1*}, Ben Hamouda M.², Bergaoui R.¹

¹Department of Animal Science, Institut National Agronomique de Tunisie, 43 Av Charles Nicolle, 1082 Tunis Mahrajène, Tunisia

²Institution de la Recherche et de l'Enseignement Supérieur Agricoles, 30 rue Alain Savary, 1002 Tunis, Tunisia

*Corresponding author: benrayana.aniss@iresa.agrinet.tn

ABSTRACT

Hydric restriction, which is an indirect feed restriction, is a common practice to reduce post weaning digestive disorders in rabbits. Two hydric restriction times (4 h and 2 h per day) to induce feed restriction in growing rabbits in good sanitary conditions were tested in this study. Thirty six rabbits were divided at weaning (4 weeks) into three groups: T: Control group; R2 with restricted access to drinking water from 35 to 77 days of age of 2 h per day (from 8 to 10 am); and R4 with access to drinking water 4 h per day (from 8 to 12 am). Body weights, mortality, daily food and water consumption were recorded. Once a week, from 41 to 76 days of age, the alimentary compartment was followed by control of water and feed consumptions each half an hour (between 8 am and 12 am). A restricted access to drinking water of 2 or 4 hours/day induced feed restriction in growing rabbits of 25 and 20% respectively. Compared to group T, water consumed by restricted groups R4 and R2 were 71% and 58% respectively ($P < 0.01$). The water intake for R2, R4 and T were respectively: 171, 207 and 291 g/day. Water/feed ratio was lower ($P < 0.01$) with restricted groups compared to group T (1.65, 1.86 and 2.05 for R2, R4 and T respectively). Water restriction ameliorated feed conversion: 3.5 g/g for restricted groups (R2 and R4) and 3.8 for the control group. Weight gain decreased with the degree of restriction ($P < 0.01$): 36.9, 32.8 and 29.9 g/d respectively for T, R4 and R2. Controlling water and feed consumptions once a week (6 times between 41 and 76 days) is a good predictor of global feed consumption for the duration of the trial (35 to 77 day of age), with at most 2% of difference (group R2). The prediction of water consumption differed with groups. It decreased with the degree of restriction: 4%, 12% and 29% for T, R4 and R2 respectively.

Key words: Water restriction, Growing rabbits, Water, Feed, Consumption.

INTRODUCTION

Several studies note the effect of feed and water restrictions on performances of growing rabbits. Perrier and Ouhayoun (1996) observed that the effects on zootechnical performances depend on the type of feed rationing. Although, in spite of his interest, feed restriction is not easy in application because it engender more work (Boisot *et al.*, 2005). Several authors (Boisot *et al.*, 2004, 2005), Ver Delhan *et al.* (2004) undertaken the interest of water restriction (2 h and 1h30 per day) and had shown that limiting access to drinking water induced feed restriction of 18% and 22% less respectively.

The present work was undertaken to study the effects of limiting access to drinking water during the fattening period (5–11 weeks). The objectives of our trial are to compare the interest of two durations of access to drinking water on zootechnical performances in good sanitary conditions.

MATERIALS AND METHODS

This study was carried out between the 23rd of April and the 11th of June 2007 at INAT research center in Mornag, Tunisia.

Animals and experimental design

Thirty six rabbit kits, from the rabbitry of INAT (Californian grandparent stock) were at random divided at weaning at 28 days of age into 3 groups: T, R2 and R4 of 12 individuals, homogenous in body weight, sex ratio and origin (mothers). The animals from each sex and each litter were allocated to different lots. Rabbits from the three groups were placed in cages of 4 rabbits and received *ad libitum* standard commercial pellet food (10.45 MJ DE/kg, 15.5% crude protein and 16% cellulose). Group T had unrestricted access to drinking water during the all fattening period (35 to 77 days of age). Group R2 had access to drinking water from 35 to 77 days of age for 2 hours (continuously from 8 am to 10 am). Group R4 had access to drinking water from 35 to 77 days of age for 4 hours (continuously from 8 am to 12 am). Only one access to drinking water through a pipette in a 5 litres tank was available per cage of 4 rabbits.

Growth and consumption

Animals were individually weighed at weaning, 5, 6, 7, 8, 9, 10 and 11 weeks of age. Daily weight gain (DWG) was determined week by week (from 5 to 11 weeks) for each group and global DWG was determined for the period of the trial. Feed consumption (FC) and water consumption (WC) were controlled daily for each cage from 5 to 11 weeks of age. Besides, we have determined weekly feed and water consumption. The feed conversion ratio (FCR) was calculated for the same period and week by week. The ratio water/feed intake was determined.

Alimentary comportment

From the end of 5 weeks of age (41 days), until 11 weeks (76 days), alimentary comportment was followed each Sunday for the three groups. Feed and water consumptions were followed each half an hour during 4 hours (8 am to 12 am) for all the cages. We have determined evolution of water consumption during the time of access to water (groups R2 and R4) and during 24 hours (group T). We have determined feed consumption during access to water and compared values to consumption during 24 hours (Sunday at 8 am to Monday 8 am of the following day).

Mortality and morbidity

Daily supervision has permitted to enregister cases of morbidity and mortality.

Statistical Analysis

Variance analyses were performed with SAS GLM procedure (version 9.1.3). Means were compared with the student t test.

RESULTS AND DISCUSSION

Table 1 shows the performances collected for our trial from 5 to 11 weeks of age. The DWG of groups R2 and R4 were significantly lower than DWG of group T from 35 to 77 days of age. It was 29.9, 32.8 and 36.9 (g/d) respectively for R2, R4 and T (Table 1). Hydric restriction with access to drinking water for 2 or 4 hours per day reduced growth rate over all fattening period by -19% and -11% of the *ad libitum* access respectively. DWG of group R4 was slightly higher than DWG of group R2 through the trial but this difference was not significant.

Feed consumptions on groups R2 and R4 were significantly lower than group T throughout the trial: 25% and 20% less respectively (Table 1). This study clearly shows that a restricted access to drinking water for 2 or 4 hours induce feed restriction in growing rabbits. Boisot *et al.* (2005) showed that access to water of 3 hours induce a feed restriction of -23%. Boisot *et al.* (2004) and Verdelhan *et al.*

(2004) demonstrated that limitation of access to water of 2 and 1h30 per day engendered feed restriction of -18% and -22% respectively.

Table 1: Growth performance for rabbits (35-77 days) having different times of access to drinking water

	Group			Prob.	MSE
	T	R4	R2		
Rabbits, no.	12	12	10		
Live weight 35 d (g)	785	778	801	0.92	109
Live weight 77 d (g)	2335 ^A	2155 ^B	2056 ^B	<0.01	259
Weight gain (g/d)	36.9 ^A	32.8 ^B	29.9 ^B	<0.01	4.9
Feed intake (g/d)	141.9 ^a	114.2 ^b	106.2 ^b	0.03	21.8
Feed conversion (g/g)	3.8 ^a	3.5 ^b	3.5 ^b	0.03	0.5
Water intake (g/d)	291 ^A	207 ^{AB}	171 ^B	<0.01	74
Water/Feed ratio	2.05 ^A	1.86 ^{AB}	1.65 ^B	<0.01	0.56

Means with different letters on the same row differ significantly at the 5% level (Duncan test)

Groups having limited access to drinking water (R2 and R4) had lower consumption compared to group T. The daily water consumptions were significantly different between the 3 groups: 171 g, 207 g and 291 g respectively for R2, R4 and T (Table 1). The restricted animals consume 58% (group R2) and 71% (group R4) of the quantity of water consumed by animals of group T (*ad libitum*). Water consumption is lower for group R2 compared to group R4 but not significantly. Water/feed ratios (WFR) decrease with hydric restriction. Feed conversion ratios were significantly improved with hydric restriction. The same value was recorded for restricted groups R2 and R4 (3.5 g/g).

Impact of water restriction on growth, feed intake (feed conversion) on this study were similar to results obtained by Boisot *et al.* (2004) using two hydric access times to drinking water (2 h and 3 h per day).

Followed during 24 hours, results showed that feed consumption after 2 hours from access to water (8–10 am) compared to consumption for 24 hours (Sunday 8 am–Monday 8 am) were about 30%, 23% and 13% respectively for groups R2, R4 and T (Figure 1). These proportions increase to 40%, 35% and 20% after 4 hours from access to water. Compared to restricted groups, the tendency was reversed with group T.

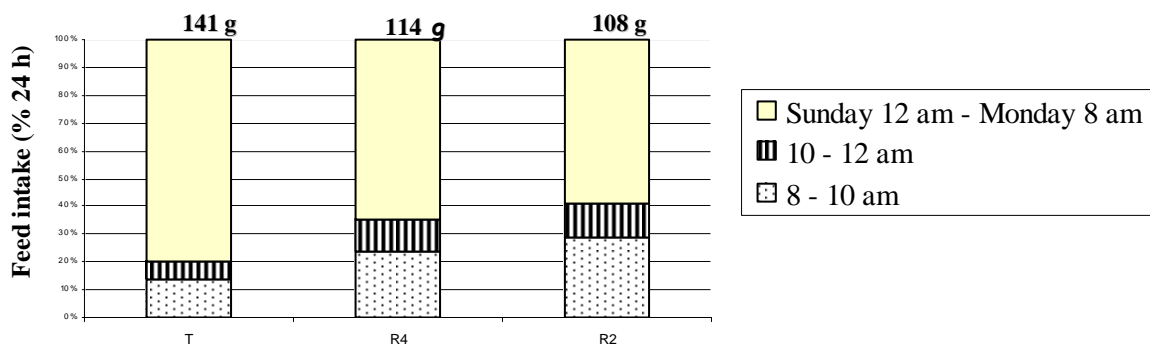


Figure 1: Feed intake in 24 hours (Sunday 8 am – Monday 8 am); means of 6 observations (41-76 d)

Figure 2 shows that water consumption is high for restricted groups for the first 30 minutes after access to drinking water (8 am–8h30 am). It is more than 40% for R2 and more than 30% for R4 compared to consumption for all the duration of access to water (2 h and 4 h). For the group T, it was less than 10%. After the second half of hour (9 am), consumption for R2 and R4 reached respectively: 58% and 43%. In two hours, animals from group R2 had consumed 221 g. Animals from group R4 had consumed 169 g in 2 hours of access to drinking water (8–10 am) and 232 g in 4 hours. Animals from group T had consumed 279 g in 24 hours: 25% in 2 hours (8-10 am), 33% in 4 hours (8-12 am) and more than 66% in 20 hours (Sunday 12 am to Monday 8 am).

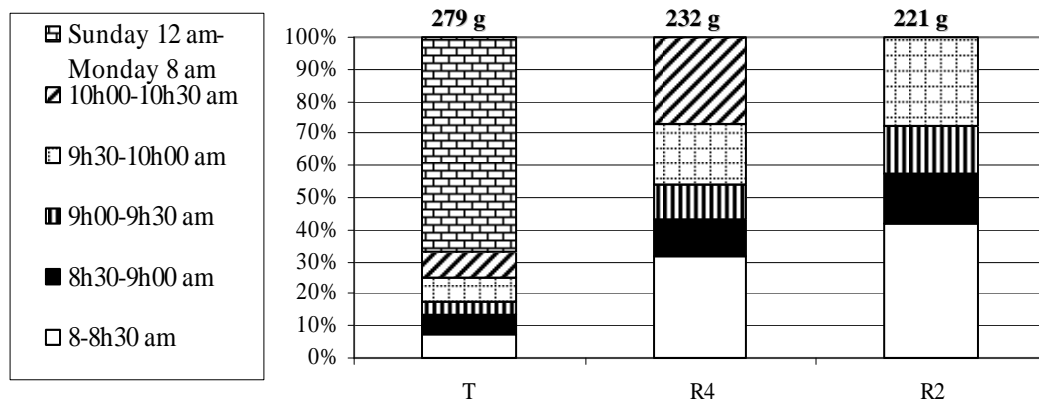


Figure 2: Water intake in 24 hours (Sunday 8 am–Monday 8 am); means for 6 observations (41-76 d)

In Table 2, we have summarized feed and water consumptions calculated by using daily data (35 to 77 day of age) and values collected in the alimentary compartment (6 times between 41 and 76 days). Our results show that supervision of water and feed consumptions for restricted groups once a week gives fairly good prediction of feed consumption for all the groups, with at most 2% of difference (group R2). The prediction of water consumption differs with groups. It decreases with the degree of restriction: 4%, 12% and 29% for T, R4 and R2 respectively.

Table 2: Comparison of data (feed and water consumption) by daily recorded and by supervision once a week

	Group								
	T			R4			R2		
	V T ¹	V AC ²	VAC/VT	V T	V AC	VAC/VT	V T	V AC	VAC/VT
Feed consumption	142	141	0.99	114	114	1	106	108	1.02
Water consumption	291	279	0.96	207	232	1.12	171	221	1.29
Water/Feed ratio	2.05	1.98	0.97	1.81	2.03	1.12	1.61	2.05	1.27

¹value of the trial; ²value of the alimentary compartment (6 times between 41 and 76 days)

Death rate was low on this trial with only two dead rabbits at 8 weeks of age on group R2 (16%). No rabbits died on groups R4 or T during the trial. Three cases of morbidity (1 in R4 and 2 in R2) were registered. No conclusion on the eventual effect of hydric restriction on mortality can be taken out of this trial. Boisot *et al.* (2003) and Gidenne *et al.* (2003) suggested that feed restriction (-80%) of *ad libitum* level was necessary to reduce mortality and morbidity of growing rabbits in ERE condition of farm.

CONCLUSIONS

Limiting access to drinking water to 2 or 4 hours per day induced feed restriction of -25% and -20% of the *ad libitum* access to water and improved feed conversion ratios. In addition, water restriction is very interesting because of its simple application.

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