INTEREST OF HYDRIC RESTRICTION TIMES OF 2 AND 3 HOURS PER DAY TO INDUCE FEED RESTRICTION IN GROWING RABBITS

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ABSTRACT

Feed restriction is a common practice to reduce post weaning digestive disorders in rabbits but is time consuming when automatic feeders are not available. Indirect restricted feeding through hydric restriction time could be an interesting alternative .Two hydric restriction times (2h and 3h per day) to induce feed restriction in growing rabbits were tested on this study. Weanlings (189) were divided at 32 days of age into 3 groups: control group with unrestricted access to drinking water (group A) and 2 groups having a restricted access to drinking water from 35 to 63 days of age of 2h/day (group B) and 3h/day (group C) (continuously from 9am to 11am for group B and from 9am to noon for group C). Body weights, mortality, food and water consumption were controlled regularly throughout the trial. Groups B and C had a growth rate over the all fattening period reduced by 10% and 8.5% compared to group A ($P<0.001$), respectively. A restricted access to drinking water of 2 to 3 hours per day induced feed restriction in growing rabbits of -18.1% and -14.6% ($P<0.001$), respectively. Feed conversion ratio were improved with hydric restriction ($P<0.001$). Zootechnical results between groups B and C were not significantly different. Death rate being extremely low on this trial (2 dead rabbits over 189 rabbits at the start of the study) no conclusion of the eventual effect of hydric restriction on mortality can be taken out of this trial. Knowing that a feed restriction of at least –20% is necessary to reduce mortality and morbidity, more work would be needed to check if a shorter hydric restriction time (e.g.: one hour per day) would induce such level of feed restriction. These results are encouraging for farmers willing to use feed restriction without automatic feeders.

Key words: feed- restriction-water.

INTRODUCTION

Feed restriction is a common practice to reduce post weaning digestive disorders in rabbits. Feed restriction can also be interesting because it improves feed efficiency (BOISOT *et al., 2003 ;* GIDENNE *et al*., 2003) and reduces carcass fat (LEDIN, 1984 ; PERRIER, 1998). GIDENNE *et al*. (2003) showed that during feed restriction mortality and morbidity were significantly reduced from a feeding level of 80% and 70%, respectively. During an experimental reproduction of epizootic rabbit enteropathy (ERE) syndrome, BOISOT *et al.* (2003) demonstrated the interest of a preventive restricted feeding to reduce the negative impact of ERE on zootechnical performances in growing rabbits. In their study, a feeding level of 60% was more efficient than a feeding level of 80% in ERE

syndrome conditions. The main problem with feed restriction is that it is time consuming when automatic feeders are not available. Indirect restricted feeding through hydric restriction time could be an interesting alternative.

The objective of this trial was to study the interest of two hydric restriction times (2h and 3h per day) to induce feed restriction in growing rabbits.

MATERIAL AND METHODS

This study was carried out between the 6th of January and the 20th of February 2004 at Evialis research centre in St Nolff (56), France.

Animals and treatments

189 kits (Hyplus strain), coming from the Evialis experimental narrow house were divided at weaning at 32 days of age into 3 groups (A, B, and C) of 63 individuals, homogenous in body weight and sex ratio. Rabbits from the 3 groups were placed in cages of 7 rabbits (9 cages per group) in a common room with *ad libitum* access to a regular rabbit growing feed (14.5% protein, 16.5% cellulose and 12% starch).

Group A had unrestricted access to drinking water during the all fattening period (32 to 67 days of age). Group B and C had restricted access to drinking water from 35 to 63 days of age for 2h and 3h per day (continuously from 9am to 11am for group B and from 9am to noon for group C) , respectively (Figure 1). Only one access to drinking water through a pipette was available per cage of 7 rabbits.

Groups	Age in days	Treatment period					Age in days
A	D32	Unrestricted Access to drinking water (UA)					D67
B	D32	(UA)	D35	Access to drinking water 2h/day	D63	(UA)	D67
C	D32	(UA)	D35	Access to drinking water 3h/day	D63	(UA)	D67

Figure 1. Type and period of treatment

Zootechnical performances collected

Rabbit body weights were controlled individually at 31 days of age (day before weaning), 39, 46, 53, 60 and 67 days of age. Feed consumption per cage was controlled when animals were weighted. Water consumption per day was controlled 16 times on 4 cages per group (4 days per week from the second week until the fifth week of the trial). Individual tanks per cage were used for the control of water consumption. Carcass weight per group was recorded individually at the end of the trial.

Statistical analyses

Statistical analyses were conducted using SPSS 11.0 software. Body weights, daily weight gains, feed consumption, water consumption and feed conversion ratio were analysed by an analysis of variance using the UNIANOVA procedure and adjusting for treatment (A, B or C). The litter effect was not included in the model for body weight and daily weight gains because the number of rabbits per litter was not homogenous among treatments. Differences among means were tested with a Duncan test. Outliers value (0.5% right or left of the normal curve) were eliminated from the analysis.

RESULTS

Growth

Growth results are presented in Table 1.

Table 1: Growth performances (means ± standard error of the mean)

	Treatments (access to drinking water)			
	A unrestricted	B 2 h per day	C 3 h per day	Significance
BW[1] at weaning (g)	775.6 ± 11.2	775.6 ± 11.4	775.5 ± 11.2	NS
BW at 46 days (g)	1538.1^{b} ± 16.7	1468.9^{a} ± 16.2	1468.5^{a} ± 18.5	P<0.001
BW at 53 days (g)	1907.0^{b} ± 19.6	1824.5^{a} ± 19.2	1833.2^{a} ± 20.3	P<0.001
BW at 60 days (g)	2248.5^{b} ± 24.5	2123.9^{a} ± 22.4	2146.0^{a} ± 22.3	P<0.001
BW at 67 days (g)	2526.7^{b} ± 28.3	2356.3^{a} ± 24.5	2380.3^{a} ± 28.9	P<0.001
DWG[2] 39-60 days (g/day)	52.2^{b} ± 0.8	48.1^{a} ± 0.6	48.5^{a} ± 0.6	P<0.001
DWG 31-67 days (g/day)	48.6^{b} ± 0.6	43.8^{a} ± 0.5	44.5^{a} ± 0.7	P<0.001
Carcass weight (g)	1461^{b} ± 17.9	1344^{a} ± 16.1	1377^{a} ± 16.4	P<0.001
Carcass yield (%)	57.8	57.0	57.9	

[1] Body weight
[2] Daily weight gain
[a, b,] on the same raw, means having the same letter are not significantly different at the 5% level

Body weights of groups B and C were significantly lower than body weights of group A from 39 days of age until the end of the trial. Hydric restriction with access to drinking water for 2h or 3h per day reduced growth rate over the all fattening period by 10% and 8.5%, respectively. No significant differences of growth rates were observed between groups B and C. Body weights of group C were slightly higher than body weights of group B throughout the trial but these differences were not significant at the 5% level (P<0.12 for differences in body weight at 67 days of age between group B and C). Groups B and C had respectively two and one outliers rabbit on body weigh criteria that were not taken into account in the analysis. No outlier rabbit was found on group A.

Apart from that, body weight homogeneity was similar among the three groups. No compensatory growth was observed on groups B and C during the 60 to 67 days period whereas rabbits from these two groups had unlimited access to drinking water the last four days of the study. Results in carcass weight followed results in body weight at the end of the trial. Groups having restricted access to drinking water had lower carcass weight than group A. Carcass yields were 57.8%, 57.0% and 57.9% for groups A, B and C, respectively. No statistical analysis can be carried out on carcass yields because individual carcass weights were followed by group without keeping track of the identification number of each rabbit.

Feed consumption, feed conversion ratio and water consumption

Results on feed consumption, feed conversion ratio and water consumption are presented in Table 2. Feed consumption on groups B and C were significantly lower than group A during the hydric restriction time period: -18.1% and -14.6%, respectively. Differences with the control group were slightly smaller over the whole fattening period: –5.9% and –12.8% for groups B and C, respectively. Rabbits from group C tended to consume more feed than rabbits from group B (significance of the difference between group B and C: $P<0.06$ for the 39 to 60 days period and $P<0.10$ for the whole fattening period). Feed conversion ratios were significantly improved with hydric restriction but no differences between groups B and C were observed. Daily water consumption was significantly lower for groups B and C compared to group A: -19.1% and -18.6%, respectively. No differences in water consumption were found between a hydric restriction of 2h per day (group B) and 3h per day (group C).

Table 2: Daily Feed consumption (DFC; g/rabbit/day), feed conversion ratio (FCR) and daily water consumption (DWC; g/rabbit/day) (means ± sem)

	Treatments (access to drinking water)			
	A	**B**	**C**	
	unrestricted	**2 h per day**	**3 h per day**	**Significance**
DFC (32 to 53 days)	$121.7^{b} \pm 0.8$	$100.9^{a} \pm 1.48$	$103.4^{a} \pm 1.1$	P<0.001
DFC (39 to 60 days)	$145.5^{b} \pm 1.3$	$119.1^{a} \pm 1.8$	$124.2^{a} \pm 1.7$	P<0.001
DFC (32 to 67 days)	$139.9^{b} \pm 0.8$	$117.6^{a} \pm 1.61$	$121.9^{a} \pm 1.94$	P<0.001
FCR (32 to 53 days)	$2.3^{b} \pm 0.01$	$2.1^{a} \pm 0.02$	$2.2^{a} \pm 0.01$	P<0.001
FCR (39 to 60 days)	$2.8^{b} \pm 0.02$	$2.5^{a} \pm 0.02$	$2.6^{a} \pm 0.01$	P<0.001
FCR (32 to 67 days)	$2.8^{b} \pm 0.02$	$2.7^{a} \pm 0.03$	$2.7^{a} \pm 0.02$	P<0.001
DWC (g/rabbit/day)	$234.9^{b} \pm 3.2$	$190.0^{a} \pm 3.2$	$191.2^{a} \pm 3.2$	P<0.001

$^{a, b,}$: on the same raw, means having the same letter are not significantly different at the 5% level (Duncan Test)

Mortality

Death rate was extremely low on this trial with only two dead rabbits on group C (3.2% of mortality). No rabbits died on groups A or B during the trial. No conclusion on the eventual effect of hydric restriction on mortality can be taken out of this trial.

DISCUSSION

Results from this study clearly show that a restricted access to drinking water for 2h to 3h per day induce feed restriction in growing rabbits. No statistical differences on feed restriction induced was found between the two restriction times even though feed restriction tended to be stronger when rabbits had access to drinking water for 2hours per day compared to 3hours per day. Sample controls of water consumption did not show any significant differences or tendency in water consumption between groups B and C. Despite the limited access to drinking water, rabbits from groups B and C were able to consume more than 80% of the voluntary daily water intake.

Impact of feed restriction on growth and feed conversion ratio on this study were similar to results obtained by BOISOT *et al*. (2003) using a feed restriction of –20%. Results from BOISOT *et al.* (2003) and GIDENNE *et al.* (2003) suggested that feed restriction of at least -20% of the *ad libitum* level was necessary to reduce mortality and morbidity in growing rabbits. Hydric restriction times of 2h to 3h per day induced a feed restriction higher than -20% and would not be sufficient as a preventive zootechnical technique to reduce efficiently mortality and morbidity in rabbit farms in view of results from BOISOT *et al.* (2003) and GIDENNE *et al.* (2003). Further work would be needed to see if a hydric restriction time of one hour per day would induce feed restriction stronger than -20%.

Other alternative that could be interesting to induce feed restriction would be quantitative hydric restriction. This technique consists in giving a daily limited amount of drinking water according to rabbit body weights. This approach would require much more follow-up than hydric restriction time but would be less time consuming than feed restriction. More work would also be needed on this topic to establish guideline practices.

CONCLUSION

A restricted access to drinking water of 2 to 3 hours per day induced a significant feed restriction in growing rabbits as well as slower growth rate and improved feed conversion ratios. The feed restriction induced was lower than –20% of the *ad libitum* feed consumption. Knowing that a feed restriction of at least –20% is necessary to reduce mortality and morbidity after weaning, additional work would be needed to check if a shorter hydric restriction time (e.g.: one hour par day) would induce a stronger feed restriction. Globally, results of the present study are encouraging for farmers willing to use feed restriction without automatic feeders.

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