WATER NUTRITIONAL SUPPLEMENTATION FOR FATTENING RABBITS: EFFECT ON FEED AND WATER INTAKE, GROWTH PERFORMANCE AND VIABILITY OF FATTENING RABBITS DURING THE SUMMER PERIOD IN THE WEST OF FRANCE.

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ABSTRACT

Performances and viability of 1728 growing rabbits divided in 3 groups with different water nutritional supplementation were analysed. This study was realised in a closed farm in western France during summer 2011. The first group (FG) received during all the fattening period (35 days to 71 days) a nutritional supplementation in the water (called Fortizen). The second group (TG) received the supplementation only when the temperature in the farm was over 24°C. The control group (CG) did not receive any supplementation. Fortizen is composed of dextrose, vitamin C, grape polyphenol, betaine and electrolytes (Na-K-Cl). Viability rate for FG group was better than for TG group (96.0 % vs 91.5) and for CG group (92.6 %, $p<0.006$). During the first week after weaning FG and TG groups viabilities equalled to 100% whereas a slight decrease in group CG viability was observed. There was no significant difference between the 3 groups for live weight, weight gain, feed intake and feed conversion for the periods considered. During the whole fattening period, the maximal daily temperature exceeded 24°C on 18 days only. The average of maximum temperature was 24.5°C. Those mild conditions turned out to be not favourable to test the beneficial role of a nutritional complement in the prevention of heat stress but the supplementation improved the viability of growing rabbits.

Key words: Heat stress, weaning stress, growth, viability, rabbit.

INTRODUCTION

A temperature of 21°C is known as the "Comfort Zone" for rabbits (Marai *et al.,* 2002). At either higher or lower temperatures, the animal has to spend energy to maintain the body temperature. At this temperature its corporal temperature (39.5°C, Shafie *et al.,* 1982) varied within a very short range (0.2-0.3 °C). Rabbit meat production is developed in countries with high summer temperatures (Italy, Spain, China, Mexico, Egypt…), and in many cases in semi-open and even open-air housing systems. In those systems, animals are highly exposed to climate changes. In hot periods, rabbits have difficulty eliminating body heat because of their non-functional sweat glands (Marai *et al.,* 2002). High temperatures affect negatively growth performance (Chiericato *et al*., 1992). In fact, feed intake decreases with heat stress. In addition weaning is determinant moment for rabbits because their environment is changing (separation of their mother, change of ambient conditions, change of cages…). For those reason, it's important to reduce the stress in order to maintain good health status and high growing performance.

To reduce these stresses, a liquid nutritional supplementation was composed with betaine, vitamin C, grape polyphenol, dextrose and electrolyte (Na, K, Cl). Hassan *et al*. (2011) shown that supplemental dietary betaine enhanced growth performance and carcass weight, stabilized the normal physiological balance. Furthermore betaine elevated the humoral and cell-mediated immunity as well as reduced rectal temperature and respiration rate when growing rabbits were subjected to heat stress. In other species, betaine supplementation significantly improved body weight gain and feed conversion in chickens (Zhan *et al.,* 2006), and pigs (Campbell *et al.,* 1995). Vitamin C and grape polyphenol

control the increase of free radicals in the blood which can affect the cardiovascular system and reduce growth performances. The elevation of temperature will activate the respiratory rate about 1.5 and 2.5 times at 25°C and 33°C, respectively (Johnson *et al.,* 1957)., and the dilation of veins of the ear. Both of these parameters generate minerals losses and affect the viability of rabbits. Dextrose will give rapid digestible energy to rabbit in order to compensate the reduction of feed intake. Therefore an experiment was set up in on-field conditions to assess the interest of this water supplementation on viability and performances of growing rabbits during the summer period.

MATERIALS AND METHODS

The study took place in a farm in western France belonging to the Sanders farms networks for innovation in rabbit husbandry. The study was carried out during summer 2011.

Animals, diets, water supplementation and housing

A total of 1728 hybrid rabbits (216 cages) were allotted at weaning (35 days), trying to balance by their litter and live weight. Rabbits were housed in collective cages, with 600 cm² per rabbits (8 rabbits per cage) and distributed in order to prevent an effect of the room. Building was closed and the temperature was controlled by a dynamic ventilation system without a pad-cooling system. Three groups of rabbits were constituted (576 rabbits per group); the first group (FG) received during all the fattening period (35 days to 71 days) a liquid nutritional supplementation (1 ml/L), called Fortizen, in the water. Fortizen is composed of sodium chloride, potassium chloride, vitamin C 99%, betaine, dextrose and grape polyphenol. Each day a new solution was realised in tempered water, and water was not restricted. The second group (TG) received the supplementation (1 ml/L) only when the ambient temperature in the fattening room was over 24°C. The control group (CG) did not receive any supplementation. During the 36 days of fattening, rabbits received the same feed with neither antibiotic nor coccidiostatic. Feed was composed of wheat bran (29%), sunflower meal (23%), beet pulp (16%), alfalfa meal (12%), barley (6%), mustard bran (5%), apple pulp (2.5%), beet molasses (2.5%), canola meal (1.5%) and vitamin / mineral premix (2.5%). .Nutritional values of the feed were DE = 2350 Kcal / Kg, crude protein 162 g/Kg, crude fiber = 175 g / Kg, crude fat = 30 g / Kg, starch 112 g / Kg. Feed distribution was manual, the animals had access to the feed during 12h00 each day (8h00 pm to 8h00 am) according to the Duréfix program (Salaün *et al*., 2011). The access to feeding trough was controlled by a trapdoor.
Mortality and water intake were measured daily. Water intake was recorded at group level (no repetitions). In each treatment, 24 cages (192 animals) were weighted at 35, 56 and 71 days old. Feed intake was measured per period and per cage with a correction by dead rabbits. Temperature was also controlled each day in order to determine the pattern of distribution of the water supplement to the TG group.

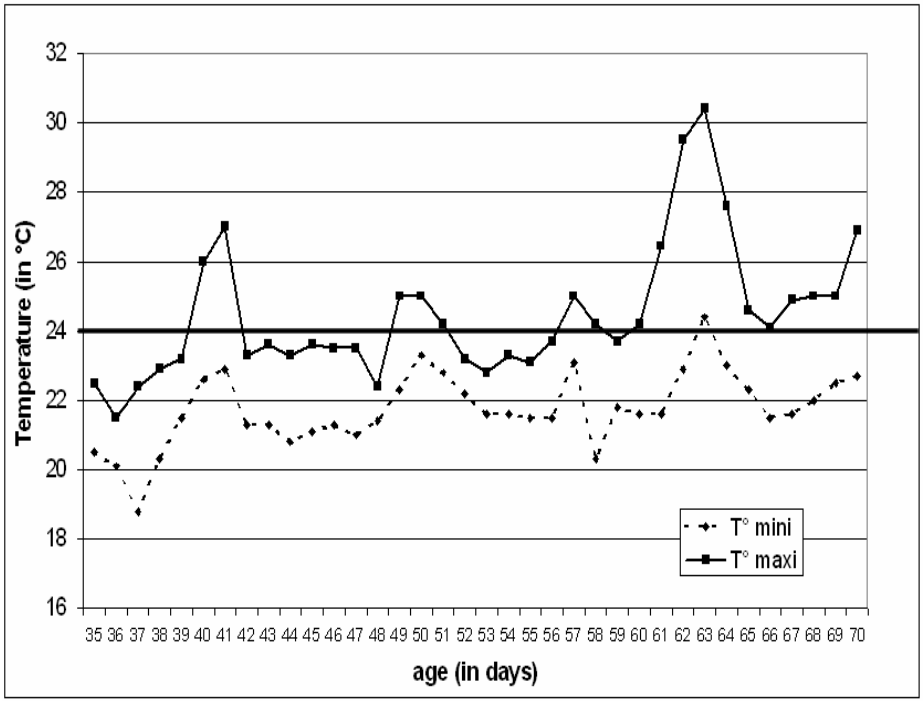
Statistics

The performances of growth and feed intake were compared by an analysis of variance with a general linear univariate model using Statistical Packages for the Social Sciences (SPSS®, 2001) with the supplementation as fixed effect. Initial weight was included as a covariate in the statistical model for growth traits. The significant differences among means were compared using the Waller-Duncan test. The viability (percentage of animals alive at the end of the period) over the period 35-71j was analyzed by a test of Chi Square.

RESULTS AND DISCUSSION

Minimum and maximum temperatures recorded in the fattening room are shown in Figure 1 from 35 to 71 days of age. During the whole fattening period, the maximum daily temperature exceeded 24°C on 18 days only. The average of maximum temperature was 24.5°C

Figure 1: Distribution of minimum and maximum temperatures within the farm during the fattening period



Growth parameters, water and feed intakes are shown in Table 1. There was no significant difference between the 3 groups for live weight, weight gain, feed intake and feed conversion rate for 3 the periods considered. Growth performances were high considering that the study took place in summer. Indeed the maximum temperatures observed during the study period remained temperate and no adverse effect on the rabbits' growth was seen. Those mild conditions turned out to be not favourable to test the beneficial role of a nutritional supplementation in the prevention of heat stress.

Table 1: Feed, water intake and growth of rabbits* for each 3 groups

Groups :	FG	TG	CG	r CV, %	P
Live weight. g					
35 days (weaning)	1 021	1 020	1 019	NC	NC
56 days	2 075	2 077	2 048	3.3	0.298
71 days	2 700	2 694	2 676	2.8	0.743
Daily weight gain. g/d					
35 to 56 days	50.2	50.4	49.0	6.5	0.298
56 to 71 days	41.7	41.1	41.9	10.1	0.687
35 to 71 days	46.6	46.5	46.0	5.4	0.743
Daily feed intake. g/d					
35 to 56 days	136.1	137.3	133.2	4.2	0.587
56 to 71 days	158.7	161.1	157.5	6.7	0.329
35 to 71 days	145.5	147.2	143.4	4.7	0.370
Feed conversion					
35 to 56 days	2.71	2.73	2.73	5.7	0.955
56 to 71 days	3.82	3.94	3.78	9.8	0.663
35 to 71 days	3.12	3.17	3.12	2.9	0.330
Water intake. ml/d					
35 to 56 days	274	261	268	NC	NC
56 to 71 days	313	310	324	NC	NC
35 to 71 days	291	282	292	NC	NC

*: n=192 animals per group for weight, weight gain, n=24 cages per group for feed intake and feed conversion, n=576 animals per group for water intake; rVC: residual coefficient of variation, according to the bifactorial variance analysis; NC: not calculable.

Results on viability are shown in Table 2. Mortalities were associated to digestive disorders only. During the first week after weaning FG and TG groups viabilities equalled to 100% whereas a slight

decrease in group CG viability was observed. At the end of the fattening period the viability rate for FG group was better than for TG group (96.0 % vs 91.5) and for CG group (92.6 %, P<0.006).

Table 2: Evolution of the viability (%) in each 3 groups* during the 5 weeks of fattening.

Groups :	FG	TG	CG	*Pr> F*
at 42 days	100.0[a]	100.0[a]	99.3[b]	0.014
at 49 days	99.6	98.1	98.5	0.094
at 56 days	99.3[a]	96.7[b]	95.8[b]	0.050
at 63 days	96.9[a]	93.6[b]	94.9[b]	0.030
at 71 days	96.0[a]	91.5[b]	92.6[b]	0.006

* n=576 Rabbits per group.

CONCLUSION

In conclusion the viability of fattening rabbits was improved during the summer period by using water nutritional supplementation. In this study, temperatures conditions were not extreme enough to clearly demonstrate the beneficial effect of such a supplementation to prevent heat stress. However even in mild conditions the differences observed for viability between Fortizen Group and Control Group contributes to ameliorate technical results.

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