EFFECT OF SUPPLEMENTARY TRYPTOPHAN, VITAMIN B_6 AND FAT ON STOMACH WATER CONTENT, AND CARCASS AND MEAT QUALITY OF PIGS

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Introduction

Fasting pigs before slaughter reduces the volume of stomach contents, minimizing the spread of viscera contents and microbial contamination that result from inadvertent puncture during the carcass dressing process (Miller et al., 1997). However, a recent project revealed a high variability in stomach weights at slaughter in pigs that were subjected to the same fasting interval before slaughter (Rabaste et al., 2007). In this study the stomach content was liquid in about 80% of the harvested stomachs. The presence of liquid content, even in small quantities, in the stomach jeopardizes meat safety as it spreads more readily over the carcass than solid content does. A direct relationship was observed between the drinking rate of pigs in lairage and the liquid content of the stomachs, this content increasing with pellet feeding and the length of the fasting interval (Saucier et al., 2007). The higher drinking rate in long-term fasted pigs may be a behavioural response to hunger. The supplementation of fat as energy source in the last meals prior to slaughter, or of tryptophan through the drinking water until slaughter, could be good strategies for curbing fasting pigs' hunger and reducing their drinking rate and water volume in the stomach. Indeed, one of the physiological effects of tryptophan is to decrease appetite (Chung et al., 1991). Adding vitamin B_6 (pyridoxine), which plays a key role in the metabolism of tryptophan in pigs, would enhance its effect (Matte et al., 2001). Tryptophan showed to reduce pig activity, but may also make pigs more lethargic and thus hard to handle (Li et al., 2006). Handling problems have been related to poor pork quality by Rabaste et al. (2007). The objectives of this study were to evaluate the effects of tryptophan and vitamin B_6 in the drinking water and of dietary fat supplementation on stomach content weight and composition, and carcass and meat quality traits of fasted pigs.

Materials and Methods

Thirty barrows of 98.3 kg (± 5.1) were randomly allotted into individual pens and subjected to the following three treatments (10 repetitions/ three treatments) over the last five days prior to slaughter: (1) conventional diet (control); (2) tryptophan (3 g/L) and vitamin B_6 (10 mg/L) supplemented drinking water (TRT1); (3) fat supplement diet (+ 3-4%; TRT2). Tryptophan and vitamin B_6 were administered through the drinking water during the last five days at the farm and in lairage, whereas fat was spread directly onto the feed in the feeder during the last day of feeding before the start of fasting. The drinking rate was measured using water-flow metres that were installed in the drinking trough of each finishing and lairage pen. At the end of the fifth day, a total feed withdrawal time of 24 h before slaughter was applied. Pigs were weighed and shipped to the experimental abattoir where they were slaughtered after 1.5 h rest. Pigs were kept in individual pens in lairage as well. After slaughter, the stomachs were removed and the weight of the stomach content was recorded. Proportion of water over the stomach content weight was obtained according to the quantity of water evaluated by weight difference between the wet and dry contents. Carcass dressing yield was recorded, and meat quality measurements, such as pH, light reflectance (L*), drip loss, in the longissimus dorsi (LD) muscle, were taken at 24 h post mortem. A LD muscle chop was aged and frozen pending the shear force analysis. Data were analysed with PROC MIXED of SAS (SAS, 2002) according to a complete randomized block design.

Results and Discussion

TRT1 pigs consumed 9.6 g of tryptophan per day on average over the whole treatment period. During the fasting interval this consumption did not result in a significant change in water intake at the farm and in lairage. However, during the 22 h fasting at the farm TRT1 pigs drank almost 2 L of water less than control pigs (3.8 *vs* 5.2 L) and in lairage they showed half of the water consumption recorded in control pigs (0.15 *vs* 0.32 L). The water consumption of TRT2 pigs was numerically the highest in lairage (0.55 L). This result, although not significant, showed a potential benefit of supplementing tryptophan in the water on the drinking rate of pigs as it was already shown in poultry (Kerr et al., 2005). The water proportion over the stomach content weight did not differ among treatments either and the numerical response did not differ to the same extent as that of water intake among treatments (Table 1). While for TRT2 pigs water consumed in lairage and proportion of water in

the stomach at slaughter seems to be related, in TRT1 and control pigs the relationship between these two parameters is not evident. As liquid evacuation rate from the stomach is higher than that of solid content (Gregory et al., 1990), a possible explanation may be the different time of drinking in lairage. Control pigs might have drunk most of the water at the beginning of lairage so that most water consumed might have been already absorbed or evacuated at the time of slaughter. TRT1 pigs instead might have concentrated their water consumption at the end of lairage limiting the time for stomach water emptying.

The carcass dressing percent of TRT2 pigs was higher (P = 0.04; Table 1) than that of control pigs indicating a lower impact of fasting on body weight losses in these pigs. Among the meat quality traits evaluated, only the shear force value was affected by the treatments. Pork of TRT2 pigs was significantly tougher (P = 0.04) than that of TRT1 pigs. In the light of the lack of difference in pH or drip loss, this result is difficult to explain. However, such a small difference (< 1 kg) in shear force values would not have any impact on the sensory perception of consumers.

Table 1. Carcass dressing yield, stomach and meat quality characteristics of pigs as affected by the tryptophan and vitamin B_6 supplemented water (TRT 1) and fat supplemented diet (TRT 2)

	Treatments				*P*- value for contrasts		
	CONTROL	TRT 1	TRT 2	SEM	CONTROL *vs* TRT 1	CONTROL *vs* TRT 2	TRT 1 *vs* 2
Dressing yield (%)	81.8	82.3	82.9	0.5	NS	**0.04**	NS
Stomach content weight (g)	221.1	248.2	322.3	70.4	NS	NS	NS
Water content (%)	96.2	95.8	96.4	0.7	NS	NS	NS
pH24	5.53	5.53	5.54	0.04	NS	NS	NS
L*	54.93	54.26	53.44	1.11	NS	NS	NS
Drip loss (%)	4.8	4.5	3.5	0.5	NS	NS	NS
Shear force (kg)	3.4	3.3	4.0	0.2	NS	NS	**0.04**

Conclusions

In this study the water supplementation with tryptophan and vitamin B_6 showed to have the potential to limit water intake in lairage. However, these results and its effects on stomach content need to be validated on a larger scale in a commercial (and more stressfull) conditions. This study also confirms that when fasting is not complicated by other preslaughter practices (i.e. mixing) muscle glycogen does not deplete to such an extent that pork quality is influenced negatively. The dietary fat supplementation applied in this study does not seem to be a recommendable feeding strategy to reduce water intake or improve pork quality.

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