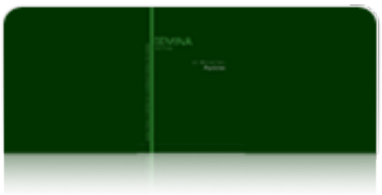

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Carcass characteristics and meat quality of finishing gilts fed diets with different levels of SID methionine + cystine and vitamin B_6 supplementation

Características de carcaça e qualidade de carne de fêmeas suínas em terminação alimentadas com dietas contendo diferentes níveis de metionina+cistina digestíveis e suplementação de vitamina B_6

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Abstract

This study was carried out to evaluate the effects of different levels of standardized ileal digestible (SID) methionine + cystine (Met + Cys) and vitamin B_6 supplementation on the carcass characteristics and *longissimus lumborum* (LL) quality in gilts from 75 to 100 kg. Fifty-six gilts were used (Talent x Topigs 20), with an initial average body weight of 75.06 ± 1.68 kg, allotted in a completely randomized block design arranged in a 2×4 factorial scheme, composed of two vitamin B_6 supplementation levels (1.58 and 3.58 mg/kg) and four levels of SID Met + Cys (0.370, 0.470, 0.570, and 0.670%), with seven replicates and one animal per experimental unit. No interactions ($P > 0.05$) between vitamin B_6 supplementation and SID Met + Cys levels were observed. The levels of SID Met + Cys and vitamin B_6 supplementation did not affect the carcass characteristics. Thawing loss increased linearly, and a quadratic effect was observed for cooking loss and shear force of the LL when dietary SID Met + Cys levels increased. The highest cooking loss (27.29%) and shear force (21.58 N) were estimated at 0.528 and 0.539% SID Met + Cys levels, respectively. The dietary SID Met + Cys requirement for gilts (75–100 kg) did not exceed 10.60 g/day (0.37%), based on carcass characteristics and meat quality parameters, and was not affected by vitamin B_6 supplementation.
Key words: Sulphur amino acids. Meat colour. Backfat thickness. Cooking loss. Lean yield.

Resumo

O objetivo foi avaliar os efeitos de níveis de metionina+cistina (Met+Cis) digestíveis e da suplementação de vitamina B_6 sobre as características de carcaça e qualidade de carne de fêmeas suínas, dos 75 aos 100 kg. Foram utilizados 56 fêmeas suínas (Talent x Topigs 20), com peso médio inicial de 75,06 ± 1,68 kg; distribuídas em um delineamento experimental de blocos casualizados, num esquema fatorial 2×4, constituído de dois níveis suplementares de vitamina B_6 (1,58 e 3,58 mg/kg) e quatro níveis de

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Met+Cis digestíveis (0,370; 0, 470; 0, 570 e 0, 670%), com sete repetições e um animal por unidade experimental. Não foram observadas interações (P > 0,05) entre suplementação de vitamina B_6 e os níveis de Met+Cis digestíveis estudados. Os níveis de Met+Cis digestíveis e a suplementação de vitamina B_6 não afetaram as características de carcaça. Foi observado um aumento linear na perda de líquido por descongelamento e uma resposta quadrática para a perda de líquido por cocção e força de cisalhamento em função dos níveis de Met+Cis digestíveis. A maior perda por cocção (27,29%) e força de cisalhamento (21,58 N) foram estimados para os níveis de 0,528 e 0,539%, respectivamente. Conclui-se que a exigência de Met+Cis digestível para fêmeas suínas, dos 75 aos 100 kg, é de no máximo 10,60 g/dia (0,370%), com base nas características de carcaça e nos parâmetros de qualidade de carne, não alterando com a suplementação de vitamina B_6.
Palavras-chave: Aminoácidos sulfurados. Cor da carne. Espessura de toucinho. Perda de líquido por cocção. Rendimento de carne magra.

Introduction

Methionine (Met) is a valuable amino acid in the formulation of pig diets. In addition to its protein deposition function, Met is the precursor of other amino acids, including cysteine, which are also used for body protein synthesis. Initially, Met is converted to homocysteine, which transfers its sulfur group to the serine, forming a cysteine molecule (trans-sulphuration pathway). Cysteine is therefore considered a nutritionally non-essential amino acid if the methionine levels are sufficient for its synthesis (BROSNAN; BROSNAN, 2006). Met is an important donor of methyl groups (CH_3), an intermediate in the biosynthesis of several biomolecules, such as creatine, and like S-adenosylmethionine (SAM), it participates in polyamine synthesis (NELSON; COX, 2014). Cysteine participates in the synthesis of the coat protein and several major biomolecules, such as glutathione – GSH (STIPANUK; UEKI, 2011).

Creatine, in its phosphorylated form (phosphocreatine), is an important energy reserve in the muscle and used for ATP re-synthesis, but is not involved in the glycolytic pathway or in lactic acid production (JANICKI; BUZALA, 2013). In contrast, GSH is an important cellular antioxidant, responsible for transforming organic hydroperoxides and hydrogen peroxides into alcohol and water, respectively, preventing the oxidation of lipids and muscle proteins (ELISABETH et al., 2005). Thus, an adequate Met supply may improve meat quality.

However, high dietary Met concentrations can elevate blood homocysteine levels, causing the condition hyperhomocysteinaemia (FRANÇA et al., 2006). According to Toborek et al. (1996), high homocysteine concentrations may induce lipid peroxidation by increasing the free radicals during auto-oxidation of a thiol group, potentially affecting meat quality.

In addition to high dietary Met levels, hyperhomocysteinaemia can be caused by a deficiency of vitamins involved in Met metabolism, such as vitamin B_6 (pyridoxine) (ZHANG et al., 2009). Vitamin B_6 acts as a cofactor for three enzymes linked to Met metabolism: serine hydroxymethyltransferase, cystathionine β-synthase, and cystathionine-γ-lyase; the latter two are related to the trans-sulphuration pathway, which is considered the major route to eliminate excess homocysteine (BROSNAN; BROSNAN, 2006).

This study aimed to evaluate the effects of various levels of standardised ileal digestible (SID) methionine + cystine (Met + Cys) and vitamin B_6 supplementation on the carcass characteristics and *longissimus lumborum* quality of gilts weighing 75−100 kg.

Material and Methods

General

The materials and methods used in this experiment were approved by the Maringá State

University Animal Care and Use Committee under the protocol number 164/2014.

Animals, housing, and diets

Fifty-six female pigs were used (Talent x Topigs 20), with an initial average body weight of 75.06 ± 1.68 kg. The pigs were housed in an open-sided finishing barn in pens of 2.20 × 1.00 m, divided in half by iron bars (1.10 m² each), with a solid cement floor and a shallow pool area (0.10 m deep) and equipped with semi-automatic individual feeders and nipple drinkers (free access to feed and drinking water). The barn was located in a masonry building.

Temperature and humidity were monitored with the aid of a Data Logger (Hobbo U10®), installed in the center of the experimental building, and data were collected every 30 minutes during the experimental period.

The animals were allotted in a completely randomized block design arranged in a 2 × 4 factorial scheme, with seven replicates per treatment and one animal per experimental unit.

Treatments consisted of two vitamin B_6 supplementation levels (1.58 and 3.58 mg/kg) and four levels of sulfur amino acids, i.e. 0.370, 0.470, 0.570, and 0.670% SID Met + Cys, corresponding to SID Met + Cys: SID Lysine ratios of 48, 61, 74, and 87%, respectively. The period was the main criteria used for block formation, since all animals used in the experiment were not available at the same time. The experimental diets were formulated using corn, soybean meal, vitamins, minerals, and additives (Table 1) and met the requirements proposed by the NRC (2012) for female pigs from 75 to 100 kg, except for SID Met + Cys, which ranged from 0.370 to 0.670%.

Table 1. Centesimal, chemical and energetic composition of experimental diets (as feed basis) containing different levels of standardized ileal digestible (SID) methionine + cystine (Met+Cys).

Ingredientes, %	SID Met+Cys, %			
	0.370	0.470	0.570	0.670
Corn	84.34	84.34	84.34	84.34
Soybean meal	11.35	11.35	11.35	11.35
Oil	1.07	1.04	1.03	1.00
Limestone	0.99	0.99	0.99	0.99
Dicalcium phosphate	0.70	0.70	0.70	0.70
Salt (NaCl)	0.20	0.20	0.20	0.20
L-Lysine-HCl (78.4%)	0.39	0.39	0.39	0.39
DL-Methionine (99.0%)	-	0.10	0.20	0.30
L-Threonine (98.0%)	0.11	0.11	0.11	0.11
L-Tryptophan (98%)	0.03	0.03	0.03	0.03
L – Valine (98.5%)	0.03	0.03	0.03	0.03
Glutamic acid	0.31	0.21	0.10	-
Inert[1]	-	0.03	0.05	0.08
Antioxidant[2]	0.01	0.01	0.01	0.01
Growth promoter[3]	0.02	0.02	0.02	0.02
Mineral premix[4]	0.05	0.05	0.05	0.05
Vitaminpremix[5]	0.40	0.40	0.40	0.40
Calculated composition, %				
Metabolizable energy, kcal/kg	3,300	3,300	3,300	3,300

continue

continuation

Total nitrogen, %	2.01	2.01	2.01	2.01
Calcium, %	0.56	0.56	0.56	0.56
Available phosphorus, %	0.26	0.26	0.26	0.26
Sodium, %	0.10	0.10	0.10	0.10
Potassium, %	0.45	0.45	0.45	0.45
Chlorine, %	0.25	0.25	0.25	0.25
SID lysine, %	0.770	0.770	0.770	0.770
SID methionine, %	0.174	0.274	0.374	0.474
SID Met+Cys, %	0.370	0.470	0.570	0.670
SID threonine, %	0.480	0.480	0.480	0.480
SID tryptophan, %	0.130	0.130	0.130	0.130
SID valine, %	0.510	0.510	0.510	0.510
SID isoleucine, %	0.411	0.411	0.411	0.411
SID leucine, %	1.046	1.046	1.046	1.046
SID histidine, %	0.298	0.298	0.298	0.298
SID phenylalanine, %	0.522	0.522	0.522	0.522
SID arginine, %	0.668	0.668	0.668	0.668
SID Met+Cys:Lys	0.48	0.61	0.74	0.87

[1]Sand. [2]BHT. [3]Tylosin phosphate (25%). [4]Content/kg of diet: iron – 50.00 g; cooper – 5.00 mg; cobalt –0.50 mg; manganese – 20.00 mg; zinc –50.00 mg; iodine- 0.75 mg; selenium – 0.30 mg. [5]Content/kg of diet: vit. A – 4400 IU; vit D_3 – 960 IU; vit. E – 25.60 IU; vit B_1 –0.640 mg; vit B_2–2.13 mg; vit. B_6–1.58 mg; vit B_{12}–16.00 mcg; nicotinic acid – 19.34 mg; pantotenic acid –12.16 mg; vit. K_3 –1.92 mg; folic acid –0.192 mg; biotin –0.064 mg and choline – 127.31 mg.

The amino acid compositions of corn and soybean meal used in the diets were analyzed at Evonik Industries (São Paulo, SP, Brazil) by reflectance spectrophotometry on near infrared; we then applied the ileal digestibility coefficients proposed by Rostagno et al. (2011) to estimate the SID amino acid values.

The DL-Met was added to the experimental diets to meet the studied levels of SID Met + Cys. Glutamic acid was used in the experimental diets to standardise the nitrogen across all the diets. The vitamin premix set the vitamin B_6 supplementation at 1.58 mg/kg, according to the manufacturer's recommendation, and the 3.58 mg/kg level was achieved by using pyridoxine (99%).

Slaughter procedures

At the end of the trial period (100.11 ± 3.52 kg BW), the pigs were fasted for 24 hours and subsequently slaughtered in the abattoir of the Maringá State University Experimental Farm. The pigs were submitted to electrical stunning (200 W), killed by exsanguination, shaved, and gutted.

Carcass characteristics

The carcasses were chilled (1–2ºC for 24 hours) and individually evaluated, according to the Brazilian Method of Swine Carcass Classification (BRIDI; SILVA, 2009), to determine hot carcass weight, cold carcass weight (CCW), hot carcass yield, carcass weight loss on cooling (CWLC), ham yield, backfat thickness (BT), and *longissimus lumborum* (LL) depth. The liver and kidneys were weighed to obtain the relative organ weight based on the hot carcass weight.

The BT, LL depth, and CCW values were then used to estimate lean yield (LY), using the equation proposed by Guidoni (2000), as follows: LY (%) = 65.92 – [(0.685 x BT) + (0.094 x LL depth) – (0.026 x CCW)].

Meat quality

The LL pH was measured in the hot carcass 45 minutes after slaughter (initial pH) and in the chilled carcass stored at 1–2ºC for 24 hours (final pH), using a portable digital pH meter HI 99163 (Hanna Instruments), following the recommendations of Bridi and Silva (2009). The pH meter was calibrated before use to pH 7.01 and 4.01.

For qualitative evaluations, three samples (2.5 cm thick) of the LL were obtained from the insertion region of the last thoracic vertebra to the first lumbar in the caudal-cranial direction, as described by Bridi and Silva (2009). The samples were used to determine colour, drip loss, thawing loss, cooking loss, and shear force.

For colour, six Minolta lightness measurements were performed (L*, a*, and b*) using a portable colorimeter CR-400 Minolta (settings: illuminant D65; 0° viewing angle; four auto-average modes). The components L* (luminosity), a* (red-green intensity), and b* (yellow-blue intensity) were expressed in the CIELAB colour system.

Drip loss was evaluated according to the procedures described by Boccard et al. (1981). Thawing loss was obtained by the weight difference between the frozen sample ad the sample stored at 4°C for 24 hours. Cooking loss was determined according to Bridi and Silva (2009) by using an electric oven, preheated to 170°C, and a final internal temperature of 71ºC.

Shear force (N) was measured for the cooked LL samples. Briefly, six cylindrical subsamples (diameter 1.27 cm) were taken from each sample longitudinally and in the direction of the muscle fibres, according to Ramos and Gomide (2012). Analyses were performed on a texturometer (model Stable Micro System TA-Xt2i) fitted with a Warner–Bratzler shear force blade; we used the software Texture Expert Exponent – Stable Micro Systems.

Subsequently, the values of initial pH, final pH, component L*, and drip loss were used to determine the PSE (pallid, soft, exudative) meat frequency, according to Warner et al. (1997) and adapted by Bridi and Silva (2009).

The incidence of PSE meat (as a percentage) was measured and the data were processed for $y = \arcsin \sqrt{PSE/n}$, assuming a binomial distribution, according to Haddad and Vendramim (2000).

Statistical analysis

The univariate procedure was used to identify any outliers in the data. Carcass characteristics and meat quality data, as well as the effects of the block design, SID Met + Cys, vitamin B_6 supplementation, and interaction between SID Met + Cys and vitamin B_6, were analysed by analysis of variance. Slaughter weight was used as a covariate for carcass characteristics and was withdrawn from the model because it had no significant effect ($P > 0.05$). The average values for vitamin B_6 supplementation were analysed by the F-test. The degrees of freedom relating to SID Met + Cys levels were deployed in orthogonal polynomials to obtain the regression equations. All statistical tests were performed using the general linear model (SAS, 2002. Inst. Inc.; Cary, NC, USA), with a significance level of 5% ($P \leq 0.05$).

Results and Discussion

Considering the minimum (15.84 ± 3.13ºC) and maximum (25.17 ± 4.10ºC) temperatures and the relative humidity (69.2 ± 13.13%) recorded during the trial period, the animals were not subjected to extreme environmental conditions. Ferreira (2005) considers temperatures of 5 and 27°C as the minimum and maximum critical temperature, respectively, with an ideal relative humidity for finishing pigs between 50 and 70%.

Methionine has a complex metabolism, interacting with several biomolecules such as vitamin B_6. It acts like a cofactor for three

enzymes linked to methionine metabolism: serine hydroxymethyl transferase, cystathionine β-synthase, and cystathionine-γ-lyase; the latter two are related to the trans-sulphuration pathway, which is considered the major route for the elimination of excess homocysteine (BROSNAN; BROSNAN, 2006). Despite this, no interactions ($P > 0.05$) were observed between vitamin B_6 supplementation and SID Met + Cys levels among the evaluated parameters (Tables 2 and 3).

In addition to its role in the Met metabolism, the active form of vitamin B_6, pyridoxal 5'-phosphate (PLP), acts as a coenzyme, participating in numerous enzymatic reactions related to the metabolism of others amino acids. Conventionally, pyridoxal phosphate acts as an intermediate carrier of amino groups in the transamination reactions, acting at the active site of transaminases. Thus, pyridoxal phosphate is converted into its aminated medium (pyridoxaminephosphate), but then gives an amine radical (NH_3) to a specific α-keto acid (NELSON; COX, 2014). These authors also reported that vitamin B_6 plays important roles in the maintenance of the energy metabolism, especially in situations with low blood glucose levels (e.g. fasting). Pyridoxal phosphate is cofactor of the enzyme glycogen phosphorylase, responsible for the cleavage of glycogen to release glucose (glycogenolysis). Nevertheless, supplementation with the highest vitamin B_6 levels had no significant impacts ($P > 0.05$) on carcass characteristics and meat quality (Tables 2 and 3, respectively), indicating that the lowest level (1.58 mg/kg) met the animals´ requirements. Rostagno et al. (2011) suggested a vitamin B_6 supplementation of 1.2 mg/kg for a BW of 70-100 kg, while the NRC (2012) recommends 1 mg/kg for a similar BW range (75-100 kg).

The effect of SID Met + Cys levels on the lipid metabolism in swine has previously been reported. Vaz et al. (2005) and Moura et al. (2006) observed a lower fat deposition in the carcasses of growing pigs, while Pena et al. (2008) obtained the lowest cholesterol levels in the loin and backfat of finishing pigs fed a diet with a Met + Cys/lysine ratio of 0.66.

The SAM is the most important CH_3 donor for the synthesis of biomolecules such as carnitine, which is essential for lipid metabolism as it is involved in the transport of long-chain fatty acids across the mitochondrial membrane. The acyl-fatty acids bind to carnitine to form acyl fatty-carnitine, enabling its transport from the cytosol to the mitochondrial matrix, where it is oxidised to generate energy (STEPHENS et al., 2007; APPLE et al., 2011). Therefore, carnitine can decrease the number of free fatty acids available for lipid biosynthesis, reducing BT. Despite this, the levels of SID Met + Cys did not significantly affect ($P > 0.05$) carcass characteristics (Table 2).

In addition to improving carcass characteristics, an adequate Met + Cys supply can improve meat quality attributes such as colour, water-holding capacity, and softness. One of the main causes of meat quality loss is the rapid and extensive decline in pH *post-mortem* due to lactic acid accumulation from anaerobic glycolysis, prior to efficient carcass cooling (ADZITEY; NURUL, 2011). This combination of low pH values and high temperature leads to muscle protein denaturation, particularly of myosin and myoglobin (meat pigment), resulting in meat with a light colour and low water-holding capacity (SCHEFFLER; GERRARD, 2007; BARBUT et al., 2008) and, consequently, in pale, soft, and exudative meat.

Table 2. Carcass characteristics and relative organs weight of gilts (75 to 100 kg) fed diets containing different levels of standardized ileal digestible (SID) methionine + cystine (Met+Cys) and vitamin B_6 supplementation.

Item	SID Met+Cys (%)				B_6 (mg/kg)		Pooled SEM	*P*-value			
	0.370	0.470	0.570	0.670	1.58	3.58		Met+Cys x B_6	B_6	Met+Cys	
										Lin	Quad
Hot carcass weight, kg	80.37	80.52	80.36	79.97	80.15	80.46	0.165	0.683	0.129	0.725	0.758
Cold carcass weight, kg	78.14	78.28	78.10	77.61	77.88	78.18	0.175	0.599	0.165	0.652	0.719
Hot carcass yield, %	83.79	83.31	83.23	83.24	83.11	83.68	0.171	0.710	0.119	0.289	0.460
CWLC, %	2.78	2.78	2.81	2.96	2.83	2.84	0.072	0.846	0.992	0.407	0.631
Ham yield, %	29.15	29.46	29.47	29.35	29.36	29.36	0.134	0.866	0.959	0.585	0.389
LL depth, mm	58.69	58.94	59.81	60.43	59.10	59.83	0.582	0.771	0.510	0.227	0.479
Backfat thickness, mm	13.97	13.07	13.37	11.77	12.98	13.12	0.493	0.154	0.868	0.174	0.377
Lean yield, %	52.86	53.46	53.17	54.27	53.54	53.34	0.328	0.174	0.748	0.203	0.419
Organs weight, %											
Liver	1.78	1.76	1.71	1.80	1.79	1.74	0.025	0.437	0.400	0.966	0.310
Kidneys	0.49	0.48	0.49	0.46	0.48	0.48	0.007	0.278	0.870	0.151	0.285

CWLC= Carcass weight loss in cooling.

In the creatine biosynthesis, Met, as the SAM form, acts as a CH_3 donor. In its phosphorylated form (phosphocreatine), creatine is an important energy source for muscle tissue because it provides an immediate ATP re-synthesis (phosphocreatine + ADP = ATP + creatine). The ATP produced from phosphocreatine is particularly important because it does not involve the glycolytic pathway or lactic acid production (BERG; ALLEE, 2001; JANICKI; BUZALA, 2013). Thus, an adequate Met supply for creatine synthesis can decrease the rate and intensity of the *post-mortem* pH decline. However, in this study, no effect of SID Met + Cys levels on muscle pH (initial and final) was evidenced, suggesting that the glycolytic rate in the *post-mortem* period had not changed.

Methionine can be metabolically converted into cysteine, which is used for GSH synthesis, an important antioxidant. Cysteine is also required for selenocysteine synthesis, which is part of the active site of glutathione peroxidase (GPx), an enzyme of the GSH antioxidant system (BOLER et al., 2009; LU, 2013). This system is responsible for decreasing organic hydroperoxides (such as lipoperoxide) and hydrogen peroxides to alcohol and water, respectively, preventing membrane lipid peroxidation, thereby maintaining membrane integrity (WANG et al., 2009). The GSH antioxidant activity also prevents the oxidation of proteins, such as myoglobin and myofibrillar proteins, preserving the colour and water retention capacity of meat (ELISABETH et al., 2005). Methionine is also required for phosphatidylcholine biosynthesis, the most abundant phospholipid in mammalian cell membranes (ZEISEL, 2006), which is essential to maintain membrane integrity and cell fluid rates.

The colour components (L*, a*, and b*) and the drip loss of LL were not affected by the SID Met + Cys levels in the diet (Table 3), indicating no improvements in the oxidative stability and cell membrane integrity. These results are in agreement with the pH values (initial and final), which were also not affected, as these parameters are related (SCHEFFLER; GERRARD, 2007).

Although the SID Met + Cys levels did not affect the LL drip loss, there was a linear increase (P = 0.048) in thawing loss and a quadratic response for cooking loss (P = 0.013), where the highest value (27.29%) was observed at a SID Met + Cys level of 0.528% (Table 3). The shear force of the LL was also influenced by increasing SID Met + Cys levels in the diets, presenting a quadratic response (P = 0.046),

where the highest value (21.58 N) was observed at a SID Met + Cys level of 0.539%. These results are partially due to the increased cooking loss, as these parameters are related (RAMOS; GOMIDE, 2012). While shear force indirectly represents the degree of meat softness, in the present study, all the obtained values were in an extreme softness range. According to Lyon and Lyon (1991), the LL of pigs can be rated in the same manner as the *pectoralis major* of chickens. Thus, the authors ranked the samples as extremely soft (< 35.50 N), moderately soft (35.51−64.82 N), slightly hard (64.83−94.14 N), moderately hard (94.15−123.56 N), and extremely hard (> 123.56 N).

The optimum dietary SID Met + Cys level for gilts (75–100 kg) did not exceed 0.37% (10.60 g/day), based on carcass characteristics and meat quality parameters. This intake is lower than the 14.50 g/day suggested by Rostagno et al. (2011) for female pigs from 70 to 100 kg, but is close to the 10.55 g of Met + Cys/day recommended by the NRC (2012) for female pigs from 75 to 100 kg.

Table 3. Meat quality measured on *longissimus lumborum* of gilts (75 to 100 kg) fed diets containing different levels of standardized ileal digestible (SID) methionine + cystine (Met+Cys) and vitamin B_6 supplementation.

Item	SID Met+Cys (%)				B_6 (mg/kg)		Pooled SEM	*P*-value			
	0.370	0.470	0.570	0.670	1.58	3.58		Met+Cys x B_6	B_6	Met+Cys	
										Lin	Quad
Starter pH	6.25	6.35	6.13	6.24	6.22	6.27	0.032	0.070	0.416	0.489	0.789
Final pH	5.63	5.71	5.58	5.61	5.62	5.64	0.023	0.952	0.692	0.335	0.559
Drip loss, %	4.23	3.34	3.10	3.59	3.63	3.50	0.214	0.864	0.748	0.275	0.156
Thawing loss, %[a]	6.33	6.35	7.50	7.26	6.68	7.03	0.213	0.735	0.445	0.048	0.237
Cooking loss, %[b]	24.40	27.24	26.78	25.14	26.49	25.28	0.383	0.587	0.132	0.776	0.013
Color L*	55.37	53.66	54.08	53.91	54.97	53.54	0.350	0.247	0.053	0.314	0.372
Color a*	6.91	6.59	6.50	7.10	6.80	6.75	0.153	0.681	0.860	0.731	0.157
Colorb*	4.92	4.32	4.51	4.64	4.80	4.40	0.104	0.056	0.063	0.498	0.081
Shear force, N[c]	18.93	21.37	21.17	20.12	19.92	20.87	0.044	0.393	0.369	0.445	0.046
PSE, %[d]	0.00	7.15	0.00	7.15	3.57	3.57	2.290	-	-	-	-

[a] $Y= 4.8350 + 3.9095X$ (R^2=0.70). [b] $Y= –3.8410 + 117.9103X – 111.6594X^2$ (R^2=0.94). [c] $Y= –0.4526 + 9.8328X – 9.1141X^2$ (R^2=0.87). [d] Not different by Tukey Test (P>0.05), with transformed data for y= arc sin √PSE/n.

Conclusions

The optimum dietary SID Met + Cys level for gilts (75–100 kg) did not exceed 0.37% (10.60 g/day), based on carcass characteristics and meat quality parameters, and was not affected by supplementation with high vitamin B_6 levels.

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