

EFFECTS OF MODIFIED VITAMIN E DIETARY FORMULATION ON MEAT QUALITY OF FINISHING PIGS

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Introduction

The effects of Vitamin E on the meat quality has been reported by many studies as regard to the finishers fed with corn soybean type diet. Pork quality can be improved by feeding preslaughter diet with 50-300 ppm (Corine et al. 1999) Vitamin E for 60 days before slaughter. In case of corn-Soybean-wheat-ricebran diet rather than typical corn-soybean the Vitamin E requirement could be modified to a lower level without negative effects for better quality pork because there are rich resource of Vitamin E in ricebran already. Ricebran is one of the major feedstuff for finishers in Anhui province. It can be used as Vitamin fortifier in combination with additive Vitamin E and other nutritional enhancers. This trial is to study preliminarily the effect of a modified formulation with ricebran, Vitamin E and other enhancers in the diet on the meat quality of finishing pigs.

Materials and methods

50 Duroc x Landrace x Yorkshire castrated males of about 90 kg live weight were divided randomly into two groups (25 for each). Group 1 was fed with control diet while Group 2 fed with modified Vitamin E diet for 15 days before slaughter.

Control diet (DE=3200Cal/kg; CP=13%): corn 68%, soybean meal 6.8%, wheat 17%, cottonseed meal 3.8%, rapeseed meal 0.4%, premix 4%.

Modified diet(DE=3200Cal/kg; CP=13%): corn 56%, soybean meal 10%, wheat 15%, fresh ricebran 15%, premix 4%, modified vitamin E 100 ppm, NaHCO₃ 0.2%, vitamin C 800mg/d.(* NaHCO₃ was fed at countdown time schedule 96-72h and 48-24h preslaughter, and Vitamin C was fed 72-48h and 24-0h preslaughter. Modified Vitamin E consists of 100ppm Vitamin E, 100ppm Fe and 0.25 ppm Se.)

4 finishers of about 100 kg live weight from each group were slaughtered for meat quality analysis. The whole eye muscle (M. Longissimus dorsi) of each dressed carcass was carefully taken then stored overnight in a refrigerator at 4°C. The sample section of the eye muscle between the 7th rib and last rib was taken out of the refrigerator and used for meat quality tests at 24 hrs post mortem. A piece of eye muscle of each eyes muscle sample at due time was measured with a pH meter (type pH-29, made in China) for pH₂₄ and with a Minolta Color Meter (type II, made in Japan) for L* (brightness), a* (redness) and b* (yellowness) values at 24h, 48h, and 72h post mortem as described by Bocard et al(1980). The other piece of each eye's muscle sample at the 8th rib of 70-100 g was used for drip loss and cooking loss as described by Honikel (1987). One other piece of 100 g eye muscle was used for Napole yield test described by Naveau et al. (1985). By the way, a cubic meat of 1x1x5 mm³ was cut from each sample at the last rib location for fiber diameter measurement as described by Staun(1972). For tenderness measurement, each sample was aged at 15-16°C for 24h and 0-4°C for 48h, and then incubated in 80°C water bath until the meat temperature reached 70°C. The cooked meat sample then was measured for shearing force (tenderness)with C-LM Tenderness Meter(made by North East Agri. Uni. China) as described by Chen Runsheng(1990).

All data were analyzed statistically (SAS, 1990) for comparisons of least significant differences

Results and discussion

The data of the result in table 1 imply no significant effects of the modified preslaughter formulation on meat color L*, a*, saturation, pH₂₄ and tenderness while the b* of the treated group was lower(p<0.05) at 24h and 48h post mortem. There might be a tendency that the super-oxidation product of met-myoglobin was hampered by Vitamin E. The decreasing yellowness caused by decreasing brown met-myoglobin of the treated samples could be the key to lower b*.

The data of the result in table 2 show that the modified formulation with additive NaHCO₃ at 0.2% level in the diet has not been as strong as expected to increase muscle pH₂₄ significantly (p>0.05). More formulations need to be tried to insure the higher pH₂₄.

However, there was a significant improvement in decreasing drip loss and cooking loss and in increasing Napole yield(p<0.05). The results above confirmed the improvement of water holding capacity caused by the modified formulation. The hypothesis is based on the effects of Vitamin E from both rice bran (15% in diet) and additive of 100ppm Vitamin E, and other related enhancers in the diet. The Vitamin E and possibly with the interaction of Vitamin C and other enhancers favored muscle fiber membranes and microstructure in

binding water. In addition, the anti-oxidation or anti-free radical function of Vitamin E in the muscle could be another interpretation for better water holding capacity in post mortem time.

The fiber diameter and the tenderness were not influenced by the modified formulation (table2). It could be reasonably regarded as a kind of reference in case the formulation needs to be used and insured for future practical usage.

Conclusions

The favorite effect of rice bran combined with additive Vitamin E and other enhancers on the water holding capacity of finishing pig is to some extend meaningful, even if the feeding duration could be as short as 15 days. However, further studies of higher free degree on the effect of rice bran and vitamin E grouped at different concentration, different duration, with different enhancers need to be conducted.

Table 1 The meat color parameters of different treatments at 24h, 48h and 72h post mortem.

Color parameter	Control	Treated
L* _{24h}	56.94 ± 2.70	54.20 ± 2.69
a* _{24h}	7.99 ± 2.08	6.16 ± 2.19
b* _{24h}	3.34 ± 3.34 ^a	1.22 ± 1.32 ^b
S _{24h}	8.66 ± 2.87	6.27 ± 2.10
L* _{48h}	57.32 ± 2.97	57.44 ± 1.63
a* _{48h}	7.12 ± 2.14	5.94 ± 1.14
b* _{48h}	7.16 ± 1.25 ^a	4.88 ± 1.59 ^b
S _{48h}	10.10 ± 2.48	7.69 ± 1.96
L* _{72h}	58.48 ± 2.97	58.10 ± 1.63
a* _{72h}	6.95 ± 2.10	5.83 ± 1.20
b* _{72h}	5.88 ± 2.11	5.35 ± 1.82
S _{72h}	9.10 ± 2.11	7.91 ± 2.18

L*, a*, b* and S stand for brightness, redness, yellowness and saturation separately

Means with different superscripts differ significantly (p<0.05)

Table 2. The other meat quality parameters of different treatments

Parameters	Control	Treated
Drip loss%	5.77 ± 0.73 ^a	4.42 ± 1.53 ^b
Cooking loss%	29.11 ± 2.86 ^a	25.50 ± 3.33 ^b
Napole yield%	66.66 ± 1.45 ^a	70.05 ± 0.84 ^b
pH ₂₄	5.76 ± 0.03	5.87 ± 0.13
Tenderness (N)	39.21 ± 4.93	38.38 ± 4.17
Fiber diameter (μ)	69.80 ± 4.50	70.16 ± 4.12

Means with different superscripts differ significantly (p<0.05)

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