EFFECT OF CARROT-FEEDING ON THE COLOR AND FAT RANCIDITY OF PORK

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Abstract – LYD hogs were fed with 0.5 kg/day at the ages of 135 days and lasted for 50 days before slaughtered. Loin muscles were evaluated for colors and thiobarbituric acid-reactive substances (TBARS) values during storage at 4°C for 4 days. The results showed that the TBARS values of samples were increased with storage time as expected. The carrot-feeding samples had significantly lower TBARS values after storage for more than 2 days. Except for a* values of raw samples, no significant difference was observed in the instrumental color evaluation between treatments. Overall sensory evaluation results showed that less difference was observed in the sensory characteristics between treatments. Decrease in meat odor/flavor and increase in rancid odor/flavor resulted in decrease in overall acceptance of samples as the storage time increased.

Key Words – Carrot, Color, Pork, Rancidity

I. INTRODUCTION

Meat quality is very critical when consumers evaluate or purchase meat and meat products. Among them, color and odor (flavor) are the two major criteria during evaluation. Fat or lipid in meat might be oxidized and even produce some unpleasant odors which causes the rejection of products during storage of products. Some plants, extracts and additives have been added in the diets of animals to increase meat quality (Gonzalez & Tejeda, 2007). Carrot which is a primary vegetable in many countries contributes significantly to dietary vitamin A intake through the bioavailability of carotenes (Singh et al., 2012). Therefore, the aim of this study was to evaluate the effect of carrot-feeding on the color and fat rancidity of pork during refrigerated storage.

II. MATERIALS AND METHODS

LYD castrated male hogs which were raised in a local commercial farm were raised according to the conventional methods and given the commercial diets. After feeding for 135 days, hogs were segregated into the two groups. For the control group, commercial diets were provided to hogs, whereas 0.5 kg fresh carrot/head per day was provided to the carrot-feeding ones in addition to the regular diet. After feeding for 50 days, hogs were slaughtered according to the conventional procedure in a local abattoir. After chilling for approximately 24 h in the chilling room, carcasses were fabricated and loin muscles (*Longissimus dorsi*) between the 4th and 10th ribs were removed and evaluated. Boneless loins were packed in the trays which covered with plastic films, stored at 4°C and evaluated at days 1, 2 and 4. Thiobarbituric acid-reactive substances (TBARS) values of the samples were determined according to the methods described by Chang et al. (2011) and expressed as mg malonaldehyde/kg. For the instrumental color measurement, the L* (lightness), a* (redness) and b* (yellowness) values of samples were measured using a colorimeter (Nippon Denshoku Ze 2000, Japan). A standard plate with 'Y' = 94.81, 'X' = 92.83, and 'Z' = 111.27 was used as a reference. Sensory characteristics including color, meat odor/flavor, rancid odor/flavor and overall acceptance of samples were evaluated base on a 7-point scale which 1 = the lowest intensity, the lightest color and the lowest overall acceptance.

III. RESULTS AND DISCUSSION

Figure 1 showed that TBARS values of pork were increased significantly ($P < 0.05$) with storage time as expected. For example, the TBARS value was increased from 0.14 mg MDA/kg at day 1 to 0.20 MDA/kg at day 2 and eventually 0.43 MDA/kg at day 4 for the controls, whereas the TBARS value was increased from 0.10 MDA/kg at day 1 to 0.15 MDA/kg at day 2 and eventually 0.32 MDA/kg at day 4 for the carrot-feeding one. On the other hand, there was no significant difference in the TBARS values between the two treatments at day 1. However, after storage for 2 days, TBARS value of the carrot-feeing pork was significantly lower than the control (P < 0.05). This retarding of fat rancidity in pork due to the feeding of carrots was also observed when the samples storage for 4 days.

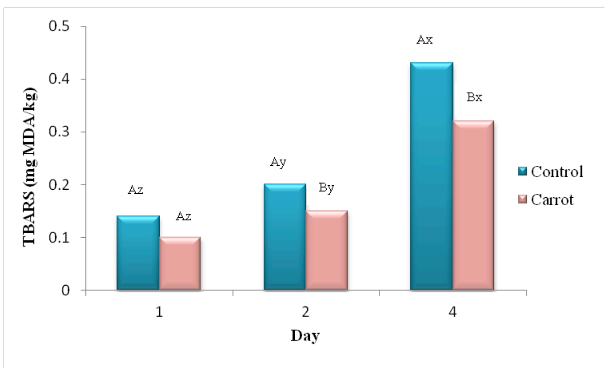

Fig 1. TBARS value of pork loin storage at 4°C.
^{A,B} P<0.05 between treatments; ^{x,y,z} P<0.05 between storage time.

No significant differences were observed in the L* and b* values of raw samples between treatments, whereas a* values of controls were higher than the ones of the carrot-feeding samples (Fig 2). After cooking, there was no significant difference between the treatments in all color parameters (Fig 3).

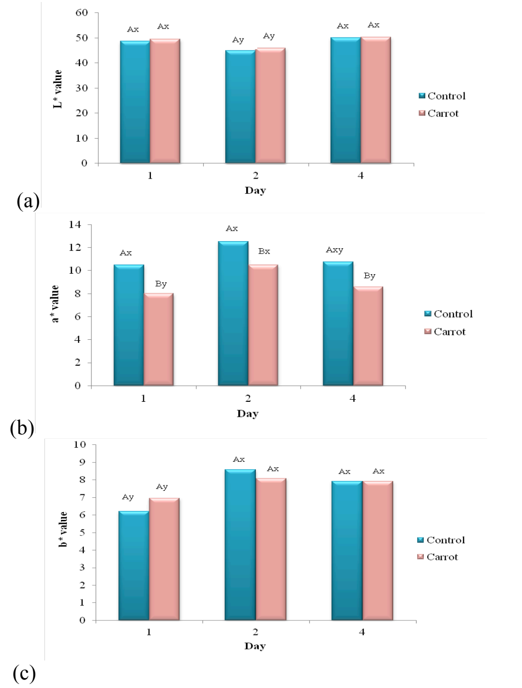

Fig 2. L*a*b* values of raw samples stored at 4°C.
^{A,B} P<0.05 between treatments; ^{x,y,z} P<0.05 between storage time.

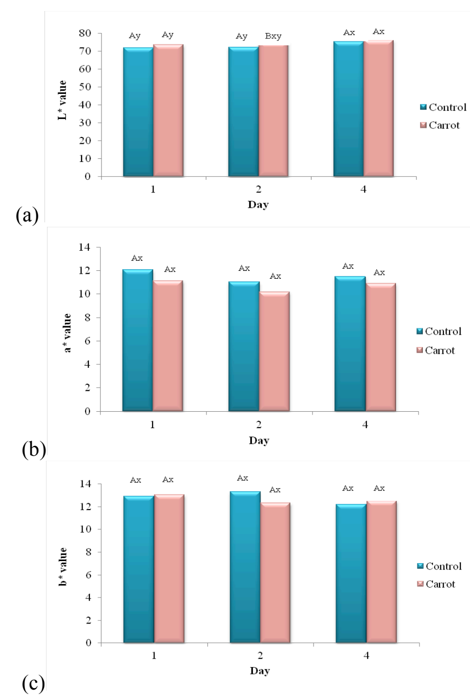

Fig 3. L*a*b* values of cooked samples stored at 4°C.
^{A,B} P<0.05 between treatments; ^{x,y,z} P<0.05 between storage time.

Table 1 showed that except for some minor exceptions, overall, there was no significant difference in the sensory characteristics between the controls and carrot-feeding samples. As illustrated in Fig 1, the carrot-feeding samples had significantly lower TBARS values after storage for more than two days. However, this significant difference was not observed in the sensory rancid odors of raw samples. For the raw samples, meat odors of sample were decreased during storage, whereas rancid odors were increase during storage. This decrease in meat odor and increase in rancid odor might result in the decrease of overall acceptance after refrigerated storage, especially after storage for 4 days. Similarly, cooked meat flavors were decreased and cooked rancid flavors were increased during storage, thus resulted in the decrease of overall acceptance during storage.

Table 1. Sensory evaluation of pork stored at 4°C

Item	Day	Control	Carrot-feeding	S.E.
Raw meat				
Color	1	2.85 Ax	2.76 Axy	0.07
	2	2.70 Ax	2.97 Ax	0.08
	4	2.81 Ax	2.61 Ay	0.09
Meat odor	1	6.00 Ax	6.00 Ax	0.00
	2	5.18 Ay	4.97 Ay	0.04
	4	3.83 Az	3.88 Az	0.02
Rancid odor	1	1.00 Ay	1.00 Ay	0.00
	2	1.07 Ay	1.07 Ay	0.01
	4	1.75 Ax	1.89 Ax	0.04
Overall acceptance	1	5.85 Ax	5.92 Ax	0.06
	2	5.15 Ay	5.38 Ay	0.04
	4	3.94 Az	3.92 Az	0.05
Cooked meat				
Color	1	1.03 Az	1.00 Ay	0.01
	2	1.29 Ax	1.24 Ax	0.02
	4	1.17 By	1.34 Ax	0.01
Meat flavor	1	6.08 Ax	5.68 Ax	0.12
	2	4.86 Ay	4.85 Ay	0.10
	4	3.43 Az	3.72 Az	0.15
Rancid flavor	1	1.00 Az	1.02 Ay	0.01
	2	1.20 Ay	1.18 Ay	0.01
	4	2.46 Ax	2.42 Ax	0.08
Overall acceptance	1	6.19 Ax	5.89 Ax	0.11
	2	4.90 Ay	4.68 By	0.12
	4	3.30 Az	3.47 Az	0.07

IV. CONCLUSION

In conclusion, this study illustrated that less significant difference was observed in the colors between treatments. Additionally, even though a significant retard in rancidity of pork as indicated as a decrease in the TBARS values by carrot-feeding, such difference in the sensory characteristics between treatments might not be sufficient to be detected. In order to enhance the benefits, an increase carrot-feeding amount or longer feeding time might be considered in the future.

ACKNOWLEDGEMENT

The authors appreciated the assistant provided by K. Pilasonbut, T. Suppahakitchanon, S. C. Chang, K. C. Cheng, F. Chng, and K. Y. Ho.

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