3-P40

INFLUENCE OF DIETARY RANCID RICE BRAN ON LIPID OXIDATION OF GROUND PORK DURING FROZEN STORAGE

Chang-Gie Kang, [1]Byong-Jo Chae, and Sung-Ki Lee

Department of Animal Food Science and Technology, [1]Department of Feed Science and Technology, Kangwon National University, Chunchon, 200-701, South Korea

Keyword: rancid, dietary rice bran, lipid oxidation, frozen pork

Background:

Rice bran is by-product of processing from brown rice to polished rice. Rice bran is good for energy source of feeding because it is rich in lipid. Since rice bran contains high levels of polyunsaturated fatty acid, it is easy to oxidize. However rice bran has so many antioxidant compounds such as phytic acid and tocopherol that can retard the warmed-over flavor in the meat products(Pszczola, 1998). Lipid oxidation of rice bran was rapidly accelerated when stored under hot and humid condition or in the place of a bad ventilation. Warren and Farrell(1990) reported that rice bran oxidized 50~60% of it's lipid after 4~6 weeks of milling. Rice bran oil was rapidly converted to free fatty acid by lipolytic enzymes. Lipid oxidation brings out decline of nutritive value and formation of abnormal warmed-over flavor, due to the destroy of essential lipid acids and vitamins, and formation of volatile lipid decomposed products, such as aldehydes, hydrocarbones, alcohols, ketones. The feeding of rancid rice bran to broiler chicken brought out slowdown of growth performance(Chae et al., 1997). Xu(1994) reported that pigs used for fattening up's growth were not significantly different according to feeding of a little rancid rice bran. In the case of South Korea, the rice bran is used as a source of feed. There is limited information regarding the influence of feeding rancid rice bran on the oxidative quality of pork during frozen storage.

Objectives:

This study was to investigate the influence of using different oxidized rancid rice bran in diet pig on the oxidative stability of ground pork during frozen storage.

Methods:

Preparation of sample. We purchased the rice bran from rice processing factory that located in South Korea. We used three treatments according to levels of lipid oxidation of rice bran such as defatted rice bran(control), less rancid rice bran(LRRB, free fatty acid value was 8.2%), and more rancid rice bran(MRRB, free fatty acid value was 15.6%). Pigs were fed 20% rice bran of feeds(total diets weight) for 56 days until pigs became 92kg. Lean pork was ground two times through diameter 6mm plate, and then stored frozen at -20℃ for 3 months.

Determination of quality. The lipid oxidation and color of frozen pork were assessed at 0, 1, 2, 3 months storage at -20℃. The thiobarbituric acid reactive substance(TBARS) and lipid peroxide value(POV) were measured by the methods of Yu and Sinhuber(1977), and Shantha and Decker(1994), respectively. The CIE L^*, a^*, b^* values were determined using a color difference meter(CR-310, Minolta, Tokyo, Japan) The determination of free fatty acid and pH were in accordance with the methods of AOAC(1990).

Results and discussions:

Color value including redness(a^*)and redness/yellowness(a^*/b^*) of rancid rice bran diet was higher than those of control pigs fed defatted rice bran. Rancid rice bran fed to pigs decreased b^* value compared with control pigs fed defatted rice bran, but there was not significantly different($P<0.05$) between in LRRB and MRRB(Table 1). It suggested that the meat color became gray during frozen storage because myoglobin of meat pigments converted to metmyoglobin. Rice bran played an important role in maintaining the original color of the pork, and was also related with the oxidative quality to the pork during storage. The pH of rancid rice bran fed to pigs was slightly higher than control pigs fed defatted rice bran. The pH of meat might be one of factors affecting color value during storage. Figure 1 and 2 show change of the lipid oxidation of the pork during storage at -20℃ for 3 months. Defatted rice bran treatment accelerated lipid oxidation compared with rice bran fed to pigs. A conclusion could be made that dietary rice bran has an effect to retard lipid oxidation of pork, and plays an important role of antioxidant in ground frozen pork. Although it had oxidation already before feeding to pigs. Pszczola(1998) reported that rice bran retarded the warmed-over flavor in meat products because it contained many antioxidant compounds such as phytic acid and tocopherol. For the rancid rice bran fed to pigs, the TBARS and POV values of MRRB treatment were slightly higher than those of LRRB treatments although there was not significantly different($P<0.05$).

This results was similar to Hussein and Kratzer's report(1982) that the TBARS of rancid rice bran fed to broilers increased compared with control, but there was not significantly different. The trend of POV was similar to that of TBARS in ground pork during frozen storage. It showed that the POV increased sharply after 1 month, and the TBARS value increased after 2 month, respectively.

Conclusions:

The influence of using different oxidized rancid rice bran in a pigs's diet on the oxidative stability of ground pork during frozen storage was investigated. There were three treatments such as defatted rice bran(control), less rancid rice bran(LRRB, free fatty acid 8.2%), and more rancid rice bran(MRRB, free fatty acid 15.6%). Pigs were fed 20% rice bran of feeds(total diets weight) for 56 days until pigs became 92kg. Color value including redness(a^*)and redness/yellowness(a^*/b^*) of rice bran diet was higher than those of control pigs fed defatted rice bran. Pork from rancid rice bran fed to pigs decreased yellowness(b^*) value compared with control pork, but there was not a significant difference($P<0.05$) between LRRB and MRRB treatments. Rice bran played an important role in maintaining original color of pork. Defatted rice bran treatment accelerated lipid oxidation compared with pork from rancid rice bran fed to pigs. Dietary rice bran itself, regardless the level of oxidation, was significant in the lipid stability of ground pork during frozen storage. Comparing with porks from rancid rice bran fed to pigs, the TBARS and POV values of MRRB treatment were slightly higher than those of LRRB tratments although there was not significantly different. It appeared that the rancidity of dietary rice bran as a source of feed affected the lipid oxidation of ground frozen pork.

Pertinent literature:

Chae, B.J., Lee, K.H., and Lee, S.K. 1998. The 8th WCAP Proceeding, PN3-4, p.788-789.
Hussein, A.S. and Kratzer, F.H. 1982. Poultry Sci. 61:9-12.
Pszczola, D. 1998. Food Technol. 52(7):38-46.
Shantha, N.C. and Decker, E.A. 1994. J. Assoc. Offic. Anal. Chem. Intl., 77: 421-424.
Sinnhuber, R.O. and Yu, T.C. 1977. J. Jap. Soc. Fish Sci., 26:259-267.
Warren, B.E. and Farrell, D.J. 1990. Animal Feed Science and Technology 27: 219-228.
Xu, Z. 1994. M.S. Thesis. Louisiana State University.

Table 1. Color value and pH of ground pork from pigs fed rice bran diet during storage at -20℃

Storage peroids	Control[1]				LRRB[1]				MRRB[1]			
(months)	a^*	b^*	a^*/b^*	pH	a^*	b^*	a^*/b^*	pH	a^*	b^*	a^*/b^*	pH
0	15.9^{B}	7.9^{a}	2.0^{Y}	5.57^{y}	16.8^{A}	6.8^{b}	2.5^{X}	5.62^{y}	16.9^{A}	6.3^{b}	2.7^{X}	5.85^{x}
1	17.9^{A}	9.1^{a}	2.0^{Y}	5.51^{y}	18.1^{A}	7.5^{b}	2.4^{Y}	5.52^{y}	16.7^{A}	6.6^{c}	2.6^{X}	5.76^{x}
2	17.8^{A}	9.4^{a}	1.9^{Y}	5.60^{y}	18.5^{A}	7.9^{b}	2.3^{X}	0.57^{y}	18.4^{A}	8.0^{b}	2.3^{X}	5.81^{x}
3	15.4^{B}	1.0^{ab}	1.6^{Z}	5.60^{y}	17.5^{A}	9.1^{b}	1.9^{X}	5.62^{y}	18.4^{A}	10.1^{a}	1.8^{Y}	5.92^{x}

$P<0.05$

[1] Control: defatted rice bran, LRRB: less rancid rice bran(FFA=8.2%), MRRB: more rancid rice bran(FFA=15.6%)

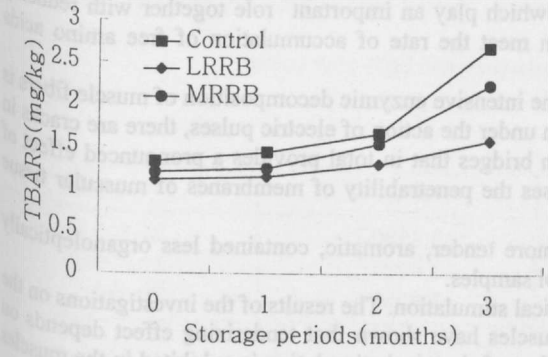

Fig. 1. Changes in TBARS(mg/kg) of ground pork from pigs fed rice bran diet during storage at -20℃.

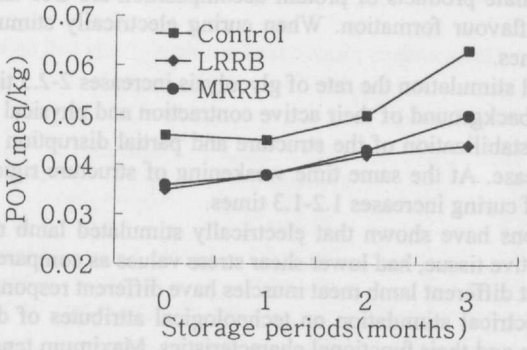

Fig. 2. Changes in POV(meq/kg) of ground pork from pigs fed rice bran diet during storage at -20℃.