

Dietary Onion Peels enhance the Pork Quality

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ABSTRACT

Effects of dietary onion peels (OP) on pork quality was investigated using 20 gilts. Pigs were fed one of 4 treatment diets (0, 1, 3, and 6 % OP) for 4 weeks before slaughter. Concentrations of quercetin and rutin in pork loin samples were positively related to OP levels of the diets and cholesterol concentration was reduced by dietary OP. LDL concentrations in the blood were reduced by dietary OP, whereas HDL was not significantly changed. Mutagenicity was significantly reduced by dietary OP, as compared to that by control. Meat color and bacterial growth were not affected by dietary OP; however, TBARS was significantly reduced. These results suggest that lipid oxidation of pork could be inhibited by accumulated quercetin and rutin from dietary OP.

INTRODUCTION

Bioactive substances such as antioxidants, anticarcinogens and immunostimulants have been used to enhance the pork quality. These substances require the expensive extraction and purification steps; thus, inexpensive and bioactive-containing matters could be quested to use animal feed supplements without any purification steps. Onions or onion processing wastes contain a substantial amount of quercetin and other phenolic compounds that exhibit antioxidative and anticarcinogenic activities. Quercetin and some other flavonoids in onion is able to inhibit carcinogenesis, and mutagenicity (Stavric et al., 1992) and lipid oxidation (Silvia et al. 1984).

Recently the value-added pork contained docosahexaenoic acid (DHA) or conjugated linoleic acid (CLA) have been developed in Korea. These brand porks giving positive effects on human health have been concerned by a number of consumers. As quercetin and some other flavonoids in onion also possess such have the positive effects, it is necessary to develop new techniques for enhancement of pork quality using onion or onion processing waste. The objective of this study was to investigate the effects of dietary onion peels (OP) on pork.

MATERIALS AND METHODS

A total of twenty gilts (Landrace×LargeWhite×Duroc) were selected and each of five pigs was randomly assigned to one of the following 4 diets for 4 weeks before slaughter (slaughter weight was about 110 kg). Diets control, T2, T3 and T4 contained 0, 1%, 3% and 6% OP, respectively. After slaughter, blood was collected immediately and pork loin was transported to laboratory at 24 hr postmortem to measure physical and biochemical traits. Blood (HDL, LDL, VLDL, total cholesterol, hemoglobin and white blood corpuscles) was analyzed by enzymatic methods, and mutagenicity was analyzed by method of Ames(1983). Cholesterol concentration was analyzed by gas chromatography. The pH was recorded using pH meter with a combined glass electrode in muscle homogenates. Color of pork loin was determined by Hunter Lab using Minolta Chromameter. Thiobarbituric acid reactive substances (TBARS) was measured at 531 nm (Calculation: TBARS value = 5.88 × absorbance). The data were processed statistically using the SAS(1988) 6.12 with a significance level of P<0.05).

RESULTS AND DISCUSSION

Fig. 1 shows changes in concentration of quercetin, rutin and cholesterol in pork loin affected by dietary OP. The concentrations of quercetin (0.53-6.89mg/kg) and rutin (0.11-0.72mg/kg) in pork loin samples were positively related

to the OP levels of diet. The cholesterol concentration was also reduced by dietary OP. LDL concentrations in the blood were significantly reduced ($P < 0.05$) by dietary OP, whereas HDL was not (Table 1). Total cholesterol concentration of T3 was significantly lower than those of other treatments. Mutagenicity of pork loin samples containing a substantial amount of quercetin and other flavonoids was decreased as compared to that of control sample (Table 2). These results suggested that the quercetin and rutin could be accumulated in pork loin, and LDL and total cholesterol concentration in blood could be reduced by dietary OP. These positive effects might be, in part, due to the flavonoids absorbed from OP.

There were no significant difference in meat color (Hunter Lab) and bacterial growth (total plate counts) among treatment groups, when stored at 4°C for 4 weeks (data not shown). TBARS was significantly lower in OP-treated samples than that in control one stored at 4°C for 4 weeks (Fig. 2). It is assumed that delayed lipid oxidation of treated groups was related to the high levels of quercetin and rutin in pork. According to Silvia et al. (1984), quercetin and flavonoids in onion is able to inhibit *in vitro* lipid oxidation. The present data also confirmed the fact that the quercetin and rutin in pork loin inhibited lipid oxidation.

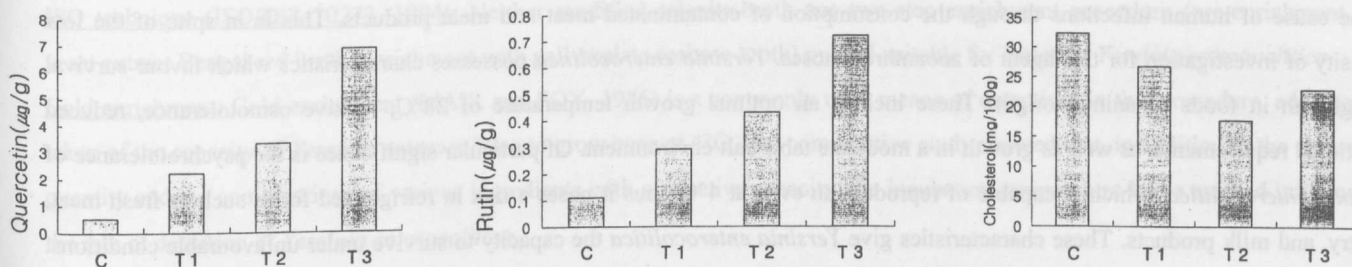


Figure 1. Changes in concentration of quercetin, rutin and cholesterol in pork loin by dietary onion peels.

Table 1. Effect of dietary OP on HDL, LDL, VLDL, total cholesterol and white blood corpuscles in the blood

Treatment ¹⁾	Concentrations in the Blood				White blood corpuscles
	HDL	LDL	VLDL	Total cholesterol	
Control	18.58 ± 4.1 ²⁾	282.28 ^{A3)} ± 55	54.05 ^B ± 34	97.63 ^A ± 2.0	19.11 ^A ± 0.5
T1	23.11 ± 6.8	243.84 ^{AB} ± 18	68.47 ^B ± 3.6	94.84 ^A ± 2.9	13.43 ^D ± 1.4
T2	21.72 ± 4.5	197.00 ^B ± 11	117.72 ^A ± 18	97.75 ^A ± 1.2	16.91 ^B ± 0.6
T3	20.95 ± 3.9	217.42 ^B ± 4.2	40.84 ^B ± 4.2	76.99 ^B ± 2.5	15.01 ^C ± 0.4

¹⁾ T1 = 1% OP, T2 = 3% OP and T3 = 6% OP
²⁾ Mean ± SD for 4 experimental data
³⁾ Means with different capital letters of superscript represent

Table 2. Antimutagenic activity of pork derived from dietary onion peels

Treatment ¹⁾	TA 98		TA 100	
	Revertants/g	Inhibition(%)	Revertants/g	Inhibition(%)
Control	530 ^A ± 153 ²⁾	0.000	58 ^{A3)} ± 5	0.00
T1	521 ^A ± 34	1.700	43 ^A ± 6	25.86
T2	425 ^A ± 13	19.81	20 ^B ± 3	65.51
T3	331 ^B ± 25	37.55	32 ^B ± 2	44.83

¹⁾ T1 = 1% OP, T2 = 3% OP and T3 = 6% OP
²⁾ Mean ± SD for 4 experimental data
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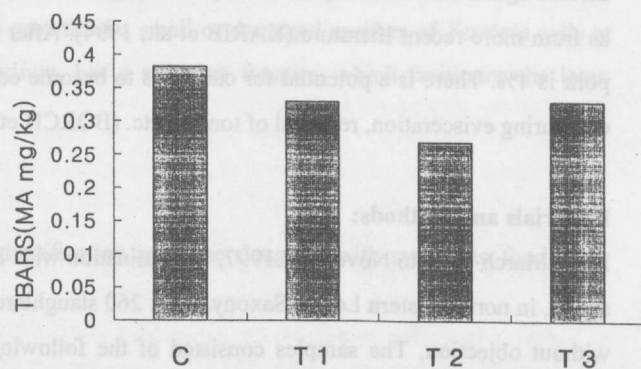


Figure 2. Effect of dietary onion peels on TBARS in pork loin after storage 4 weeks at 4°C

CONCLUSION

Onion peels, actually wastes, improved pork qualities with regard to lipid oxidation by using feed ingredients. Onion peels may be attractive to the health-conscious consumer.

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