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EFFECT OF *RHUS VERNICIFLUA* STOKES AND ITS EXTRACT ON THE QUALITY OF EMULSION-TYPE SAUSAGE DURING REFRIGERATED STORAGE

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Introduction

Rhus verniciflua Stokes (RVS) has been used as a traditional medicine and as a food additive in Korea (Hong et al. 1999). It is also used to treat gastritis, stomach cancer, and arteriosclerosis (Jung 1998). Recently, various biological activities of RVS have been reported. In model linoleic emulsion experiments, antioxidant activity of RVS has been shown to correspond to well-known enzymatic and non-enzymatic antioxidants (Lim et al. 1997). Recently we studied the effect of dietary RVS supplementation on the quality of Hanwoo (Korean cattle) steer beef (Lee et al. 2004). We found that RVS-supplemented Hanwoo (Korean cattle) beef was effective in increasing color stability, water holding capacity, unsaturated fatty acid and retarding lipid oxidation than the control during refrigerated storage.

Objective

The objective of this study was to determine whether addition of RVS extract to pork from the finishing pigs fed dietary RVS can improve the qualities of emulsion-type sausages during refrigerated storage.

Methodology

Raw materials and sausage processing

Fresh hams from pigs (gilts, live weight 110 kg) fed with 0 and 4% RVS in diet for 4 months prior to slaughter were utilized. The hams so collected were further treated with RVS extract. Thus the treatments (n = 3/treatment) include hams from pigs with 0 % RVS (Control), 4 % RVS (T1), 0 % RVS + RVS extract (T2), and 4% RVS + RVS extract (T3). The RVS extract was prepared from 100 g of RVS sawdust and 1 L of deionized water that was heated for 48 hours using Red Ginseng Master (HS-777, Hans Science, South Korea). 20.8% of frozen RVS extracts were added to T3 and T4. Emulsion-type sausages were prepared using lean meat (54.1%), back fat (30%), starch (0.5%), ISP (0.5%), FOS/ENR (0.14%), NaCl (1.5%), and ice (20.8%). Ground lean meat and back fat, starch, ISP, FOS/ENR, NaCl, ice were mixed using a silent cutter and vaccum-mixer for 15 min. The mixtures were stuffed into a cellulose casing, and cooked in a water bath at 80℃ for 60 min.

The cooked sausages were cooled in ice water for 15 min, dried at room temperature (10℃) for 30 min, and vacuum-packaged in polyethylene bags. All samples were stored at 4℃ for 4 weeks.

Analytical methods

The proximate composition was analyzed according to AOAC (1995). The pH value was determined on a 10 g sample with 100 ml deionized water for 1 min. Sample color was measured by a Minolta Chroma meter (CR-301, Minolta Co., Japan) that recorded the lightness (L^*), redness (a^*), and yellowness (b^*). The chroma (C^*) was obtained from a^* and b^* by formula: $C^* = (a^{*2}+b^{*2})^{1/2}$ (Commission Internationale de l'Eclariage. 1986). The TBARS (2-thiobarbituric acid reactive substances) value was determined as described by Sinnhuber and Yu (1977) and reported as mg malonaldehyde (MA)/kg sample. The VBN (volatile basic nitrogen) value was measured as described by Kohsaka (1975). Data was analyzed using the General Linear Model procedure of SAS (1999) program. Differences between means at the 5% level were determined by the Duncan's multiple range tests.

Results & Discussion

The proximate composition and pH value of emulsion-type sausages are presented in Table 1. Moisture, crude protein, and crude ash were significantly higher in T1 than in control and T2 ($P < 0.05$). The crude fat and pH value were significantly lower in T1 and T3 than control ($P < 0.05$). This showed that feeding of RVS in diet had a significant impact on the sausage quality. As shown in Fig. 1-4, the lightness (L^*) and redness (a^*) were significantly lower in T2 and T3 than in control and T1 during refrigerated storage ($P < 0.05$), and the yellowness (b^*) and chroma (C^*) were significantly higher in T2 and T3 than control and T1 ($P < 0.05$). The lightness (L^*) and yellowness (b^*) were significantly lower in T1 than in control ($P < 0.05$), and the redness (a^*) was higher in T1 than the other treatments ($P < 0.05$). This showed that the sausage color values are affected by feeding RVS to pigs and adding RVS extract to hams. The VBN (Fig. 5) and TBARS value (Fig. 6) were significantly lower in T2 and T3 treatments than in control and T1 during refrigerated storage ($P < 0.05$), and those were lower in T3 at all measurements as compared to its counterparts ($P < 0.05$).

Conclusions

The sausage (T1) prepared from pigs fed 4% RVS was more effective in increasing the redness (a^*) and delaying the protein deterioration, lipid oxidation than that without RVS in diet.

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Tables and Figures

Table 1: Effect of RVS and its extract on the proximate composition and pH value of emulsion-type sausage.

Items	Treatments*			
	Control	T1	T2	T3
Moisture	57.11^{B}	58.23^{A}	55.33^{C}	58.63^{A}
Crude fat	28.03^{A}	24.03^{B}	28.44^{A}	23.73^{B}
Crude protein	13.96^{C}	16.47^{A}	15.51^{B}	15.59^{B}
Crude ash	0.71^{B}	0.79^{A}	0.66^{C}	0.78^{A}
pH	6.08^{A}	5.98^{B}	6.01^{B}	5.87^{C}

^{ABC}Means in the same rows with different superscripts are significantly different ($P < 0.05$).

*Control: 0% RVS-fed pork, T1: 4% RVS-fed pork, T2: 0% RVS-fed pork + RVS extract, T3: 4% RVS-fed pork + RVS extract.

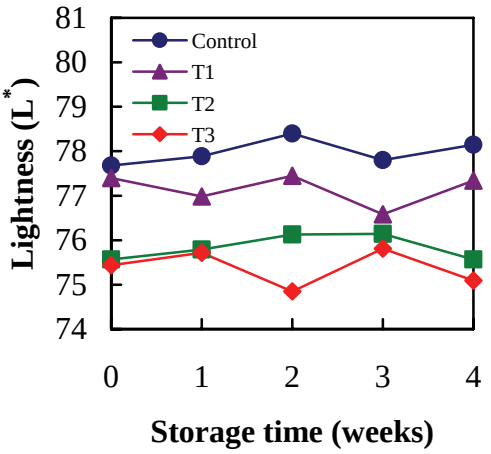

Fig. 1: Effect of RVS and its extract on the lightness (L*) of emulsion-type sausage during refrigerated storage.

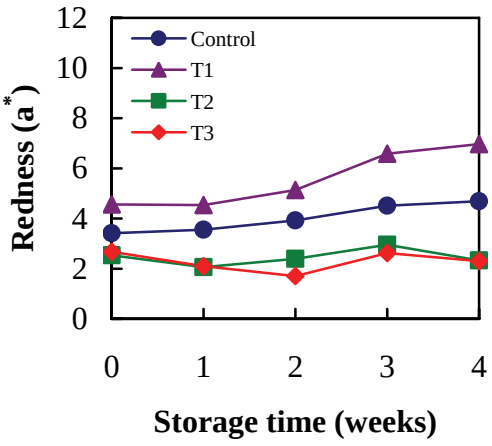

Fig. 2: Effect of RVS and its extract on the redness (a*) of emulsion-type sausage during refrigerated storage.

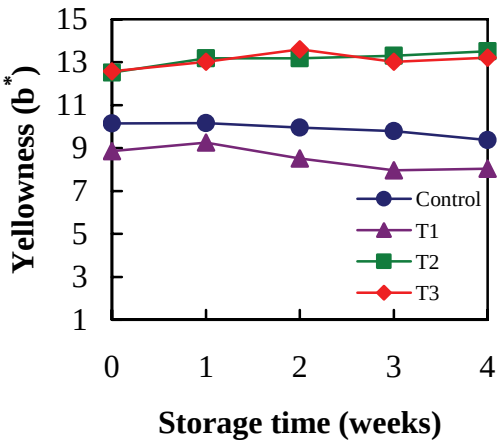

Fig. 3: Effect of RVS and its extract on the yellowness (b*) of emulsion-type sausage during refrigerated storage.

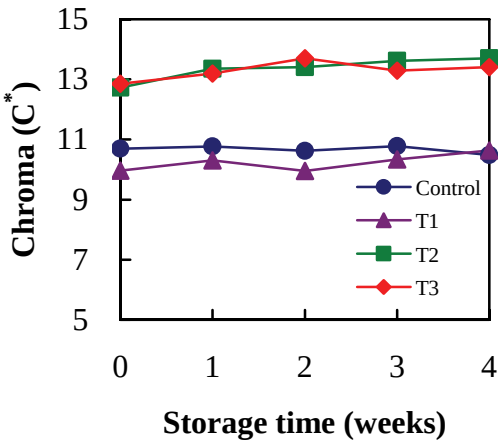

Fig. 4: Effect of RVS and its extract on the chroma (C*) of emulsion-type sausage during refrigerated storage.

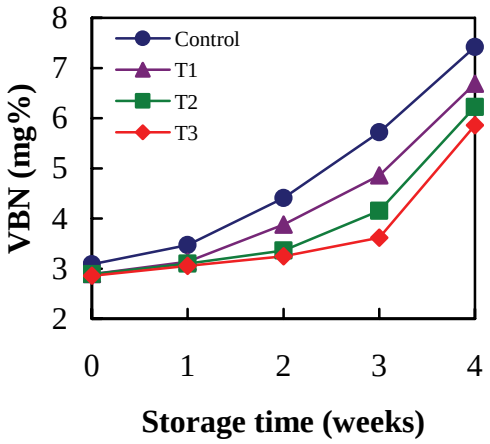

Fig. 5: Effect of RVS and its extract on the VBN value of emulsion-type sausage during refrigerated storage.

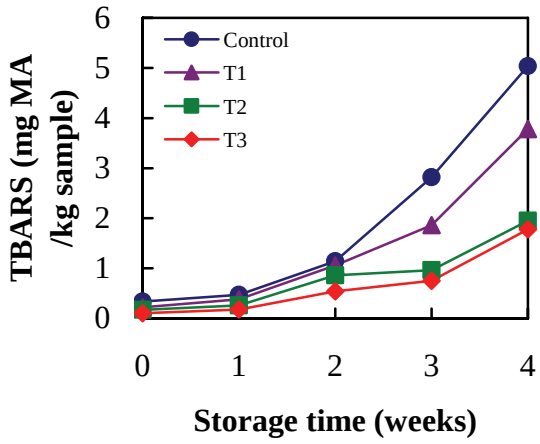

Fig. 6: Effect of RVS and its extract on the TBARS value of emulsion-type sausage during refrigerated storage.