EFFECTS OF ONINON SKIN POWDER AND BLACK CURRANT POWDER ON PHYSICOCHEMICAL CHARACTERISTICS AND LIPID OXIDATION OF HANWOO BEEF TTEOKGALBI

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I. INTRODUCTION

Lipid oxidation is a major cause of deterioration of meat color, flavor, texture and nutritional value of meat products, and it can also produce active oxygen and have harmful effects on human body. So, various antioxidants that prevent the deterioration, discoloration and rancidity of meat are added to foods. Most of the antioxidants added to foods are synthetic antioxidants such as BHA and TBHQ (Shin, 1999). But, they are toxic to the body when consumed in large quantities. For this reason, consumers are more interested in the nutritional and safety of foods, so they prefer natural antioxidants that are safer and healthier than synthetic antioxidants. Therefore, this study was conducted to investigate the effects of onion skin powder and black currant powder on the physicochemical characteristics and lipid oxidation (TBARS) of Hanwoo beef Tteokgalbi.

II. MATERIALS AND METHODS

To make Tteokgalbi, Hanwoo beef rump, which is the main ingredient, is crushed to a size of 6 mm by using a meat grinder (M-12S, Fujee, Korea). Then, crushed Hanwoo beef rump was added according to the blending ratio (Hanwoo beef 76.38%, ice 7%, minced onion 5%, soy sauce 4%, sugar 2%, salt 1%, spices 4.62%), and Ascorbic acid or natural antioxidant materials (CON: ascorbic acid 0.1%, T1: onion skin powder 0.3%, T2: onion skin powder 0.6%, T3: black currant powder 0.3%, T4: black currant powder 0.6%, T5: onion skin powder 0.15% + black currant powder 0.15%, T6: onion skin powder 0.3% + black currant powder 0.3%) were added in a beef mixtures and mixed. The final Hanwoo beef Tteokgalbi was vacuum packed and stored at 4 ℃ for 10 days and used as analysis sample per experiment days. Analysis traits were pH, water holding capacity, meat color (L^*, a^*, b^*) and TBARS, and total polyphenol and flavonoid contents of natural powders were measured.

III. RESULTS AND DISCUSSION

Table 1. Total polyphenol and flavonoid contents of onion skin powder and black currant powder

Traits*	Onion skin powder	Black currant powder
Polyphenol(mg/g)	69.23±0.44[a]	4.50±0.09[b]
Flavonoid(mg/g)	4.26±0.43[a]	2.97±0.04[b]

[a, b]Means±SD with different superscripts in the same row differ significantly($p<0.05$).

Table 1 shows the contents of polyphenol and flavonoid in black currant powder and onion skin powder. Polyphenol and flavonoid contents of onion skin powder were significantly higher than those of black current powder ($p<0.05$). Physicochemical characteristics of Hanwoo beef Tteokgalbi with natural antioxidant powders are shown in Table 2. The pH and water holding capacity of T2 treatment were significantly higher than those of the other treatments ($p <0.05$). In the meat color, the lightness values of T4 (0.6% black current powder) and T6 (0.3% onion skin powder + 0.3% black current powder) were lower than control and the other treatments ($p<0.05$), and the addition of onion skin powder and black current powder decreased the redness and yellowness values in all treatments compared with control ($p<0.05$). Drip loss values were not significantly different in all treatments. Cooking loss values were significantly lower in control and T2 treatment than the other treatments ($p<0.05$). The TBARS values of Hanwoo beef Tteokgalbi with natural antioxidant powders are shown in Table 3. The treatments (T1 and T2) with onion skin powder showed lowered TBARS values compared with black current powder single treatments and onion skin powder and

black current powder complex treatments during 7 days, and all treatments except for T4 were lower than control at the 10 day ($p<0.05$). In the report of Jang et al. (2009), 85% MeOH and BuOH fractions of onion skin showed excellent antioxidant effect among the fractions obtained from onion extract.

Table 2. Physicochemical characteristics of Hanwoo beef Tteokgalbi with natural antioxidant powders

Traits*		CON	T1	T2	T3	T4	T5	T6
pH		5.40 ±0.01^{c}	5.43 ±0.01^{b}	5.46 ±0.01^{a}	5.31 ±0.01^{e}	5.24 ±0.02^{f}	5.36 ±0.00^{d}	5.34 ±0.00^{d}
WHC (%)		53.52 ±3.16^{b}	55.47 ±1.60^{b}	62.51 ±3.32^{a}	54.71 ±2.41^{b}	50.70 ±4.45^{b}	50.65 ±3.02^{b}	50.97 ±2.09^{b}
Hunter Color	L*	42.64 ±3.48^{a}	41.83 ±1.29^{ab}	41.74 ±3.64^{ab}	40.80 ±0.77^{ab}	24.45 ±1.05^{c}	39.29 ±1.65^{b}	25.00 ±1.73^{c}
	a*	20.90 ±1.88^{a}	15.70 ±1.49^{b}	11.59 ±3.05^{c}	15.77 ±1.22^{b}	6.93 ±0.57^{d}	13.14 ±1.70^{c}	7.58 ±0.52^{d}
	b*	16.71 ±3.33^{a}	13.07 ±1.85^{b}	12.97 ±2.19^{b}	9.71 ±1.70^{c}	10.34 ±0.65^{c}	9.71 ±1.67^{c}	10.82 ±0.68^{bc}
Drip loss (%)		1.38 ±0.54	1.45 ±0.73	0.56 ±0.15	1.94 ±0.84	0.73 ±0.16	1.26 ±0.17	1.27 ±0.63
Cooking loss (%)		15.25 ±0.43^{b}	18.07 ±0.09^{a}	15.23 ±1.29^{b}	18.27 ±0.51^{a}	17.64 ±0.25^{a}	17.51 ±2.59^{a}	15.91 ±0.63^{a}

*CON: Ascorbic acid 0.1%, T1: Onion skin powder 0.3%, T2: Onion skin powder 0.6%, T3: Black currant powder 0.3%, T4: Black currant powder 0.6%, T5: Onion skin powder 0.15% + Black currant powder 0.15%, T6: Onion skin powder 0.3% + Black currant powder 0.3%

L*: lightness, a*: redness, b*: yellowness.

$^{a-d}$Means±SD with different superscripts in the same row differ significantly($p<0.05$).

Table 3. TBARS value of storage characteristics of Hanwoo Beef Tteokgalbi with natural antioxidant powders

Traits*	Days	CON	T1	T2	T3	T4	T5	T6
TBARS (mg malonaldehyde/ 1,000g)	0day	0.27 ±0.00^{e}	0.42 ±0.06^{d}	0.27 ±0.00^{e}	0.82 ±0.08^{b}	1.25 ±0.02^{a}	0.72 ±0.07^{c}	0.85 ±0.00^{b}
	3day	0.36 ±0.05^{d}	0.28 ±0.03^{d}	0.36 ±0.05^{d}	0.79 ±0.08^{b}	1.33 ±0.05^{a}	0.48 ±0.02^{c}	0.80 ±0.05^{b}
	7day	0.32 ±0.02^{d}	0.34 ±0.03^{d}	0.30 ±0.03^{d}	0.69 ±0.03^{b}	1.30 ±0.02^{a}	0.53 ±0.01^{c}	0.70 ±0.04^{b}
	10day	0.84 ±0.02^{b}	0.38 ±0.00^{g}	0.68 ±0.02^{d}	0.78 ±0.04^{c}	0.91 ±0.01^{a}	0.51 ±0.02^{f}	0.59 ±0.02^{e}

*CON: Ascorbic acid 0.1%, T1: Onion skin powder 0.3%, T2: Onion skin powder 0.6%, T3: Black currant powder 0.3%, T4: Black currant powder 0.6%, T5: Onion skin powder 0.15% + Black currant powder 0.15%, T6: Onion skin powder 0.3% + Black currant powder 0.3%

$^{a-g}$Means±SD with different superscripts in the same row differ significantly($p<0.05$).

IV. CONCLUSION

As a result, onion skin powder and black currant powder did not show negative effect on the physicochemical characteristics of Hanwoo beef Tteokgabi, and also lowered the TBARS values. In particular, onion skin powder was more effective than black current powder in inhibition of lipid oxidation. Therefore, onion skin powder was suitable as a natural antioxidant.

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