EFFECTS OF ADDING DIETARY FIBERS AND STEVIOSIDE ON THE QUALITY OF SAUSAGES AND THE BLOOD PROPERTIES OF RATS

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Astract-This study was carried out to investigate the quality of sausages utilizing water-soluble dietary fibers such as Fibersol-2 and non-carbohydrate sweeteners such as stevioside and the properties of the blood of the rats that were served them. While no significant differences were confirmed between the control group and the treatment group in terms of physical and chemical properties, the a* values tended to rise as Fibersol-2 increases by 1-3%, the TBA value tended to fall, thus showing an anti-oxidant effect in action. Examinations of blood properties indicated that blood glucose, neutral fats and cholesterol tended to fall.

Index Terms-blood glucose, non-carbohydrate sweetner, water soluble dietary fiber

I. INTRDUCTION

One of the imminent problems facing those concerned about hyperlipidemia or diabetes concerning meat products is animal fats high in cholesterol, and sugar and glucose that are used for those products to add sweet tastes. It is well known that dietary fibers are effective on the prevention of a variety of adult diseases by means of enhancing intestinal functions, weight control, suppression of rises in blood glucose, neutral fats, serum cholesterols, absorption of toxic substances into the body and so forth. Products enhanced in functionality by adding dietary fibers to meat products are recently being developed (Choi et al., 2008). Examinations of blood properties of rats that had been served sausages with chitosan, an animal fat, show that neutral fats and cholesterols significantly decreased in the blood (Kang and Lee, 2010). However, serious problems with blood glucose were noted.

This study looked into physical and chemical properties of sausages with Fibersol-2, a vegetable water-soluble dietary fiber, and stevioside as a substitute for sugars in an attempt to make up for the foregoing problems.

II. MATERIALS AND METHODS

Fiberso-2, a water-soluble dietary fiber, was supplied by Korea Matsutani Corp. and stevioside enhanced with 10 times the sugar content of sugar by Nambu Ham Company. Sugar 0.5 in the control group,; stevioside 0.05% and fibersol-2 1% in Treatment 1 (T1); stevioside 0.1% and fibersol-2 2% in Treatment 2 (T2); and stevioside 0.15% and fibersol-2 3% in Treament 3(T) were added, respectively. The subjects were 24 five-week-old white male rats of Sprague-Dawley (SD) descent weighing 125 ~ 150g on an average, supplied by KOA Tech (Korea). Those rats reared for 4 subsequent weeks. By way of the methods of experiments, color, pH, water holding capacity(WHC), thiobarbituric acid reactive substances(TBARS), body weight gain(BWG), and blood properties were measured along with texture and sensory examinations.

III. RESULTS AND DISCUSSION

The a* values ended up the same as in T1 and the control group, whereas they significantly differed in T2 and T3. In other words, the more Fibersol-2 was added, the higher a* values rose, whereas as to b* values, to the contrary, the more Fibersol-2 was added, the more significantly it fell (Table 1). In the case where chitosan, an animal dietary fiber, was added, the outcome was contrary to the tendency where as the amount rose from 0.5% to 1.5%, a* values declined and b* values rose (Kang and Lee, 2010). In terms of the TBARS values, no noticeable difference was noted between the control group and T1, whereas as more Fibersol-2 was added, significant anti-oxidant effects were noted (Fig. 1). When it comes to pH and WHC, T3 showed pH (Lee et al. 2008) and WHC values lower than the control group, whereas in T1 and T2 showed no noticeable difference was noted in terms of the control group (Table 2). This was similar to the case where chitosan was added (Kang and Lee, 2010).

Texture analyses and sensory evaluations indicated that while no significant differences were noted between the control group and the treatment group, the treatment group showed a value lower in adhesiveness and the texture ($p<0.05\%$). However, the more Fibersol-2 was added by 1 -3%, the higher adhesiveness increased(Table 3,4).

In terms of gains in body weights, the treatment group turned out higher than in the control group(Table 5), in blood glucose The Fibersol-2-treated group turned out lower than the control group(Table 6). In HDL-cholesterol and LDL-, neutral fats, The Fibersol-2-treated group decreased as compared with the control group, with no significant difference noted(Table 7). However, in total cholesterol, a significant decline was noted in T3, compared with the control group.

IV. CONCLUSION

Though no significant differences were noted, the impression was that the use of vegetable dietary fibers and non-sugar natural sweeteners are expected to reduce blood glucose, cholesterol and neutral fats while exerting no significant influence on feels of the texture, flavors and tastes.

V. ACKNOWLDGMENT

The present study was carried out by Dankook university research funds in 2009.

VI. REFERENCES

Choi, Y. S., Choi, J. H., Han, D. J., Kim, H. Y., Lee, M. A., Kim, H. W., Jeong, J. H., Paik, H. D., & Kim, C. J. (2008) Effect of adding levels of rice bran fiber on the quality characteristics of ground pork meat product. Korean J. Food Sci. Ani. Resour. 28, 319-326.

Lee, M. A., Han, D. J., Jeong, J. Y., Choi, J. H., Choi, Y. S., Kim, H. Y., Paik, H. D., & Kim, C. J. (2008) Effect of *kimchi* powder level and drying methods on quality characteristics of breakfast sausage. *Meat Sci*. 80, 708-714.

Kang, J. O., & Lee, S. G. (2010) Effects of chitosan on reduction of sodium lactate in sodium nitrite-reduced sausages. Korean J. of Anim. Sci. and Tech. 52, 43-50.

Table 1. Color of sausages added Fibersol-2 and stevioside

Parameters	Treatments				
	C[1)]	T1[2)]	T2[3)]	T3[4)]	SEM[5)]
L*	73.65[a]	73.57[a]	71.69[b]	71.97[b]	0.18
a*	9.41[c]	9.36[c]	10.10[b]	11.20[a]	0.08
b*	5.70[c]	7.49[a]	6.44[b]	5.28[d]	0.08

[1)] Control (Fibersol -2 0% + sugar 0.5%);[2)] Treatment 1 (Fibersol-2 1% +stevioside 0.05%);

[3)] Treatment 2 (Fibersol-2 2% +stevioside 0.1%); [4)] Treatment 3 (Fibersol-2 3% +stevioside 0.15%);[5)] Pooled standard error of mean;[6)] Lightness; [7)] Redness; [8)] Yellowness;

[a-d] Means with same row having same superscript are not significantly different ($p<0.05$).

Table 2. The pH, WHC of sausage added Fibersol-2and stevioside

Parameters	Treatments				
	C[1)]	T1[2)]	T2[3)]	T3[4)]	SEM[5)]
pH	5.31[ab]	5.67[a]	5.66[a]	5.12[b]	0.06
WHC(%)[6)]	66.06[a]	66.57[a]	63.65[a]	43.79[b]	1.15

[1)-4)]Abbreviation is the same as Table 1.

Table 3. Texture analysis of sausages added Fibersol-2and stevioside

Parameters	Treatments				
	C[1)]	T1[2)]	T2[3)]	T3[4)]	SEM[5)]
Springiness	0.96[a]	0.65[a]	0.95[a]	0.92[a]	0.14
Cohesiveness	0.59[a]	0.48[a]	0.60[a]	0.60[a]	0.06
Chewness	736.90[a]	645.40[a]	829.40[a]	775.20[a]	90.01
Hardness	1303.94[a]	1415.08[a]	1449.20[a]	1386.94[a]	57.34
Gumminess	769.50[a]	695.50[a]	868.90[a]	839.00[a]	95.70
Adhesiveness	-37.17[b]	-16.89[a]	-29.89[ab]	-31.99[ab]	4.94

[1)-4)]Abbreviation is the same as Table 1.

Table 4. Sensory evaluation of sausages added Fibersol-2 and stevioside

Parameters	Treatments				
	C[1)]	T1[2)]	T2[3)]	T3[4)]	SEM[5)]
Appearance	2.63[a]	3.20[a]	2.65[a]	3.34[a]	0.12
Color	3.13[a]	3.14[a]	2.75[b]	2.94[b]	0.14
Texture	2.83[a]	2.51[b]	2.61[ab]	2.65[ab]	0.15
Flavor	1.98[a]	2.45[a]	2.43[a]	2.34[a]	0.13

[1)-4)] Abbreviation is the same as Table 1.

Table 5. Effect of feeding sausages added Fibersol-2 and stevioside on body weight gain(BWG) of rat

Parameters	Treatments				
	C[1)]	T1[2)]	T2[3)]	T3[4)]	SEM[5)]
B.W.G[6)]	56.67[b]	72.00[ab]	82.17[a]	80.50[a]	5.30

Table 6. Effect of feeding sausages added Fibersol-2 and stevioside on blood glucose of rat

Parameters	Treatments				
	C[1)]	T1[2)]	T2[3)]	T3[4)]	SEM[5)]
Pre-Feeding	91.17[a]	100.00[a]	85.00[a]	98.00[a]	8.32
Post-Feeding	139.67[b]	138.66[a]	134.83[ab]	136.33[ab]	10.37

[1)-4)]Abbreviation is the same as Table 1.

Table 7. Effect of feeding sausages added Fibersol-2 and stevioside on total cholesterol(TC), HDL, and LDL- cholesterol and triglyceride(TG) concentration of plasma in rat

Parameters	Treatments				
	C[1)]	T1[2)]	T2[3)]	T3[4)]	SEM[5)]
TC[6)]	97.00[a]	87.17[ab]	84.50[ab]	83.83[b]	4.05
H.D.L	29.50[a]	28.67[a]	28.17[a]	27.17[a]	1.26
L.D.L	17.67[a]	15.00[a]	14.33[a]	15.33[a]	1.42
TG[7)]	146.50[a]	103.50[a]	116.33[a]	104.67[a]	8.02

[1)-4)]Abbreviation is the same as Table 1.