EFFECTS OF PIGMENT OF RED BEET AND CHITOSAN ON REDUCED NITRITE SAUSAGES

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Background

Nitrate or/and nitrite plays a significant role in color development of processed meat products in spite of its potentiality as an addictive and toxic reagent. It is certain that exclusion of the nitrite component from our table would be the best practice provided other alternatives can be used. Nevertheless, a little achievement has been made and consequently the reluctant colorant is practically in use. There have been some attempts to reduce the limit of use with the supplement of natural pigments such as paprika, carotene, turmeric and red beet (e.g., Von Elbe et al., 1974). The nitrite component is also known to have an antimicrobial function (Pearson and Gillett, 1996), and recently Youn et al. (2001) observed a similar characteristic from natural chitosan. Red beet and red crap are rich sources of natural pigment, and red carp is also a source of chitosan. Hence, it was of interest to uncover whether the extracts of red beet and red crap can be a color and antibiotic supplement of the nitrate component in sausage manufacture without any defects in other quality characteristics.

Objectives

The current study investigated the effects of red beet and red crab extracts on color and other quality properties of home-made sausage.

Methods

The primary formulation of sausages contained the followings: lean meat 80%, fat 20%, red beet 0.02%, β-cyclodextrin 0.02%, chitosan 0.2% (MW. 10,000), nitrite 0.075% (75 ppm). Hunter values (L*, a* and b*) were determined after a 30 min blooming period using a Minolta Chroma Meter CR-200b. Water holding capacity (WHC) and shear force were measured by a planimeter using a press method and by a texture analyzer (TAXT-ll, MHK Trading Co.), respectively. For residual NO^{2}- measurement, sulfanilamide solution and N-(1-naphthyl)ethylenediamine dihydrochloride were used as color developing reagents.

Results and discussions

When the amount of nitrite was reduced down to a 50% of normal range (i.e., ca 150 ppm), all treatments resulted in a similar redness (a*) with ranging from approximately 14 to 15 (Table 1). In addition, there was no particular defect on other color characteristics. This raised a possibility that the amount of nitrite being necessarily used could be reduced to at least 75 ppm. Even without addition of red beet and chitosan, the color property for 75 ppm nitrite treatment was similar to other treatments contained the same amount of nitrate in color property. However, the use of red beet pigment with 75 ppm nitrite improved WHC and tenderness with a least residual NO_2-. β-cyclodextrin plus chitosan treatment resulted in a better WHC than others, but this treatment had a little effect on scavenging ability of nitrite (Table 2). It was of interest that chitosan treated sausage showed a better WHC than β-cyclodextrin treated one, however, in this regard, it was difficult to interpret the result.

Conclusions

The result indicated that red beet pigment could be used as a supplement of the nitrite component without any defects on color, but with the improvement of WHC and tenderness.

Pertinent literature

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Table 1. Effect of the supplement of red beet, β-cyclodextrin and chitosan on color property

	L*	a*	b*
Nitrite 150 ppm	66.15 cd	15.32 bc	8.83 a
Nitrite 75 ppm	65.17 de	15.45 b	8.50 bc
Nitrite 75 ppm + β-cyclodextrine 0.02%	65.95 cd	14.93 cd	8.53 bc
Nitrite 75 ppm + chitosan 0.2%	64.60 e	15.88 a	8.70 ab
Nitrite 75 ppm + pyrophosphate 0.2%	67.45 b	14.83 d	8.37 c
Nitrite 75 ppm + red beet pigment 0.02%	66.82 bc	15.22 bcd	8.48 bc
Nitrite 75 ppm + β-cyclodextrine + chitosan	66.17 cd	15.15 bcd	8.82 a
Nitrite 75 ppm + β-cyclodextrine + chitosan + Pyrophosphate	68.77 a	13.90 f	8.50 bc
Nitrite 75 ppm + β-cyclodextrine + chitosan + Pyrophosphate + red beet pigment0.02%	68.98 a	14.40 e	8.32 c
Nitrite 75 ppm + β-cyclodextrine + chitosan +red beet Pigment 0.02%	64.73 e	15.55 ab	8.82 a

a, b, c, d,e within a same column without shearing a same letter differ significantly ($P<0.05$)

Table 2. Effect of the supplement of red beet, β-cyclodextrin and chitosan on shear force, WHC and NO2-

	Shear force (g)	WHC (%)	NO2- (ppm)
Nitrite 150 ppm	2490.2 d	50.47 c	69.65 a
Nitrite 75 ppm	2542.0 cd	50.97 c	24.68 cd
Nitrite 75 ppm + β-cyclodextrine 0.02%	2217.0 d	54.67 bc	26.30 bc
Nitrite 75 ppm + chitosan 0.2%	1649.2 e	58.18 ab	27.50 b
Nitrite 75 ppm + pyrophosphate 0.2%	3085.2 ab	52.50 c	22.53 ef
Nitrite 75 ppm + red beet pigment 0.02%	1485.4 e	54.15 bc	20.80 fg
Nitrite 75 ppm + β-cyclodextrine + chitosan	2866.4 bc	61.06 a	24.35 de
Nitrite 75 ppm + β-cyclodextrine + chitosan + pyrophosphate	3247.4 a	54.46 bc	21.63 f
Nitrite 75 ppm + β-cyclodextrine + chitosan + pyrophosphate + red beet pigment0.02%	2860.2 bc	60.94 a	19.38 g
Nitrite 75 ppm + β-cyclodextrine + chitosan +red beet Pigment 0.02%	1802.8 e	60.11 a	21.43 f

a, b, c, d,e within a same column without shearing a same letter differ significantly ($P<0.05$)