THE RESTRUCTURED OF LOCAL BEEF OF LOW QUALITY WITH DIFFERENT BINDERS, FAT EMULSIFIERS AND FORTIFICATION WITH VITAMIN A IN SAUSAGE

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ABSTRACT

The study was conducted to evaluate the low local beef quality processed sausage by different binders, fat emulsifiers and fortification with vitamin A. The low local beef quality was separated from fat and connective tissue components by trimming of 54 kg meat, and were mixed with binding agents (carrageen, gelatin, albumin) at the level of 0; 1.5; 2.5% w/w, and mixed with different kinds of fats (fish oil, poultry fats, and margarine) of 5%, and fortification with vitamin A was done for all treatments. The study was conducted with two replications of 0.50 kg meat and standardized by loin quality for all treatments. The variable measurements were physical property (pH, tenderness, water holding capacity and cooking loss). The chemical test was water content, total protein, soluble protein, fat, fatty acid, ash. The data colleted were analyzed by using a 3×3×3×2 factorial pattern of analysis of variance, using CRD (Three factors of binder agents, levels, fats, and two factors of fortification). The results showed that there were significant differences ($P<0.05$) on binding agent, which the gelatin was found to be the best, followed by carrageen and albumin and increasing level had a greater bond. The kinds of fat showed significant differences ($P<0.05$) with the best result was found on poultry fat, followed by margarine binder and kinds of fats on physical property. The kinds of fat were respectively: cod oil, poultry fat and margarine with the fortification of vitamin A.

Key word: Quality, Restructured, Local beef sausage.

RESTRUKTURISASI DAGING SAPI LOKAL KUALITAS RENDAH DENGAN MACAM BAHAN PENGIKAT DAN LEVELNYA, MACAM LEMAK SEBAGAI EMULSI DENGAN FORTIFIKASI VITAMIN A PADA SOSIS

ABSTRAK

Penelitian bertujuan untuk mengetahui kualitas fisik, dan kimia sosis yang dibuat dari daging sapi lokal kualitas rendah dengan perbedaan level, macam bahan pengikat, macam emulsi lemak, dan fortifikasi vitamin A. Daging sapi lokal kualitas rendah yang sudah dipisahkan dari jaringan ikat dan lemak, dicampur dengan bahan pengikat: karagenan,gelatin, dan albumen dengan level 0;1,5; dan 2,5% (b/b) dengan macam lemak: minyak ikan, lemak ayam, dan margarin sebagai emulsi serta fortifikasi vitamin A dan non fortifikasi. Masing-masing perlakuan diulang tiga kali, setiap sampel menggunakan 0,25 kg daging dan sebagai standart daging loin. Variabel yang diamati adalah kualitas fisik dan kimiawi. Data dianalisis variansi dengan metode rancangan acak lengkap faktorial 3x3x3x2 (tiga faktor bahan pengikat, tiga faktor level bahan pengikat, tiga faktor macam lemak, dan dua faktor fortifikasi vitamin A. Hasil penelitian menunjukan bahwa macam bahan pengikat dan levelnya berbeda nyata $P<0,05$) pada kualitas fisik dan kimia, paling baik adalah dihasilkan oleh bahan pengikat gelatin dan diikuti oleh karagenan danalbumin pada level 2,5%. Kenaikan bahan pengikat meningkatkan kemampuan daya mengikat air dan menurunkan susut masak pada sosis daging sapi lokal. Macam lemak yang terbaik adalah lemak ayam dan diikuti oleh margarin dan minyak ikan pada sosis daging sapi lokal. Perlakuan fortifikasi vitamin A tidak berbeda nyata pada kualitas fisik dan kimia. Tidak ada interaksi diantara semua perlakuan.

Kata kunci : Kualitas, Restrukturisasi, Sosis daging sapi lokal.

INTRODUCTION

Meat yielded from livestock slaughtered in Indonesia has a less support to the health and has the low quality. This is caused by the slaughtered livestock from draught livestock and fattened livestock, so that the meat yielded contains a lot of fat and cholesterol (Soeparno, 2005). Cholesterol fat and unsaturated fatty acid could from plants and animals. The meat content was less enhancing crude fiber at food product. Sea grass contains the active substance which is necessary for health and pharmacy, among other things to inhibit the growth of cancer cell, to degrade hypertension caused by fatness, and to improve repairing impenetrability system by pushing the formation of lymph cell. (Hoelscker *et al*. (1988), Setiyono, (2002), and Setiyono, (2008).

Restructured meat with different emulsion binders and fortification which Vitamin A in Making Beef sausage for Health Food", has not yet been checked, so that this research was aimed top obtain a basic data of pattern of meat processing with kinds and levels binder, and also with different fat origin as emulsion food of health food which can give support to society health. It was expected that the result of research can be used as a meat processor.

It is also intended to give a contribution to the meat industry, especially to the technology of meat processing, development of healthy food in relation to arterioscleroses, fatness, blood pressure which are expected to reduce diseases by consuming of products of meat processing.

Product of beef such as sausage is completely determined by the binder used. Kinds of binders can come from vegetable such as carrageen which is a sea grass, representing soluble glycoprotein in water holding capacity to push the cell in meat through cell membrane and to catalyst calcium ion. Lectin found in young crop of leguminoceae represents the protein compound which can enhance water holding capacity of the meat protein, causing trans-plantation network of a cell or organ. Binder come from animal such as gelatin from collagen has the character to form the gel, so that it make a compact product. The albumen has the character of colloid and can make a compact meat product such as Beef sausage. Binders, emulsion substance fat level condition and time, formulation technique, appropriate level of concentration for the compound and substance of beef sausage, fatty acid profile and protein. Increase of physical quality, chemical, nutrition and food security.

Thus Research was conducted to determine the effect of levels of binders, fats and fortification of meat product the quality of beef sausage for health food contribution in ranch of area of especially technology of meat processing.

METHODOLOGY

The low local beef quality was separated from fat and connective tissue components by trimming of 54 kg, meat and were mixed with binding agents (carrageen, gelatin, albumin) on the level 0, 1.5, 2.5% w/w, and mixed with kinds of fats (fish oil, poultry fats, and margarine) of 5%, and fortification vitamin A was done for all treatments. The study was conducted with two replications of 0.50 kg meat, and standardized by loin quality for all treatments. The variable measurements were physical property, pH (AOAC 2005), tenderness (penetrometer), water holding capacity (Hamm Method) and cooking loss (Bouton *et al*, 1971). The chemical tests was water content (AOAC method, 2005), crude protein (Kjeldahl method, AOAC 2005), soluble protein (Lawrie method, AOAC 2005), fat (Soxhlet method, AOAC 2005), ash (AOAC 2005). The physical and chemical data colleted were analyzed by using a 3x3x3x2 factorial pattern of analysis of variance using CRD (Three factors of binder agents, binder levels, fats, and two factors of vitamin A fortification).

RESULTS AND DISCUSSION

Tenderness

The tenderness of restructured beef with different kinds and levels of binders, different fat emulsifier and vitamin A fortification of beef sausage is shown in Table 1.

The result showed that the binder treatments gave significant differences ($P<0,05$), on the tenderness the highest binder levels was found on 2.5% level, the lowest tenderness was shown on carrageen, followed by albumin and gelatin. The results were in accordance with Hoelscker, *et. al*. (1988), Barbut (1992), Shank *et al*. (2002), Wood *et al*. (2003), Soeparno (2005), and Setiyono (2008), and that albumin as a globular protein hat the nature of softening nature of soft physical and

enhancing soluble chemical substance. There was no interaction among treatments.

Table 1. Average of tenderness of restructured beef sausage with three kinds and three levels binder, three emulsion of fat and vitamin A fortification

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		0	1. 5	2. 5	0	1. 5	2. 5	0	1. 5	2. 5
	Carrageen	9.97	8.84	7.59	9.93	8.99	7.22	9.95	9.10	7.45
NF	Gelatin	10.01	8.98	7.59	10.09	8.91	7.28	10.08	9.27	7.32
	Albumin	9.22	8.97	7.32	9.96	9.61	7.29	10.12	9.35	6.84
	Carrageen	9.62	8.45	7.62	9.39	8.25	7.05	9.38	7.77	7.05
F	Gelatin	9.95	7.99	7.42	9.86	7.75	6.64	9.26	7.68	7.18
	Albumin	9.89	8.22	7.38	9.49	7.65	6.64	9.34	7.52	6.98

NF : No Fortification with Vitamin A

F : Fortification with Vitamin A

Water-Holding Capacity

The water-holding capacity of restructured beef sausage characteristics is shown in Table 2.

Table 2. Average of water holding capacity of restructured beef sausage as affected by kinds and levels of binders, fat emulsion and vitamin A fortification

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		0	1. 5	2. 5	0	1. 5	2. 5	0	1. 5	2. 5
	Carrageen	31.25	36.05	38.24	31.43	35.94	38.58	30.51	33.35	37.22
NF	Gelatin	32.48	37.45	39.22	32.08	34.85	35.80	30.41	33.34	34.83
	Albumin	32.42	36.35	37.26	31.85	32.67	36.01	30.75	33.08	34.39
	Carrageen	30.75	33.84	36.32	30.49	32.68	34.25	30.82	33.72	35.18
F	Gelatin	30.81	33.86	36.35	31.20	32.88	34.77	30.95	31.92	34.01
	Albumin	30.28	31.46	32.87	30.27	31.83	33.03	30.25	33.31	33.37

NF : Not Fortification with Vitamin A

F : Fortification with Vitamin A

The water-holding capacity did not differ significantly among carrageen, gelatin and albumin binders. The levels of binders differed significantly ($P< 0.05$). The highest water-holding capacity was found on gelatin treatment. Fortification of vitamin A did not affect water-holding capacity. There was no interaction among treatment. The results were in accordance with Fogending and Lanier (1989), Adegoke & Falade (2005), Soeparno (2005), and Setiyono (2008). That the water-holding capacity had no significant relationship with kinds binders.

pH value

pH value of restructured beef sausage characteristic is shown in Table 3.

pH value, kinds and levels of binders did not differ significantly. The kinds of fat and fortification of vitamin A did not affect pH value, was relating similar. The result were in accordance with Bouton, *et. al.* (1971), Endres, *et al*. (1987), Grun *et al*. (2006), and Setiyono (2008), who explained that processed meat on different kinds of binders did not change the pH value. This processed meat usually had similar pH value

Table 3. Average of pH value of restructured beef sausage as affected by kinds and levels binders, three fat emulsion, and vitamin A fortification.

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		0	1. 5	2. 5	0	1. 5	2. 5	0	1. 5	2. 5
	Carrageenan	6.23	6.04	6.01	5.91	6.10	6.19	6.12	6.20	6.27
NF	Gelatin	5.85	6.07	6.25	6.09	6.25	6.38	5.71	6.21	6.40
	Albumin	6.19	6.03	5.85	6.06	6.26	6.40	5.90	6.21	6.52
	Carrageenan	6.06	6.11	6.38	5.85	6.08	6.25	6.07	6.12	6.29
F	Gelatin	6.23	6.04	5.93	6.09	6.13	6.27	6.05	6.19	6.35
	Albumin	6.38	6.19	5.89	6.06	6.28	6.36	6.11	6.13	6.36

NF : No Fortification with Vitamin A
F : Fortification with Vitamin

Cooking Loss

Cooking loss of restructured beef sausage characteristic is shown in Table 4.

Table 4. Average cooking loss of restructured beef sausage as affected by kinds and levels of binders, three fat emulsion, and vitamin A fortification.

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		0	1. 5	2. 5	0	1. 5	2. 5	0	1. 5	2. 5
	Carrageen	9.97	8.94	7.59	9.93	8.99	7.22	9.95	9.09	7.45
NF	Gelatin	10.02	9.18	7.72	9.09	8.92	7.28	10.08	9.31	7.33
	Albumin	10.22	8.97	7.49	10.16	9.42	7.29	10.12	9.05	6.84
	Carrageen	9.58	8.45	7.45	9.39	8.15	7.05	9.42	7.78	7.05
F	Gelatin	10.05	8.00	7.42	9.36	7.85	6.64	9.27	7.88	7.18
	Albumin	9.89	8.22	7.38	9.49	7.45	6.64	9.24	7.52	6.98

NF : No Fortification with Vitamin A
F : Fortification with Vitamin A

Cooking loss, differed significantly ($P<0.05$) among kinds and levels of binders. The lowest cooking loss was found on cod oil, followed by the margarine and chicken fat. Increase in level of binders decreased cooking loss. The lowest cooking loss was obtained on gelatin followed by carrageen and albumin a close relationship with the cooking loss. The higher was the water-holding capacity, the lower was the cooking loss. Fortification of vitamin A did not affect cooking loss. There was no interaction among fat, kinds and level of binders. The results were in accordance with Barbut (1992), Soeparno (1998), Grun *et al*. (2006), and Setiyono (2008), that water content and water-holding capacity had cooking loss from product process.

Crude Protein

Crude protein of restructured sausage characteristic is shown in Table 5.

Kinds and levels of binders differed significantly ($P<0.05$) on the crude protein content. The highest crude protein was found on gelatin, followed by the albumin and carrageen at the level of 2.5%. Kinds of fat and fortification vitamin A did not differ significantly. There was no interaction among fat, kinds, levels of binders, and fortification with vitamin A. The results were according to Setiyono (2002), Soeparno (2005), Adegoke & Falade (2005), and Setiyono (2008) that protein content had no close relationship with binders and probably with vitamin A fortification.

Table 5. Average crude protein of restructured beef sausage as affected by kinds and level of binders three fat emulsion, and vitamin A fortification.

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		0	1. 5	2.5	0	1. 5	2. 5	0	1. 5	2. 5
NF	Carrageen	42.68	41.78	42.18	42.25	40.86	42.07	40.58	41.54	40.92
	Gelatin	41.42	42.24	41.90	41.45	40.37	41.96	40.32	41.51	40.26
	Albumin	44.25	42.45	42.58	40.56	42.37	43.39	42.32	40.29	41.32
F	Carrageen	40.88	41.92	41.81	40.26	42.38	42.25	40.72	42.33	41.78
	Gelatin	42.00	40.99	42.79	42.91	42.83	40.50	43.08	41.42	42.75
	Albumin	39.99	42.42	41.52	41.71	41.05	41.77	40.45	41.45	43.18

NF : No Fortification with Vitamin A
F : Fortification with Vitamin A

Soluble protein

Soluble protein of restructured beef sausage characteristic is shown in Table 6.

Tables 6. Average soluble protein of restructured beef sausage as affected by kinds and levels of binders three fat emulsion, and vitamin A fortification.

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		0	1. 5	2. 5	0	1. 5	2. 5	0	1. 5	2. 5
NF	Carrageen	4.68	4.72	4.78	4.62	4.65	4.7	4.35	4.29	4.51
	Gelatin	4.23	4.29	4.35	4.30	4.36	4.44	4.11	4.32	4.36
	Albumin	4.82	4.98	5.19	4.48	4.72	5.07	4.71	5.12	5.12
F	Carrageen	4.58	4.59	4.63	4.36	4.39	4.44	4.34	4.38	4.42
	Gelatin	4.52	4.6	4.65	4.21	4.3	4.32	4.24	4.33	4.41
	Albumin	4.75	4.86	5.19	4.51	4.56	4.95	4.18	4.58	4.83

NF : No Fortification with Vitamin A
F : Fortification with Vitamin A

Kinds and levels of binders differed significantly ($P<0.05$) on soluble protein content. The highest soluble protein was found on albumin 4.65 %, followed by the carrageen 44.38 %, and gelatin 41.05 % at the levels of binders of 2.5%. Kinds of fat and fortification of vitamin A did not differ significantly. There was no interaction among fat, kinds and levels binder fortification of vitamin A. The results were according to Foegending and Lanier (1989), Setiyono (2002), Biesalski (2005), and Setiyono (2008) that albumin protein constituted a globular which was protein soluble in water, where as the carrageen and gelatin contained more fibrous protein.

Crude Fat

Average crude fat characteristic is shown in Table 7.

Kinds and levels binder did not have significant differences on the crude fat content. Fortification of vitamin A did not affect crude fat content. There was no interaction among fat, kinds and levels of binders and fortification of vitamin A. The results agreed with Endres and Monagle (1987), Simopoulos (2002), Setiyono (2002), Wood *et al.* (2003), Lee *et al*. (2006), and Setiyono (2008 that fat content had a negative correlation with the water content. The higher water content, the lower was fat content.

Ash Content

Average ash content characteristic is shown in Table 8.

Ash content kinds and levels binder did not significantly kinds of fat and fortification of vitamin A did not significantly. There was no interaction among of fat kinds and binder levels

and fortification vitamin A. The ash content in meat product was relatively similar and was minimal variation Biesalski 2005, Soeparno (2005), and Setiyono (2008).

Table 7. Average crude fat of restructured beef sausage as affected by kinds and levels of binders, three fat emulsion and vitamin A fortification.

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		0	1. 5	2. 5	0	1. 5	2. 5	0	1. 5	2. 5
NF	Carrageen	7.357	7.88	8.71	7.29	7.76	8.56	7.25	7.9	8.57
	Gelatin	7.257	7.4	7.94	7.23	7.32	7.61	7.16	7.25	8.02
	Albumin	7.12	7.33	7.64	7.53	7.68	7.85	7.37	7.62	7.94
F	Carrageen	7.03	7.32	7.39	7.15	7.27	7.36	7.55	7.42	7.65
	Gelatin	7.3	7.35	7.44	7.15	7.16	7.45	7.17	7.29	7.58
	Albumin	7.16	7.29	7.41	7.27	7.37	7.53	7.13	7.29	7.82

NF : No Fortification with Vitamin A
F : Fortification with Vitamin A

Table 8. Average ash content of restructured beef sausage as affected by kinds and level of binders, three fat emulsion and vitamin A fortification.

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		**0**	**1. 5**	**2. 5**	**0**	**1. 5**	**2. 5**	**0**	**1. 5**	**2. 5**
NF	Carrageen	1.00	1.00	1.01	0.96	1.09	1.03	0.95	0.98	1.01
	Gelatin	1.00	0.96	1.01	0.98	1.00	1.01	0.97	0.98	0.99
	Albumin	0.98	0.94	0.99	1.00	1.05	0.98	0.93	0.97	1.01
F	Carrageen	0.99	1.00	0.97	0.95	0.95	0.99	0.96	0.98	0.99
	Gelatin	1.00	1.01	0.99	0.95	0.94	0.99	1.00	0.99	1.35
	Albumin	0.96	0.94	1.02	0.96	1.02	1.00	0.96	0.99	1.01

NF : No Fortification with Vitamin A
F : Fortification with Vitamin A

Water Content

Average water contain characteristic is shown in Table 9.

Table 9. Average water content restructured beef sausage as affected by kinds and level of binders, three fat emulsion and vitamin A fortification.

		Kinds of Fat								
		Cod oil			Chicken Fat			Margarine		
Binder Level		**0**	**1.5**	**2.5**	**0**	**1.5**	**2.5**	**0**	**1.5**	**2.5**
NF	Carrageen	76.42	74.96	71.31	74.92	73.90	73.81	74.61	73.6	71.78
	Gelatin	75.82	74.42	72.57	74.61	75.09	73.7	77.29	76.18	75.24
	Albumin	77.82	76.4	74.89	76.47	76.10	73.62	76.53	75.25	73.61
F	Carrageen	76.24	75.33	74.86	76.34	75.08	74.34	77.78	74.09	75.03
	Gelatin	78.13	76.4	75.37	76.82	75.31	73.62	77.39	76.58	73.71
	Albumin	78.48	76.89	74.89	77.47	76.41	76.27	76.51	75.38	74.92

NF : No Fortification with Vitamin A
F : Fortification with Vitamin A

Water content differed significantly ($P<0.05$) between kinds and level of binders. The highest water content was found on albumin binder, followed by the carrageen and gelatin. Kinds of fat differed significantly ($P<0.05$). The lowest water content was found on cod oil, namely 70.05% followed by margarine 70.63% and chicken fat 71.23% respectively. There was no interaction among all treatments. The results were in accordance with Setiyono (2002), Soeparno (2005), and Setiyono (2008) that water content had negative correlation with fat content.

CONCLUSION

These results showed that restructured beef sausage formulation increased the quality of the product. The best binder was gelatin at the level of 2.5% w/w, followed by carrageen and albumin. The best fat was found on chicken fat, followed by margarine and cod oil.

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