The restructured of local beef of low quality with different binders, fat emulsifiers and fortification with vitamin a in beef burger

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ABSTRACT: The study was conducted to evaluate the low local beef quality processed 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 at the level of 0; 1.5; 2.5 % w/w, and mixed with different kinds of fats of 5 %, and fortification with vitamin A was done for all treatments. The study was conducted with two replications of 0.25 kg meat and standardized by loin quality for all treatments. The variable measured were physical property, and the chemical test. The data colleted were analyzed by using a 3 x 3 x 3 x 2 factorial of analysis of variance, using CRD. 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. There was no interaction among treatments. The nearest meat tenderness to the loin by Warner-bratzler meat shear was resulted from gelatin binder and poultry fats combination. The kinds of fat were: fish oil, poultry fat and margarine respectively with the fortification of vitamin A.

Key words: quality, Local beef, restructured beef, beef burger.

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 contained 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 a fatness ,and to improve repairing impenetrability system by pushing the formation of lymph cell.(Hoelscker, *et al*. (1988) ; Setiyono, 2002)

Restructured meat with different emulsion binders and fortification with Vitamin A in Making Beef Burger for Health Food", has not yet been checked, so that this research was aimed to 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 (Setiyono 2002 and Wan *et al* 2005). 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 products of meat processing (Setiyono 2008). Product of beef such as burger 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. 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 burger . Binders, emulsion substance fat level condition and time, formulation technique, appropriate level of concentration for the compound and substance of beef burger, fatty acid profile and protein. Increase of physical quality, chemical, nutrition and food safety (Robale *et al* 2006 and Setiyono, 2008). Thus Research was conducted to determine the effect of levels of binders ,fats and

fortification of meat product the quality of beef burger for health food contribution in ranch of area of especially technology of meat processing.

MATERIALS AND METHODS

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 vitamin A fortification was done for all treatments. The study was conducted with two replications of 0.25 kg meat, and standardized by loin quality for all treatments. The variable measured were physical property, pH (AOAC 1984), tenderness (penetrometer), water holding capacity (Hamm Method) and cooking loss (Bouton et al, 1971). The chemical tests were water content, crude protein, fat, ash (AOAC 1984). Soluble protein the physical and chemical data colleted were analysis by using a 3 x 3 x 3 x 2 factorial of analysis of variance using CRD. Three factors of binder agents, three factors of level, three factors of 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 burger* is shown in Table 1.

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

		Kinds of fat								
		Cod oil			Chicken fat			Margarine		
Binder level[1]		0	1.5	2.5	0	1.5	2.5	0	1.5	2.5
NF	Carrageen	9.97	8.94	7.59	9.93	8.99	7.22	9.95	9.10	7.45
	Gelatin	10.01	9.18	7.59	10.09	8.91	7.28	10.08	9.27	7.32
	Albumin	10.22	8.97	7.32	10.16	9.41	7.29	10.12	9.05	6.84
F	Carrageen	9.62	8.45	7.62	9.39	8.15	7.05	9.38	7.77	7.05
	Gelatin	10.05	7.99	7.42	9.36	7.85	6.64	9.26	7.88	7.18
	Albumin	9.89	8.22	7.38	9.49	7.45	6.64	9.24	7.52	6.98

[1]NF : No Fortification with vitamin A, F : Fortification with vitamin A

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), Soeparno (2005), 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.

Water-Holding Capacity

The water-holding capacity of restructured beef burger characteristics is shown in Table 2. 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 were no interaction among treatment. The results were in accordance with Foegending and Lanier (1989), Wan *et al.* (2005). That the water-holding capacity had no significant relationship with kinds of binders.

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

		Kinds of fat								
		Cod oil			Chicken fat			Margarine		
Binder level[1]		0	1.5	2.5	0	1.5	2.5	0	1.5	2.5
NF	Carrageen	31.25	36.05	38.24	31.43	35.94	38.58	30.51	33.35	37.22
	Gelatin	32.48	36.45	39.22	32.08	34.85	35.80	30.41	32.34	34.83
	Albumin	32.42	36.35	36.26	31.85	32.67	36.01	30.75	33.08	34.39
F	Carrageen	30.75	33.84	36.32	30.49	32.68	34.25	30.92	33.92	35.18
	Gelatin	30.81	33.86	36.35	31.20	32.98	34.77	30.95	31.92	34.01
	Albumin	30.28	31.46	32.97	30.27	31.83	33.03	30.25	33.31	33.37

[1]NF : No Fortification with vitamin A, F : Fortification with vitamin A

pH Value

pH value of restructured beef burger characteristic is shown in Table 3

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

		Kinds of fat								
		Cod oil			Chicken fat			Margarine		
Binder level[1]		0	1.5	2.5	0	1.5	2.5	0	1.5	2.5
NF	Carrageen	6.23	6.04	6.01	5.91	6.10	6,19	6.12	6.20	6.27
	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
F	Carrageen	6.06	6.11	6.38	5.85	6.08	6.25	6.07	6.12	6.29
	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

[1]NF : No Fortification with vitamin A, F : Fortification with vitamin A

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) and Rebole *et al*. (2005) who found that processed meat on different kinds of binders did not change the pH value. There was no interaction among the treatment. This processed meat usually had similar pH value.

Cooking Loss

Cooking loss of restructured beef burger characteristic is shown in Table 4

Tables 4. Average cooking loss of restructured beef burger 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[1]		0	1.5	2.5	0	1.5	2.5	0	1.5	2.5
NF	Carrageen	9.97	8.94	7.59	9.93	8.99	7.22	9.95	9.09	7.45
	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
F	Carrageen	9.58	8.45	7.45	9.39	8.15	7.05	9.42	7.78	7.05
	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

[1]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. Increasing level of

binders decreased cooking loss. The lowest cooking loss was obtained on gelatin followed by carrageen and albumin. The higher the water-holding capacity had the lower 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 (2005) and Setiyono (2008) that water content and water-holding capacity had cooking loss from product process.

Crude Protein

Crude protein of restructured burger 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 content was found on gelatin, followed by the albumin and carrageen at the level of 2.5 %. Kinds of fat and fortification of vitamin A did not differ significantly. There were no interaction

Table 5. Average crude protein of restructured beef burger 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[1]		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	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

[1]NF : No Fortification with vitamin A, F : Fortification with vitamin A

among fat, kinds, levels of binders, and fortification with vitamin A. The results were according to Setiyono (2002), Soeparno (2005) and Setiyono (2008) that protein content had no close relationship with binders and probably with vitamin A fortification.

Soluble Protein

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

Tables 6. Average soluble protein of restructured beef burger 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[1]		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

[1]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 were no interaction among fat, kinds and levels binder fortification of vitamin A. The results were according to Foegending and Lanier (1989),Wan *et al.* (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

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 founding of Endres and Monagle (1987), Wan *et al.*(2005) and Setiyono (2008) that fat content had a negative correlation with the water content. The higher water content had the lower fat content.

Average crude fat characteristic is shown in Table 7.

Table 7. Average crude fat of restructured beef burger 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[1]		0	1,5	2,5	0	1,5	2,5	0	1,5	2,5
	Carrageen	7.357	7.88	8.71	7.29	7.76	8.56	7.25	7.9	8.57
NF	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
	Carrageen	7.03	7.32	7.39	7.15	7.27	7.36	7.55	7.42	7.65
F	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

[1]NF : No Fortification with vitamin A, F : Fortification with vitamin A

Ash Content

Average ash content characteristic is shown in Table 8.

Table 8. Average ash content of restructured beef burger 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[1]		0	1.5	2.5	0	1.5	2.5	0	1.5	2.5
	Carrageen	1.00	1.00	1.01	0.96	1.09	1.03	0.95	0.98	1.01
NF	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
	Carrageen	0.99	1.00	0.97	0.95	0.95	0.99	0.96	0.98	0.99
F	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

[1]NF : No Fortification with vitamin A, F : Fortification with vitamin A

Ash contain kinds and levels binder did not significantly kinds of fat and fortification of vitamin A did not significant. 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 Wan et al. (2005) and Setiyono (2008).

Water Content

Average water contain characteristic is shown in table 8. 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, of 70.05% followed by margarine 70.63% and chicken fat 71.23% respectively. There was no interaction among treatments. The results were in accordance with Setiyono (2002), Soeparno (2005) and Setiyono (2008) that water content had negative correlation with fat content.

Table 9. Average water content restructured beef burger 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[1]		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

[1]NF : No Fortification with vitamin A, F : Fortification with vitamin A

CONCLUSIONS

These results showed that restructured beef burger 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 fish oil.

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