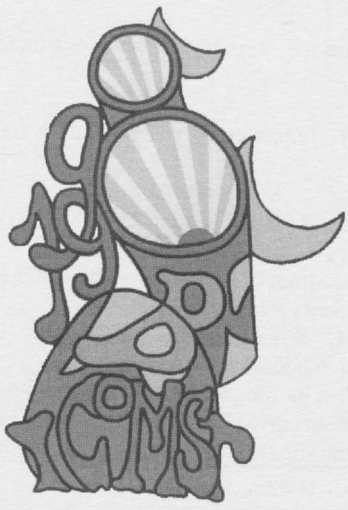
PS 5

Poster session and workshop 5

Novel technologies and ingredients



Tuesday, September 1st
11:15h-12:45h

Effect of transglutaminase of chicken liver from different steps of purification on the physical properties of gel from chicken surimi

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Introduction

Commercial transglutaminase from microorganisms are already used in meat industry to improve gel strength and hardness of meat products in recently years(Kuraishi, 1997; Nielsen, 1995). Some researcheres also reported that the cross-linking of myosin in fish paste during a low temperature was due to formation of covalent non-disulfide cross-links, apparently catalyzed by an endogenous transglutaminase.(Joeph *et al.*, 1994). The rate of enzyme –mediated cross-linking of proteins would be limited by the conformation of both the enzyme activity and substrates as influence by additives such as salt or polyphosphate. Our objective was to contribute to a better understanding of the gel of chicken surimi with chicken liver transglutaminase from different purifying procedures.

Materials and Methods

Transglutaminases of chicken liver of crude extract, chromatography and protamine precipitation and extraction were prepared by the methods of Connellan et al.(1971). Chicken surimi was produced with the procedures described by Pang et al.(1990). In trial 1, a 100g of chicken surimi was treated with transgultaminase from crude extract (0.1%, 0.5%, 1% and 2%), from chromatography (0.03%, 0.05%, 0.1%, 0.3% and 0.7%) and from protamine precipitation and extraction (0.005%, 0.01%, 0.03%, 0.05% and 0.07%), individually. A 2.5% salt was contained in all samples and incubated at 37℃ for 2 hrs. In trial 2, a 100g sample containing 2.5% salt was added with 0.01% purified chicken liver Tgase and was incubated at 4-7 ℃ for 2, 4, 6, and 8 hrs. In trial 3, 100g sample was treated with transglutaminase or without transglutaminase then the mixture was added with 0, 1, 1.5 , 2 and 2.5% salt in this study, separately. The gel formation was carried out at 85℃ for 10min. The rheological properties of gel from all chicken surimi with transgultaminase treatment measured with a Rheometer (NRM-2010J-CW, Fudoh, Japan).

Results and Discussion

In trial 1, table 1 was shown that the rheological properties of gel from chicken surimi with chicken liver transglutaminase from crude extract. The strength and hardness of chicken surimi gel was not significantly different among the control and treatments. But breaking intension with transglutaminase was significantly increased ($P<0.05$) with concentration up to 0.3% but decreased with over 0.3% addition. The similar results also were found in chicken surimi gel with chicken liver transglutaminease from chromatography (Table 2). A better efficiency on the rheological properties of gel was found in chicken surimi with transglutaminase from protamine precipitation and extraction (Table 3). These results indicated that purified extract had a better and higher enzyme activity than that from crude extract and chromatography extract using in meat processing. In trial 2, The strength of gel with 0.01% transglutaminase had no significant difference among the samples incubated at 4℃ for 0, 2,4,6,and 8hrs. The hardness of gels with incubated for 4 and 6hrs was significantly higher than the others (Table 4). In trial 3, The gel strength and breaking intension of the sample with 0.03% transglutaminase and different salt concentrations were higher than that of the samples with only salt. Two percentage of salt was added to chicken surimi with 0.03% transglutaminase resulted in the highest gel strength and breaking intension in this study (Fig.1).

Conclusion

0.03% transgultaminase obtained from protamine precipitation and extraction had the best efficiency on the physical properties (gel strength, hardness and breaking intension) of gel when the chicken surimi with 2% salt was incubated at 4-7℃ for 4-6hrs.

Acknowledge

We would like to thanks for National Science Council, Republic of China for financial support for this research (NSC86-2313-B005-017).

References

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Table 1. Effect of different concentrations of transglutaminase from crude extract on rheological properties of chicken surimi gel

Concentration	Gel strength (g)	Hardness (dyn/cm^2)	Breaking Intension(g/cm^2)
0%	171.63±24.97	929250.00±109110.00	888.13±112.46^{ab}
0.1%	186.88±16.86	960957.50±99976.90	951.75±85.82^{a}
0.3%	188.75±14.41	969127.50±73357.50	991.88±76.36^{a}
0.5%	184.25±28.75	959375.00±151570.80	883.88±161.09^{ab}
1%	185.88±36.66	935578.70±180393.20	827.00±113.30^{b}
2%	165.50±19.36	889500.00±92953.14	806.13±113.30^{b}

a, b Means within the same column without the same superscripts are significantly different ($P<0.05$).

Table 2. Effect of different concentrations of transglutaminase from chromatography on rheological properties of chicken surimi gel

Concentration	Gel strength (g)	Hardness (dyn/cm^2)	Breaking Intension (g/cm^2)
0%	177.50±10.28^{ab}	967525.00±74988.00	924.88±56.72^{abc}
0.03%	182.25±13.36^{ab}	968792.50±73637.60	957.50±77.23^{a}
0.05%	189.25±11.45^{a}	1001231.00±68231.40	951.00±76.90^{ab}
0.1 %	181.00±7.17^{ab}	1015191.00±166266.80	915.50±46.83^{abc}
0.3 %	174.13±10.11^{a}	979865.00±88549.30	862.63±44.01^{c}
0.7 %	177.50±10.60^{ab}	964425.00±85763.70	889.13±13.89^{ac}

Table 3. Effect of different concentrations of transglutaminase from protamine precipitation and extraction on rheological properties of chicken surimi gel

Concentration	Gel strength (g)	Hardness (dyn/cm^2)	Breaking Intension (g/cm^2)
0%	180.50±8.72	977807.10±61109.88	938.50±69.31
0.005%	183.50±12.86	1009850.00±94050.33	952.00±65.59
0.01%	204.75±23.12	1043031.00±115357.00	1043.00±117.9
0.03%	203.25±22.79	1024091.00±128341.70	1035.25±116.20
0.05%	199.25±11.50	993730.00±74198.51	1039.13±46.08
0.07%	188.75±13.92	967737.00±68671.77	976.88±98.23

Table 4. Effect of different incubating times on rheological properties of chicken surimi gel with 0.01% transglutaminase at 4℃

Time	Gel strength (g)	Hardness (dyn/cm^2)	Breaking Intension (g/cm^2)
control	207.38±22.12	1042680.00±102979.10^{ab}	1056.38±112.98^{a}
2 hr	208.00±11.69	998520.00±51674.27^{b}	1059.50± 59.72^{a}
4 hr	210.50±11.41	1100975.00±90065.72^{a}	1072.25± 58.16^{ab}
6 hr	211.25±19.91	1107974.00±117021.30^{a}	1055.00±117.94^{a}
8 hr	221.50±21.99	1068619.00±94699.00^{ab}	1115.00± 99.74^{a}

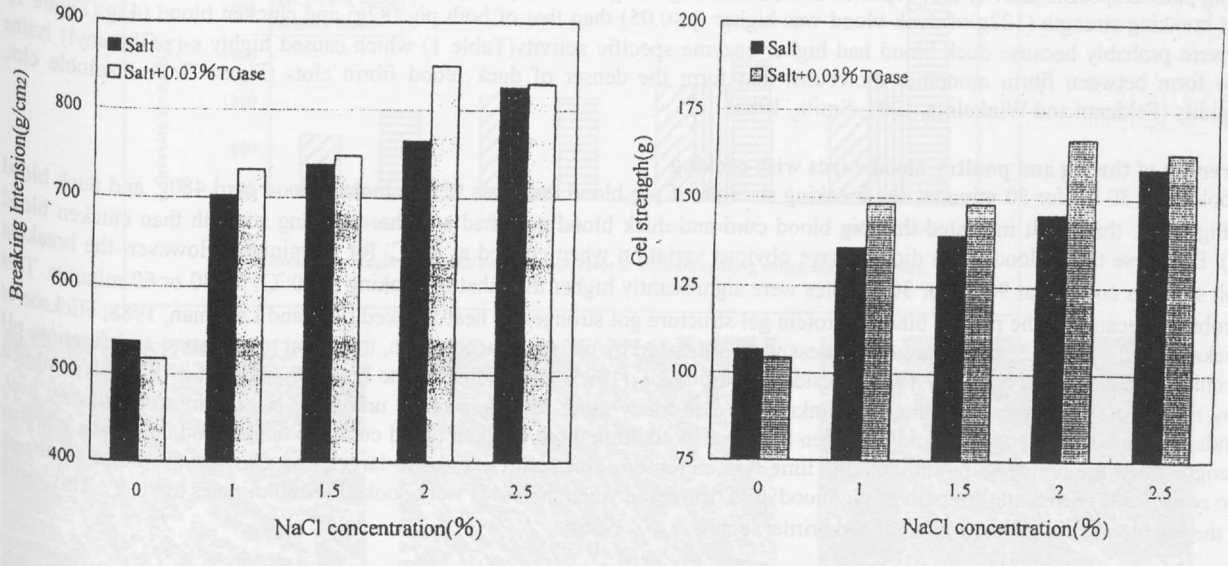

Figure 1. Effect of different salt concentrations on gel strength (A)and breaking intension (B) of chicken surimi gel with 0.03% transglutaminase.