Effect of simultaneous use of high pressure processing and transglutaminase enzyme on spent hen protein isolate (SPI)

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Summary

Texture of spent hen meat is of great concern for its utilization. In order to improve the value of spent hen meat, proteins were isolated using pH shift technology. However the quality of the isolated proteins needs to be improved. This study helps to understand the effect of simultaneous use of high pressure processing and transglutaminase (TGase) enzyme on spent hen protein isolate.

Problem

Every year millions of egg production hens become "spent" at the end of their laying cycle. Meat from spent hens is generally tough, less tender and poor in functional properties, because of its increased collagen content and cross linkages.

Due to these problems associated with spent hen meat, it has become inevitable to find new ways for its utilization. Isolating proteins from spent hen meat is one of the approaches and improving the properties of isolated protein will help in utilizing this meat for preparation of gel type of products.

Hence the major objectives of the study were:

1) To isolate proteins from spent hen meat using pH shift technology
2) To study the effect of simultaneous use of high pressure processing and TGase enzyme on textural and color properties of spent hen protein isolate

Our Approach

Extraction of spent hen protein isolate (SPI) was carried out as explained in our earlier research (Omana et al., 2010). pH of protein extraction was 11.5 and the final pH of protein isolate was adjusted to 6.2. SPI with/without TGase enzyme (0.3%) was packed in cryovials (2 mL capacity), processed at 400/600 MPa pressure and 40°C for 30 minutes. NaCl (1.0%) was added to all the samples. The spent hen meat used in this study was obtained from Lilydale Inc., Edmonton, Canada. TGase enzyme (Activa) was obtained from Ajinomoto, Japan. Variables used in the present study are presented in Figure 1.

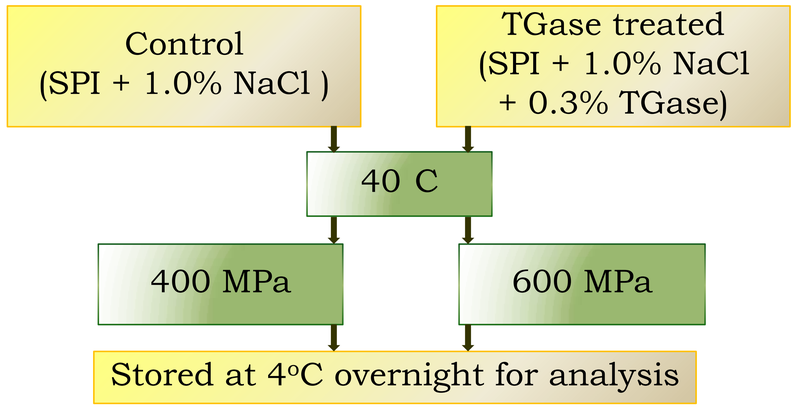

Figure 1. Flow diagram of experimental design

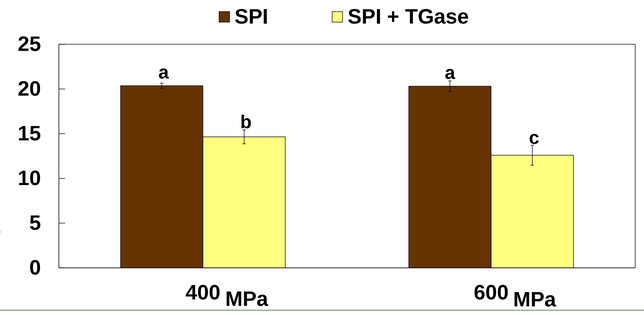

Figure 2. Expressible moisture of high pressure processed spent hen protein isolate (SPI) treated with TGase enzyme

	SPI Control		SPI + TGase	
Parameters	400 MPa	600 MPa	400 MPa	600 MPa
Hardness (g)	$1465^{b,c}$	1108^{c}	2473^{a}	$2168^{a,b}$
Adhesiveness	0.05^{a}	0.00^{a}	0.18^{a}	0.15^{a}
Springness	0.93^{a}	1.00^{a}	0.96^{a}	0.96^{a}
Chewiness	$1017^{b,c}$	824^{c}	1875^{a}	$1607^{a,b}$
Cohesiveness	0.74^{c}	$0.75^{b,c}$	0.79^{a}	$0.78^{a,b}$
Resilience	0.42^{b}	0.42^{b}	0.48^{a}	$0.47^{a,b}$

Table 1. Textural Profile Analysis of high pressure processed SPI treated with TGase enzyme

Observations

Color and textural properties of high pressure processed SPI were studied. Increase in pressure level caused significant ($P < 0.05$) increase in L* value, however addition of TGase enzyme did not affect lightness values. a* and b* values were unaffected by high pressure application or TGase addition. Improvement in water holding capacity of the sample was evident with enzyme treated sample as revealed by significant ($P < 0.05$) decrease in expressible moisture content. Textural profile analysis showed significant ($P < 0.05$) increase in hardness, chewiness, cohesiveness and resilience values for TGase treated samples; however increase in pressure did not affect these parameters.

Conclusions

This study demonstrates that simultaneous use of transglutaminase enzyme and high pressure processing is of much importance in improving the functionality of SPI, especially in improving water holding capacity and gel texture.

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