EFFECT OF CRUDE SALT SOLUBLE MYOFIBRILLAR PROTEINS FROM DUCK AND GOOSE GIZZARDS ON THE QUALITY OF CHICKEN MEAT BALLS

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Introduction

Gizzard is a heavily muscle pouch that is used to masticate the feed and begin the digestion of the feed in poultry. Gizzards occupied about 3.5-4.1% of the poultry carcass and usually removed from the carcass on the slaughtering line then emptied and took away the lining and washed (Mountney and Parkhurst, 1995). They are prepared for retail sale by fresh or cooked with spiced in far eastern Asia area. Zarkadas *et al.* (1997) stated that the total soluble intracellular protein fraction averaged 86.3% of the total protein isolated from chicken gizzards. They also concluded that gizzard soluble protein may be added to formulations of meats and poultry products due to their good protein quality and digestibility. The aim of the present study is evaluate the protein quality of the salt soluble myofibrillar proteins from duck and goose gizzards and really applied in chicken meat balls.

Materials and Methods

Prechilled duck and goose gizzards (4 ℃), separately, were cut into small cubes, ground in a meat grinder (3/16- then 1/8-in plates) then prepared to extract crude salt soluble myofibrillar proteins by the method of Laemmli（1970）. The lyophilized samples were used to prepare 20% crude salt soluble myofibrillar protein solutions. The protein solutions were used to replace 10, 20, and 30% of chicken breast muscle in chicken meatballs (75% chicken breast muscle and 25% lard), separately. The chicken meatballs were prepared by the method of Liu *et al*. (1990). The rheological properties (gel strength, hardness, viscosity and elasticity) and sensory panel test (appearance, texture, color, juiciness and overall acceptance) were performed to obtain an optimum replacing amount in chicken meat balls.

Results and Discussion

The highest gel strength (516.84 g), hardness (0.90048 kg/mm^2) and elasticity (835553 dyn) of meat ball was found in the sample with replacing of 20% chicken breast muscle by goose gizzard salt protein solution, nevertheless the control had the highest viscosity(3564.2 dyn·cm^3) when compared to all samples in this research (Table 1). The same improving efficacy for rheological property also was found in chicken meatballs when 10% chicken breast muscle replaced by goose gizzard protein solution in the products. However, The worst rheological properties were found in the products with 30% replacing of chicken breast muscle by goose gizzard salt protein solution. Conversely, in duck gizzards, the rheological properties of the products with replacing of 30% chicken breast muscle by duck gizzard protein solution were better than the products with replacing of 10 or 20 % chicken breast muscle by duck gizzard protein solution and the control.

The results of the sensory panel test were showed in Table 2. The data indicated that chicken meatballs with replacing of 20% or 30% chicken breast muscle by goose gizzard salt soluble protein solution had the highest score in all sensory panel items (color, juiciness, texture, flavor and overall acceptable) when compared to all products. Similarly, in duck

gizzard salt soluble protein solution, 20 or 30 % also had better scores than the control or 10% replacing amount. On the whole, the better results were obtained in rheological properties and sensory panel when goose gizzard salt soluble protein solutions were utilized to replace chicken breast muscle in chicken meatballs.

Table 1 The reheological properties of chicken meat ball with different replacing amounts of duck and goose gizzards salt soluble myofibrillar protein solutions

	Gel strength(g)	Hardness(kg/mm^2)	Viscosity(dyn·cm^3)	Elasticity (dyn)
Control	431.25^{c}	0.73484^{e}	3564.2^{a}	720115^{bc}
Duck				
10%	431.20^{c}	0.75908^{c}	2941.0^{d}	743310^{ab}
20%	440.25^{c}	0.79346^{b}	3291.8^{c}	737646^{ab}
30%	454.75^{b}	0.79316^{b}	2912.9^{d}	777305^{ab}
Goose				
10%	503.50^{a}	0.89684^{a}	3517.7^{ab}	781410^{ab}
20%	516.84^{a}	0.90048^{a}	3448.4^{bc}	835553^{a}
30%	431.26^{c}	0.71452^{e}	2230.0^{e}	658411^{c}

$^{a\,b\,c\,d\,e}$ Means in the same column with different subscript letters differ significantly (P<0.05)

Table 2 The panel score of chicken meat ball with different replacing amounts of duck and goose gizzards salt soluble myofibrillar protein solutions

	Appearance	Color	Juiciness	Texture	Flavor	Overall acceptance
Control	4.57^{a}	4.14^{abc}	3.86^{b}	4.25^{ab}	4.29^{ab}	4.14 ^{b}
Duck						
10%	4.29^{a}	4.21^{abc}	3.64^{b}	4.64^{ab}	3.64^{b}	3.93 ^{b}
20%	4.29^{a}	4.50^{abc}	4.07^{ab}	4.36^{ab}	4.21^{ab}	4.29^{ab}
30%	3.57^{b}	3.86 ^{c}	4.07^{ab}	4.29^{ab}	4.07^{ab}	4.36^{ab}
Goose						
10%	4.50^{a}	4.43^{abc}	4.14^{ab}	4.64^{ab}	4.36^{ab}	4.50^{ab}
20%	4.50^{a}	4.86^{ab}	4.50^{ab}	4.93^{a}	4.43^{ab}	5.07^{a}
30%	4.50^{a}	4.93 ^{a}	4.86^{a}	4.86^{a}	4.79^{a}	5.07^{a}

$^{a\,b\,c\,d\,e}$ Means in the same column with different subscript letters differ significantly (P<0.05)

Conclusions

In conclusion, an optimum replacing amount of chicken breast muscle by duck or goose gizzard salt soluble protein solution in chicken meatballs was 20-30%. Moreover, meatballs with replacing of goose gizzard salt soluble protein solutions showed better rheological properties and sensory panel scores than those replacing with duck gizzard salt soluble protein solutions in the present study.

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