The Effect of Biduri (*Calotropis gigantean*) Latex on Meat Quality of Post Laying Hen

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Abstract. The aim of this research was to investigate the effect of biduri (*Calotropis gigantean*) latex treatment on physical quality and hedonic test of meat of post laying hen. Samples of this research used meat of post laying hen strain Lohman aged 90 weeks. Thigh muscle was used for physical quality and breast muscle for hedonic test. Extract of biduri latex were obtained by cutting and tapping of young stem tissue, and it was centrifuged to obtain crude fluid of biduri latex (supernatant). Variables of this research were pH, cooking loss, tenderness, and water holding capacity (WHC), and hedonic test. Levels of biduri latex were 0, 3, 6 and 9% were measured from weight of the samples and the treatment of biduri latex by smearing on the surface of meat samples. The experimental design of the research used one way randomized design. The data was analyzed by using ANOVA, and differences between treatment means were further analysed using Duncan's New Multiple Range Test. The effect of biduri latex did not affect on pH, but it significantly affected on cooking loss, WHC, tenderness, and hedonic test ($p<0.01$). Cooking loss started to decrease in concentration of 6%. Value of WHC and tenderness went up at concentration of 3%. Increasing of meat quality of tenderness of hedonic test, juicy and overall hedonic test started to increase in concentration of 6%, and also flavor on concentration of 3% and 9%. In conclusion, the treatment of biduri latex with concentration of 3% could increase meat quality of meat of post laying hen.

1. Introduction

Post laying hen has a potential to meet the needs of meat on society, however when its getting older, the meat become tough. So that the social needs of this hen is less in demand. The meat have good protein content and the fatty is low.

Some study prove that tough meat can be tenderize by adding fruit protease enzyme. Tenderness meat of post laying duck [1] and post laying hen [2] can be increase by using papain from papaya fruit. Bromelin from pineapple can be increase to tenderize beef [3,4] and post laying duck meat [5]. The problem is protease source to tenderize meat taken from fuits, while fruits are human food, so there is need to find other source of protease.

One source of protease can be taken from biduri (*Calotropis gigantean*). Moreover there are abundant population of biduri which are optimally untapped [6]. Biduri protease classified as exopeptidase (cut the chain of peptida from outerside) and can hydrolysis fish myofibril and meat myofibril by using hydrolysis with high specific value [7]. Biduri latex also can hydrolysis casein,

fibrinogen, fibrin [8] and systein [9]. Biduri's protease enzym activity works at 0,945mg/50mg/hour, better than rennet 0,860mg/50mg/hour [10].

Raw extract biduri latex can be used to raise the quality of meat. The purpose of this research was to understand the effect of raw extract biduri latex and to increase either physical quality and organoleptic quality of meat.

2. Materials and methods

2.1. Materials and samples preparation

Subject on this enzym activity test was latex taken from biduri (*Calotropis gigantean*). Chicken meat taken from post laying hen strain Lohman aged 90 weeks old. The thighs meat used to physical and the breast meat used to hedonic test.Biduri latex obtained from tapping young stem tissue [10] was centrifuged to obtain crude fluid of biduri latex (supernatant) [11]. The thigh and breast meat has been cut with size 5x2x1cm and divided into groups of treatments. Sample were smeary using biduri latex and punctured using needle then incubate for about 30 minutes inside sterile laminar air flow (LAF) in room temperature [12].

2.2. Methods

pH measurement used pH meter [13], cooking loss indicated by how much percentation of meat water loss, tenderness indicated by how strong the meat used warner blatzer method and WHC used Hamm method [12].

Hedonic test used nine point hedonic scale which use numeric data. It consist of value according to [14] in modification description definition score. Score 9 for very much like, 8 for very like, 7 like, 6 for rather like, 5 for neutral, 4 for rather dislike, 3 for dislike, 2 for very dislike, dan 1 for very much dislike, then tabulated and count the average.

2.3. Experimental designs

The design of experiment used One Way Randomized Design [15] with addition of biduri latex in some concentration (0, 3, 6, 9%) from sample weight of meat.

Physical and hedonic test data analyzed using ANOVA. If the difference is significant then use Duncan's New Multiple Range Test [15].

3. Results and Discussion

Physical quality test result of post laying hen with treatment of crude extract latex biduri can be seen in Table 1.

Result shown that there increased of the value of cooking loss and WHC, however there were decreased in tenderness value and pH value did'nt had affected in addition crude extract biduri latex in post laying hen meat. Cooking loss value started to were increased in concentration of 6%, WHC in concentration of 3%. However there was decreased in tenderness value at 3% in addition of crude extract biduri latex.

Table 1. Average and Statistic Test Result of The Physical Quality of Post Laying Hen with Crude Extract Biduri Latex

Variable	Biduri latex addition percentase (%)				P
	0	3	6	9	
Cooking Loss (%)	36.53 ± 1.46^{a}	$35.15\pm0.94^{a,b}$	37.68 ± 0.68^{b}	40.59 ± 0.45^{c}	0.001
pH	5.78±0.06	5.78±0.05	5.71±0.09	5.72±0.07	0.576
WHC (%)	28.43 ± 0.68^{a}	38.00 ± 2.38^{b}	46.26 ± 3.95^{c}	42.38 ± 1.82^{c}	0.000
Tenderness (kg/cm^2)	4.24 ± 0.18^{a}	3.72 ± 0.15^{b}	3.64 ± 0.15^{b}	3.58 ± 0.13^{b}	0.010

Description: ^{a,b}Different superscript in the same row indicates significantly

There are similarity and difference beetwen predecessor study and this study. The addition of raw extract protease taken from *Calotropis procera* up to 0,5% will affect to decrease the value of tenderness, WHC and cooking yield, however increase the value of poultry meat pH [16]. Addition of 6×10^3 unit activity/100g from the total of protease meat from *Calotropis procera*, papaya and bromelin can decrease pH and tenderize chicken, beef, catfish meat [17]. The use of bromelin pineapple crude extract increase tenderness, cooking loss and WHC, however decrease in pH for beef meat [3].

Actin and myosin having proteolysis because of protease from *Calotropis procera*, it becomes protein with molecul weight fewer on chicken [16], beef, catfish and squib meat [18]. This also happen when pineapple protease is used [3]. Then protein myofibril hydrolized by protease, it cause meat fragmentation and the establishment of microstructure space, so therefore water inside meat can move and loss while being cooked. These reason induced in increasing cooking loss value, WHC and decreased tenderness value, based on this study.

Regardless of amino acid by bromelin proteolitic activity in protein meat, causing the decrease of pH [3]. This action did'nt happen in this study, it might caused by meat pH still in normal condition, based on [19] in about 5,1-7,2. Meat with normal pH which close to meat isoelectric pH, therefore ionic protein molecul in the meat is well-balanced. This statement in accordance with [20], pH in isoelectrical point consist of positive ion and negative ion in protein molecul when they are balance. This made meat pH no differently in this study.

Hedonic quality test result of post laying hen with crude extract biduri latex can be seen in Table 2.

Table 2. Average and Hedonic Statistic Test Result of Post Laying Hen with Crude Extract Biduri Latex

Variable	Biduri latex addition percentase (%)				P
	0	3	6	9	
Tenderness	6.12 ± 0.91^a	6.44 ± 1.33^a	5.28 ± 1.56^b	4.60 ± 1.72^b	0.000
Flavor	4.32 ± 1.32^a	5.36 ± 1.35^b	6.20 ± 1.32^c	4.48 ± 1.55^a	0.000
Juicy	6.68 ± 1.05^a	5.00 ± 1.77^b	5.04 ± 1.78^b	4.56 ± 1.65^b	0.000
Overall Taste	6.20 ± 1.79^a	4.56 ± 1.42^b	4.48 ± 1.36^b	4.32 ± 1.76^b	0.000

Description: ^{a,b}Different superscript in the same row indicates significantly

Hedonic analytic result shown was decreased in tenderness, juicy and overall taste value, therefore increased in flavor when crude extract latex biduri added. Tenderness taste decreased in 6%, juicy and favorite decreased in 3%, while flavor increased in 3% then decreased in 9% of levels of biduri latex.

Predecessor study concerning favorite rate by hedonic in protease meat shown different result. Addition of biduri hay (*Calotropis procera* SW.) in feed decrease juicy, flavor and overall taste from *semimembranosus* (SM) sheep meat [21]. Addition of protease biduri latex concentration have no effect on aroma, taste and flavor of windu shrimp [22]. The addition of papain doses injection up to 3mg/kgBB can increase tenderness, decrease juicy and increase overall taste of post laying hen meat [2].

Degradation occur in endometrium layer by gap formation in meat bundle which circling muscle, degradation happen by the provision of protease from papaya latex and *C. procera* latex. It means there are protease activity in protein myofibril connective cell in meat [17]. Higher concentration of protease result in higher hidrolysis rate, therefore more chain loss of molecule in colagen protein [23].

Tenderness taste decreased at 6% levels of crude biduri latex. This case may happen caused by the provision of 6% biduri latex therefore when the meat is cooked, structural protein denaturated

and the water went out eksudatively, it caused muscle shortening in protein structure so the meat seems toughing. Myofibrilar protein such as actin and myosin denaturated by heating, resulted in the meat tenderness quality [24]. Heating on meat can make the water dipped from the meat and myofibril degenerate in diameter and shrink, therefore affect the tenderness, WHC and juicy value [25].

Flavor in addition biduri latex increased at 3% and 6% otherwise did'nt in 9% levels of crude biduri latex. This happen because fatty acid aroma when cooked and accumulate in bigger microstructure gap and will induce flavor in response of degradating meat microstructure in crude biduri latex 3% and 6%. Addition of bromelin caused increasing pH and increasing cooking loss [5], therefore meat water increase and so the flavor. Based on [26], intramucular fat will melting when cooked and going to fiber muscle and stimulate salivary gland when eating, so that resulting in flavor, taste, juicy and meat aroma. At 9% there are decreased of flavor taste because fat comes out with meat water eksudatively, because microstructure meat gap cant be maintained, therefore flavor taste decrease in this study.

Juicy flavor and overall taste decreased in addition biduri latex at 3% otherwise did'nt at 6% and 9%. The panel preferred juicy taste than overall taste. Sensation taste decreased in addition biduri latex. Protease biduri latex hydrolysis protein from long chain protein to short chain protein or hydrolisat protein in fish [27]. Cooking process can make the water form water gap in meat microstructure and when it repeat the water exsudative from microstructure [12]. Cooking process can make the water content decrease, coagulate and denaturate of protein [28]. Structure change in meat caused by biduri protease and cooking process can make water inside meat eksudated and become dry, therefore juicy rate decreased. At 3%, 6%, and 9% addition of biduri latex did'nt make difference in juicy taste and favorite taste, this may caused by water eksudative rate inside meat resulted the same on this study. Based on [12] water eksudative meat happen in freely water and immobilization water inside meat. Moreover water eksudative meat formed when protein which binding water either enzymate or heating are degradated. Eksudation will maximally work when all water bound freely and immobilization is up.

4. Conclusions

The treatment of biduri latex with concentration of 3% could increase meat quality (cooking loss, WHC, tenderness of hedonic, juicy, flavor, overall taste) of meat of post laying hen.

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