PHYSICAL CHARACTERISTICS (pH and Early Decay) SALAMI CULLED HENS USING STARTER YEAST AND LACTIC ACID BACTERIA

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ABSTRACT

Research on the physical characteristics (pH and initial decay) of culled layer hens salami using yeast and lactic acid bacteria as starter, was investigated. The purpose of this study was to determine the effect of yeast and lactic acid bacteria as starters, to physical characteristics such as pH and early decay in culled layer hens salami. The research was used Isa Brown strain culled layer hens. Completely randomized design (CRD) was used with 5 treatments and 4 replications (T_0 = using of 2% LAB and 1% yeast without spices; T_1 = using 2% LAB and 1% yeast; T_2 = using 2% LAB and 2% yeast, T_3 = using 2% LAB and 3% yeast ; and T_4 = using 2% LAB and 4% yeast, followed by Polynomial Orthogonal Test. Results indicated that the sausages pH was decreased as the yeast increased, T_0 = 4.64; T_1 = 4.52; T_2 = 4.46; T_3 = 4.39 and T_4= 4.35, respectively; indicated that when the yeast increased will decreased the sausage pH. Until 20 hours, there were no initial decay on all sausages, but after 30 hours, the sausages color changing, especially on T_0, T_1, T_2 and T_3, there were black brown color, but on T_4 there is no color changing. It means that using 2% LAB and 4% yeast (T_4) have antimicrobial compounds on culled hens salami.

Keywords: *culled layer hens salami, yeast, pH, early decay*

INTRODUCTION

Meat or chicken carcasses are a food source of animal protein for humans. Each year, the reported needs of chicken meat as food in Indonesia continues to increase, so that the demands of food safety of these products need to be improved, given the chicken meat is the most widely traded commodity and much liked by the public. But the chicken is a food that is easily damaged due to the high nutritional content.

Initial contamination in meat derived from microorganisms that enter the bloodstream when cutting. Fresh meat is generally contaminated by a large number of bacteria, including pathogens, including bacteria that contaminate food *Salmonella* sp, *Escherichia coli sp, Staphylococcus aureus*, and other pathogenic bacteria. Fresh meat may also be contaminated by the extent of the yeast population and including also the meat which has undergone fermentation.

Yeast utilization in Indonesia is still relatively small, especially on just a few species only. Its presence in food is very difficult to avoid, but should be considered, given the yeast is able to contribute positively to the fermentation products. Positive role in the fermentation products is very diverse, among others, in the fermentation process sausage (salami). Salami (fermented sausage) is a processed meat products from a mixture of meat with fat through a process of fermentation using lactic acid bacterial culture, and is able to convert carbohydrates into lactic acid. Salami is a meat product that is damaged (perishable food), so it requires special handling to extend the old store, one with preservation. Preservation has been done typically uses chemicals are toxic and carcinogenic, which can harm human health. The use of preservatives through biological methods, known as biopreservatif, put into use in late through the activity of microorganisms or their metabolites result as an antimicrobial agent. Cultures of microorganisms can extend the shelf life of meat products as a result of acid formation.

Meat produced from meat of culled birds generally have a tough, tough and hard and smells already strayed from the smell of fresh chicken meat. In addition to the lack of interest of consumers taking culled hens, also because it has not been accustomed to cultivate in different variations to be preferred by consumers. Therefore, the meat of culled hens is one alternative raw materials processed into salami, however, necessary to study the changes that can be caused that dairy products are safe for consumption based on physical characteristics through testing and initial pH and early decay

MATERIALS AND METHODS

Materials

The materials used in these research, include culled laying hens strain Isa Brown aged 96 weeks comes from a breeder hens in Tanjungsari, Sumedang, West Java who maintained the system battery. The sample used in this study were culled laying hen meat intact. Seasoning - seasoning to manufacture salami such as garlic, ginger, pepper, NPS (Nitrite Pokeln Salt), which is a mixture of salt (NaCl) and sodium nitrite (NaNO3), nutmeg, sugar and salt, cornstarch, skim milk and fat , Starter that will be used is a species of yeast (*Trichosporon beigilii*) and lactic acid bacteria isolated from meat of culled hens.

Research equipment.

The equipment will be used in the research phase of this are: Food Processor brand Philips HR 7620 is used to grind meat and mixing the dough sausage, a thermometer to measure the temperature of the room, Harnir / cookie cutter as a filler into casings sausage casings sausage (casings) by brand Nalo Faser with size 45 Lange Caliber 60.0 Menge 25 came from Germany to wrap salami. Strap casing (thread mattresses), display devices sausage (hand stuffer), grinder (grinder) to grind meat, furnaces and ovens for curing salami, basin for storing meat, plastic placemat for storing spices, gloves, scales ohaus.

Salami Making Process

The main ingredient of salami teardiri manufacture of meat and fat culled hens in the ratio 80: 20 grams. Meat 200 grams of fat and 40 grams of milled simultaneously, then meat and fat is frozen for 24 hours. Meat that has been milled and frozen then ground in a food processor along with spices, salt, sugar, garlic, ginger, pepper, nutmeg, cultures of lactic acid bacteria isolated from chicken meat as much as 2% as well as species of yeast (*Trichosporon belgilii* that isolated from meat of culled hens) in accordance with the treatment that is 0% (P1), 1% (P2), 2% (P3), 3% (P4) and 4% (P5) until well blended. The dough into a sausage added cornstarch, powdered milk and chicken fat. Once well blended, the batter has become incorporated into the casing and then fastened. The main function of sausage casings is for the formation of the product, maintaining the stability of the product, as well as protection from physical and chemical damage. Then hung on a rack and allowed to stand (conditioning) for 24 hours at room temperature (Ariel et al.

2008). After the salami through the conditioning process, the fermentation process is then performed at room temperature for 6 days and interspersed with the process of curing for one hour per day. The temperature during curing is maintained 27 - 30 ° C by adding ice in the fumigation chamber when the temperature exceeds 30 ° C. The fuel used is dried coconut shells. Salami making process outlined in the flow diagram is based on a modification Suryaningsih (2006) (Figure 1).

Tools and materials

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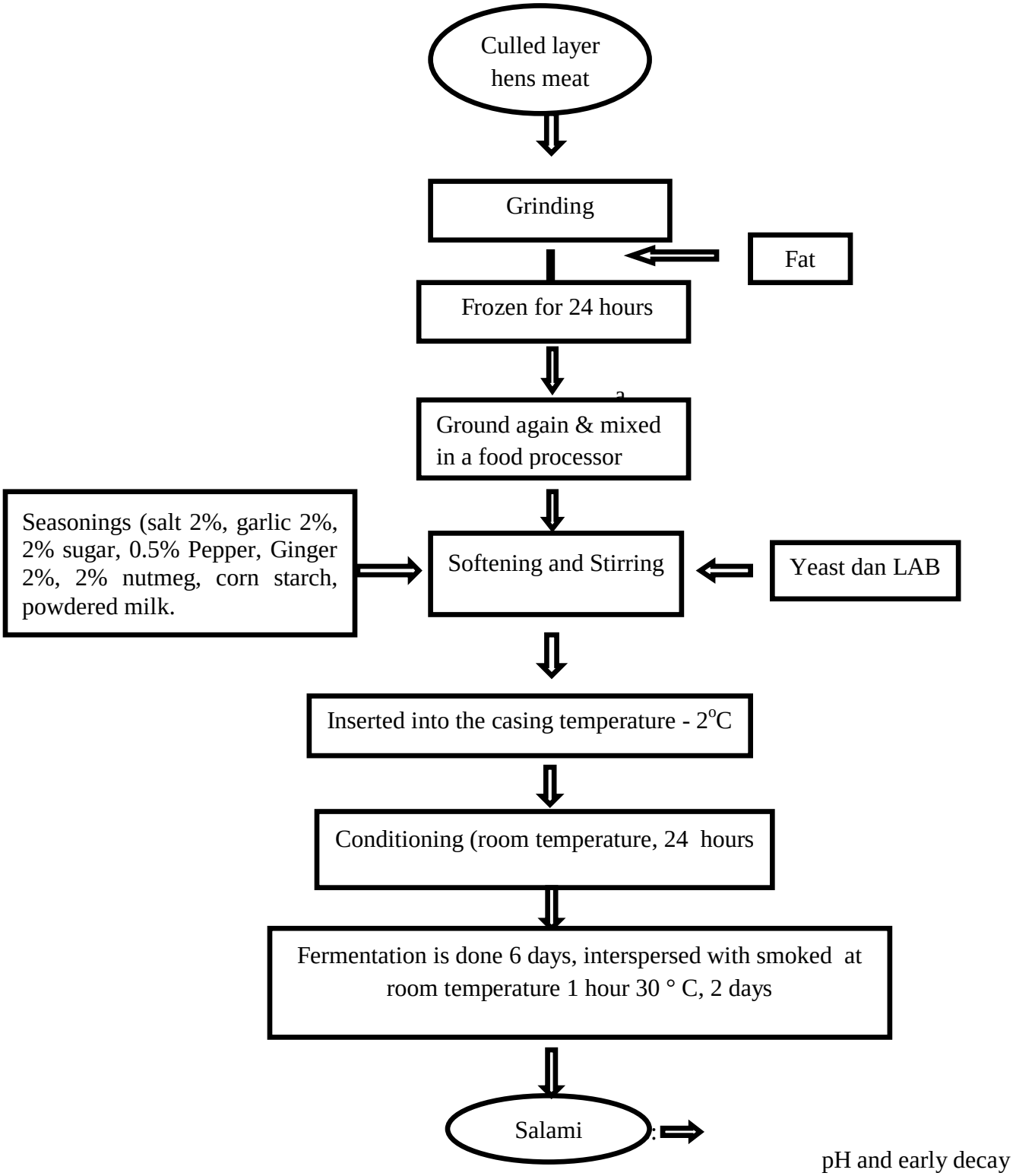

Figure 1. Salami Making (Suryaningsih, 2006, which have been modified).

Variables Observed

1. Measurement of pH
2. Preliminary Analysis decay .

Analysis procedures

a. pH measurement (Lukman and Trioso, 2009)

Measurement of the degree of acidity (pH) of meat is done by using a pH meter . Measurement procedure are as follows :

1. Before the first measurement done, calibration use standard solution (buffer pH 4 and 7)
2. Meat taken from a sample of 10 grams then ground using a mortal and add distilled water as much as 100 ml
3. pH meter electrode is dipped into a sample of meat that has been pounded , left for some time until a constant pH value (chart appears on the screen) .

b . Early Decay Test (Lukman and Trioso, 2009)

Initial determination of salami rotting using Pb-acetate test . The principle that H_2S gas generated at the beginning of the decay process will : reacts with lead acetate and produce black .

Reaction : H_2S (gas) + Pb acetate → PbS (black) + acetic acid

The process of decay early test , as follows :

a. 5 g Salami put in a petri dish
b. Petri dish covered with filter paper, then drops two drops of Pb-acetate on the filter paper .
c. Petri dish covered with lid, and placed the filter paper between salami and the petri dish cover.
d. Observed the filter paper, if there are some black spot, timed when the spot observed.

Positive results (any H_2S): there are black spot on filter paper around the droplets of Pb-acetate
Negative results (no H_2S): there are no black-brownish spot on filter paper around the Pb-acetate.

Experimental design and Statistical Analysis

Research conducted at the Laboratory of Animal Products Processing Technology, Faculty of Animal Husbandry, Universitas Padjadjaran, Bandung; using completely randomized design (CRD) with five treatments, namely:

P-0 = Salami using starters of 2% Lactic acid bacteria and 1% yeast, without spices.

P-1 = Salami using starters of 2% Lactic acid bacteria and 1% yeast, with spices.

P-2 = Salami using starters of 2% Lactic acid bacteria and 2% yeast, with spices.

P-3 = Salami using starters of 2% Lactic acid bacteria and 3% yeast, with spices.

P-4 = Salami using starters of 2% Lactic acid bacteria and 4% yeast, with spices.

Each treatment was repeated four times in order to obtain a combined treatment of 20 treatment combinations, to be test the physical quality (pH and early decay). The model equations according Gaspersz (1995) as follows: $Yij = \mu + \sigma 1 + \varepsilon ij$

notes :

Yij: Response or observation of treatment to the value-I and replicates to-j

μ : general central value (average)

σI: Influence of treatment of the i-th

εij: Error trial of treatment to-I and replicates to-j

i: Treatment to-I (1,2,3,4,5)

j: Deuteronomy j (1,2,3,4).

Decision Rule:

When Fhit ≤ F005: Accept H0, meaning there is no difference between treatments (not significant)

When Fhit ≥ F005: Totak H0, means at least one difference in each treatment (significantly different).

If Ho is rejected will be analyzed by Test Polinominal Orthogonal (Gaspersz, 1995)

Mathematical model as follows:

$Y = \alpha 0 + \alpha 1P1\ (T) + \alpha 2P2\ (T) + \alpha 3P3\ (T) + \alpha 4P4\ (T) + \varepsilon$

RESULTS AND DISCUSSION

1. Effect of Treatments of pH Salami

Results indicated that the effect of treatment, starter yeast and lactic acid bacteria on the degree of acidity (pH) is presented in Table 1.

Table 1. The degree of acidity (pH) of culled hens Salami With Various Treatments

	Treatments					
Replication	P0	P1	P2	P3	P4	Total
1	4,73	4,54	4,53	4,42	4,37	
2	4,67	4,51	4,48	4,36	4,33	
3	4,56	4,53	4,43	4,40	4,38	
4	4,60	4,50	4,40	4,38	4,32	
Total	18,56	18,08	17,84	17,56	17,40	89,44
Aveage	4,64	4,52	4,46	4,39	4,35	

Based on Table 1, shows that the more starter yeast given on chicken salami rejects the degree of acidity (pH) produced lower. The averages of the acidity degree (pH) of culled hen salami, using yeast and lactic acid bacteria as starters, ranged from 4.35 to 4.64. Results of analysis of variance showed that the use of yeast and lactic acid bacteria starters provide a significantly different effect ($p \leq 0.05$) on the pH. Based on the results of variance test Orthogonal polynomial (Annex 1) showed significant differences ($P \leq 0.05$) is the linear regression, regression quadratic and cubic regression, and regression quartic .

The final pH of Salami value in this study was more acidic than the pH of salami mostly European-style salami. Most of this kind salami are preferred by consumers because it has pH between 4.8 to 5.0 (Lucke , 1997). Under that value, the sausages would be very acidic and less acceptable to the public, but for some types of sausages such as summer sausages, German sausages, Bologna cervelat with pH of about 4.4 to 5.0 can be accepted (Rose, 1982) . A decreased of pH, because of the acid addition in foodstuffs such as meat will gave a distinct advantage. Foods with a low pH is more acceptable to be stable against microbial damage compared with a neutral pH (Frazier and Westhoff, 1998). Meat that has a high pH, generally very good for the growth of bacteria (Aberle, *et al* . , 2001)

2. Effect of the Treatment of Early Decay Salami .

The effect of treatments of early decay salami, using yeast and lactic acid bacteria starters are presented in Table 2 .

Table 2. Effect of the Treatment of Early Decay Salami

Reprication	Treatment					Total
	P0	P1	P2	P3	P4	
	----------		hour -	----------		
1	35	35	36	36	42	
2	28	34	36	36	43	
3	29	30	32	36	39	
4	30	29	34	34	38	
Total	120	128	138	142	162	690
Average	30	32	34.5	35.5	40.5	

The data in Table 2 shows, that the higher the percentage of yeast that is given to the manufacture of culled chicken salami, then the beginning of the decay time becomes longer. The average initial longest decay obtained in treatment P4 P0 lowest in the treatment with the percentage of 1% yeast and 2% of lactic acid bacteria that is at the 30^{th} hour.

Statistical analysis by ANOVA showed that the starter yeast and lactic acid bacteria significant effect ($p<0.05$) for the initial decay salami. Based on the results of variance test Orthogonal polynomial (Appendix 2) shows significant differences ($p \leq 0.05$) is the linear regression, regression quadratic and cubic regression, and regression quartic. From Table 2 it can be seen that the greater the percentage of yeast starter on salami culled hens, produce early decay time with a longer trend pattern in accordance with an increase in the percentage of yeast starter. This is because the yeast has antimicrobial properties that can inhibit the growth of bacteria and mold (Roostita, 2004), by extending the salami initial decay time.

The observations made at the 10^{th} hour till 20^{th} all treatments have not shown any signs of decay. After initial testing rot on salami that until the 30^{th} hour for the treatment of P-0 give rise to blackish brown color, P-1 = pose a brown color but not until the black color as well as in the treatment of P-2 and P-3, while for the treatment of P-4 (the use of starter yeast by 4 % and 2%

lactic acid bacteria has not shown the existence of rot, and then the hour-40.5th has begun to emerge the brownish color.

Foodstuffs otherwise damaged if it has undergone changes that are not required of her nature. Damage may occur due to physical damage, chemical and enzymatic. But in general, foodstuffs damage caused by various factors one of which is the growth of bacteria in food, which can damage proteins, resulting in a foul odor, also can form mucus, gases, acids and toxins (Leni, 2010). There are several types of microorganisms that can spoil food (decay) coliform group such as Pseudomonas and Proteus vulgaris and can also cause spoilage in fresh chicken meat (Pelczar and Chan, 1988; Fardiaz , 1992 and Buckle, et al., 2010). These bacteria produce H_2S in their metabolism that can bind with lead acetate which is characterized by the emergence of a brownish color on filter paper attached to the meat . Organoleptic testing through tactile and olfactory, at the beginning of the decay of meat already smelled the stench , but the mucus is not yet formed. The stench formed by the decomposition of protein by proteolytic bacteria into amino acids, amines, ammonia, and hydrogen sulfide .

CONCLUSION

The results showed that the average pH of salami on P-0 = 4.64 ;P-1 = 4.52 ; P-2 = 4.46 ; and P-3 = 4.39 and P-4 = 4.35. From these data showed a decrease of pH in the salami using yeast and lactic acid bacteria starter. The observations made at the 10th hour till 20th of all treatments have not shown any signs of decay . After initial testing shows that the rot in the salami until the 30th hour to treatment, pose a blackish brown color P-0, P-1 = raises brown color as well as the treatment of P-2 and P-3, P-4 while treatment has not shown any decay . From these data it can be concluded that the salami that uses yeast and lactic acid bacteria starters, as much as 4 % and 2% more durable compared to other treatments.

BIBLIOGRAPHY

Aberle, D. E., J.C. Forrest, D.F. Gerrard and E.W. Mills. 2001. Principles of Meat Science. 4th Ed. W.H. Freeman and Company. San Francisco, United State of America.

Arief II, RRA Maheswari., T. Suryati, Komariah and S. Rahayu 2008. Microbiological Quality of Fermented Sausage Beef and Lamb Using Dried Lactobacillus plantarum culture 1B1 with Different Age.

Buckle, K.A., R.A. Edwards., G.H. Fleet., M. Wootton, 2010. Food Science. Hari Purnomo Adiono translator. Publisher University Indonesia.p. 31-34

Fardiaz, S., 1992. Food Microbiology. Publisher Utama PT Gramedia. Jakarta.Hal. 227-259

Frazier, W.C., and D.C. Westhoff. 1998. Food Microbiology. Tata McGraw Hill Publishing Company Limited. New Delhi

Gaspersz, V. 1995. Technical Analysis In Experiment Research Volume 1. Publisher Tarsito Bandung. p. 62-111

Gaspersz, V. 1995. Technical Analysis In Experiment Research Volume 2. Publisher Tarsito Bandung. p. 107-126.

Leni, H.A. 2010. Natural and Synthetic Food Preservation. Alfabeta. Bandung.

Lengkey, Hendronoto A. W., 2008.

Lilis Suryaningsih, 2006. Influence of meat type, Addition Antidenaturan, and sodium tripolyphosphate at Nikumi against Processed Meat Product Characteristics. Dissertation. Graduate School of Bogor Agricultural University.

Lucke, F.K. 1997. Fermented Sausages in: J.B. Wood (Editor). Microbiology of Fermented Foods. Elsevier Applied Science, New York.

Lukman, DW and Trioso. 2009. Practical guide Higieni Food of Animal Origin. Veterinary Public Health Section. Department of Animal Diseases and Veterinary Public Health Faculty of Veterinary Medicine IPB.p 10-14

Rose, A.H. 1982. Fermented Food. Academic Press, USA.

Roostita, LB 2004. Potential and Prospects Yeast (Yeast) in Improving Food Diversification in Indonesia. Inauguration speech Position Professor of the Science of Food Quality at the Faculty of Animal Husbandry, Padjadjaran University, Bandung.