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Physical-Chemical, Microbial and Sensory Characteristics of Buffalo and Cattle Grinding Dry Cured Meat at Sunlight and Oven Drying Methods

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ABSTRACT

This research was aimed to determine and to compare the physical-chemical, microbiological and sensory characteristics of beef and buffalo jerky dried by sun drying and oven drying methods. This research used two treatment of dried beef and buffalo meat jerky (sun drying and oven drying methods). Each treatment consisted of three replication. Sun drying was did during 7 hours per day in 3 days, while oven drying was did during 15 hours at temperature of 50oC . The collected data were analyzed using Randomized Complete Block Design and the difference was tested by factorial method (2x2). The for analysys was software Statistical Package for the Social Sciences (SPSS). Ground beef jerky research results that show significantly different ($P<0.05$) in terms of drying methods on physico-chemical characteristics (pH, tenderness, fat content and protein content) and sensory (color). Judging from the type of meat physicochemical characteristics (levels of protein and ash content) and sensory (color, texture, and tenderness). Judging from the interaction between the method of drying the meat is kind of physico-chemical characteristics (protein content) and sensory (color and texture), while the test results showed no significant difference ($P>0.05$) was observed from drying methods physico-chemical characteristics (ash content, water content, and water activity), microbiological (total plate count) and sensory (taste, aroma , texture, tenderness and acceptance). Judging from the type of meat physico-chemical characteristics (tenderness, fat content, water content, and water activity), microbiological (total plate count) and sensory (taste, aroma, and acceptance). Judging from the interaction between the different types of meat drying method is physico-chemical characteristics (pH, tenderness, water content, ash content, fat content, and water activity), microbiological (total plate count), and sensory (taste, aroma, tenderness and acceptance).

Keywords: Buffalo Meat and Beef Jerky, Drying, Physico-Clams Characteristics, Microbiological and Sensory

INTRODUCTION

Indonesia's population of about 220 million people requires the availability of high-quality, halal and safe food for consumption. Total national meat consumption consists of 56% are chicken meat, 23% beef, 13% pork, 5% goat meat and others 3% (Fajria, 2007). The need for meat also increases with population, income per capita, people's purchasing power, lifestyle and public awareness of nutrition. Meat is one source of animal protein that has a complete nutritional content so that to increase the consumption of meat, meat processing is required to be interesting meat products, such as sausage, jerky, and meatballs. The problem faced is not the popularity of buffalo meat in the wider community. The people are not

accustomed to consume buffalo meat extensively, as well as the public's willingness to consume buffalo meat because it considers the buffalo as a sacred animal, and as a work cattle. In contrast to the beef that has been popular in the community so it is used to consume beef.

MATERIALS AND METHODS

This research was conducted at Animal Product Feed Laboratory, Animal Product Technology Section, Faculty of Animal Science, Gadjah Mada University. Chemical analysis test will be conducted at Food Technology and Agricultural Products Laboratory, Faculty of Agricultural Technology, Gadjah Mada University, Yogyakarta. This research was conducted within five months from March to June 2012. The research tools used were: knives, weights, buckets, aluminum pans, analytical scales, plastic bags, gas stoves, LPG gas tubes, and fryers, while the tools used for physical and sensory quality tests are analytical scales, stirrer, beaker glass, film bottle, stopwatch, pH meter, thermometer, warner-bratzler meat shear, knife, cutting board, sliding, tissue, plastic, oven, water bath and Erlenmeyer. The tools used for chemical characteristic test are analytical scale, filter paper, plastic bag, stirrer, beaker glass, water bath, weighing bottle, desiccator, pumpkin, erlenmeyer, warner-bratzler meat shear, Soxhlet), a protein test kit (Kjeldahl), and a water content test kit (oven). Tools used for total microbial tests are: erlenmeyer, magnetic stirer, autoclave, test tube, incubator and laminar flow cabinet. While the tools used to test the sensory characteristics of the questionnaire sheet, place (container) jerky, paper labels, toothpicks, straws and tissues. The material used during the manufacture of beef jerky is buffalo and beef, brown sugar (Java sugar), salt, coriander powder, crushed garlic, galangal, belching, and cooking oil, while the material used in physical quality test is aquadest, standard buffer 7. Materials used in chemical analysis are H2SO4, K2S, Kjeltab tablets, zinc, NaOH, HCl, BCG + MR indicator, saturated aqueous boric acid, aqudest, and chloroform methanol. Materials used for microbial characteristic test are sterile aquadest, pepton water and medium Agate Count Agar (PCA). Materials used to test sensory characteristics of mineral water size 500 ml, fresh cucumber, and snack.

Method of Making jerky

Tabel 1. Komposisi bahan dendeng untuk 1 kg daging

Ingredients	Percentage *	Amaunt
Sugar	25%	250 g
Salt	4%	40 g
Coriander Powder	2%	20 g
Garlic	0,1%	1 g
Galangal	0,05%	0,5 g
Belching	0,05%	0,5 g

***** The percentage of the ingredients is calculated based on the fresh weight of the meat.

Making beef meat buffalo and beef ie meat washed and then sliced into small pieces. Results small sliced and then ground meat. After the ground meat and spices mixed until homogeneous. Buffalo meat is placed on a baking sheet that has been plastic to the sun dried. Drying under the sun is done 7 hours a day, for 21 hours, with temperatures greater than 50 c. The composition of buffalo and beef jerky seasoning with sun drying has been presented in Table 1.

Physical quality test

Test the pH value of beef jerky. Samples of 10 g tall jerky were finely chopped, added 10 ml of aquadest, stirred homogeneously. The pH value of the sample was measured by pH meters that had been calibrated with phosphate buffer pH 7 (Bouton and Harris, 1972). Test of jerky tenderness. Tester testing using warner-bratzler meat shear method (Soeparno, 2005), is making a rectangular pattern of samples with width of 1.5 cm and length adjusted to the direction of meat fiber. The sample was measured on the three parts of the beef jerky with the warner-bratzler tool and taken average.

Chemical quality test

The protein content was calculated based on the method contained in AOAC (1975). Calculation %N:

$$\%N = \frac{\text{ml HCl sample} - \text{ml HCl blanko} \times \text{N HCl} \times 100\% \times 14{,}008}{\text{g sample} \times 1000}$$

% protein = %N x dilution factor

(Sudarmadji *et al.,* 2003).

Test the fat content. Fat content was calculated based on the method contained in AOAC (1975). Fat level = [(Y-Z)/X] x 100%

X = initial sample weight (g)

Y = sample weight + fat free filter paper after dioven 105 ° C, not yet extracted (g)

Z = sample weight + fat free filter paper after dioven 105 ° C, after extracting (g)

Ash ash test. The ash content is calculated based on the method contained in AOAC (1975). The ash content = [(Z-X) / Y] x 100%

X = the weight of the empty porcelain exchange rate (g)

Y = weight of the sample before it is furnished in Muffle Furnace (g)

Z = sample weight + porcelain exchange rate after dioven with Muffle Furnace (g).

Test moisture content. The water content is calculated according to the method contained in AOAC (1975). Water content = [(x-y) / z] x 100%

X = weight vochdoos + sample before dioven 105 ° C (g)

Y = weight vochdoos + sample after dioven 105 ° C (g)

Z = sample weight of the initial jerky (g).

Water activity test (Aw). Measurement of Aw value of foodstuff can be done in several ways, namely: based on water balance of material with relative humidity of air, based on Raoult law, and based on indirect measurement. Based on the moisture content of the material with the relative humidity of the surrounding air. Water balance

$$Aw = \frac{ERH}{100}$$

ERH = Equilibrium Relative Humidity (Balanced Relative Humidity).

Total microbial test

Total plate count (TPC) test method. First of all, beef jerky is crushed until smooth and then weighed 2.5 g. Then the beef jerky is included in the 2.5 ml sterile aquadest that has been mixed with pepton water, then divorteks to homogeneous. Thereafter 1 ml of ground beef jerky filtrate was diluted with sterile aquadest until dilution of 10 -6. Last take the 0.1ml sample on the last three dilutions using a macro pipette and inoculated on a PCA medium that has been solidified in petridish twice (duplo). Subsequently incubated at 370C for 24 hours and calculated the total amount of bacteria (Fardiaz, 1993).

Sensory quality test

These sensory tests include color, taste, smell, texture, tenderness, and acceptability. Using the scoring method with 15 untrained panelists. The panelist gives an assessment according to the instructions given (Kartika et al., 1988).

Table 2. Scores of sensory test values of beef jerky milled buffalo and beef meat.

Score	Color	Taste	Aroma	Texsture	Taste	Power received
1	Dark brown	Very bad	Very unpleasant	Very rough	Very hard	Very dislike
2	Dark brown	Not good	Not good	rude	hard	Do not like
3	Brown	Somewhat nice	Somewhat savory	Somewhat subtle	Somewhat soft	Somewhat like
4	Brown is reayher bright	Delicious	Sober	Smooth	Soft	Likes
5	Light brown	Very delicious	Very tasty	Very smooth	soft	Really like

Data analysis

Data on physical and chemical quality test results were analyzed by Independent T-Test analysis (Steel and Torrie, 1993). Sensory test data were analyzed by non parametric analysis through Hedonic Kruskal-Wallis test (Saleh, 1996), followed by spyder web test on Excel program.

RESULTS AND DISCUSSION

The value of pH

Table 3. Mean value pH of beef jerked pod of buffalo and beef meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	5,84 ±0,07^{ab}	5,81±0,07^{a}	5,83±0,07
Cattle	5,89±0,05^{b}	5,78±0,08^{a}	5,84±0,06
Average	5,86±0,06^{r}	5,79±0,07^{s}	-

Tenderness

Table 4. The average value of tendering jerky milling of buffalo and cow meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	8,44±1,49^{ab}	8,71±0,97^{a}	8,57±1,23
Cattle	7,49±1,43^{b}	9,16±1,79^{a}	8,32±1,61
Average	7,97±1,46^{r}	8,94±1,38^{s}	-

Water content

Table 5. Mean of water content of beef jerky milled buffalo and cow meat with method of drying sun and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	14,83 ±2,86^{ab}	14,90±4,51^{a}	14,86±3,68
Cattle	19,17±8,48^{b}	12,17±0,75^{a}	15,67±9,23
Average	17,00±5,67^{r}	13,54±2,63^{s}	-

Protein levels

Table 6. Mean value of protein content of beef jerky milled buffalo and cow meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	31,38±0,38^{a}	33,29±0,21^{b}	32,34±0,30^{y}
Cattle	34,28±0,98^{c}	34,48±0,36^{c}	34,38±0,67^{z}
Average	32,83±0,91^{r}	33,89±0,29^{s}	-

Fat level

Table 7. Mean value of fat content of beef jerky milled buffalo and cow meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	3,10±0,38^{a}	3,34±0,32^{ab}	3,22±0,35
Cattle	3,23±0,43^{ab}	3,58±0,09^{b}	3,41±0,26
Average	3,17±0,41^{r}	3,46±0,21^{s}	-

Ash Content

Table 8. Mean value of gray beef jerky degree of buffalo and cow meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	8,41±0,55^{b}	8,16±0,87^{ab}	8,29±0,71^{y}
Cattle	7,66±0,16^{a}	7,79±0,23^{a}	7,73±0,20^{z}
Average	8,04±0,36	7,98±0,55	-

Water Activities Test

Table 9. Mean of activity value of jerky water of buffalo and cow meat with sun and oven drying method.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	0,45±0,03^{ab}	0,43±0,03^{a}	0,44±0,03
Cattle	0,47±0,03^{b}	0,45±0,03^{ab}	0,46±0,93
Average	0,46±0,03	0,44±0,03	-

Test Total plate count

Table 10. Average total plate count of beef jerky milled buffalo meat and beef with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	5,38±7,48	7,07±2,11	6,23±4,80
Cattle	8,20±3,91	8,70±3,05	8,45±3,48
Average	6,79±11,39	7,89±2,58	-

Color

Table 11. Average of beef jerky color of buffalo and beef meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	1,80±0,70^{b}	1,10±0,31^{a}	1,45±0,50^{y}
Cattle	4,15±0,67^{d}	2,85±0,93^{c}	3,50±0,80^{z}
Average	2,97±0,68^{r}	1,97±0,62^{s}	-

Flavors

Table 12. Mean of beef jerky flavor of buffalo and cow meat with sun and oven drying method.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	3,15±0,67^{ab}	3,55±0,69^{a}	3,35±0,68
Cattle	3,30±1,17^{b}	3,60±0,82^{a}	3,45±0,99
Average	3,22±0,92^{r}	3,57±1,51^{s}	-

Aroma

Table 13. Average value of aroma jerky milled buffalo meat and beef with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	3,35±0,59	3,30±0,74	3,32±0,66
Cattle	3,35±1,04	3,25±0,85	3,30±0,94
Average	3,35±0,81	3,27±0,79	-

Texture

Table 14. Mean texture value of beef jerky milling of buffalo and cow meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	2,40±0,60^{a}	2,85±0,67^{ab}	2,62±0,63^{y}
Cattle	3,30±0,81^{b}	2,85±0,67^{ab}	3,07±0,74^{z}
Average	2,85±0,70	2,85±0,67	-

Tenderness

Table 15. The average value of tendering jerky milling of buffalo and cow meat with sun drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	3,00±0,65[a]	3,10±0,72[a]	3,05±1,37[y]
Cattle	4,10±0,55[b]	4,20±0,70[b]	4,15±0,62[z]
Average	3,55±0,60	3,65±0,71	-

Power received

Table 16. The average value of receiving power jerky milling of buffalo and cow meat by solar drying method and oven.

Type of Meat	Drying Methods		Average
	Sun	Oven	
Buffalo	3,10 ±0,72	3,40±0,68	3,25±0,70
Cattle	3,20±1,11	3,50±0,83	3,35±0,97
Average	3,15±0,91	3,34±1,51	-

Information:
[abcd]Different Supperscripts on each treatment combination showed a marked difference (P <0.05).
[rs]Different Superscript on the same line shows a noticeable difference (P <0.05).
[yz]Different Superscript on the same column show a marked difference (P <0.05).
[ns]Different not real

Ground beef jerky research results that show significantly different (P<0.05) in terms of drying methods on physico-chemical characteristics (pH, tenderness, fat content and protein content) and sensory (color). Judging from the type of meat physicochemical characteristics (levels of protein and ash content) and sensory (color, texture, and tenderness). Judging from the interaction between the method of drying the meat is kind of physico-chemical characteristics (protein content) and sensory (color and texture), while the test results showed no significant difference (P>0.05) was observed from drying methods physico-chemical characteristics (ash content, water content, and water activity), microbiological (total plate count) and sensory (taste, aroma , texture, tenderness and acceptance). Judging from the type of meat physico-chemical characteristics (tenderness, fat content, water content, and water activity), microbiological (total plate count) and sensory (taste, aroma, and acceptance). Judging from the interaction between the different types of meat drying method is physico-chemical characteristics (pH, tenderness, water content, ash content, fat content, and water activity), microbiological (total plate count), and sensory (taste, aroma, tenderness and acceptance).

CONCLUSIONS

The results can be concluded that the ground beef jerky with oven drying is better than drying the sun in terms of physico-chemical characteristics (tenderness, protein content, ash content, and fat content) and sensory (color and texture). Beef jerky meat buffalo meat is better than beef in terms of physico-chemical characteristics (pH, tenderness, and ash content) and sensoris (color, texture and tenderness). There is an interaction between the beef

jerky of buffalo and cow meat with the method of sun drying and oven is observed from physico-chemical (protein content) and sensory (color and texture) characteristics. Suggestion of further research on microbiological characteristics (bacteria type), microstructures, and rancidity (expiration period) beef jerky grind buffalo and cow meat with sun drying and oven hopefully the utilization of this research result can be used for entrepreneurship.

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