The meat quality comparison of Ongole grade and Kebumen Ongole grade cattle

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Abstract. Meat is a strategic food commodity, one thathave a role in meeting the nutritional needs of the market.The fulfilment of beef demand is done by maintaining local cattle that produce meat. One of them is Ongole Grade and Kebumen Ongole Grade cattle.Ongole Grade and Kebumen Ongole Grade cattle have several differences, including differences in physical characteristics that cause differences in meat quality. Improving meat quality is considered to meet consumer preference trends in choosing meat quality products. The purpose of this study is to compare meat quality in both Ongole Grade and Kebumen Ongole Grade cattle. Thirty meat samples from both cattle were analyzed for meat quality analysis (carcass weight, pH, tenderness, Water Holding Capacity, water, fat, protein, and collagen content). The data obtained were analysed using the Complete Randomized Design with factorial pattern 2x3 for age and breed factor. Carcass weight is affected by both of age and breed factor, and is significantly greater in Kebumen Ongole Grade cattle in age 4-5 years. Ongole Grade cattle has significantly greater carcass weight, water content, and tenderness than Kebumen Ongole Grade cattle. Kebumen Ongole Grade has a significantly greater fat content than Ongole Grade cattle. In conclusion, breed factor and age factor has a significant effect to meat quality and there is no interaction between the two factors in all traits of both cattle.

1. Introduction

Meat is one of animal products that having a role in meeting humanprotein needs, especially animal protein, it also has a role in supporting human resource development in Indonesia. As the standard of living and mindset of an increasingly advanced society demands for food availability, the demand for meat quality will also increase. This is a challenge as well as encouragement for producers to produce good quality of meat.Meat production in Indonesia in 2016 reached 524,109 tons, while the Indonesian beef needs in 2015 reached 639,000 tons. Fulfillment of beef needs is done by maintaining local cattle that produce meat, one of them is Ongole Grade and Kebumen Ongole Grade cattle. The population of beef cattle in the Special Region of Yogyakarta (DIY) in 2016 was ranked 12th at the national level with the number of Ongole Grade cattle constituting 40% of the total population of beef cattle [1] while the population of beef cattle in Kebumen Regency was 89,429, 90% of which were Ongole Grade cattle [2]. Ongole Grade cattle and Kebumen Ongole Grade cattle have several differences, including differences in physical characteristics that cause differences in meat quality.

Ongole Grade cattle are the result of a cross between Java local cattle and Ongole cattle from India [3]. The qualitative characteristics of Ongole Grade cattle based on Indonesian National Standards are white-gray fur, fur around black eyes, large body and hump, and short horns [4]. Another Ongole Grade namely Kebumen Ongole Grade cattle,is a result of crossing between Java, Ongole and Brahman cattle [5]. Kebumen Ongole Grade cattle have special characteristicswith a black muzzle, black color around the eyes, long and hanging ears and has a large hump that called by "ngembang turi" [6].

As an effort to utilize the role of cattle production to support the fulfillment of food needs of meat products, improving the quality of meat is considered. Meat quality improvement can be used to meet consumer preference trends in choosing meat quality products. The carcass weight, chemical properties (fat, protein, and collagen content), and physical properties (pH, tenderness, and water binding capacity), are all determinants of meat quality, so that they can be categorized as high economic value properties. Therefore, an analysis of meat quality in Ongole Grade cattle in the Special Region of Yogyakarta and Kebumen is imperative.

2. Material and Methods

2.1.Material

The meat samples were collected from thirty Ongole Grade cattle in Giwangan slaughter house Yogyakarta and Kebumen Ongole Grade cattle were collected from a slaughter house in Kebumen. The meat samples were taken from longisimuss dorsi which was a part of sirloin.

2.2. Methods

2.2.1. General. The carcass weight was calculated with hot boning method. The pH was determined using a slurry method in which 2 g of the meat sample was homogenized in 18 ml of deionised water then measured by pH meter calibrated at pH 7.0. The tenderness was measured by Warner-Bratzler Shear Force (WBSF). The Water Holding Capacity (WHC) was determined with the filter paper press. The NIR Spectroscopy was used to measured chemical contents.

2.2.2. Statistic. The data obtained were analyzed using the Complete Randomized Design for age category and t test for breed category of Statistical Package Service Solution software (SPSS for Windows, version 16; SPSS, USA) with the level of significance was determined at $P<0.05$.

3. Results and Discussion

The meat quality analysis results is shown in Table 1. Based on the results of statistical analysis, show that age factors significantly influence the carcass weight of Ongole Grade cattle and Kebumen Ongole Grade cattle ($P <0.05$). In this study, the Duncan test for age factors on carcass weights shows that in age 4-5 years is significantly different from age 0-2 years and shows the greatest results. This means that the older cattle have the greater carcass weight. [6] states that age is one of the factors that influence carcass weight including the ratio of meat and bone, the level and distribution of fat, and the quality of meat. Breed factors showed a significant difference in carcass weight ($P <0.05$). This is consistent with the study of [7] which shown a significant influence of breed and gender factors on the carcass weight. In this study, there was no interaction between factors of age and breed ($P> 0.05$) on carcass weight. This is presumably due to the significant difference in numbers between age factors and breed factors.

The pH was not influencedby the age and breed factors of Ongole Grade cattle and Kebumen Ongole Grade cattle. There was also no interaction between factors of age and breed ($P> 0.05$). This is assumed that pH of this study be affected by other factor such as stress of cattle. [8] argues that pH is influenced by stress before slaughter, injection of hormones or drugs, species. The pH results of this study are in accordance with the ultimate pH of meat, which is 5.3-5.7.

Based on the statistical analysis, the factors of age and breed did not influence the Water Holding Capacity of Ongole Grade and Kebumen Ongole Grade cattle. There is also no interaction between both of them ($P> 0.05$). This is presumably because the WHC is affected by other factors, such as pH. [9] state that WHC is influenced by the acidity of the meat where the water endured in the muscle is directly proportional to the increase in pH even though the increase is small. The results of this study is in

accordance with [10] which states that the WHC of Ongole Grade cattle longissimus dorsi is 19.83 to 29.20%.

Table 1. Meat Quality Analysis of Ongole Grade and Kebumen Ongole Grade cattle

Variable	Age (year)			Average of breed
	0-2 (kg)	2-4 (kg)	4-5 (kg)	
Carcass Weight				
Ongole Grade	212,58±56,2	229,92±41,7	211,04±57,5	220,41±49,0[a]
Kebumen Ongole Grade	145,77±15,5	177,20±24,8	232,33±48,8	178,50±41,3[b]
Average of age	188,80±52,9[a]	202,65±42,8[a]	222,65±51,3[b]	
Physical characteristics				
pH				
Ongole Grade	5,55±0,44	5,46±0,90	5,60±0,45	5,52±0,68
Kebumen Ongole Grade	5,18±0,40	5,41±0,54	5,45±0,61	5,35±0,45
Average of age	5,38±0,45	5,43±0,72	5,51±0,30	
Water Holding Capacity				
Ongole Grade	27,60±12,3	27,41±8,54	28,67±7,52	27,69±9,63
Kebumen Ongole Grade	29,54±10,5	22,56±10,6	21,24±12,7	24,39±11,1
Average of age	28,47±11,3	24,90±9,81	24,61±10,9	
Tenderness				
Ongole Grade	4,77±1,46	5,53±1,04	4,48±1,92	5,08±1,39[a]
Kebumen Ongole Grade	5,86±0,50	5,62±1,18	5,43±1,14	5,66±0,99[b]
Average of age	5,26±1,24	5,58±1,10	5,00±1,54	
Chemical characteristics				
Water Content				
Ongole Grade	71,02±1,57	71,07±1,65	71,91±2,00	71,19±1,65[a]
Kebumen Ongole Grade	71,49±2,13	70,14±2,67	68,13±4,74	70,14±3,16[b]
Average of age	71,23±1,81	70,59±2,25	69,84±4,09	
Protein content				
Ongole Grade	20,21±1,24	20,48±0,96	20,70±1,21	20,41±1,09
Kebumen Ongole Grade	20,88±0,80	20,95±1,18	20,54±1,70	20,85±1,17
Average of age	20,51±1,09	20,72±1,09	20,61±1,43	
Fat content				
Ongole Grade	6,40±3,38	6,08±2,52	5,48±2,21	6,10±2,75
Kebumen Ongole Grade	5,07±1,89	6,53±3,20	8,63±7,02	6,51±4,00
Average of age	5,80±2,83	6,31±2,85	7,20±5,41	
Collagen content				
Ongole Grade	2,05±0,43	2,08±0,26	1,88±1,03	2,04±0,32
Kebumen Ongole Grade	1,91±1,96	1,97±0,28	2,14±0,38	1,99±0,28
Average of age	1,99±0,34	2,02±0,27	2,02±0,31	

Meat tenderness was significantly affected by breed of Ongole Grade and Kebumen Ongole Grade cattle ($P < 0,05$) while age factor did not have any effect ($P > 0,05$). There was no interaction between cattle age to the meat tenderness ($P > 0.05$). This is supposed to be due to the age factor that does not affect the tenderness of both breed. The results of this study are in accordance with the research of [11] which states that the WBSF of meat is from 3 kg/cm^2 to 6.10 kg/cm^2.

Factors of breed have significant effect on water content (P <0,05), but there is no interaction between breed and age factors on the water content in this study (P> 0,05). This is presumed by age factor which does not indicate any significant difference with water content.Protein content was not affected by the factors of age and breed of Ongole Grade and Kebumen Ongole Grade cattle meat (P> 0.05). This is thought to be due to protein levels influenced by other factors such as temperature. The increase in room temperature causes the myofibril protein and connective tissue to be denatured which results in a decrease in protein content [7]. According to [13] the levels of protein found in meat ranged from 16 to 22%. Based on statistical analysis of age factor and breed, there were no difference in the fat content of Ongole Grade and Kebumen Ongole Grade cattle. The interaction between two factors did not affect (P> 0,05) with fat content. This study assumes that lipid levels are affected by water content. According to [13], the higher the fat content, the lower the water content. The fat content in this study is in accordance with the opinion of [14] which states that beef fat content ranges from 0.5-13%.Collagen level was not influence by the factors of age and breed of both cattle breed. This is suspected because collagen is affected by protein levels and body weight. According to [15], almost one third of the proteins in vertebrate bodies are in the form of collagen.

4. Conclusion

Breed factor has a significant effect on carcass weight, water and fat content, tenderness. Age factor only has a significant effect on carcass weight. There is no interaction between the breed and age factor in both cattle.

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