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Malonaldehyde and Fat Contents of Kampong-meat Type Crossbreed Chicken

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Abstract

Malonaldehyde (MDA) is a toxic and mutagenic compund produced from lipid oxidation, and also correlated to the rancid flavorof products.The occurence of MDA in meat poultry and its productsshould be controled as low as possible. The objective ofthis study was to reduce MDA content in meat chicken through crossing between kampong and meat type chicken, and evaluate their fat content.A number of 30 chickens were devided into 5 groups including: 1) meat type chicken (parent stock Cobb Strain) (MTC); 2) Kampong chicken (KC); 3)F2 Kampong-meat typecrosbreed chicken fast growth (KMCFG); 4) F2 Kampong-meat typecrossbreedchicken medium growth(KMCMG);5) F2 Kampong-meat typecrossbreed chicken slow growth (KMCSG). Samplesused were meat from thigh part without skin. Each group contained 3 heads of male and 3 heads of female chickens.MDA content was estimatedby thiobarbituric acid reactive substances value. Male crossbreed chickens contained MDA lower than KC($p<0.05$) and no significant different with MTC. Female KMCFG and KMCMG contained MDA lower than KC ($p<0.05$) and not different with MTC. KMCMGcontained MDA level not different withKC and MTC. All male group had no different fat content, but female group showed that KChad higher fat content than MTC ($p<0.05$). Fat content of KMCSG was not different withKCorMTC. Fat content of KMCMG and KMCFG were not different with fat content of KC.In conclusion, crossing meat between KC and MTCreduced MDA content for all groupF2 chicken, except female F2 KMCMG, but not with fat content.

Keywords : Malonaldehyde, fat, Kampong-meat type crossbreed chicken

1. Introduction

Kampong chicken is an original chicken, which has been adapted to the tropical environment of Indonesia (Iskandar, 2010). Kampong chicken has some potential, such as the high number of the genetic and phenotypic diversity, high levels of adaptation, heat resistance, and disease resistance. (Nataamijaya 2000; Mardiningsih et al., 2004; Pagala et al., 2013; Tamzil et al., 2013; Ulupi et al. 2013). As a producer of meat, Kampong chicken has commercial potential to be developed, because the meat is highly favored by several people in Indonesia.

Productivity improvement efforts is not enough just with increased of feed quality and maintenance management, but need to increase genetic quality also by breeding programs. One of the breeding program, heading to increase productivity could be done by crossbreeding. This crossing was expected to be increase the average body weight and slaughter weight of chicken rapidly in short time (Kgwatalala*et al.* 2015).

Crosses could be done with meat-type chicken (broiler) to incerase the results from a combination of two clusters of the chicken.

Meat quality is the major priority consumers to select chicken meat for consumption. One of the factors that influence the quality of the meat is fatty acid oxidation.Hight rate of fatty acids oxidation reduces the quality of meat and meat products, negatively affecting their flavor, odor, color, and texture. (Avila-Ramos *et al*. 2013). MDA is a secondary product of lipid oxidationthat hascontribution to the off-quality of meat product (Fernandez, Perez-Alvarez, & Fernandez-Lopez, 1997). The high level of MDA content could be potent ashazard in meat and meat product as a result of lipid oxidation in meat (Suryati*et al*. 2013). This study aimed to reduce MDA content in meat chicken through crossing between kampong and meat type chicken, and evaluate their fat content.

2. Material and Methods

2.1 Materials

A number of 30 chickens were devided into 5 groups including: 1) meat type chicken (parent stock Cobb Strain) (MTC); 2) Kampong chicken (KC); 3)F2 Kampong-meat typecrosbreed chicken fast growth (KMCFG); 4) F2 Kampong-meat typecrossbreedchicken medium growth(KMCMG);5) F2 Kampong-meat typecrossbreed chicken slow growth (KMCSG). Samplesused were meat from thigh part (drumstick) without skin. Each group contained 3 heads of male and 3 heads of female chickens. Analyses wereconducted by using chemicals of analytical grade: thiobarbituric acid (TBA) from Merck (Merck KGaA, Germany), and 1,1-diphenyl-2picrylhydrazil (DPPH), propylgallate (PG), ethylenediaminetetraacetic acid (EDTA), 1,1,3,3-tetraethoxypropane (TEP), 1-(N)naphthylethylenediaminedihydrochloride and sulfanilamide from Sigma (Sigma Aldrich Co., USA).

Malonaldehyde (MDA) Analysis

Malonaldehydecontentwas determinedby using thiobarbituric acid reactive substances (TBARS) analysis according to the method as described by Sørensen and Jørgensen (1996)with a little modification. The modification was the homogenization of sample before the addition of PG and EDTA solution (Suryati et al. 2013). TBARS analysis by spectrophotometer (GeneQuant 1300, Sweden) was done after 5 mL sampledistillate was reacted with 5 mL TBA 0.02 M and then incubated at 100°C for 40 min. Absorbance at λ 532 nm was measured using two replications for each sample. TBARS was expressed as mg of malonaldehyde (MDA) per kg dry matter (DM) of dendeng using TEP as a standard.

Fat Content Analysis

Fat content was analysed according to themethod described by AOAC (2005).Fat content was expressed as percent (%) from sample wei

3. Result and Discussion

3.1 Malonaldehyde (MDA)Content

The MDA content of Kampong, meat-type, Kampong-meat type crossbreed chickens with different rate growth are presented in Table 1.Male crossbreed chickens contained MDA lower than Kampong chicken ($p<0.05$) and no significant different with meat-type.Female crossbreed fast and slow growth contained MDA level lower than Kampong chicken ($p<0.05$) and not different with meat type chicken as their parent. Kampung-meat type crossbreed medium growth contained MDA level not different both of Kampung and meat type chickens. Statistically MDA level of Kampong Chicken was not different with MDA level of meat type chicken.

Table 1. Malonaldehyde (MDA) Kampong, meat-type, Kampong-meat type crossbreed chickens with different rate growth

Chicken types	Sex	
	Male	Female
Kampong	4.06±2.59[a]	5.63±3.82[a]
Meat-Type	1.52±1.25[b]	1.95±1.09[ab]
Kampong-Meat type crossbreed fast growth	1.33±0.44[b]	1.52±0.79[b]
Kampong-Meat type crossbreed medium growth	0.78±0.26[b]	2.02±0.39[ab]
Kampong-Meat type crossbreed slow growth	1.24±0.35[b]	1.18±1.61[b]

Note: Different superscripts in the same column mean significant different ($p<0.05$).

Table 2. Fat content of Kampong, meat-type, Kampong-meat type crossbreed chickens with different rate growth (%)

Chicken types	Sex	
	Male	Female
Kampong	3.03±0.83	6.76±1.57[a]
MeatType	4.26±0.83	2.03±1.68[b]
Kampong-Meat type crossbreed fast growth	4.65±1.48	5.19±1.06[a]
Kampong-Meat type crossbreed medium growth	2.88±1.71	4.76±1.62[a]
Kampong-Meat type crossbreed slow growth	4.07±1.05	4.40±0.94[ab]

Note: Different superscripts in the same column mean significant different ($p<0.05$).

Frozen storage could affect the MDA content drumstick chicken meat. The mean concentrations of MDA increased 44% in fat from both breast and leg meat after 3 months of frozen storage and increased 2.5 and 2.2 times in fat from breast and leg after 6 months of frozen storage (Abdel-Kader 1996). The MDA content could affect by stress also, such as heat stress or stress before kill. Heat stress increased lipid peroxidation as a consequence of increased free radical generation, as indicated by MDA concentration (Altan*et al* 2010). Heat stress also caused oxidative stress, increased red blood cell susceptibility to peroxidation,as indicated by increased MDA concentration (Altan*et al* 2010).

3.2 Fat content

The Fat content of Kampong, meat-type, Kampong-meat type crossbreed chickens with different rate growth are presented in Table 2. Male group for all group had no different fat content, but female group showed that Kampong chickens contain fat higher than meat type chickens ($p < 0.05$). Fat content of Kampong-meat type crossbreed slow growth was not different with either Kampong nor meat type chicken. Fat content of Kampong-meat type crossbreed medium growth and Kampong-meat type crossbreed fast growth were not different with fat content of Kampong chicken.

The present feed chicken by adlibitum could affect the fat content of chicken. Fat content in the body animal is obtained from advantages energy consumed. Food rations consumed by the excess energy are saved as fat, so that the higher energy content of the ration, the higher the fat content in the body (Anggorodi 1985).

The results of chicken meat by fat content included normal, ranged between 1.2% to 12% (Aberle et al., 2001). The fat content of meat is influenced by breed, location of muscle, muscle type, sex and age of animal. The percentage of fat in general increases with age but can be changed at any time depending on the nutrients consumed

(Soeparno 1994), according Aberle et al, (2001) fat content meat varies depending on the amount of external fat and intramuscular fat.

Conclusion

Crossing meat between KC and MTC reduced MDA content for all group F2 chicken, except female F2 KMCMG, but not with fat content.

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