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DUCK MEAT OFF-ODOR AS AFFECTED BY DIFFERENT STRAINS AND DIETARY LIPIDS

BAU DAGING ITIK YANG DIPENGARUHI OLEH PERBEDAAN GALUR TERNAK DAN JENIS PAKAN

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ABSTRAK

Penelitian ini bertujuan menilai pengaruh perbedaan jenis galur ternak dan lemak pakan terhadap bau *off-odor* (menyimpang) pada daging ternak itik. Percobaan dilakukan dengan menggunakan rancangan dua faktor pada rancangan acak lengkap. Sebagi faktor pertama adalah jenis galur ternak, yakni galur alabio dan cihateup; sedangkan faktor kedua adalah jenis sumber lemak pakan, yakni lemak sapi, minyak kedelei dan minyak kelapa. Analisis sensori yang dilakukan melibatkan 10-14 orang panelis terlatih untuk menilai kualitas sensori daging dengan menggunakan metode uji ranking, skala dan uji deskriptif. Hasil penelitian memperlihatkan bahwa perbedaan galur ternak dan jenis lemak berpengaruh nyata ($P < 0,05$) terhadap komposisi asam-asam lemak dan intensitas bau *off-odor* pada daging itik. Itik cihateup memiliki intensitas bau *off-odor* yang lebih tinggi daripada itik alabio. Analisis deskriptif memperlihatkan bahwa jenis bau *off-odor* pada daging itik adalah bau tengik, amis, bau lemak, bau jamur, langu, dan bau tanah.

Kata kunci: *bau off-odor, daging itik, itik cihateup, itik alabio, lemak pakan*

ABSTRACT

The main objective of this study was to investigate the effects of strain and type of dietary lipids on off-odor of duck meat. The experiment was done using a two-factor design in a Completely Randomized Design. The first factor in this experiment was two duck strains, Alabio strain and Cihateup strain. The second factor was a different type of fat as lipid sources for the ration. There were three kind of fats i.e. tallow, soybean oil, and coconut oil, to compose three different treatments of the ration, and there was one ration without additional fat as a control treatment. Sensory analysis involved 10-14 trained panelists that examined meat samples using ranking, scaling, and descriptive test. The experiment results showed that different strain and dietary fats significantly affected fatty acids composition, and meat off-odor intensity. Cihateup strain had meat off-odor intensity higher ($P < 0.05$) than of Alabio. Descriptive sensory analysis showed that attributed to the meat off-odor were rancid, fishy, fatty, moldy, beany, and earthy.

Key words: *meat off-odor, duck meat, cihateup meat, alabio duck, lemak pakan, dietary lipid*

INTRODUCTION

Duck meat contribution for the food supply from poultry production in Indonesia is still lower compares to the chicken meat. Duck population in Indonesia was about 34 millions and approximately produced 22,000 ton meat, or about only 1.70% of the total poultry meat production in Indonesia in 2006. According to size population, the duck population in Indonesia is in the fourth of world duck population, after China, India, and Vietnam (FAO, 2006). It means that based on the population, duck meat in Indonesia should be a good potency to fulfill meat demand in Indonesia.

Mostly in Indonesia, especially in Java and Kalimantan, traditional farmers raise ducks just for eggs, but not for meat. According to them, most of Indonesian people are not familiar in consuming duck meat. The consumption of duck meat in Indonesia is 0.1 kg/capita/year or only about 1.73% of national meat consumption, which is 5.79 kg/capita/year. Factors affected the low consumption of duck meat in Indonesia is predominantly caused by the odor of duck meat that it makes sensational perception as fishy odor. This kind of odor in meat could be categorized as off-odor. Chartrin, *et al.* (2006) reported that the development of duck meat flavor is affected by fat level. Baéza (2006) studied that fatty acid composition of intramuscular was affected by the lipid composition of diets, and directly affected the meat flavor. However, based on breed, Omojola (2007) found that breed did not significantly affected the duck meat flavor.

Concerning of duck population, this animal has a potency to be developed as an important meat source in Indonesia. To achieve this goal, one thing should be done to reduce or if it is possible to remove off-odor in duck meat. This experiment was conducted as a part of the study to overcome the off-odor problem of duck meat. Therefore, this study was done to find some factors responsible for the production of off-odor in duck meat.

MATERIALS AND METHODS

A total of 80 male ducks consisted of 40 ducks of Alabio strain and 40 ducks of Cihateup strain used in this experiment. The animals were raised since daily old ages. The Alabio strain was obtained from Animal Research Center in Ciawi, Bogor; whereas Cihateup strain was obtained from Poultry Laboratory of Animal Faculty of Bogor Agriculture Institute.

The experimental diets (Table 1) were formulated according to NRC (1994) standard for starter and finisher phase of duck growth. Nutritional composition for all experimental diets was formulated based on iso-calorie and iso-nitrogenous principles. Protein content for starter-grower phase diets was 20%, while for finisher diets was 16%. Metabolizable Energy (ME) content for all phase diets was 3,000 kcal/kg.

The experimental diets were given to the animals since they were two weeks old. The starter diets were provided for three weeks then followed by finisher diets for five weeks. All diets were prepared in all-mash form. Drinking water was provided *ad-libitum*.

The experiment was designed according to two-level factor procedure. The factors were strain of animals and type of dietary lipid sources. After ten weeks of trial periods, the animals were slaughtered. Meat samples which obtained from legs were used for laboratory and sensory analysis. Fatty acid analysis was done using Gas Chromatograph Shimadzu GC-7A. Meat used for analysis was prepared without skin.

The sensory analysis was done with involved 14 trained panelists. The evaluation procedure was designed according to Balanced Incomplete Block (BIB) with using multi sample different test (Meilgaard *et al.*, 2007). The results of evaluation were analyzed using Friedman and Quantitative Descriptive Analysis (QDA). The intensity of off-odor attribute was measured by intensity scale line 0 – 150 mm. The relationship between diet treatment and off-odor attribute was analyzed using Principal Component Analysis (PCA).

RESULTS AND DISCUSSION

Table 2 shows that different sources and type of lipid used in the diets resulted in changing of fatty acid composition of meat. The meat of the animals which were fed with control diet - no using certain dietary lipid – the unsaturated fatty acid content was almost doubled compare to saturated fatty acid.

Table 1. Composition of experimental diets[a].

Item	Diet[b]							
	Starter-grower (%)				Finisher (%)			
	C	BT	SO	CO	C	BT	SO	CO
Ingredients								
Corn, yellow	11.67	10.00	10.00	10.00	34.80	15.00	15.00	15.00
Cassava flour	31.20	10.22	5.00	7.05	15.00	11.52	7.00	7.00
Beef tallow	0.00	7.50	0.00	0.00	0.00	7.50	0.00	0.00
Soybean oil	0.00	0.00	7.50	0.00	0.00	0.00	7.50	0.00
Coconut oil	0.00	0.00	0.00	7.50	0.00	0.00	0.00	7.50
Corn gluten meal	10.00	9.50	7.92	8.64	7.50	5.00	5.00	5.00
Soybean meal	23.30	18.33	18.07	18.26	9.51	11.85	9.70	9.71
Wheat flour	10.00	15.46	11.48	8.68	17.46	12.63	5.83	7.55
Wheat pollard	10.00	25.11	36.00	36.00	11.93	32.87	46.03	44.27
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Dicalcium phosphate	1.50	1.50	1.50	1.50	1.25	1.25	1.25	1.25
Limestone	0.30	0.51	0.53	0.52	0.58	0.51	0.77	0.78
DL-methionine	0.07	0.06	0.08	0.08	0.06	0.09	0.10	0.10
L-lysine	0.56	0.40	0.50	0.37	0.23	0.11	0.13	0.14
L-threonine	0.13	0.14	0.16	0.14	0.41	0.41	0.42	0.42
L-triptophan	0.02	0.02	0.01	0.01	0.02	0.01	0.02	0.03
Vitamin mix	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Mineral mix	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Calculated composition								
Metabolizable Energy (kcal/kg)	3000	3000	3000	3000	3000	3000	3000	3000
Crude Protein (%)	20.00	20.02	20.01	20.01	16.03	16.02	16.02	16.03
Crude Fiber (%)	4.47	5.22	6.08	6.08	4.01	5.45	6.35	6.21
Crude Fat (%)	1.76	9.52	9.80	9.79	2.38	9.86	10.18	10.14
Ash (%)	2.51	3.10	3.58	3.57	2.15	3.03	3.53	3.46
ADF (%)	3.88	5.60	6.72	6.70	4.15	5.96	7.31	7.14
Calcium (%)	0.65	0.67	0.68	0.68	0.61	0.61	0.70	0.71
Available Phosphorus (%)	0.44	0.44	0.44	0.45	0.37	0.38	0.39	0.39

[a]As-fed basis
[b]C, control diet; BT, beef-tallow diet; SO, soybean oil diet; CO, coconut oil diet

However, when to formulate diet used different lipid sources, it changed overall fatty acid composition in meat of both Alabio and Cihateup strains. The lauric acid content, for instant, increased clearly in both strain when the animals fed coconut oil diet. This diet was also increased the ratio of saturated fatty acid to unsaturated fatty acid.

The different of duck strain and lipid sources not only affected the fatty acid composition of the duck meat, but they also affected the meat sensory quality. As it shown in Figure 1 and Figure 2.

Based on descriptive sensory analysis, it was found that there were at least six off-odor attributes detected on duck meat off-odor. These off-odors were categorized as fishy, rancid, moldy, beany, fatty, and earthy. Basically as shown on Figure 1 and 2, the intensity of duck meat off-odor is different between Alabio strain and Cihateup strain as representing by off-odor diagram related to control diet treatment. The component off-odor of Alabio meat was more intense of fishy and fatty, otherwise Cihateup meat was fishy and rancid. The intensity of these off-odor components changed as the animals fed diets which contained different lipid sources. The fishy odor in Cihateup strain was more intense ($P < 0.05$) than in Alabio strain when

animals fed coconut oil diet. However, comparing to the control diet, the fishy odor intensity was getting lower when the animals were fed with either soybean diet or beef-tallow diet.

Table 2. Fatty acid composition (%) of leg meat (without skin) based on different duck strain and dietary lipid sources.

Fatty Acid Component	Alabio[1)]				Cihateup			
	C	BT	SO	CO	C	BT	SO	CO
Lauric	0.29	0.24	2.25	15.95	-	-	0.18	10.74
Myristic	0.68	2.63	1.11	7.90	-	1.97	1.15	8.59
Palmitic	21.22	21.87	26.61	22.22	24.83	20.70	27.50	27.65
Stearic	7.81	21.14	3.87	4.71	11.64	20.88	3.99	7.43
Arakidic	0.52	0.61	0.42	0.13	0.53	0.37	0.43	0.60
Palmitoleic	3.37	1.88	2.35	2.45	-	1.62	2.43	2.88
Oleic	47.79	36.26	23.14	28.80	43.21	36.12	22.72	26.75
Linoleic	14.48	11.90	28.69	14.37	16.43	11.44	29.65	12.08
α-Linolenic	0.57	-	9.81	0.95	0.52	0.68	10.14	0.78
Arachidonic	3.28	3.47	1.76	2.52	2.84	6.23	1.82	2.49
SFA[2)] Total	30.52	46.49	34.26	50.91	36.99	43.92	33.25	55.02
UFA[3)] Total	69.48	53.51	65.74	49.09	63.01	56.08	66.75	44.98

[1]C, control diet; BT, beef-tallow diet; SO, soybean oil diet; CO, coconut oil diet
[2]SFA, saturated fatty acid; [3]UFA, unsaturated fatty acid

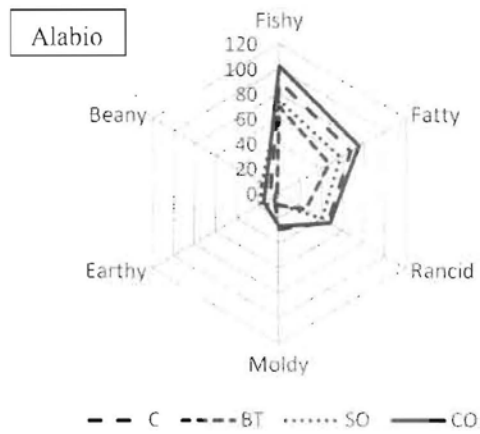

Figure 1. Off-odor attribute diagram of duck meat of Alabio strain affected by different lipid sources

Further study to look into the relationship between off-odor attribute and dietary lipid sources in both strain, the diagram of PCA showed that the effect of coconut oil on the development of off-odor almost similar. Fishy, rancid and fatty odors were significant related to coconut oil diet. The use of beef-tallow was less responsible for the development of off-odor in both strains. Figure 3 shows also that moldy odor is more typical off-odor for Alabio strain; on the contrary, earthy odor for Cihateup strain.

Fatty acid component which is different in both strains before having diet treatments is stearic acid. Cihateup strain contains stearic acid higher than what Alabio strain does. It indicates that animals with difference in strain could affect their fatty acid composition (Rhee, 1992). The utilization of soybean oil as unsaturated fatty acid source did not much change the total ratio

between unsaturated fatty acid and saturated acid. However, as individual, the use of soybean oil increased certain fatty acids, such as linoleic acid and α-linolenic acid.

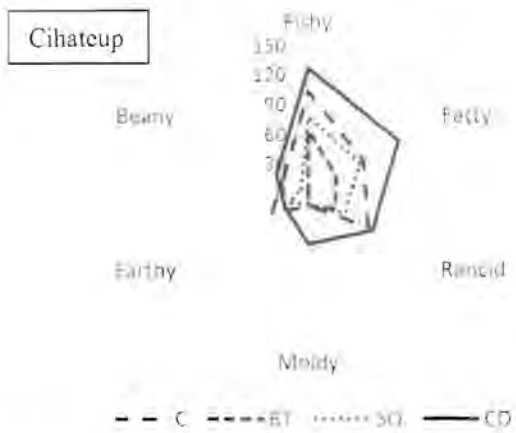

Figure 2. Off-odor attribute diagram of duck meat of Cihateup strain affected by different lipid sources.

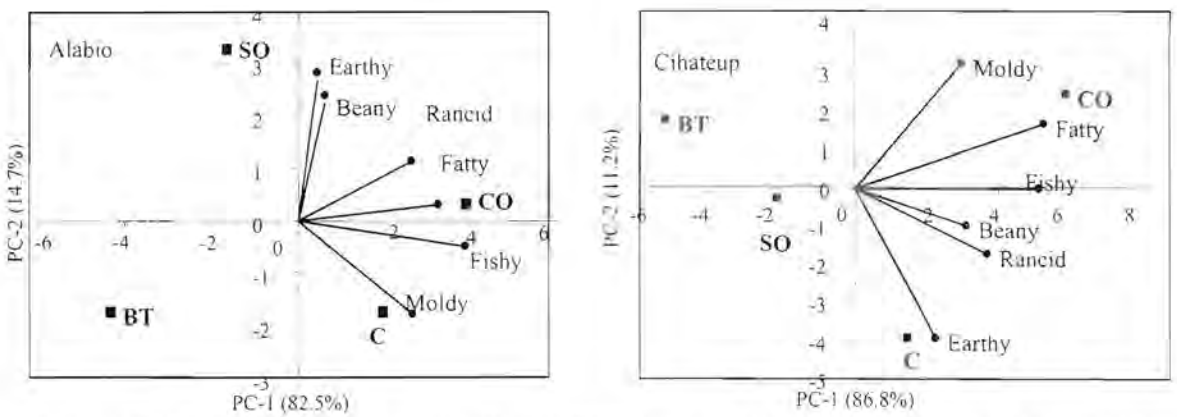

Figure 3. Relationship between meat off-odor attribute and dietary lipid in Alabio and Cihateup strain based on Principal Component Analysis,PCA. (C, control diet; BT, beef tallow; SO, soybean oil; CO, coconut oil).

Based on descriptive sensory test which involved trained panelists, this study found there were six off-odor attributes, namely fishy, fatty, rancid, moldy, earthy, and beany. Some of these attributes were also found by Hustiany (2001) when conducted study on local Java ducks. In that study the attributes off-odor which identified were green, grassy, beany, fishy, and ammonia. According to Hustiany (2001) those off-odor attributes were developed by some chemical components namely (*E*)-4-penten-2-ol, 1-pentanol, heksanal, (*E*)-1-okten-3-ol, nonanal, (*E*)-2-okten-1-ol, (*E*)-2-dekenal, (*E*)-2-nonen-1-ol, and *trans*-2-undekanal.

Descriptive analysis conducted by using spider web diagram and PCA shows that coconut oil is most probable responsible for development fishy odor in meat ducks especially in Cihateup duck meat. One of typical characteristic of coconut oil is high of volatile free- fatty acid. Coconut oil contains also high of δ-decalaktone compound which might be responsible together for producing off-odor in duck meat (Sonntag, 1979).

CONCLUSIONS

The intensity and the attribute of duck meat off-odor are signicicantly affected by either duck strain

or fat dietary sources. The different intensity of the off-odor are related with fatty acid composition contained in the duck meat. The composition of fatty acid is changeable depending on the type of dietary fat given to the duck. The saturated fatty acid of coconut oil is mostly responsible for the development of fishy odor in the duck meat.

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