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Production performance and meat quality of local ducks fed rations containing extract of torch ginger (*Etlingera elatior*) flowers and betel (*Piper Betle linn*) leaves

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ABSTRACT: Compared to chickens, ducks still have low productivity and other limitations. One of the causes of these problems might be attributed to the off-odor found in duck meat. Therefore, production performance and meat quality of ducks need to be improved. The inclusion of extracts of betel (*Piper betle* Linn) leaves and torch ginger (*Etlingera elatior*) flowers wereas done to improve production performance and meat quality of local ducks. This study was aimed at assessing the effects of the inclusion of betel leaves and torch ginger flowers in the basal rations on production performance and meat quality of local ducks in the growing phase. A completely randomized factorial design in 4 x 4 with three replicates was used. The first factor consisted of four levels of torch ginger flower solution, namely 0, 2.5, 5, and 7.5%. The second factor consisted of four levels of betel leaf solution, namely 0, 2.5, 5, and 7.5%. Results showed that no significant differences ($P>0.05$) were found in body weight gain, feed intake, feed conversion, mortality rate and meat quality (pH, water holding capacity, tenderness and cooking loss). It was concluded that the inclusion of extract of betel leaves and torch ginger flowers did not improve production performance and meat quality of male local ducks.

Keywords: Herb; Antioxidant; Feed conversion; Meat off-odor

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INTRODUCTION

Duck is one of local poultry available to provide meat and egg for consumers. However, the productivity level of local duck is much lower than that of chicken. In addition, duck meat is found to be less preferred as it has off-odor, darker color, coarser texture, and tougher than chicken meat (Ali et al., 2007). Therefore, efforts need to be done in order to improve duck production performance and meat quality with a special attention on the elimination of its meat off-odor.

Yet, today, especially in developed countries where public health is a big concern, the use of antibiotics is restricted or even banned. (Islam et al., 2014) Several herbs such as green tea (Biswas & Wakita, 2001), oregano (Park et al., 2015), sea tangle (Islam et al., 2014), roosbos tea (Juráni et al., 2008), and Indian camphorweed (Rukmiasih, 2011) were attempted to be used as natural antibiotics, growth promoters, antimicrobial agents, or antioxidants. Betel leaves and torch ginger flowers therefore might be used as feed additives. Betel leaf extract is found to have antibacterial and antioxidant activities. It was found enable to kill decomposing and pathogenic bacteria including *E. coli*. The use of betel leaf extract, compared to zinc bacitracin, was shown to potentially improve nitrogen retention and metabolizable energy of broiler rations (Sudrajat & Kardaya, 2017). Similarly, the flowers, stems, rhizomes, and leaves of torch ginger contains alkaloid, saponin, tannin, phenolic, flavonoid, triterpenoid, steroid, and glycoside compounds which can actively play a role as antioxidants (Naufalin et al., 2005). The main chemical components contained in torch ginger flower are 1-dodecanol (13.82%), dodecanal (12.1%), and 17-pentatriacontane (10.52%). Torch ginger flowers extracted in methanol were found to have higher antioxidant potential (IC 50 = 21.14 ug/ml) than those extracted in ethyl acetate (IC 50 = 68.24 ug/ml) against DPPH free

radicals (Maimulyanti & Prihadi, 2015). The inclusion of 0.5 and 1.0% of dried oregano powder in rations were found to improve meat cooking loss, reduce TBARS values, and increase GPx and SOD activities of meat in ducks (Park et al., 2015). Proportion of leg muscle was higher, but abdominal fat was lower, and meat color was improved, as well as *Lactobacillus* growth was higher in broiler chickens fed diets containing green tea powder (Juráni et al., 2008).

MATERIALS AND METHODS

The study was conducted for two months at the Duck Farm of Department of Animal Science, Faculty of Agriculture, Djuanda University, Bogor. One-hundred-and-forty-four male local ducks aged 2 weeks were used.

Extract of torch ginger flowers and betel leaves were prepared in the following way: 1) a liter of water was added to 600 g of mashed betel leaves/torch ginger flowers; 2) The mixture was boiled at 60°C for 30 minutes; 3) the boiled mixture was then sieved to obtain betel leaf/torch ginger flower extract; 4) the extract was then cooled and stored at 4°C. Betel leaf and torch ginger flower extract solution obtained was used into duck rations treatments.

Commercial ration (Genta GT-10) of PT Sinta Prima Feedmill containing 10.02% water, 5.11% ash, 4.72% fat, 20.06% protein, and 3.14% fiber for broiler finisher was used as a basal ration. A completely randomized design in 4 x 4 factorial scheme was used. The first factor consisted of four levels of torch ginger flower solution (TGFS) and the second factor consisted of four levels of betel leaf solution (BLS). Each treatment had 3 replicates consisting of 3 ducks each. The treatments were as follows:

R1	: BLS 0 %	+ TGFS 0 %
R2	: BLS 2,5 %	+ TGFS 0%
R3	: BLS 5 %	+ TGFS 0 %
R4	: BLS 7.5%	+ TGFS 0 %
R5	: BLS 0 %	+ TGFS 2.5 %

- R6 : BLS 2.5 % + TGFS 2.5 %
- R7 : BLS 5 % + TGFS 2.5 %
- R8 : BLS 7.5 % + TGFS 2.5%
- R9 : BLS 0 % + TGFS 5%
- R10 : BLS 2.5 % + TGFS 5 %
- R11 : BLS 5 % + TGFS 5 %
- R12 : BLS 7.5 % + TGFS 5 %
- R13 : BLS 0 % + TGFS 7.5 %
- R14 : BLS 2.5 % + TGFS 7.5 %
- R15 : BLS 5 % + TGFS 7.5%
- R16 : BLS 7.5 % + TGFS 7.5 %

Measurements were taken on feed intake, final body weight, body weight gain, feed conversion, mortality rate, and meat quality parameters including pH, water holding capacity, tenderness, and cooking loss.

RESULT AND DISCUSSION

Average feed intake, feed conversion, and body weight gain of male local ducks aged 4-10 weeks were listed in Table 1.

Feed Intake

Average feed intake of male local ducks aged 4-10 weeks were 3869.3 to 4157.1 g/duck. No different feed intake was found indicating that the inclusion of betel leaf and torch ginger flower solution in ration did not change feed intake. In other

words, the inclusion of betel leaf and torch ginger flower solution by up to 7.5% each did not affect palatability in ducks. As a comparison, feed intake in this study was lower than that (4499.73-4508.79 g/duck) obtained by(Widianto et al., 2015) in ducks fed great morinda meal for 40 days. Feeding the ducks for 10 weeks (Iskandar et al., 2001) found that two-week old ducks which were raised until they were 10 weeks old had a feed intake of 7500 g/duck while that of (Purba 2010) was 7242.14-7635.72 g/duck within 8 weeks.

Body Weight Gain

Results showed that the body weight gain of male local ducks reared from the age of 4-10 weeks was 889.1-1095 g. No differences in body weight gain were found. This result was in line with that of (Park et al., 2015) who added oregano meal as antioxidants into the rations of Cherry Valley ducks. The inclusion of torch ginger with and without betel leaves in rations did not increase body weight gain. This might due to the fact that the ducks were reared intensively in clean individual cages and had a similar feed intake. Active substances contained in betel leaves and torch ginger flowers did not seem to function as antibiotics or growth promoters.

Table 1. Average body weight gain, feed intake, and feed conversion of male local ducks aged 4-10 weeks

Parameter	Treatment				
	Betel Leaf Extract (%)	0	Torch Ginger Flower Extract (%)		
			2.5	5	7.5
Body Weight gain (g)	0	1075±30	1083.±135	889.1±28.9	1091.6±170
	2.5	955±105	1011.6±53	1005±154	1033.3±142
	5	968.3±118	1048±115	1050±134	941.6±118
	7.5	946.6±120	1095±66	1016±76	985±59
Feed Intake (g)	0	4141±111	4068 ±104	3869.3±363	4071.3±124
	2.5	4151.2±32	4112.9±19	4113.1±51	4138.1±80
	5	4151.1±11	4157.1±20	4113.4±51	4117.4±51
	7.5	4136.5±54	4147.3±16	4115.6±46	4151.8±16
Feed Conversion	0	3.85±0.03	3.79±0.51	4.35±0.40	3.78±0.53
	2.5	4.38±0.50	4.07±0.23	4.15±0.64	4.06±0.64
	5	4.32±0.48	4.00±0.49	3.96±0.50	4.42±0.58
	7.5	4.41±0.51	3.79±0.21	4.06±0.32	4.22±0.24

Note: no significant differences were detected (P>0.05)

Feed Conversion

The feed conversion of male local ducks reared from the age of 4-10 weeks was 3.78-4.41. No differences in feed conversion were found. This might be attributed to no differences in feed intake and body weight gain. However, the feed conversion found in this study was lower than that (5.35±0.25) found by (Purba 2010) in MA ducks given santoquin and vitamin E supplementation.

Mortality Rate

During the trial period done from the age of 4 to 10 weeks, no duck was found died, so the mortality rate of was 0%. This showed that the inclusion of extract of betel leaves and torch ginger flowers substances having antimicrobial property (Maimulyanti & Prihadi, 2015) and (Sudrajat & Kardaya, 2017) might partly explain the finding in this study.

Table 2. Average meat quality of male local ducks aged 10 weeks

Parameters	Treatments				
	Betel Leaf Extract (%)	0	Torch Ginger Flower Extract (%)		
			2.5	5	7.5
pH	0	5.97 ± 0.06	5.90 ± 0.10	5.97±0.02	5.84±0.04
	2.5	5.87 ± 0.06	6.08 ± 0.07	5.84 ± 0.04	5.88 ± 0.07
	5	5.96 ± 0.03	5.87 ± 0.06	6.02 ± 0.04	5.91 ± 0.02
	7.5	6.03 ± 0.04	6.07 ± 0.12	6.01 ± 0.02	5.93 ± 0.03
Water holding capacity (%)	0	48.10 ± 1.15	48.13 ± 0.32	48.0±0.44	52.19 ± 0.22
	2.5	48.27 ± 0.06	49.64 ± 0.55	47.07± 0.5	50.73± 0.23
	5	52.27 ± 0.25	47.33 ± 0.64	46.78±1.2	52.79 ± 0.11
	7.5	48.17 ± 0.74	47.43 ± 0.70	47.18±0.2	45.60 ± 0.52
Tenderness (kg/cm ²)	0	4.11 ± 0.34	4.12 ± 0.39	3.96±0.11	3.59 ± 0.18
	2.5	3.87 ± 0.37	4.13 ± 0.27	4.37±0.16	3.82 ± 0.17
	5	3.71 ± 0.20	3.92 ± 0.26	3.92±0.25	3.74 ± 0.16
	7.5	3.95 ± 0.20	3.77 ± 0.21	3.79 0.25	3.91 ± 0.37
Cooking loss (%)	0	40.57 ± 3.09	42.1 ± 7.57	36.03±2.2	41.6 ± 2.15
	2.5	46.45 ± 2.45	41.58 ± 4.64	39.033.1	38.49 ± 1.88
	5	43.9 ± 3.78	43.84 ± 2.78	46.6± 2.4	44.51 ± 1.96
	7.5	42.87 ± 2.67	39.48±0.78	45.49±4.9	41.8 ± 2.75

Note: no significant differences were detected (P>0.05)

Meat Quality

Meat pH of local ducks fed extract of torch ginger flower and betel leaves was not significant (P>0.05). The range of meat pH resulted from this study was 5.84 to 6.08. These figures were higher than those (5.90-5.96) of meat of Korean local ducks fed oregano powder (Park et al., 2015). Water holding capacity (45.60 to 52.79%) of meat was also not significant (P>0.05). As comparison, water holding capacity of meat of Korean local ducks fed oregano powder as herb antioxidant was 48.17% (Park et al., 2015). Meat tenderness as tested by using a

Warner Blatzer method in ducks fed extract of betel leaves and torch ginger flowers was found to be not significant (P>0.05). It ranged from around 3.59 to 4.37 kg/cm³. Meat with these tenderness levels was categorized as tender. Treatments, therefore, did not improve cooking loss which ranged from 36.03 to 46.60% (P>0.05). These findings were in contrast with the results of a study carried out by (Park et al., 2015) who found that feeding antioxidant-rich herb supplement (oregano) significantly reduced cooking loss by about 50%, from 15.17% to 7.71%.

1 CONCLUSIONS

The inclusion of extract of betel leaf and torch ginger flower solution in the rations did not affect production performance and meat quality in male local ducks.

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