Physiological Responses of Broiler Chicken Fed Native Gedi Leaves (Abelmoschusmanihot (L.) Medik) at High Ambient Temperature

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ABSTRACT

Gedi (Abelmoschus manihot (L.) Medik) is a native herbal and vegetable plant in Northern Sulawesi-Indonesia. It contains high crude protein, lysine, crude fiber, mucilage, calcium, steroid, flavonoid, and total phenol, which may offer beneficial effects as poultry feedstuff on a special production trait, such as cholesterol-less meat and nutritional strategies to reduce heat stress. The literature of gedi leaves utilization as feedstuff in broiler chicken diet is scarce. In this experiment, the effects of gedi leaves on the physiological responses, specific growth rate (SGR), and carcass traits of broiler chicken exposed to high ambient temperature was investigated. Total of 100 unsexed Cobb CP 707 broiler chicken were randomly allocated to 4 dietary treatments: diets containing 0 (control), 5, 10, and 15% gedi leaves. To induce chronic heat stress, the temperature was increased to 33.5ºC with 63% relative humidity for 5 h daily starting from d 1 until d 35. At d 36, one chicken per pen were sampled for carcass traits and abdominal fat. Feeding up to 15% gedi leaves diet reduced feed intake, weight gain, and SGR (p<0.01). Feed consumption ratio of chicken fed up to 10% gedi leaves diet was better compared to control and less GE obtained for R3 treatment. Data suggested lower dressing percentage (p<0.036) but still was good category and significantly lower abdominal fat (p<0.01) for feeding up to 15% gedi leaves diet. These results indicated that gedi leaves in diet under heat stress enhanced the performance of broiler chicken for functional food and may benefit after processing the mucilage of gedi leaves.

Key Words: Chickens, Heat stress, Gedi leaves, Growth performance, Carcass traits

INTRODUCTION

Suitable ambient temperature for poultry in the finishing phase is between 16 to 25ºC (Sahin et al., 2001). Several dietary manipulations have been done to reduce the negative effects of heat stress on productive performance of poultry, especially with plant origin in diet as active components. Gedi (Abelmoschus manihot (L) Medik) is a native herbal and vegetable plant in Northern Sulawesi-Indonesia, and has been reported containing chemical properties that may affect human health. The pharmacological action of gedi is due to their active compounds. In North Sulawesi of Indonesia, gedi leaves were used by local people to improve viscosity of the traditional porridge called tinutuan. Its viscosity effect was due to its water-soluble macromolecule associated with the gum content (mucilage) containing polysaccharides.

Previous researchers reported that gedi leaves grown in Manado, North Sulawesi of Indonesia contain steroid, total flavonoid quercetin equivalents (0.48% w/w), total phenolic (0.082% w/w), high crude protein (18.76 to 24.16%), crude fiber (13.06 to 17.53%), calcium (29.2 to 37.0 mg/g DM), and lysine (425 mg/g) (Mandey, 20131,2; Mandey et al., 2013; Mandey et al., 2014). Those compounds might affect feed efficacy by modulate the gut ecosystem. There was slight information about the utilization of gedi leaves as feedstuff in broiler chicken ration. Therefore, the objective of this research was evaluate the effects of gedi leaves on the physiological responses, specific growth rate, and carcass traits of broiler chicken exposed to high ambient temperature.
MATERIAL AND METHODS

A total of 100 unsexed broiler DOC (Cobb CP 707), averaged 44.94 ± 1.98 g with coefficient of variance 4.40% have been used in this experiment. Feed and water were provided ad libitum throughout experiment. Ambient temperature (°C) and relative humidity (%) inside experimental room were recorded daily throughout experimental period and average values were range 26.0 to 33.5°C and 63 to 93%, respectively.

Animals were fed commercial complete based diet and gedi leaves. Dietary treatments were basal diet (control = R0), then substituted by 5, 10, and 15% gedi leaves for R1, R2, and R3, respectively, and these treatments were administrated for a 35-day period.

Parameters were evaluated: body weight gain, feed intake, feed conversion ratio (FCR), specific growth rate (SGR), growth efficiency (GE), and carcass traits exposed to high ambient temperature. Feed conversion ratio was calculated on feed intake and weight basis. At 36-day of age, one representative bird from each pen was slughtered by cervical dislocation technique, as described in the Report of the AVMA Panel on Euthanasia (AVMA, 2001) and its carcass parameters (ready to cook) including dressing percentage and abdominal fat were recorded. Specific growth rate and GE (Orheruata et al., 2006, modified) were calculated by formula:

\[
\text{SGR(\%)} = \frac{\ln (LW_f) - \ln (LW_i)}{t} \times 100
\]

where: \(\ln LW_f\) is natural log of the final weight, \(\ln LW_i\) is natural log of initial weight, and t is time (days) between \(\ln W_f\) and \(\ln W_i\); (2006); b. \(\text{SGR Lean Mass(\%)} = \ln (\text{Carcass weight} - \text{abdominal fat weight}) - \ln (\text{initial weight}) / t \times 100\); c. GE = WG / LW, where: GE is growth efficiency for time period, WG is weight gain for specific time period, and LW is initial weight as a covariate.

The completely randomized design (CRD) was employed in one-way analysis of variance, and significant differences compared by Duncan’s multiple range tests (Snedecor and Cochran, 1971). Software package Genstat 12.2 was used for statistical calculation.

RESULTS AND DISCUSSION

The effects of dietary gedi leaf on the physiological responses of broiler chicken exposed high ambient temperature during the entire trial period were given in Table 1.

Table 1. Performance, specific growth rate and carcass traits during the entire trial period for the broiler chicken treatment groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Diets</th>
<th>Pvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R0</td>
<td>R1</td>
</tr>
<tr>
<td>ATFI (g/b)*</td>
<td>2708 ± 35.33d</td>
<td>2362 ± 50.82c</td>
</tr>
<tr>
<td>AFI (g/b/d)*</td>
<td>77.38 ± 1.01d</td>
<td>67.48 ± 1.46c</td>
</tr>
<tr>
<td>FCR (NU)*</td>
<td>1.56 ± 0.05a</td>
<td>1.86 ± 0.13ab</td>
</tr>
<tr>
<td>Final wt, g</td>
<td>1754.4 ± 82.33</td>
<td>1354.5 ± 39.99</td>
</tr>
<tr>
<td>Initial wt, g</td>
<td>46.04 ± 0.83</td>
<td>46.21 ± 0.92</td>
</tr>
<tr>
<td>SGR (% g/day)</td>
<td>10.396 ± 0.067d</td>
<td>9.643 ± 0.125c</td>
</tr>
<tr>
<td>SGR lean mass (%)</td>
<td>9.657 ± 0.042d</td>
<td>8.811 ± 0.282c</td>
</tr>
<tr>
<td>GE</td>
<td>1.06 ± 0.025</td>
<td>0.81 ± 0.037</td>
</tr>
<tr>
<td>Dressing %</td>
<td>72.31 ± 0.65b</td>
<td>68.76 ± 3.64a</td>
</tr>
<tr>
<td>Abdominal fat %</td>
<td>1.618 ± 0.32c</td>
<td>0.682 ± 0.16b</td>
</tr>
<tr>
<td>Mortality</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Means followed by different letters within rows are different (p<0.05).**

**Mandey et al. (2013)**

ATFI = average total feed intake, AFI = average feed intake, FCR = feed conversion ratio, g/b = grams per bird, g/b/d = grams per bird per day, NU = no unit; SGR = specific growth rate, GE = growth efficiency for time period, Pvalue = probability value;
There was no case of mortality in this experiment. The decreasing of feed intake and weight gain of chicken fed diets supplemented *gedi* leaves might be attributed to the high ambient temperature and also to the majority of mucilage of *gedi*. However, SGR values decreased slowly (R2 to R3 was 3.82%), FCR was in a good category for feeding up to 10% *gedi* leaves diet, and less GE values obtained for R3 treatment, therefore suggesting that feeding R3 optimized feed utilization. Improvement of SGR and GE values in the present study might be due to the effects of active components of *gedi*. Active substance of *gedi* serves as antioxidant and anti-microbial (Jain and Bari, 2011; Jain et al., 2011). So that, although the size of chicken bodies fed R3 treatment were smaller than fed R0, chickens still were healthy and the dressing percentage still was in a good category for feeding up to 15% *gedi* leaves diet with highly significant (p<0.01) lower of abdominal fat. That performance was appropriate for special production, as functional food.

In a recent study, Akbarian et al. (2013) reported that lemon extract, orange peel extracts, and *C. xanthorrhiza* essential oil modified microbial and intestinal traits, but did not affect broiler chicken performance under heat stress. Another study showed that using high propolis rich in phenolics and vitamin C could partially overcome the dejection in growth and carcass quality in broiler chicken caused by heat stress (Seven et al., 2008). According to El Iraqi et al. (2013), broiler chicken welfare, productive performance, and immune response of broiler chicken against disease during summer improved by supplying broiler chicken with anti-stress, such as dry peppermint and *Ginkgo biloba*. In our experiment, *gedi* leaves supplementation decreased feed intake and weight gain. However, broiler chicken fed *gedi* leaves showed improvement in feed conversion ratio and dressing percentage compared to control. Degumming process of *gedi* leaves prior used, may enhance broiler chicken performance for functional food under high ambient temperature.

**IMPLICATIONS**

It could be concluded that *gedi* leaves supplementation in diet might be beneficial as functional food for broiler chicken exposed to ambient temperature. Further studies are required to fully understand the mechanism of mucilage response to the broiler chicken performance.

**REFERENCES**


Mandey, J.S. 2013. Analisis Botani dan Pemanfaatan Anti mikroba Daun Gedi 
(\textit{Abelmoschus manihot} (L.) Medik) Sebagai Kandidat Bahan Pakan Ayam Pedaging.
Laporan Penelitian Hibah Doktor. Lembaga Penelitian dan Pengabdian pada
Masyarakat Universitas Sam Ratulangi. Manado.
(\textit{Abelmoschus manihot} L. Medik.) of Northern Sulawesi-Indonesia as a source of 
Mandey, J.S., H. Soetanto., O. Sjofjan, and B. Tulung. 2014. Genetics characterization, 
nutritional and phytochemicals potential of gedi leaves (\textit{Abelmoschus manihot} (L.) 
Medik) growing in the North Sulawesi of Indonesia as a candidate of poultry feed. J. 
and economy of feed intake of broiler chickens fed changing commercial feed brands at 
supplement vitamin E on lipid peroxidation, vitamins E, A and some mineral 
Seven T.P., I. Seven.,M. Yilmaz, and E.K.Ugsims. 2008. The effects of Turkish propolis on 
Ames, IA.