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

Jet S. Mandey[1], Hendrawan Soetanto[2], Osfar Sjofjan[2] and Bernat Tulung[1]
[1]Faculty of Animal Husbandry, Sam Ratulangi University, Manado, Indonesia, [2]Faculty of Animal Husbandry, Brawijaya University, Malang, Indonesia
Corresponding email: jetsm_fapet@yahoo.co.id

ABSTRACT

Gedi (*Abelmoschusmanihot* (L.) Medik) isa native herbal and vegetable plant in Northern Sulawesi-Indonesia. Itcontains high crude protein,lysine, crude fiber, mucilage, calcium, steroid, flavonoid, and total phenol,whichmay 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 dietis 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 wererandomly 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, onechicken per pen were sampled for carcass traits and abdominal fat. Feedingup to15% *gedi* leaves dietreducedfeed intake, weight gain,and SGR ($p<0.01$).Feed consumption ratioof chicken fed up to 10% *gedi* leaves dietwas better compared to control andless 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 has 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* (*Abelmoschusmanihot* (L) Medik) is 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 itswater-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 (13.06to17.53%), calcium (29.2 to37.0 mg/g DM), and lysine (425 mg/g)(Mandey, 2013[1,2];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 gwith coefficient of variance 4,40% have been used in this experiment.Feed and water were provided *ad libitum* throughout experiment.Ambient temperature (ºC) and relative humidity (%) inside experimental room were recorded daily throughout experimental period and average values were range 26.0 to 33.5ºC 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 percentageand abdominal fat were recorded. Specific growth rate and GE (Orheruata et al., 2006, modified) were calculated by formula:a.SGR(%) = (ln (LW_f) – ln (LW_i)) x 100 / t; where: lnLW_f is natural log of the final weigh,lnLW_i is natural log of initial weight, and t is time (days) between lnW_f and ln W_i; (2006); b.SGR $_{Lean\ Mass}$(%) = Ln (Carcass weight – abdominal fat weight) – Ln (initial weight) / t x100; 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

Variables	Diets				*Pvalue*
	R0	R1	R2	R3	
ATFI (g/b)*	2708 ± 35.33^{d}	2362 ± 50.82^{c}	2044 ± 73.46^{b}	1869 ± 55.51^{a}	p<0.001
AFI (g/b/d)*	77.38 ± 1.01^{d}	67.48 ± 1.46^{c}	58.41 ± 2.13^{b}	53.40 ± 1.59^{a}	p<0.01
FCR (NU)*	1.56 ± 0.05^{a}	1.86 ± 0.13^{ab}	2.01 ± 0.10^{bc}	2.29 ± 0.41^{c}	p<0.01
Final wt, g*	1754.4 ± 82.33	1354.5 ± 39.99	1067.4 ± 49.9	935.4 ± 52.40	
Initial wt, g	46.04 ± 0.83	46.21± 0.92	46.84 ± 0.91	46.72 ± 1.45	
SGR (%) g/day	10.396 ± 0.067^{d}	9.643 ± 0.125^{c}	8.907 ± 0.159^{b}	8.567 ± 0.223^{a}	p<0.01
SGR lean mass (%)	9.657 ± 0.042^{d}	8.811 ± 0.282^{c}	8.137 ± 0.307^{b}	7.676 ± 0.439^{a}	p<0.01
GE	1.06 ± 0.025	0.81 ± 0.037	0.63 ± 0.042	0.55 ± 0.040	
Dressing %*	72.31 ± 0.65^{b}	68.76 ± 3.64^{a}	68.19 ± 2.10^{a}	67.57 ± 2.61^{a}	p<0.036
Abdominal fat %*	1.618 ± 0.32^{c}	0.682 ± 0.16^{b}	0.302 ± 0.05^{a}	0.270 ± 0.09^{a}	p<0.01
Mortality	0	0	0	0	

$^{a, b, c}$ 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 optimizedfeed 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 anti-oxidant 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 broilerchickenperformance 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 broilerchicken 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 antistress,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 tocontrol. Degumming process of *gedi*leaves prior used, mayenhance broiler chicken performance for functional food under high ambient temperature.

IMPLICATIONS

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

REFERENCES

Akbarian, A., A. Golian, H. Kermanshahi, R. Farhoosh, A.R. Raji, S. De Smet, and J.Michiels. 2013. Growth performance and gut health parameters of finishing broilers supplemented with plant extracts and exposed to daily increased temperature. Spanish J. Agric. Res. 11: 109-119.

AVMA. 2001. Report of the AVMA Panel of Euthanasia. JAVMA, Vol. 218 (5): 682.

El Iraqi, K.G., E.M. Abdelgawad., H.M. Ibrahim and A.E. El Sawe. 2013. Effect of gingko biloba, dry peppermint and vitamin C as antistress on broiler welfare during summer heat stress. Global Veterinaria 10(7): 770-778.

Jain, P.S., A.A. Todarwal., S.B. Bari, and S. J. Sanjay. 2011. Analgesic activity of *Abelmoschusmanihot* extracts. Int. J. Pharmacology 7:716-720.

Jain, P. and S. Bari. 2011. Antimicrobial properties of *Abelmoschusmanihot* Linn. Int. Pharmaceutica. Sci. 1 (2):32-35.

Lara, L.J. andM.H. Rostagno. 2013. Impact of heat stress on poultry production. Animals 3: 356-369.

Mandey, J.S[1]. 2013. PotensiTepungDaunGedi (*Abelmoschusmanihot* L. Medik) Asal Sulawesi Utara SebagaiSumberBahanPakanAyamPedaging.Disertasi. Universitas Brawijaya, Malang.

Mandey, J.S[2].2013. Analisis Botani dan Pemanfaatan Anti mikroba Daun Gedi (*Abelmoschusmanihot* (L.) Medik) Sebagai Kandidat Bahan Pakan Ayam Pedaging. Laporan Penelitian Hibah Doktor. Lembaga Penelitian dan Pengabdian pada Masyarakat Universitas Sam Ratulangi. Manado.

Mandey, J.S., H. Soetanto., O. Sjofjan, and B.Tulung. 2013. The effects of native gedi leaves (*Abelmoschusmanihot* L. Medik.) of Northern Sulawesi-Indonesia as a source of feedstuff on the performance of broilers. Int. J. Biosciences 3 (10):82-91.

Mandey, J.S., H. Soetanto., O. Sjofjan, and B. Tulung. 2014. Genetics characterization, nutritional and phytochemicals potential of gedi leaves (*Abelmoschusmanihot* (L.) Medik) growing in the North Sulawesi of Indonesia as a candidate of poultry feed. J. Res. Biol. 4(2):1276-1286.

Orheruata A.M., S.O. Nwokoro., G.O. Alufohai, and B.I.Omagbon. 2006. Growth indices and economy of feed intake of broiler chickens fed changing commercial feed brands at starter and finisher phases. Int. J. of Poult. Sci. 5 (12): 1123-1127.

SahinK., N. Sahin., M. Onderci., S. Yaralioglu, and O.Kucuk. 2001. Protective role of supplement vitamin E on lipid peroxidation, vitamins E, A and some mineral concentrations of broilers reared under heat stress. Vet. Med. 46:140-144.

Seven T.P., I. Seven.,M. Yilmaz, and E.K.Ugsims. 2008. The effects of Turkish propolis on growth and carcass characteristics in broilers under heat stress. Anim. Feed Sci. Technol. 146:137-148.

Snedecor G.W. and W.G.Cochran. 1967. Statistical Methods. 6th Ed. Iowa State Univ. Press, Ames, IA.