Excretions of Urinary Creatinineon Young and Mature Kacang Goat under Different Feeding Levels

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Abstract. This study was aimed to examine the excretion of urinary creatinine in young and mature Kacang goat bucks under different feeding levels. This study used 16 Kacang goat bucks consisting of 2 groups of age, i.e. eight young bucks (aged 6-7 months, weighed 12.75±2.68 kg) and 8 mature bucks (age 9-12 months, weighed 17.34±3.32 kg). The bucks were fed pelleted complete feed containing 78.82% dry matter (DM), 18.80% crude protein (CP), and 76.29% total digestible nutrients (TDN). The bucks were allocated into a 2x2 nested design with four replications. The treatment was the amount of 2.24% dry matter intake (T1) and 4.48% of body weight (BW) (T2) for the young goat, while the mature buck was 1.87% and 3.74%, respectively. The results showed that DM, CP and TDN intake were significant different across ages and highly significantly different between feeding levels. Changes of urinary creatinine from week 0–12 showed no differences in the age group (142 mg/dl) and feeding level (143 mg/dl). Conclusively, age and feed level affected body weight, feed intake and creatinine excretion of Kacang Goat. The more body weight gain (age) and feed level, the more urinal creatinine excretion in male Kacang goat.

Key words: Kacang goat, ages, feeding level, and creatinine

Abstrak. Penelitian ini bertujuan untuk mengkaji kadar kreatinin pada kambing Kacang muda dan dewasa dengan jumlah pemberian pakan yang berbeda. Materi berupa 16 ekor kambing Kacang jantan, terdiri dari 8 ekor umur muda (6-7 bulan) dan 8 ekor umur dewasa (9-12 bulan). Pakan komplit yang diberikan memiliki kandungan bahan kering (BK) 78,82%, protein kasar (PK) 18,80%, dan *total digestible nutrients* (TDN) 76,29%. Rancangan penelitian ini adalah pola tersarang 2x2 dengan 4 ulangan. Perlakuan pakan berupa jumlah BK pakan yang diberikan yaitu 2,24% bobot badan (BB) (T1) dan 4,48% BB (T2) untuk kambing muda, sedangkan kambing dewasa sebesar 1,87% BB (T1) dan 3,74% BB (T2). Hasil penelitian menunjukkan bahwa konsumsi BK, PK dan TDN berbeda nyata pada kelompok umur dan berbeda sangat nyata pada perlakuan pakan. Kadar kreatinin pada minggu ke 0-6 tidak berbeda nyata, namun pada minggu ke 12 berbeda nyata baik kelompok umur maupun akibat perlakuan pakan. Perubahan kadar kreatinin dari minggu ke 0-12 menunjukkan perbedaan yang tidak nyata pada kelompok umur dan perlakuan pakan. Kesimpulan dari penelitian ini adalah kadar kreatinin semakin meningkat dengan semakin meningkatnya bobot badan (umur) dan pakan ternak.

Kata kunci : kambing Kacang, umur, level pakan, dan kreatinin

Introduction

The efficiency of protein utilization is partly affected by the amount of protein intake (Islam et al., 2000), age and cattle body weight (Borg et al., 2009; Ngawa et al., 2009). The more protein intake, the more protein deposition. The higher protein deposition, the more body protein is expected to synthesize because the utilization is not only observed from the body weight gain but also body composition, particularly body protein.

Estimating body protein without slaughtering has been widely conducted using the indicator of excreted urinary creatinine (Basal et al., 2011).Creatinine is anhydride of creatinine mostly formed in muscle with water excretion from irreversible and non enzymatic phosphocreatine as the final yield of muscle metabolism (George et al., 2011 and Mateescu et al., 2012). Urinal creatinine correlates with body weight and height or body mass tissue (Liu and McMeniman, 2006; Kim et al., 2013; Ma et al., 2014). According to Chen et al. (1995) and Pathak et al. (2013), the comparison of

creatinine daily excretion is relatively constant with the amount of body protein, because creatinine daily excretion reflects body metabolism so the amount of excreted urinal creatinine could be the indicator of cattle body protein. By measuring creatinine, the amount of cattle body protein could be observed. The objective of this study was to evaluate the effect of different feed level on creatinine excretion of young and mature male Kacang goat.

Materials and Method

Research Materials

Materials used in this research were 16 male Kacang goat consisting of eight young goats (6-7 months) with early weight 12.75±2.68 kg (CV 21.52%) and eight mature buck (9-12 months) with early weight 17.34±3.32 kg (CV 19.63%). Ration used to be pellet complete feed composed of wheat stem (25%), ricebran (39%), soybean waste (32%), molasses (3%), and mineral (1%). The feed contained 78.82% dry matter (DM), 18.80 crude protein (CP), 3.10% ether extract (EE), 9.63% crude fiber (CF), 7.77% ash, 60.70% nitrogen free extract (NFE), 4199 kcal/kg energy and 76.29% total digestible nutrients (TDN).

Research Design

This research was subject to completely randomized nested design 2x2 with 4 replications. Factor 1 was two age groups (young and mature), and factor 2 was feed level treatment (low and high). The observed variable consisted of: YL: Young goat with a low feeding level (2,24% BW), YH: Young goat with a high feeding level (4,48% BW), ML: Mature goat with a low feeding level (1,87% BW), and MH: Mature goat with a high feeding level (3.74% BW).

Research Procedure

Research was conducted in three stages, adaptation stage (6 weeks), initiation stage (1 week) and treatment stage (12 weeks). Adaptation stage included goat adaptation to the cage (environment) and feed. At this stage, the goats were injected with 1 ml/10 kg BW Wormzol to rid the potential endoparasitic disorder. Body weight gain and feed intake were recorded during the adaptation stage. The young Kacang goat had 2.24% BW and 4.48% BW for low and high feed level, respectively, while mature Kacang goat had 1.87% BW and 3.74% for low and high feed level. Feed was given three times a day and water ad libitum.

Initiation stage was conducted by randomizing cattle on treatment feed and cage allocation. Goats weighing was done at the end of the stage for initial body weight data. For treatment stage collected data, feed was rationed three times a day and water ad libitum. Remaining feed was weighed in the morning before the feed was given. Goats were weighed every week to adjust the amount of feed given.

The creatinine data collection was conducted three times, at the start, middle and final treatment, by collecting urine 7 x 24 h using metabolism cage (Schneider and Flaat, 1975). Urine were collected in 7 days in week 0, 6 and 12 of the treatment period. Urine was mixed with H_2SO_4 20% to maintain pH 3 or lower to prevent ammonia loss.Urine was homogeneously mixed, then sampled. It was kept in a freezer (−4^{o}C) prior to analysisusing the Jaffe method.

Data Analysis

The observed data in this research were DM, CP and TDN intakes, and creatinine excretion. The obtained data were subject to homogeneity and normality test, then analysis of variance with 5% and 1% significance decision making.

Result and Discussion

Feed Intake

DM, CP and TDN intakes of young and mature male Kacang goat fed with low and high

level feeding is presented in Table 1. DM intake shows highly significant difference (P<0.1) across feed level treatment due to different level of feed given in each treatment. Age factor on DM intake also indicated a significant difference (P<0.05), in which mature goat consumed more DM than young goat because age was linear to body weight. The older the goat, the heavier the body weight, therefore maturesgoat needed more feed than the young ones. It was in line with Borg et al. (2009) and Ngwa et al. (2009) that the older (age) the cattle the heavier the body weight, affected feed consumption and indirectly contributed to goat productivity.

CP and TDN intake at age treatment showed significant difference (P<0.05) and highly significant difference (P<0.01) due to different feeding level and DM intake was significantly different across ages (P<0.05) and level of feed given was also highly significantly different (P<0.01). Tovar-Luna et al. (2011) stated that factors affecting CP intake was protein content in feed and DM intake.

Creatinine Excretion

Creatinine excretion of male Kacang goat in this research is presented in Table 1. Different amount of feed showed no significant difference (P<0.05) on week0 and 6. However, the significant difference (P<0.05) was indicated from creatinine excretion of Kacang goat on week 12. High feed level treatment (YH and MH) resulted in higher creatinine excretion compared to that of low feed level treatment (YL and ML) on week 12. The increased creatinine excretion was assumedly due to highly significantly different (P<0.01) CP intake (Table 1). CP intake in YH and MH treatment was higher than that in YL and ML. Sufficient nutrient caused higher metabolism of tissue development, there by excreting more creatinine. It was in accordance with Faichney et al. (1995) and Susmel et al. (1995) that the variation of creatinine daily excretion was

Tabel 1. Effects of age and feeding level on body weight, DM intake, CP intake, TDN intake, body protein and urinary creatinine excretions of Kacang goat

Parameter	Young (Y)			Mature (M)			Signification	
	YL	YH	Means	ML	MH	Means	AG	FL
Body Weight (kg)								
Week 0	10.76	13.98	12.37	15.07	18.24	16.66	**	ns
Week 6	11.23	15.96	13.60	16.86	20.61	18.74	**	*
Week 12	12.26	15.88	14.07	18.21	22.85	20.53	**	*
Feed intake (g/day)								
DM	220	420	320	280	574	427	*	**
CP	41	80	60.5	53	108	80.5	*	**
TDN	169	316	243	212	435	324	*	**
Excretions of Urinary Creatinine (mg/dl)								
Week 0	137	161	149	126	246	186	ns	ns
Week 6	199	289	244	243	514	379	ns	ns
Week 12	194	263	229	259	521	390	*	*
Δ week 0-12	57	102	80	134	275	205	ns	ns
Body Protein (kg)								
Week 0	0.700	0.994	0.847	1.200	1.395	1.298	**	ns
Week 6	0.768	1.183	0.976	1.091	1.733	1.412	*	*
Week 12	0.897	1.258	1.078	1.465	1.958	1.712	**	ns
Δ Week 0-12	0.198	.264	0.231	0.265	0.563	0.414	ns	ns

DM= dry matter ; CP= Crude Protein ; TDN= total digestible nutrients; YL= Young goat with a low feeding level (2,24% BW) ; YH= Young goat with a high feeding level (4.48% BW) ; ML= Mature goat with a low feeding level (1.87% BW) ; MH= Mature goat with a high feeding level (3.74% BW) ; AG= Age ; FL= Feeding Level ; ns= non signifikan (P>0.05); * = different significant (P<0.05) ; ** = different significant (P<0.01).

mostly attributed to feeding intake, body weight, body composition, and sufficient nutrition. Rumosa et al. (2010) report that age affects the excretion of creatinine in goats. Mature goat excreted more creatinine than a young goat.

Excretion of creatinine in age groups did not show significant differences (P>0.05) on week 0 and week 6, but on the last week (12) of the research (P<0.05). On week 12, mature Kacang goat excreted more creatinine than the young goat, assumedly due to the more increased muscle tissue in mature goat than in young goat. It was because mature buck weighed more (P<0.01) than young goat at the end of the research. It indicated that creatinine excretion positively correlated with body weight. As elaborated by Basal et al. (2011); Kim et al. (2013); Ma et al. (2014) that creatinine positively correlated with body weight, so the amount of excreted creatinine increased alongside with heavier body weight and more body protein.

The increasing creatinine excretion in mature buck was higher (P<0.05) on week 12 because of the higher CP intake (P<0.01) than that in young goats (Table 1). Higher protein intake in mature buck would increase protein metabolism as well. As metabolism increased, creatinine excretion in mature buck also increased. Han et al. (1992)and Liu and McMeniman (2006) reported that creatinine excretion was affected by feed and protein ration level, therefore the more protein intake the more creatinine excretion.

This result was supported by the highly significantly different body protein increase on week 12 (Table 1). Body protein at group age showed a highly significant difference (P<0.01) on week 0 and week 12, and significant difference (P<0.05) on week 6. It indicated higher protein metabolism and muscle tissue formation in mature buck than that in young goat, thereby excreting more creatinine. George et al. (2006) and George et al. (2011) further explained that the varied creatinine daily excretion was attributed to feeding intake, body weight, body composition and sufficient nutrition.

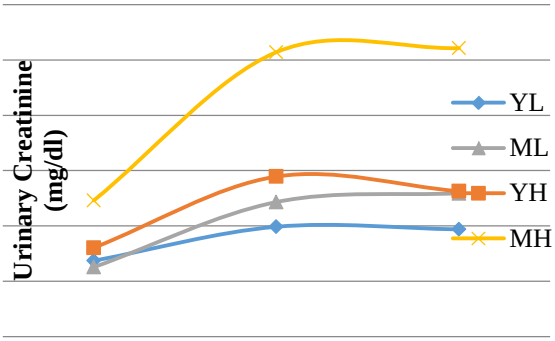

Figure 1. The change of creatinine excretionon Kacang goat with different age and feeding level

The change of creatinine excretion during research week 0-12 is presented in Figure 1. The lowest creatinine excretion was YL, ML, YH and MH, respectively, with lowest excretion in YL and the highest in MH. It indicated that nutrition and age status affected creatinine excretion in Kacang goat. However, creatinine increase from week 0–2 did not show significant differences (P>0.05) statistically in age group and feed treatment group. It showed that the increased creatinine excretion from week 0–2 was relatively constant. It was in accordance with Starke et al (2012) that high protein feed (16%) and low protein feed (11%) resulted in relatively similar creatinine excretion. Chen et al. (1995); Pathak et al. (2013) reported that the comparison of creatinine daily excretion was relatively constant with the amount of body protein.

Conclusions

Age and feed level affected body weight, feed intake and creatinine excretion of Kacang goat. The more body weight gain (age) and

feed level, the more urinal creatinine excretion in male Kacang goat.

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