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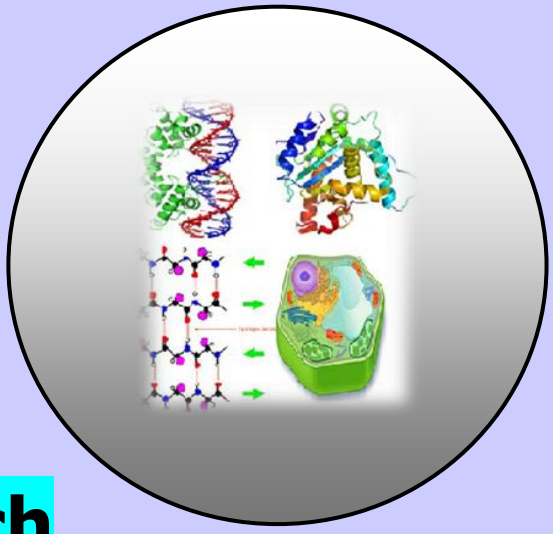
ISSN 2319-3077 Online/Electronic
ISSN 0970-4973 Print

Index Copernicus International Value
IC Value of Journal 46.52 Poland, Europe (2015)
Journal Impact Factor: 4.275
Global Impact factor of Journal: 0.876
Scientific Journals Impact Factor: 3.285
InfoBase Impact Factor: 3.66

J. Biol. Chem. Research
Volume 34 (1) 2017 Pages No. 297-303



Journal of Biological and Chemical Research

An International Peer Reviewed / Referred Journal of Life Sciences and Chemistry

Indexed Abstracted and Cited in various International and National Scientific Databases

Published by Society for Advancement of Sciences®

J. Biol. Chem. Research. Vol. 34, No. 1: 297-303, 2017
(An International Peer Reviewed / Refereed Journal of Life Sciences and Chemistry)
Ms 34/01/225/2017

ISSN 0970-4973 (Print)
ISSN 2319-3077 (Online/Electronic)

http:// www.sasjournals.com
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RESEARCH PAPER

Received: 10/05/2017 Revised: 10/05/2017 Accepted: 10/05/2017

Ruments Metabolite and Body Weight Gain of Timor Deer after Feeding Ration of Combination of Grass, Forbs and Woodys Plant

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ABSTRACT

Research has been conducted on the effect of ration from combination of grass, forbs and woody plants against rumen metabolite and weight gain of timor deer in deer captivity, Pupuan Tabanan, Which was held in February to March 2014. Four individual timor deer was used as sample. Feed rations are sourced from the plant species selected by timor deer in the wild. Rumen metabolites (VFA and N-NH3) were analyzed by gas chromatography techniques. Parameters of glucose levels, Blood Urea N (BUN) and blood proteins were also measured. The average daily gain (g/day) of timor deer is measured by weighing every 2 weeks for 6 weeks. The results showed that timor deer given ration I (grass + forbs + woodys) resulted in the highest rumen metabolite of total VFA of 59.22 mM/100 mL and the lowest was deer consuming ration IV (grass only) of 19.75 mM/100mL. Deer that consumed ration I also showed the highest of average daily gain of 138.83 g/day and the lowest was ration IV of 77.62 g/day.

Key words: combination rations of grass, forbs, woodys, rumen metabolites, daily gain, timor deer.

INTRODUCTION

Timor deer (*Cervus timorensis*) in nature is an intermediate herbivore in feeding selection, which means eating grass, forbs and woodys, if all these plant categories are available in their habitats. Some research results on the selection of wild timor deer species in the wild show that deer are generalist or diverse species of feed is high category that is eating many species of plants, both grasses, forbs (legum or non-legum), and also woody plants (legum or non -legum) (Shipley, 1999; De Garine-Wichatitsky et al., 2005; Allison, 2011; Ginantra *et al*., 2014).

The choice of forage plants for wild timor deer survival is an indicator that combinations of diverse plant feed compositions are of better nutritive value and lead to better growth. Ginantra (2015) analyzed the nutritional value of plant combinations of grass, forbs and woody categories that resulted in a better balance of nutritional value (protein, energy and mineral) than just grass or broad leafy plants alone.

Growth indicators related to feed quality (protein and energy balance) can be observed from rumen metabolites (rumen VFA and N-ammonia (N-NH3) and weight gain. Relations of feed quality with rumen metabolites have been performed by several researchers. Puuttoo and Dryden (1999) studied that improved quality of feed (protein digestible) was positively correlated with rumen VFA. Yulianto (2012) studied that deer feed with high protein content produced increased VFA and N-NH3.

Research on the effect of feed consumption on body weight gain has also been done. Sekarningrum *et al.* (2013) found that by giving of some forages and additional concentrates the gain of body weight of the deer was 150 g/day. Takandjandji (2009) also found that the weight gain of timor deer was 33% of initial body weight by feeding grass, lamtoro, bran and additional urea. Bheekhee *et al.* (2001) states that by feeding of forages and additional concentrates, molasses and sugarcane produce an increase in body weight of 112-116 g/day. Growth is the end result of the process of feeding and metabolism in the body.

Based on several research results indicate that research using plant feed diversification/ combination of natural feed (combination of grass, forbs and woody plants) to determine the growth of timor deer in breeding system has not been done. This study focuses on the effect of a combination of diversity of feed plants in nature to rumen metabolites and weight gain.

MATERIALS DAN METHODS

Experimental rations

Four individual timor deer (2 males, and 2 females) were fed with a combination of plant and nutrient rations presented in Table 1. Feeding was done at captivity of deer, Bangsing Pupuan Tabanan Bali for 6 weeks. The species of ration compound plants are derived from the plant species selected by timor deer in the wild.

Determination of rumen metabolites

The rumen metabolites analyzed were acidity (pH), total and partial VFA levels, and N-ammonia (N-NH3). The rumen fluid of timor deer was taken with suction pump of 4 individual deer each 15 ml. The taking was done at week IV and week VI on in vivo research in captivity. The collected rumen fluid is added 1 drop of sulfuric acid and inserted in the cooler container. Total and partial VFA was measured by gas chromatography technique (GC Chrompack CP 9002). The levels of N-ammonia (NH3) were determined by the Conway diffusion micro technique. The acidity (pH) level of rumen fluid was measured using pH meters that had been calibrated with pH 4 and pH 7 solutions. The tests were conducted Analytic Laboratory at Udayana University.

Measurement of glucose, protein and BUN blood

Blood samples were taken from individual deer after 4 hours of eating (samples taken at weeks 4 and 6). Blood samples were taken in the jungularis vein as much as 5 ml using venoject and stored temporarily on the sample box that has been filled coolant. Parameters observed were glucose, Blood Urea N (BUN) and blood proteins. Furthermore, blood samples were analyzed at Animal Health Laboratory, Denpasar Bali.

Measurement of Average daily gain

Each deer was given a ration (ration I, ration II, ration III and ration IV) for 6 weeks. Body weight (BW) per deer was weighed at the beginning of the experiment and every 2 weeks after being given the consumption of 4 kinds of rations. Weighing using the scale hanging capacity 50 kg. Average daily gain (ADG) is determined by the formula: ADG (kg/day) = (initial BW - body weight after 2 weeks) kg/14 days.

Tabel 1. Formulation of experimental rations (*).

Plants combination and ration nutrient	Rations I	II	III	IV
Plants combination	Grass +Forbs + Woodys	Grass+ Forbs	Grass + Woodys	Grass
DM consumption (gr/kg BW)	34.83	31.34	32.60	30.94
Crude Protein (% CP)	17.2	16.2	15.43	12.88
Gross Energy (GE, MJ/kg)	16.78	15.87	16.87	15.73

Grass : *Eriochloa ramosa, Axonopus compresus, Eriochloa subglabra, Dactyloctenium aegyptium, Panicum tryperon*

Forbs : *Commelina benghalensis, Desmodium triflorum, Fleura interupta, Tribulus terrestris, Boerhavia diffusa*

Woodys : *Leucaena leococephala , Hibiscus tiliaseus, Grewia koordersiana, Streblus asper, Schleichera oleosa*

(*) Data is the result of dissertation research (Ginantra, 2014)

Table 2. Production of rumen fluid metabolites and blood content of timor deer that's consumption combination of ration.

No	Parameter	Rations I	II	III	IV
1	VFA (mM/100 mL)	**59.22**	**38.23**	**33.91**	**19.75**
	-Acetate (mM/100mL)	33.03	20.38	18.81	10.63
	-Propionate (mM/100mL)	21.88	15.85	10.28	7.24
	-Butyrate (mM/100 mL)	4.31	2.00	4.82	1.88
2	N-NH3 (mg/100 ml)	24.44	20.60	19.59	18.32
3	pH rumen fluid	6.47	6.57	6.70	6.76
4	Blood protein Total (g/dl)	5.45	6.15	5.60	6.00
5	BUN (mg/dl)	48.50	53.95	53.00	54.00
6	Blood Glucose (mg/dl)	189.00	155.5	139.50	139.00

RESULTS AND DISCUSSION

Product of rumen metabolite and blood nutrient content

The volatile fatty acid (VFA) metabolite product measured at the end of the study (at week 6) showed that the deer with the ration I produced the highest and lowest VFA (acetate and propionate) levels of the deer with the ration IV.

N-NH3 rumen fluid as well showed the same tendency as the VFA content of the deer with the highest on ration I, ie 24.44 mg/100 ml of rumen fluid and deer ration IV the lowest rumen fluid of 18.32 mg/100 ml, rumen fluid pH ranged from 6.47 -6,76 for all rations (Table 2).

The result of measurement of blood protein and blood urea N (BUN) of timor deer showed that the highest were deer with ration IV and the lowest were deer with ration I. The opposite happened to blood glucose content, deer with ration I content of glucose highest and the lowest were deer with ration IV (Table 2).

The results showed that the ration I of acetate, propionate and butyrate production was highest compared with rations II, III and IV. Chiba (2014), Putra (2004) and Owen and Goetsch (1988) state that VFA products (acetate, propionate and butyrate) reflect the effectiveness of carbohydrate fermentation from feed by microbes in the rumen. The process is determined by several factors such as rumen microbial ecosystems, rumen pH, feed quantity, nutrient feed composition (such as protein, fiber, energy, mineral content) and balance of food substances (protein and energy balance).

The results of this study were supported by several facts that ration I in the highest quantity of DM and nutrient consumption level, the highest nutrient ration content (CP, DE, ME, and Ca Mineral) and ration I showed the best protein and energy balance (Ginantra, 2014). Balance of CP: ME ration I is 172.0: 9.72 (CP g/kg, ME in MJ/kg) is a balanced ratio for timor deer. Approaching with what Tomkins & McMeniman (1996) reported, found that the optimal CP:ME ratio for timor deer was 168.1: 9.79. Meanwhile, ratin IV with the level of DM consumption and the lowest nutrient consumption and the lowest nutrient content of feed was also followed by the lowest VFA production. Putto & Dryden (1998) reported that rural deer vaccination VFA concentrations increased with increasing protein feed content.

pH of rumen fluid on rations I, ration II, ration III and ration IV ranged from 6.47 to 6.76. This pH value is a normal physiological range for rumen microbial activity (Chiba, 2014). Ration I pH of 6.47 while the pH IV rations at the highest of 6.76. Owens and Goetsch (1988) suggest that pH is close to 6 then a higher propionate product and a pH closer to 7 acetates is higher. The results of this study indicate a tendency that the increase in pH from near pH 6 to pH 7 in rations I, II, III and IV is also followed by a tendency of decreased propionate production.

The production of NH3 rumen fluid of timor deer shows the highest value in ration I, followed by rations II, III and IV. Increased protein and protein digestibility of feed along with increased production of NH3 in rumen timor deer. Chiba (2014) and Arora (1995) suggest that NH3 is a product of fermentation of feed proteins by rumen microbes to amino acids, subsequently subjected to deamination to NH3. The NH3 content of rumen reflects the feed protein degradation activity. Feed quality such as protein content, protein digestibility is the determining factor of degradation activity. In contrast to those reported by Puuttoo & Dryden (1998) that in the difference in feed protein (12-17.8% protein range) did not show the NH3 fluid concentration difference in the deer, the range of NH3 rumen obtained was between 13.1 - 15 mg/100 ml (or 131-150 mg/L). In this study obtained NH3 concentration between 18.32-24,44 mg/100 ml. Arora (1995) further states that pH conditions also determine microbial activity in protein degradation. Proteins are more easily degraded at a pH of 6.5. The results also showed that deer who consumed ration I pH rumen was close to the pH value of 6.47.

Protein content in blood of timor deer results of this study is ranged from 5.45-6.15 g/dl. This result is no different from the healthy blood content of timor deer in Mauritius, New Caledonia and Thailand. In Mauritius the content of timor deer blood protein was 5.2-6.7 g/dl, in Thailand 5.43-7.89 g/dl and in New Celedonia 4.7-7.58 g/dl (Semiadi and Nugraha, 2004). The blood urea content of this study ranged from 48.50-54.00 mg/dl. In Thailand 15.2-30.4 mg/dl and in Mauritius 67-117 mg / dl (Semiadi and Nugraha, 2004).

The results showed that deer who consumed the ration I of protein concentration and blood urea was the lowest and the highest was ration IV. Putra (2008) states that the high total concentration of total protein in the blood is highly dependent on many at least N or absorbed amino acids, either through the rumen wall or intestinal wall and the rate of mobilization of the protein component. In this case, the animal physiologically seeks to absorb the protein component in relatively equal amounts and is stored temporarily in the blood awaiting the order of the central nervous system through the hypothalamus to its utilization

Blood glucose results of this study ranged from 139-189 mg/dl. This value is higher than the blood glucose content of timir deer in Thailand ranging from 63.5-132.5 mg/dl. Deer that consumed ration I showed the highest blood glucose content compared to rations II, III and IV. It can be explained that rations I with higher nutritive values produce VFA and protein digestibility by higher rumen microbes. This is reflected in the higher rumen fluid propionate and ammonia product. Arora (1995) states that the final product of protein and nucleic acid digestion is ammonia, purine, pyrimidine and amino acids. In ruminants a number of amino acids are catabolized for glucose synthesis. Chiba (2014) states that the VFA produced from microbial fermentation is partially absorbed by the rumen epithelium and brought to the liver via the portal system. In the liver/other tissues, propionate is oxidized into glucose through the propionyl CoA pathway. This allows the blood glucose content of deer consuming ration I higher than other rations.

Average daily gain (ADG)

The daily weight gain of timor deer consuming ration I, ration II, ration III and ration IV were presented in Table 3. Timor deer that consuming ration I the highest of ADG was 138.83 g/day and the lowest was the timor deer who consumed the ration IV, which is an average of 77.62 g/day.

Table 3. Average daily gain timor deer.

ADG 2 weeks to (g/day)	deer Ration I	deer Ration II	deer Ration III	deer Ration IV
I	137.9	75.00	67.86	111.43
II	114.3	82.14	114.29	78.57
III	164.3	85.71	157.14	42.86
Total	**416.5**	**242.85**	**339.29**	**232.86**
Average	**138.83**	**80.95**	**113.10**	**77.62**

Tuckwell (2003) states, that the level of nutrient consumption in deer, viewed from the consumption of energy metabolism, protein, minerals and vitamins reflects the nutritional value of feed for the fulfillment of needs at the level of maintenance of body functions (maintenance), growth and reproduction.

The addition of body weight is the target or indicator that the nutrients consumed have met the need for growth. The results of this study showed that timor deer that consumed ration I showed the highest increase of body weight, that is the average of body weight gain was 138.83 g/day, then deer ration III, deer ration II and the most increase of body weight was Deer that consume rations IV. Increased consumption of nutrients along with increased body weight in timor deer.

The level of dry matter (DM) consumption in ration I showed the highest value and the lowest intake of IV ration. Between ration II and ration III the level of consumption is between rations I and IV. Deer that consume ration III, digestible energy (DE) and organic matter (OM) consumption is higher than ration II, but mineral consumption and consumption of digestible protein is higher in ration II. The rate of DM consumption is positively correlated with nutrient consumption. This means that the increased consumption of DM the consumption of nutrients is increasing, Tuckwel (2003) states that consumption of nutrients reflect the nutritional value of the ration and important in determining the growth of timor deer.

Several studies related to the nutrient value of feed with increased body weight on timor deer have been done. Sekarningrum (2013) reported that feed with a CP content of 17.38% could increase the body weight timor deer as 150 g/day. Bheekhee *et al*. (2001) reported that timor deer that consumed feed with ME energy 5.4-8.2 MJ/ind. able to increase body weight between 112-116 g day.

CONCLUSION

Feeding with a combination of grass, forbs and woody plants (ration I) produces the best growth of timor deer. Growth results can be seen from rumen metabolites (VFA and N-NH3) and average daily gain of timor deer.

ACKNOWLEDGMENTS

We wish thanks to the Research Center and Community Services of Udayana University who has funded this study. Thanks to Mr. Spriadi (staff of Bali Barat National Park) who assisted in plants specimen collected in the field. Thanks to Mr Putu Eka Antara who has assisted in research in captive deer.

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