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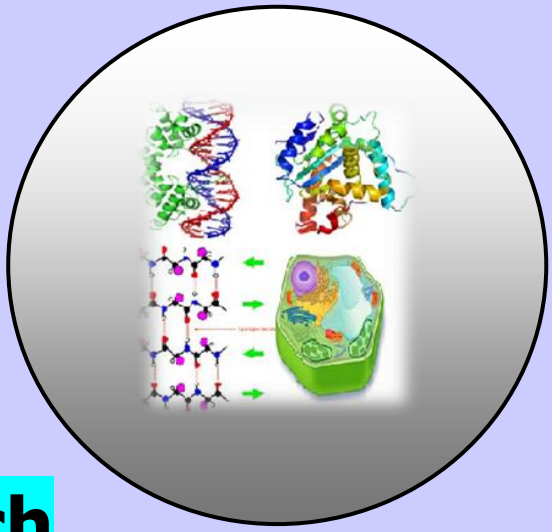
ISSN 2319-3077 Online/Electronic
ISSN 0970-4973 Print

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. 29-41



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: 29-41, 2017
(An International Peer Reviewed / Refereed Journal of Life Sciences and Chemistry)
Ms 32/2/180/2016
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ISSN 0970-4973 (Print)
ISSN 2319-3077 (Online/Electronic)

http:// www.sasjournals.com
http:// www.jbcr.co.in
jbiolchemres@gmail.com

RESEARCH PAPER

Received: 07/12/2016 **Revised: 28/02/2017** **Accepted: 02/03/2017**

Consumption and Digestibility of the Ration by Timor Deer (*Cervus timorensis* Blainville) to Forage the Composition Grass, Forbs and Woody Plants

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ABSTRACT

This study was conducted to investigate consumption and digestibility of the ration by Timor deer (Cervus Timorensis Blainville) to forages the composition grass, forbs and woody plants. The purpose of this study was to test the hypothesis that the most complete ration species composition (consisting of grass, forbs, and woody plant) will show the level of consumption and digestibility of the highest value. The study used a completely randomized desaign, with 4 treatments rations. 4 individual deer used as experimental animals. Consumption levels each treatment ration and digestibility determined by the total collection methods. The results showed that the ration most complete it's plant species composition (ration A), to produce a ration with a balanced nutrient content in terms of protein, ME and mineral. Digestible of dry matter, protein, organic matter and energy (DE) showed the highest value on the most complete ration (ration A). Ration A based on the total consumption of protein, protein digestion, the ME and consumption of minerals to meet the needs for growth in the timor deer.
Keywords: Timor Deer, Plants Forage Composition, Feed Consumption and Digestibility.

INTRODUCTION

Timor deer (*Cervus timo*rensis) is generalist herbivores in the feeding selection. Based on the botanical composition of the feed (grass and browses), Timor deer grouped into

intermediate feeder. This is because the timor deer flexible in the selection of forage, meaning that when the availability of grass habitat high and worth nutritive deer choose more categories of grass and then can switch to a category broadleaf forbs or woody in the next season (then switch to forbs or shrubs latter in season (Ginantra *et al*. 2014). Simpley (1999) states that the structure of animal anatomy and physiology clearly affects the food choices. The characteristics of the plant feed, in turn, is one of the major forces that shape the behavior of feeding selection on the herbivores. Based on the species of plants that can be eaten determined timor deer feed botanical composition that includes the proportion of grass, broadleaf plants (herbaceous dicots and woody plants). Selection and evaluation of nutritional value gives an overview ration composition and nutrient composition of the feed ration to timor deer. Nutrient ration consumed and digested demonstrated its potential in order to fulfill their need for nutrients and growth performance responses. So far, several studies on consumption level and digestibility of the ration in the timor deer is more focused on nutrient feed of the species of plants that have limited or by the addition of concentrate (Garsetiasih 2007; Hmeidanet *et al*., 2000; Takandjandji, 2009). Has been no testing the level of consumption and digestibility of the forage plant diversity available and selected by deer in the wild. This study was conducted to test the level of consumption and digestibility of the ration are sourced from the composition of species available in nature and selected by deer. Fifteen species of plants preference in nature (that consist of 5 species grass, 5 species forbs and 5 species woodys), which is the result of feeding selection studies timor deer in Bali Barat National Park was used as the composition of the ration (Ginantra *et al.,* 2014). In this study we tested hipoteisis is that the most complete ration species composition (consisting of grass, forbs, and woody plant) will show the level of consumption and digestibility of the highest value.

MATERIAL AND METHODS

The experimental design and samples animal

Research waged in captive timor deer, Bangsing Pupuan Tabanan-Bali, in January to May 2014. The study used a completely randomized desains (RAL), with 4 treatment ration, namely rations A, B, C and D. The study used four individual deer. Initial body weight of each deer is: deer 1 is 25.3 kg, deer 2 is 21.3 kg, deer 3 is 30.65 kg and deer 4 is 20.8 kg. Each individual deer placed in individual cages measuring 1.5 m x 2.0 m equipped with places to eat and drink.

Proximat analysis

250 grams of fresh material each plant species were sampled. Each sample oven at 70 ^{0}C to obtain dry weight (DW). DW finely ground sample for analysis of chemical properties. Crude protein (CP) analyzed by Semi-micro Kjeldahl technique, gross energy content (GE) by bomb calorimeter apparatus, fiber ADF (acid detergent fiber) and NDF Analyzed by Goering and Van Soest method (Ranjhan and Krishna, 1980). Minerals (Ca and P) content were analyzed by atomic absorption spectrophotometer (Sinaga, 1997). DW sample entered in an oven at 105 ^{0}C for 3 hours to obtain DM. DM samples further in a furnace at a temperature of 550 ^{o}C for 1 hour to obtain ash. The next composition of organic matter (OM) was determined by the formula: 100% -% ash.

Determining the level of feed consumption

Feeding is done twice a day (morning and evening) *ad libitum* (weight of feed given weighed). Every morning, the rest of the food was weighed before providing new feed or cleaning cages. The consumption level determined is the amount of food consumed per individual per day. Because individual deer that used to have a different weight, the daily consumption rate is calculated in grams per body weight (g/kgBW). The consumption level of each treatment ration that observed was DM, OM, CP and minerals (Ca and P).

Determination of digestibility of DM, OM, CP and energy (DE and ME)

Digestibility (digestibility) of dry matter (DMD), organic matter (OMD) digested crude protein and energy is determined by the total collection methods. Deer faeces are collected every morning (at 7.00 AM), then weighed to obtain fresh weight. Fresh faeces is dried in the oven 70 ^{0}C to obtain a sample of dry weight (DW). Faecal samples were collected every week in the composite, so that each treatment ration obtained six faecal samples to test nutrient content. Faeces that have been dried, finely ground to test the content of DM, OM, CP, and the energy in the laboratory. Nutrient digestibility is determined by the formula: digestibility (%) = $\frac{I-F}{I}$ (Tilman *et al.,* 1991); where I: nutrients in diet and F: nutrient in feces.

Statistical analysis

To determine differences in the level of consumption and digestibility of the ration difference analysis of variance (P = 0.05). Relations between the two veriabel nutrients tested with Pearson Correlation (P = 0.05). Test using software (software) "IBM SPSS 20".

RESULT AND DISCUSSION

Nutrient content of the ration

15 species of plants that are preferred by Timor deer in the wild (Bali Barat National Park), are used as a combination of rations. Ration combination consists of species graminoids, forbs and woody plant. Chemical content and plant species composition of each ration (Ration A, B, C and D) is presented in Table 1, Table 2, Table 3 and Table 4.

Based on the contribution/composition of each species in each ration, then obtained the nutrients, as presented in Table 5. Ration A is the ration of the most complete in terms of species composition that was the group of grasses (43.30%), forbs (34, 60%) and woody plants (23.10%), Based on nutrient content, crude protein (CP), digestible energy (DE), metabolism energy (ME) and calcium (Ca), ration A highest and neutral detergent fiber content (NDF) the lowest. The ration B consists of the species of grasses group (55%) and forbs (45%), rations C consisted of plant species grass group (65.4%) and woody plants (34.6%), nutrient content of the ration B and ration C intermediates between rations A and D, the lignin content of the ration C higher than the other diets. Ration D consisted only of grasses (100% grass) and the content of CP, DE, ME and Ca was the lowest, while the content of crude fiber (CF) and its NDF highest, lignin content of the ration D the lowest compared to other rations. Fourth rations (ration A, B, C and ration D) are arranged above shows the content of the nutrients for maintenance needs. CP content of between 12.88 to 17.2%. The CP content of the range is above the range of the CP content of feed for maintenance (maintenance) in deer (10%) (Deerfarmer, 2003; Tuckwell, 2003). The mineral content is fourth ration; Ca ranged from 0.73 to 1.37% and P content ranged from 0.27 to 0.34%.

The mineral content of the ration fourth is already at a good range to support the growth and development of the deer (≥0.40% Ca and P ranges from 0.28 to 0.30%) (Deerfarmer, 2003). The content of ME the fourth ration ranged from 8.90 to 9.72 MJ/kg. The content of ME is show above the minimum content of which is good for the growth of the deer (5.7 MJ ME/kg) (Tuckwell, 2003).

Table 1. Ration A: The content of nutrients and species composition.

No	Plant species	Chemical contents								Species composition
		DM	CP	GE	OM	Ca	P	ADF	NDF	
		(%)	(%)	MJ/kg	(%)	(%)	(%)	(%)	%	(%)
	Graminoids									
1	*Eriochloa ramosa*	15.17	11.24	15.78	82.03	0.35	0.28	46.41	57.05	10.90
2	*Axonopus compresus*	22.00	15.46	17.44	87.47	0.44	0.27	50.95	57.09	3.69
3	*Eriochloa subglabra*	15.79	11.54	15.84	75.92	0.92	0.26	50.24	62.79	6.84
4	*Dactyloctenium aegeptium*	16.33	13.44	15.63	79.97	1.13	0.27	50.93	60.80	13.59
5	*Panicum tryperon*	21.33	14.62	16.09	82.13	0.70	0.28	43.28	60.56	8.54
	Forbs									
1	*Commelina benghalensis*	11.88	22.44	14.74	69.11	2.29	0.46	32.79	48.66	7.07
2	*Desmodium triflorum*	22.34	21.92	16.48	82.16	1.53	0.47	40.88	44.32	7.50
3	*Fleura interupta*	14.42	16.36	17.52	85.38	1.50	0.38	48.74	61.62	5.54
4	*Tribulus terrestris*	18.89	16.10	15.76	79.23	3.30	0.40	43.31	51.83	5.81
5	*Boerhavia diffusa*	16.42	24.99	14.25	78.07	2.20	0.36	43.05	52.38	6.23
	Woodys									
1	*Leucaena leococephala*	24.82	27.65	20.22	87.96	1.21	0.27	32.57	39.63	7.96
2	*Hibiscus tiliaseus*	24.67	16.13	17.32	84.05	2.22	0.35	58.57	60.71	3.15
3	*Grewia koordersiana*	31.86	17.34	19.02	89.25	1.33	0.27	58.76	61.08	9.13
4	*Streblus asper*	27.81	15.22	15.94	81.67	1.82	0.11	57.46	61.25	2.10
5	*Schleichera oleosa*	31.49	14.78	20.10	92.62	1.11	0.20	57.80	63.67	1.97
										100

The content of the cell wall (ADF and NDF) fourth rations ranged from 45.27 to 48.83% for the ADF and 55.7 to 59.59% for NDF. ADF and NDF content was in the range of qualities that fair for deer (Semiadi and Nugraha, 2004). The content of tannin the fourth rations ranged from 0.32 to 0.56%, the tannin content that is moderate (below 4%) for deer nutrition (Cannas, 2008).

Digestibility of Dry matter and nutrient

Coefficient (%) digestibility of dry matter, organic matter and crude protein ration A, ration B, ration C and ration D is presented in Table 6. The digestibility of DM, OM and CP ration A highest compared with third other rations (P <0, 05) the next sequence is the ration C , ration B and ration D. DM digestibility of the ration B and C were not significantly different and OM digestibility of the ration B,C and D were not significantly different.

The content of CP, DE, ME and Ca was positively correlated with DM digestibility of the ration, with correlation r respectively 0.69, 0.64, 0.75 and 0.62. Regression correlation content of CP (X in %DM) with DM digestibility (Y in %) can be expressed in the following equation: Y = 39.38 + 1,57X (R^2 = 0.47; P <0.05).

Table 2.Ration B: The content of nutrients and species composition.

No	Plant species	Chemical conten								Species composition
		DM (%)	CP (%)	GE MJ/kg	OM (%)	Ca (%)	P (%)	ADF (%)	NDF %	(%)
	Graminoids									
1	*Eriochloa ramosa*	15.17	11.45	15.78	82.03	0.35	0.28	46.4	57.05	15.28
2	*Axonopus compresus*	22.00	15.46	17.44	87.47	0.44	0.27	51.0	57.09	4.90
3	*Eriochloa subglabra*	15.79	11.54	15.84	75.92	0.92	0.26	50.2	62.79	8.66
4	*Dactyloctenium aegyptium*	16.33	13.44	15.63	79.97	1.13	0.27	50.9	60.80	18.05
5	*Panicum tryperon*	21.33	14.62	16.09	82.13	0.70	0.28	43.3	60.56	10.64
	Forbs									
1	*Commelina benghalensis*	11.88	22.44	14.74	69.11	2.29	0.46	32.8	48.66	9.37
2	*Desmodium triflorum*	22.34	21.92	16.48	82.16	1.53	0.47	40.9	44.32	9.98
3	*Fleura interupta*	14.42	16.36	17.52	85.38	1.50	0.38	48.7	61.62	7.18
4	*Tribulus terrestris*	18.89	16.1	15.76	79.23	3.30	0.40	43.3	51.83	8.27
5	*Boerhavia diffusa*	16.42	24.99	14.25	78.07	2.20	0.36	43.1	52.38	7.66
										100

Increased protein content led to increased availability of protein for microbes, microbial protein need to run a more efficient digestive function. Protein of feed would be used by microbes to form protein body.

Table 3. Ration C: The content of nutrients and species composition.

No	Plants species	Chemical content								Species composition
		DM	CP	GE	OM	Ca	P	ADF	NDF	
		(%)	(%)	MJ/kg	(%)	(%)	(%)	(%)	%	(%)
	Graminoids									
1	*Eriochloa ramose*	15.17	11.24	15.78	82.03	0.35	0.28	46.41	57.05	18.93
2	*Axonopus compresus*	22.00	15.46	17.44	87.47	0.44	0.27	50.9	57.09	5.08
3	*Eriochloa subglabra*	15.79	11.54	15.84	75.92	0.92	0.26	50.2	62.79	9.25
4	*Dactyloctenium aegyptium*	16.33	13.44	15.63	79.97	1.13	0.27	50.9	60.80	20.19
5	*Panicum trype*ron	21.33	14.62	16.09	82.13	0.70	0.28	43.3	60.56	11.43
	Woodys									
1	*Leucaena leococephala*	24.82	27.65	20.22	87.96	1.21	0.27	32.6	39.63	11.36
2	*Hibiscus tiliaseus*	24.67	16.13	17.32	84.05	2.22	0.35	58.6	60.71	4.84
3	*Grewia koordersiana*	31.85	17.34	19.02	89.25	1.33	0.27	58.8	61.08	13.09
4	*Streblus asper*	27.81	15.22	15.94	81.67	1.82	0.11	57.5	61.25	2.85
5	*Schleichera oleosa*	31.49	14.78	20.10	92.62	1.11	0.20	57.8	63.67	2.97
										100

Table 4. Ration D: The content of nutrients and species composition.

No	Plant species	Chemical content								Species composition
		DM	CP	GE	OM	Ca	P	ADF	NDF	
		(%)	(%)	kcal/kg	(%)	(%)	(%)	(%)	%	(%)
	Graminoids									
1	*Eriochloa ramosa*	15.17	11.24	15.78	82.03	0.35	0.28	46.41	57.05	30.30
2	*Axonopus compresus*	22.00	15.46	17.44	87.47	0.44	0.27	50.95	57.09	8.47
3	*Eriochloa subglabra*	15.79	11.54	15.84	75.92	0.92	0.26	50.24	62.79	14.11
4	*Dactyloctenium aegyptium*	16.33	13.44	15.63	79.97	1.13	0.27	50.93	60.80	30.00
5	*Panicum trype*ron	21.33	14.62	16.09	82.13	0.70	0.28	43.28	60.56	17.12
										100

If the body enough protein, the growth and reproductive as well as the formation of digestive enzymes faster so that more foodstuffs ingested through fermentation by microbes. Some previous studies also reported that the digestibility of dry matter (DM) in the Timor deer increased with an increase in CP content of the feed.

Gersetiasih (2002) reported that in the feed with the content of CP ranges from 9-24% of its DM digestibility is 55.0 to 66.67%; Tomkins & McMeniman (1996) reported that the increase in CP content ranged from 9.13 to 20.5% of its DM digestibility is 61 to 67.4%; and Farida *et al*. (1996) also reported that feed with increased protein content of 15.54 to 18.2% can improve DM digestibility from 73.9% to 80.3%.

Table 5. The content of nutrients, fiber and tannins of ration (in % DM, except DM).

		Rations		
Nutrient	**A**	**B**	**C**	**D**
Dry Matter (DM, %)	20,00	17,18	21,1	17,24
Gross Energy (GE), MJ/kg	16,78	15,87	16,87	15,73
Digestible energy (DE), MJ/kg [(a)]	12,13	10,96	11,87	10,35
Metabolism Energy (ME), MJ/kg [(b)]	9,72	8,90	9,30	8,91
Crude Protein (CP, %)	17,2	16,2	15,43	12,88
Organic matter (OM, %)	81,8	79,91	83,35	81,03
Crude fiber (CF, %)	33,6	32,72	37,79	38,6
ADF, %	46,42	45,27	48,83	48,16
NDF, %	55,7	56,08	57,78	59,59
Lignin (%	14,07	11,67	14,69	9,57
Calsium (Ca, %)	1,37	1,35	0,99	0,73
Phospor (P, %)	0,32	0,34	0,27	0,27
Tannin total , %	0,52	0,36	0,56	0,32

Note:
[(a)] DE content is digestible energy (MJ/hari) per DM consumption (kg DM/day), [(b)]ME content is ME per DM consumption.
Based on nutrient content (CP, energy and mineral) and contains anti-nutritive (cell wall and tannin) showed that the quality of ration A was highest nutritional value and ration D the lowest. The rations B and C intermediates between rations A and ration D

Table 6. Digestibility of Dry Matter dan nutrient rations (mean ± SD).

		Rations		
Digestibility (%)	**A**	**B**	**C**	**D**
DM	68.82±2.12 ^{a}	62.62±1.84 ^{b}	62.10±2.08^{b}	60.64±1.52 ^{c}
OM	74.82±1.76 ^{a}	70.02±2.13 ^{b}	70.17±2.79 ^{b}	69.46±3.59 ^{b}
CP	82.663±1.95^{a}	77.97±2.36^{b}	76.57±2.53^{c}	73.40±3.29 ^{d}

Note: * Different letters in the same line indicate significant differences ($p < 0.05$)

The content of NDF negatively correlated to the dry matter digestibility of feed with a value of r = -0.65. Regression correlation NDF content (X in% DM) of the ration with DM digestibility (Y in %) can be expressed in the equation: $Y = 151.54 - 1.54X$ ($R^2 = 0.42$; $P < 0.05$). The results of the analysis of the relationship the digestibility with of lignin content in this study did not show a negative correlation.

Ration D is 100% grass its lignin content of the lowest, most low nutrient digestibility precisely. Rations A and C content of lignin higher, but higher nutrient digestibility. Lignin is a difficult structural carbohydrates ingested by ruminants, which can decrease the value of the feed nutrient digestibility (Tilman *et al*., 1991; Arora, 1995). Lignin will affect the digestibility only if it is in the cell wall. Grass with low lignin content but their cell wall more, less digestible than non-grass feed that contains a higher ligninnya. Related to the results of this study, the ration D is a 100% grass although lignin content lower than the of the ration A, B and C, but the content of its cell wall is higher (in terms of NDF content) so digestibility be lower (Arora, 1995).

Table 7. Consumption of dry matter and nutrients by Timor deer on four rations (means±SD).

		Ransum		
Daily consumption	**A**	**B**	**C**	**D**
Dry mateer (DM)				
- g/kg BW	34,83±0,90^{a}	31,34±1,09^{c}	32,60±0,80^{b}	30,94±0.98^{c}
- g/kg BW^{0,75}	80,66±2,63^{a}	68,76±2,14^{c}	77,90±2,0^{b}	68,08±1,58^{c}
Crude Protein (CP)				
- g/kg BW	5,99±0,16^{a}	5,08±0,18^{b}	5,03±0,12^{b}	3,98±0,13^{c}
- g/kg bb$^{0.75}$	13,87±0,45^{a}	11,14±0,35^{c}	12,02±0,31^{b}	8,77±0,21^{d}
GE (MJ/kg BW)	0,58±0,01^{a}	0,50±0,02^{b}	0,55±0,01^{c}	0,49±0,02^{d}
ME [(a)]				
- MJ/kg BW	0,339±0,014^{a}	0,279±0,015^{c}	0,303±0,017^{b}	0,277±0,014^{c}
- MJ/kg BW^{0,75}	0,786±0,041^{a}	0,612±0,032^{c}	0,725±0,042^{b}	0,609±0,029^{c}
Organic matter (OM)				
- g/kg BW	28,53±0,74^{a}	25,04±0,87^{c}	27,18±0,67^{b}	25,07±0,79^{c}
- g/kg BW$^{0.75}$	66,07±2,17^{a}	54,95±1,71^{c}	64,94±1,17^{b}	55,17±1,28^{c}
Calsium				
- g/kg BW	0,476±0,012^{a}	0,423±0,014^{b}	0,322±0,008^{c}	0,227±0,007^{d}
- g/kg BW$^{0.75}$	1,104±0,036^{a}	0,928±0,029^{b}	0,770±0,020^{c}	0,498±0,012^{d}
Phospor				
- g/kg BW	0,110±0,003^{a}	0,105±0,004^{b}	0,088±0,002^{c}	0,085±0,003^{d}
- g/kg BW$^{0.75}$	0,256±0,008^{a}	0,230±0,007^{b}	0,210±0,005^{c}	0,186±0,004^{d}

Notes: *Different letters in the same line indicate significant differences ($p < 0.05$). [(a)] ME is calculated by: 1 kg OM digested = 1.05 TDN; and 1 kg TDN= 3.62 Mkal or 15.15 MJ ME (Kearl, 1982).

Feed Intake of dry matter and nutrient

DM and nutrient consumption (OM, CP, GE, Ca and P) per kg of body weight (g/kg BW) and per kg of metabolic body weight (g/kgBW$^{0.75}$) are presented in Table 7. Average consumption DM, CP, GE, ME, OM, Ca and P in the ration A is the highest and ration D is the lowest.

DM consumption per kg of body weight and per metabolic body weight, ration A significantly different from the other three rations (P <0.05). Feed intake between ration B and D was not significantly different (P> 0.05). DM consumption sequences from highest to lowest are the rations A, C, B and D. For OM consumption ration C showed higher values than other ration and significantly different with ration B and D (P <0.05), both per body weight and per metabolic body weight. OM consumption ration B with D not significantly different from either per body weight and per metabolic body weight (P> 0.05).

Protein consumption of ration A highest compared to other rations (P <0.05). Consumption of protein sequences from the highest to the lowest, is the ration A, C, B and D. ration consumption of protein per body weight between rations B and C were not significantly different (P> 0.05), but the protein consumption per metabolic body weight significantly different (P <0.05). Similarly, consumption of gross energy (GE) ration A highest and significantly different from the rations B, C and D (P <0.05). GE consumption inclinations equals with DM consumption, ration A highest and the lowest is D. Metabolism energy (ME) ration A is the highest compared the others three rations (P <0.05). Consumption of mineral calcium (Ca) and phosphorus (P) ration A showed higher values than others rations.

Daily dry matter intake of Timor deer to rations (A, B, C and D) varied from 34.84; 31.34; 32.60 and 30.73 (g/kg BW) or 80.70; 68.76; 81.87 and 67.62 (g/kg BW ^{0,75}). DM percent rate of consumption to body weight ration A, B, C and D are respectively 3.48%, 3.13%, 3.26% and 3.07%. These results are in the range of DM in Timor deer consumption as reported by Tomkins & McMeniman (1996), Dryden (1999), Sookhareea & Dryden (2004) and Takandjandji (2009) that the daily consumption of Timor deer ranges between 52-160 g/kg $BW^{0.75}$ and the most common DM consumption is between 55-75 g / kg $BW^{0.75}$, the feed to the CP content ranged from 9 to 20%.

Ration A that contains the highest CP (17.2%) showed the highest DM intake and ration D protein content is the lowest (12.8%) resulted in the lowest consumption level as well. This relationship can be explained that protein increases the activity of the rumen microbes increased in the fermentation process, so that the rate of passage of food from the rumen also increased and the ability to fill the next feed also increased (Shookareea and Dryden, 2004; Putra, 2004). Deer shows the maximum level of consumption in the ration (diets) containing CP between 14.1 to 17.2% (Decruyenaere *et al*., 2009). Relations DM intake (g / kg BW) Timor deer with CP content of the feed can be expressed in the equation:

$Y = 21.56 + 0, 704X$ (R^2=0.47; P<0.05) (Y = DM consumption in g/kg bw, X is CP content)

Balance the ratio between the content of CP and ME important influence on consumption of DM for deer. The results of this study showed that the ration A with a ratio of CP: ME amounted to 172.0: 9.72 (CP in g/kg, ME in MJ/kg) resulted in the highest level of DM intake. In line with these results, Tomkins & McMeniman (1996) reported that the DM intake was highest in the Timor deer feed with the content ratio of CP: ME amounted to 168.1: 9.79.

Balance the content of CP and DE ratio also affect the consumption of DM on deer. Some studies show that consumption of DM on deer is not only determined by the high content of CP alone.

CP on the feed with a higher precisely the level of consumption is lower because the DE content is lower. Barteaux *et al*. (1998) found that DM consumption of white tail deer at highest CP content of 118.9 g / kg and 8.49 MJ DE / kg, instead of the CP 163.3 g/kg and DE 7.28 MJ / kg. Nolte *et al*. (2004) also found the same thing on a black tail deer (*Odocoileus hemionus*), that DM consumption is the highest is not the highest CP, but the CP is lower with higher DE. Results of research on the Timor deer also showed the same phenomenon between ration B and C. The DM consumption of ration C higher than the consumption of ration B whereas CP content of the ration C lower than the ration B. But the content of DE ration C higher than the ration B.

The content of NDF was negatively correlated with DM intake (r = -0.46). Crude fiber, NDF is a feed chemical properties that affect the palatability of feed. The higher the crude fiber (NDF), the higher the bulkiness, the lower palatability DM resulted in lower consumption. Due to the bulky longer feed digested by rumen microbes, so the feed is relatively longer be in the rumen resulting capacity to fill new feed is very limited (Behgar *et al*., 2009; Putra, 2004). Decruyenaere *et al*. (2009) also states that the content of NDF and hemicellulose negatively correlated with DM consumption in ruminants.

In addition to the macro nutrient content such as CP, energy (DE and ME), the content of micro nutrients such as minerals also affect the consumption of DM in Timor deer. In this study, the mineral content of Ca positively correlated to the consumption of DM although the correlation is less strong. Minerals in general, including Ca rumen microbial activity can assist in accelerating the degradation of the feed which increased digesta flow rate and also increase the rate of absorption of nutrients, so empty rapid of rumen and stimulate lateral hypothalamus as the central part of the meal (Putra, 2004).

Digestibility of feed effect on dry matter intake, because more materials that can be ingested through the digestive tract, which means a faster flow causes more space available for additional food (Tilman *et al*., 1991). The results of this study showed that the digestibility of dry matter and nutrient positive effect on dry matter intake and nutrient. Ration A digestibility highest level is also followed by the highest level of consumption. Ration D lowest digestibility levels are followed by the lowest level of consumption. DM digestibility real impact on the level of dry matter intake. Regression correlation DM digestibility (X in%) on dry matter intake (Y in g/kg BW) as Figure 1.

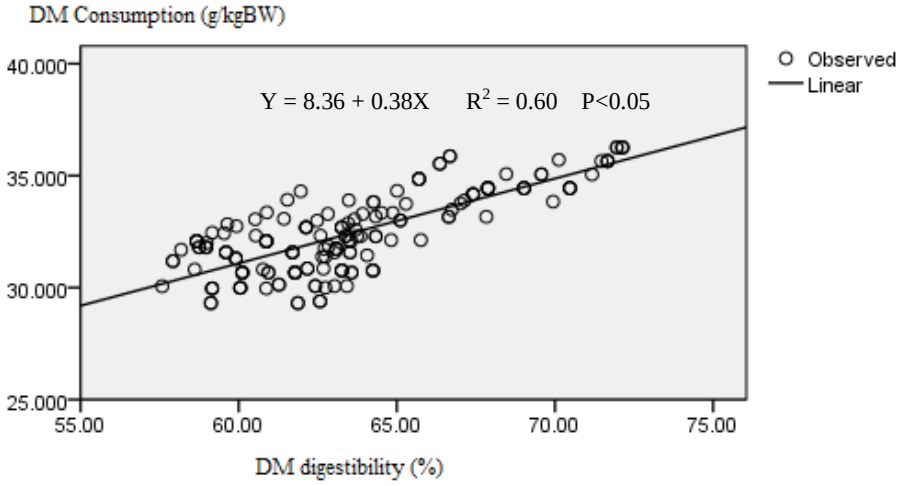

Figure 1. Relations between DM digestibility and the consumption on Timor deer.

Improved digestibility (%) of dry matter and nutrient digestibility of diets lead to increased consumption of nutrients ingested by deer (Table 8). Increased consumption of digested nutrients reflects increased compliance nutrients to the physiological needs of Timor deer.

Table 8. Dry matter and nutrient digested (Mean±SD).

		Rations		
Nutrient	**A**	**B**	**C**	**D**
Digestible DM (g/kgBW)	23.98±1.21 ^{a}	19.63±1.04^{c}	20.25±1.03^{b}	18.76±0.73^{d}
Digestible CP				
- g/kg BW	4.95±0.18 ^{a}	3.96±0.21 ^{b}	3.85±0.17 ^{c}	2.92±0.16 ^{d}
- g/kg BW$^{0.75}$	11.46±0.55^{a}	8.69±0.45 ^{c}	9.21±0.43^{b}	6.44±0.34 ^{d}
DE (MJ/kg BW)	0.432±0.01^{a}	0.343±0.02^{c}	0.387±0.02^{b}	0.321±0.02 ^{d}
Digestible OM (g/kg BW)	21.35±0.90^{a}	17.54±0.95^{c}	19.08±1.04^{b}	17.41±0.85^{c}

Note: *Different letters in the same line indicate significant differences (p <0.05).

Digestible dry matter of ration A significantly different from the other rations (P <0.05). Digested protein per body weight (g / kg BW) four significantly different rations, in order from highest to lowest rations A, rations B, C and D. Digested protein per metabolites body weight (g/kg BW$^{0.75}$) also ration A shows that the highest and ration D the lowest. However, consumption of protein per metabolites body weight ration C higher than the ration B

From the results of studies on the Timor deer and several studies on DM related consumption and antinutrien nutrient content of feed, it can be stated that the control of consumption (intake) in ruminants is determined by multifactorial. It depends on the characteristics of the plant related to the capacity of the digestive tract, the needs of animals and the concentration/nutrient content of feed, the digestibility of the feed, feedback digestive tract next to the consumption, the morphological characteristics of the plant and also environmental factors (including climate, abundance of food sources) (Decruyenaere *et al*., 2009). Nutrients consumed from botanical composition feed that high nutritional value is to meet of standards of maintenance and growth requirements needs for the Timor deer (*Cervus timorensis*). The results of this evaluation showed that the ration of A which is the botanical composition of Timor deer feed in TNBB that produces the best nutritional value indicates a balanced formula in terms of the needs of protein and minerals Ca and P. Rations A based on total consumption of protein, digestible protein, ME and energy consumption mineral consumption needs until the growth rate (Tuckwel 2003 and Dryden, 1999).

CONCLUSION

1. The botanical composition of the feed that strong selection (preference) and high nutritional value (5 species of forbs, 5 of grasses and 5 woodys) to produce a ration with a balanced nutrient content in terms of protein, energy ME, mineral.
2. Consumption of dry matter (DM) ration of feed composition that better nutritional value is 34.84 g/kg bw or 80.70 g/kgBW$^{0.75}$, protein consumption is 5.99 g/kgBW, the consumption of ME is 0,339 MJ/kg bw or 0.783 MJ/kg BW$^{0.75}$, consumption of calcium is 0.110 g/kgBW and phosphorus is 0.476 g/kgBW.

3. Dry matter digested, protein digested, organic matter digested and digestible energy (DE) showed the highest value on the most complete ration (ration A), are respectively as follows 23.98 g/kgBW, 4.95 g/kgBW, 21.35 g/kgBW and 0.43 MJ/kgBW).

ACKNOWLEDGMENTS

We wish thanks to Mr. Spriadi (staff of Bali Barat National Park) and Mr. Adi who assisted in plants spesimen colleted in the field. Thanks are expressed to Mr. Karnita and Mr Putu Eka Antara who has assisted in research in captive deer.

REFERENCES

Arora, S.P. (1995). Microbial Digestion in Ruminants. Indian Council of Agricultural Research, New Delhi.

Behgar, M., Valizadeh, R., Mirzaee, M., Naserian, A.A. and Nasiri, M.R. (2009). Correlation between the Physical and Chemical Properties of Some Forages and Non-Forage Fiber Source**s**. Journal of Animal and Veterinary Advances, Volume: 8 Issue: 11 Page No.: 2280-2285.

Cannas, A. (2008). Tannins: fascinating but sometimes dangerous molecules. Cornel University. Department of Animal Science.
Available from:http://www.ansci.cornell.edu/plants/toxicagents/tannin.html

Deerfarmer (2003). Nutrition requirements for deer and elk. Available from: http://www.deer-library.com/artman/publish

Decruyenaere, V., Buldgen, A. and Stilmant, D. (2009). Factors Affecting Intake by Grazing Ruminants and Related Quantification Methods: a Review. *Biotechnol. Agron. Soc. Environ.* 2009 13 (4), 559-573.

Dryden, G. (1999). Nutrient requirements of rusa deer (*Cervus timorensis*). In S. Le Bel, F. Maudet, N. Barré, D. Bourzat (eds.) *Le Cerf Rusa en Nouvelle-Calédonie*. Actes d'un séminaire, Port Laguerre, 18 et 19 août, 1999. Noumea: CIRAD.

Farida, W.R., Wirdaeteti dan Zein, M.S.A. (1996). Effect of Concentrate to Digest and N-Balance at Deer (*Cervus timorensis*). Media Veteriner. Vol .III No. 1: 35-42

Ginantra K., S. Putra, W. Suarna and W. Kasa (2014). Botanical Composition of forage by Timor Deer (*Cervus timorensis* Blainville) in A Monsoon Forest and Savanna of West Bali National Park. *Int. J. Pure App. Biosci.* **2 (5):** 205-213 (2014).

Garsetiasih, R. (2007). Maize and Grass Digest as Feed the Deer (*Cervus Timorensis*). *Buletin Plasma Nutfah Vol.13 No.2 Th.2007*

Garsetiasih, R. (2002). Determinasi Daya Cerna Rusa (*Cervus timorensis*) menggunakan campuran rumput (*Paspalum dilalatum*) dengan Daun Beringin (*Ficus benyamina*) daun Kebesak (*Acacia Leucophloea*) atau daun Turi (*Sesbania grandiflora*). Bul. Pen. Hutan (For.Res.Bull.) 631:41-47, 2002.

Hmeidan, M.C., G. McL. Dryden and J. E. McCosker. (2000). Predicting Digestibility in Rusa Deer (*Cervus timorensis*) Stags with Internal and External Markers. *Asian-Aus. J. Anim. Sci. 13 Supplement July* .

Kearl, L.C. (1982). Nutrien Requirements of Ruminants in Developing Countries. International Feedstuffs Institute Utah Agricultural Experiment Station, Utah State University, Logan Utah.

Nolte, D.L., Kimbal, B.A., Perry, K.R., Villalba, J.J. and Provenza, F.D. (2004). Effects of Forage Nutritional Quality (Energy and Protein) on Deer Acceptance of Foods Containing Secondary Metabolites. *USDA National Wildlife Research Center. Available from:* http://digitalcommons.unl.edu/icwdm_usdanwrc/374.

Putra, S. (2004). Manipulation of Microbes in Rumen Fermentation As One Alternative to Improve Efficiency of Use of Substances Food. Department of Animal Nutrition and Forage, Faculty of Husbandry, Udayana University.

Takandjandji, M. (2009). *Growth of Timor Deer* (Cervus timorensis timorensis Blainville) *on Various Combination of Feeds*). *Info* Hutan Vol. VI, No. 2 : 207-215, 2009

Ranjhan, S.K and G. Krishna (1980). *Laboratory Manual for Nutrition Research*. Vikas Publishing House Pvt. Ltd., New Delhi.

Sinaga, Y. (1997). Elephant Grass as Substitute Control Mineral Macro Analysis on Foliage. Livestock research centers Ciawi, Bogor.

Shipley, L. (1999). Grazers and Browsers: How Digestive Morphology Affects Diet Selection. Available at: www.cnr.uidaho.edu/

Sookhareea, R. and Dryden, G.Mcl. (2004). Consumption and Digestion of Forage by Male Russa (*Cervus timorensis*) Deer- the Effects of Castration and Season. Asian-Australian Journal Vol. 17/8.

Tilman, A.D., Hartadi, H., Reksohadiprodjo, S., Prawirokusumo, S. dan Lebdosoekojo, S. (1991). Ilmu Makanan Ternak Dasar. Gadjah Mada University Press.

Tuckwell, C. (2003). Deer Farming Hanbook. Deer Industry Association of Australia. Available from: http://deerfarming.com.au/index.html

Tomkins, N.W. and McMeniman, N.P. (1996). Nitrogen Metabolism in Rusa Deer (*Cervus timorensis*). Proc. Aust. Soc. Anim. Prod. Vol 21. Dept. of Farm Animal Madicine and Production, The University of Queensland.

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