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Characteristics Fluid Rumen from ration With Ratio Rumen Degradable and Ungradable Protein which Different In-Vitro

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ABSTRACT

Study thi Study this aim to get formulation ration with ratio RDP and The best RUP from a combination of forage feed (field grass, titonia and sweet potato leaves) and concentrate (dregs know, sweet potato wood and bran) for characteristics condition fluid rumen. A random block design with three (3) treatments and five (5) groups was used in this research. The treatment were enhancement ratio RDP and RUP in ration where P1= 50:50, P2= 55:45, P3= 60:40. The result of the research showed that ratio RDP and RUP which use forage (grass field, titonia and leaf sweet potato sweet) and concentrate (dregs know, sweet potato wood and bran) gave a very significantly different effect (P<0.01) on VFA, and which was not significantly different with respect to pH and NH3. Where the pH and NH3 values are at condition normal and VFA highest on P2 (55:45)s aim for get formulation ration with ratio RDP andThe best RUP from a combination of forage feed (field grass, titonia and sweet potato leaves) and concentrate (dregs know, sweet potato wood and bran) for characteristics condition fluid rumen. Study this use design Random Group with three (3) treatment and five group. Treatment is enhancement ratio RDP and RUP in ration where P1= 50:50, P2= 55:45, P3= 60:40. If results analysis diversity show existence significant difference between treatments then continued with the DNMRT test. Research result show that ratio RDP and RUP which use forage (grass field, titonia and leaf sweet potato sweet) and concentrate (dregs know, sweet potato wood and bran) gave a very significantly different effect (P<0.01) on VFA, and which was not significantly different with respect to pH and NH3. Where the pH and NH3 values are at condition normal and VFA highest on P2 (55:45)

keynote: ***RDP, RUP, digestibility, rations, In-Vitro.***

1. INTRODUCTION

Feeding for ruminants must also pay attention to the needs of ruminants rumen microbes and host animals. Microbial proteins are synthesized by the microbes themselves by utilizing feed sources of protein and energy sources. Energy source feed will fermented produce VFA which working as framework carbon whereas feed source protein will experience degradation Becomes NH3. Results synchronization between feed degradation of energy and protein sources will maximize microbial protein synthesis. Microbes that are lysed and microbes that are carried by digesta will enter to in post rumen and experience metabolism protein in insmall intestine. Meanwhile, proteins that are not degraded will go directly to the post-rumen and experience metabolism protein in the intestines fine.

Growth microbes rumen need optimized for increase supply protein microbes. Protein Rough which consumed by cattle ruminants must provide degraded protein which is a nitrogen source for protein synthesis microbial and non-degradable proteins for host animals. The presence of rumen microbes causes ruminants not to depend on protein, because rumen microbes can act as a source of high-quality protein for ruminants. However for cattle productivity tall like When cattle phase pregnant and phase lactation, Microbial protein alone is not enough to meet their needs, protein by is neededpass that can be directly used by the host livestock, so the feed must be able to provide nitrogen for microbes (RDP) and a direct source of protein for animals host (RUPS) Ratio RDP and RUP which appropriate required for optimizing production cattle which more efficient. Data RDP and RUP ingredient feed in Indonesia and ratio RDPand the RUP is not widely available. The need for ruminants for protein consists of two type protein that is the protein that easy to degrade *(Rumen Degradable Protein)* and non-degradable protein *(Rumen undegradable Protein)* or ordinary called with *by pass proteins* . Rumen degradable protein (RDP) is the fraction of protein that is degraded microbes in the rumen. RDP is degraded to produce ammonia as a source of N for microbes in microbial protein synthesis. Feeding low RDP levels inlivestock that consume low quality feed will cause a decrease in consumption and digestibility (Bouchers, et al, 2007). Enhancement RDP will increase digestibility dry, however rate RDP which too tall will cause the formation of NH3 in excess amounts, exceeds the ability of rumen microbes in formation protein microbes.

NH3 which too much will absorbed to in vessels blood through wall rumen going to to heart for process recycling urea forformation urea. Synthesis urea no only need energy but also minimize tendencies for nitrogen recycling (N), which results in bad performance ruminants (Akhtar, et.al, 2016; Sultan, et.al, 2009). *Rumen Undegradable Protein* (RUP) is a protein fraction that is resistant to degradation the rumen then passes directly to the intestine so that the livestock can meet their needs of amino acids. An increase in RUP levels does not only increase dry matter intake however also increase PBBH and efficiency feed (Akhtar, et.al, 2016). However RUPgiven too much will result in low levels of NH3 in the blood, which finally will lower production protein microbes, and digestibility ingredient organicand feed fiber, whereas gift RDP which too excessive will result incattle poisoning ammonia and deficiency sour amino essential. So that need balance RDP and RUP to increase livestock productivity, which is now still not yet many noticed by breeder.

Plant legumes is plant protein tall however low the degradation in rumen. Leguminous which available in Indonesia which can used as a source of RUP include field grass, titonia, and sweet potato leaves sweet. Sweet potato leaves (*Ipomea batatas)* are agricultural wastes that are very suitable to be used as feed and as well as good nutritional content for livestock. The sweet potato tuber is food for humans while the leaves are is remnants agriculture which already used for cattle cow, goat, sheep and poultry (Heuze *et al.,* 2015). Cover, *et al* (2018) stated the content of sweet potato leavesis PK 16.72%; SK 25.81%; LK 3.16%; Ca 1.09%; P 0.42%. Whereas legumes as source protein forage which often used is titonia, which his existence easy found.

Titonia is often used as an additional feed for ruminants, because has a fast growth in the nutritional content of whole plants (leaf + stem) titonia that is protein Rough 22.98% and fiber Rough 18.17% (Jamarun *et al* ., 2017). Fasuyi *et al.,* (2010) stated that titonia leaves contain amino acids that enough complex. Sour amino essential for growth microbes rumen like Methionine, leucine, isoleucine and valine are present in the titonia plant (Oluwasola and Dayro, 2016). Digestibility test is needed to determine the potency of the feed that can be consumed utilized by livestock.Production sour fat fly (VFA), concentration NH3 and pHThe rumen describes the level of fermentability of foodstuffs. How much quantity VFA, NH3 and concentration pH which formed of course will influenced by ratio feed given to livestock. Giving high forage to ruminants

will increase

levels of acetic acid. Higher VFA production describe ingredient very fermentable, so that energy which available for cattle more and more. For rumen microbes, VFA has a dual role, namely: source energy and framework carbon for formation protein microbes and NH3 (Hume, 1982). In the laboratory the total VFA, NH3 and the degree of acidity pH can be determined with see characteristics fluid rumen by in vitro.

The purpose of this study was to obtain a ration formulation with a ratio of The best RDP and RUP from a combination of forage feeds (field grass, titonia and leavessweet potato) and concentrates (tofu pulp, cassava, and bran) to optimize characteristics condition fluid rumen

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2. MATERIALS AND METHODS

Research Place.

carried out in the Ruminant Animal Nutrition Laboratory of the Faculty of Farm University Andalas field

Theory Study

The equipment used is a set of tools to measure the degradation of substances food *in-vitro in the* form of a water bath shaker, gauze, plastic funnel, water flask, thermometer, measuring cup, and equipment used to measure rumen fluid (pH, VFA, and NH_3) that is Cup *Conway* , ball suck, pipette measuring, pipette drops, set titration apparatus, a set of distillation apparatus, Erlenmayer, pH meter and gas stove. Tool formake a Mc'Dougalls solution, namely a glass beaker, a measuring flask with a capacity of 1 liter, magnetic stirrer, erlenmayer, pH meters, stem stirrer, scales, spoon, and tools other laboratories which needed.

The material used in this research is field grass, Titonia (*Tithonia diversifolia*), leaf sweet potato sweet (*Ipomoea limit)* , concentrate (dregs know, bran,sweet potato wood), fluid rumen and solution Mc Dougalls as well as ingredient chemical for analyze pH,VFA, and NH_3.

Method Study

Study conducted by experiment by in-vitro with design which used is a Randomized Block Design with 3 treatments and 5 groups test. Grouping based on time taking fluid rumen. As for treatment in study this Among other as following:

P1 = RDP : RUP (50:50),
P2 = RDP : RUP (55:45),
P3 = RDP : RUP (60:40)

Parameter which Be measured,

a. pH fluid rumen
b. Production NH3 _ rumen
c. Production VFA total

Work procedures ration Test

The experimental ration used was 3 rations which were arranged and stirred alone from various ingredient feed that is: Grass Field, Titonia (*Tithonia diversifolia*), sweet potato leaves (*Apomea batatas*) and concentrates (tofu pulp, cassava, bran). The content of food substances from the feed ingredients that make up the ration can be seen in Table 2. The rations are prepared with TDN 64-67% and PK 12-14% with a balance of forage and the concentrate is 70:30.

Table 2. Composition Content Ingredient Feed

Ingredient feed	Content substance food (%)							
	BK	PK	SK	LK	BETN	TDN	RDP	RUP
Rumput lapangan	90,19	8,40	27,59	0,91	49,48	57,63	58,48	41,52
Daun ubi jalar	85,71	16,72	16,48	10,36	43,38	70,66	31,68	68,32
tithonia	87,63	22,98	18,04	4,71	41,20	67,39	24,08	75,92
Ampas tahu	94,02	20,93	21,43	10,31	36,69	79,00	75,36	24,64
Ubi kayu	89,95	3,59	3,38	0,65	89,67	79,00	63,87	36,13
Dedak	89,34	11,09	26,80	9,01	42,50	68,00	73,26	26,74

Sumber: Analisa Laboratorium Nutrisi Ruminansia Faterna UNAND. 2020

Table 3. Formulation ration

Ingredient feed	treatment (%)		
	P1	P2	P3
forage :			
Grass field	30	44	59
Leaf sweet potato sweet	20	15	8
Tithonia	20	11	3
Concentrate :			
dregs know	14	20	20
sweet potato wood	8	2	2
Bran	7	7	7
Mineral	1	1	1
Total	100	100	100

Information : calculated based on table 1.

Table 4. Content Nutrition ration Treatment

ration 1 (Ratio RDP : RUP = 50:50)

BK Material (%)	PK (%)	SK (%)	LK (%)	BETN (%)	TDN (%)	RDP (%)	RUP (%)
Grass Court 27.06	2.52	8.28	0.27	14.84	17.29	17.54	12.46
Tithonia 17.53	4.60	3.61	0.94	7.22	13.48	4.82	15.2
Sweet potato leaves sweet 17.14	3.34	3.30	2.07	7.44	14.13	6.34	13.66
Sweet potato 7.20 . wood	0.29	0.27	0.05	6.45	6.32	5.11	2.89
Dregs Know 13.16	2.93	3.00	1.44	4.83	11.06	10.55	3.45
Bran 6.25	0.78	1.88	0.63	2.66	4.76	5.13	1.87
Minerals 0	0	0	0	0	0	0	0
Total 88.34	**14.45**	**20.33**	**5.41**	**43.44**	**67.04**	**49.98**	**50.02**

ration 2 (Ratio RDP : RUP = 55:45)

Grass Field	39.68	3.70	12.14	0.40	21.77	25.36	25.73	18.27
Tithonia	9.64	2.53	1.98	0.52	3.97	7.41	2.65	8.4

Sweet potato leaves								
sweet	12.86	2.51	2.47	1.55	5.58	10.60	4.75	10.25
Sweet potato	1.80	0.07	0.07	0.01	1.61	1.58	1.28	0.72
Wood Dregs	18.80	4.19	4.29	2.06	6.90	15.80	15.07	4.93
Know Bran	6.250	0.780	1.880	0.630	2.660	4.760	5.130	1.870
Mineral								
Total	**89.04**	**13.77**	**22.83**	**5.18**	**42.49**	**65.51**	**55.16**	**44.84**

ration 3 (Ratio RDP : RUP = 60:40)

Grass 51.41	. field	4.79	15.73	0.52	28.20	32.85	34.50	24.50
Tithonia	2.63	0.69	0.54	0.14	1.08	2.02	0.72	2.3
Sweet potato leaves	8.57	1.67	1.65	1.04	3.72	7.07	2.53	5.47
Sweet potato		0.07	0.07	0.01	1.61	1.58	1.28	0.72
1.80 . wood Dregs	18.80	4.19	4.29	2.06	6.90	15.80	15.07	4.93
Know Bran	6.250	0.780	1.880	0.630	2.660	4.760	5.130	1.870
Minerals								
Total	**89.47**	**12.18**	**24.15**	**4.40**	**44.18**	**64.08**	**59.84**	**40.16**

Preparation Ingredient ration

Ingredient feed which will used consist from feed forage and concentrate. Feedthe forage used is field grass and tithonia, sweet potato leaves taken in the Muara Panas area. Meanwhile, concentrate feed consisting of rice bran is taken from heller in Koto Baru, Solok Regency, tofu dregs obtained from the tofu factory Putri Tunggal in Solok City, and cassava from the waste of making sanjai chips which is at in Saok Laweh. All ingredient feed which will used dried until dry which marked by already start broken. Then grind untilfine use machine grinder. After fine, ingredient feed ready for mixed in accordance formulation ration test and mixed by homogeneous.

Making Solution Mc'dougalls

Preparation fluid Mc'Dougalls as buffer in implementation *in vitro.* Solutionwhich used amount in accordance with amount sample which will used.

Table 5. Ingredient Solution Mc'dougalls

Ingredient solution	Amount (g/liter)
$NaHCO_3$	9.80
$Na_2HPO\ 4.7H_2O$ _	3.68
KCL	0.57
MgSO 4.7H2O _	0.12
NaCl	0.47

Source : Tilley and Terry (1963).

All ingredients dissolved with distilled water become 1 liter, while the solutionbuffer this prepared a day before fermentation then placed in shaker water bath on temperature 39°C and flowed gas CO2 During 30-60 second for maintain anaerobic conditions, the pH is measured close to neutral which is 7. If the pH is smallof 7 or under acidic conditions add 20% NaOH and vice versa if the pH is largefrom 7 or in condition language so add HCl 1.25%.

Taking Fluid rumen

Fluid rumen taken on morning day moment goat cut in House Eat. Fluidrumen inserted into the thermos so that fixed temperature 39°C and conditions permanent *anaerobic*. Then brought to laboratory which equipment fermentation *in-vitro* has prepared. Fluid rumen taken on day which same, made one group test.

Implementation *In Vitro*

Each ration was weighed as much as 2.5 g (BK) and then put into the Erlenmeyer tube size 250 ml. Rumen fluid mixed with Mc. Dougall in a 1:4 ratio. Erlenmeyer tube that has been filled with the sample rumen fluid mixture was added with Mc solution. Dougall as much as 250 ml. Besides that, also added treatment blank which only entered mixture fluid rumenwith solution Mc. Dougall without sample. All treatment is repeated Triple. Then incubated using a *shaker water bath* at 39 ^{oC} for 48 hours. Process

Fermentation is stopped by immersing the Erlenmeyer tube with ice cubes for stop activity microbes, then conducted measurement pH.

The next step is to separate the supernatant from the residue. *In vitro* results entered into in *centrifuge* tube then separated with tool *centrifuge* During 30 minute with speed 1200 rpm until occur separation Among supernatant and residue. The residue will settle to the bottom and the supernatant is at the top. The supernatant was put into a bottle and stored in a *freezer* for analysis of total VFA, individual VFA, and NH^3. While the residue filtered with whatman paper No. 41 and then dried in an oven at 60 ^{o}C, then conducted analysis digestibility substance food.

3. RESULTS AND DISCUSSION

Table. Average Score pH, NH3, VFA From ration With Ratio Rumen DegradableAnd Undegradable Protein Which Different By *In-Vitro.*

Treatments	pH	*NH3(mg/100ml)*	*VFA (mM)*
P1	6,92	13,66	124.00 ^{b}
P2	6,93	13,84	127.00 ^{a}
P3	6,91	14,34	99.00 ^{c}
SE	*0,01*	*0,04*	*0,08*

Note: superscript which different on column which same showing influencedifferent real (P < 0.01)

Can be seen from the table above that the pH value of the rumen fluid is not significantly different(P>0.05). The pH values obtained ranged from 6.91 to 6.93. This matter caused because content RDP and RUP which given no result in happening difference degrees acidity fluid rumen by in vitro. Thing this could caused because between ration treatment originated from source feed which same. Giving rations with RDP up to 60% in the ration does not interfere with the process fermentation and digestion in the rumen. In line with Brooks *et al.* (2012) the state enhancement level RDP in ration no give results which differentreal on score pH rumen. Study previously show that with increasing levels of degraded protein in the ration did not affect the pH value rumen (Which *et al.*, 2016).

Giving ration on treatment which increase content RDP and lower RUP show that environment rumen is at in state balanced,

so that the breakdown of food ingredients from all treatments is able to makemicrobes rumen

active in process metabolism, because availability nutrients and ingredient base (precursor) in state balanced and adequate. The pH value obtained is still relatively normal for microbes rumen. This statement is supported by the opinion of Jamarun (2013) which states that pH The optimal rumen for digestive activity in the rumen is 6.0 – 7.0. pH valuefluid rumen which not enough from 6.0 or on 7.0 could hinder process proteolysis.

Results study this, for whole treatment gives response which goodto pH rumen. Thing this seen from range pH rumen is at on condition pH rumennormal so that the activity of cellulolytic bacteria is not inhibited. This corresponds to opinion (Orskov, 1982) that activity bacteria cellulolytic hampered if pH fluid rumen under 6.2 whereas bacteria amylolytic will more dominant so that digestibility fiber Rough will decrease, and activity will optimal in in rumen on pH 6.7.

The results of the analysis of diversity show that the treatment has a different effect not significant (P>0.05) on the rumen fluid NH3 concentration . The NH3 content got on study this range Among 13.66 mg/100 ml until with 14.34 mg.100ml. Thing this could caused

Other factors that also affect production Ammonia in the rumen include the protein could grow and develop as well as play a role

by enhancement ratio RDP in ration no affect the performance of microbial protein synthesis in the rumen. According to opinion Das *et al.*, (2014); Ningrat *et al.,* (2019) stated that rumen microbes, especially bacteria proteolytic utilise feed source RDP with method secrete enzyme proteasefor change protein Becomes peptides. Bacteria proteolytic secrete enzyme peptidase that converts peptides into amino acids. Furthermore, the enzyme deaminase secreted by bacteria to convert amino acids into NH3 which has role main in synthesis protein microbes.

Not significantly different (P> 0.05) the results obtained at this NH3 concentration also caused by the provision of rations to treatments that make tofu dregs be a source of easily degraded protein and a source of N for microbes, which on ration test (P1, P2, P3) no have range number which no toohigh with each percentage P1=14%, P2=20% and P3=20% (Table 3). So that the ammonia produced in the fermentation process in the rumen is also almost same. Ammonia is precursor main for synthesis protein microbes because inability microbes rumen by direct take advantage of sour amino forbody (Jayanegara *et al.*, 2017). fraction of the ration, the rate of protein degradation in the rumen, feed rate, and

efficiency of conversion of ammonia to microbial protein (Makmur *et al al.*, 2020b)

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Results analysis diversity show treatment give influence different very significant (P<0.01). This could be due to an increase in the RDP ratio in the ration affect the degradation of easily degradable organic matter by rumen microbes utilized as source energy for ruminants. Thing in accordance with opinion Zahera*et al.,* (2020), which stated the high and low total VFA production showed high low organic matter that is easily degraded by rumen microbes that are utilized as a source of energy for ruminants. Added Hackmann *et al.* (2015) the found that decreasing feed carbohydrate degradation could decrease VFA. It has also been reported by May *et al.*, (2014); Paula *et al.,* (2016) that the variation in the level of RDP changes the total VFA level. Microbial degradation of feed produces ATP which will used by host, and VFA which will utilized by microbes rumen as source carbon for shape protein microbes (Brooks *et al.*, 2012; Lascano*et al.*, 2016).

After further testing of DNMRT, P2 showed a very significant difference (P<0.01) more tall compared P1 and P3, whereas P1 show significantly different (P<0.01) higher than P3 but lower than P2 and P3 showed significantly different (P<0.01) lower than P2 and P1. The high VFA that generated in P2 this can be caused by a balance between the energy supply and nitrogen from ration with RDP 55%. Wahyuni *et al* ., (2014) state VFA concentration is the result of fermentation of feed ingredients will describe the level solubility carbohydrate and protein During process fermentation. Level tall The low concentration of VFA indicates the ease with which carbohydrates are fermented, The higher the VFA, the higher the carbohydrate and protein fermentedin in rumen (Susilo *et al.*, 2019).

Low concentration VFA on P3 this caused because happening drop digestibility ingredient organic and digestibility fiber Rough, where ingredient organic and fiber Rough is the main component for the formation of energy. According to Yang's opinion*et al.,* (2015) which states that total VFA is a product of rumen microbial activity from digesting energy sources in feed. High and low VFA production according to Arora (1995) is influenced by the level of fermentability of feed ingredients, the amount of carbohydrates soluble, rumen pH, digestibility of feed ingredients, and the number of different types of bacteriais in the rumen. According to the opinion of Hume (1982) which states that an increase in

concentration VFA reflect enhancement protein and carbohydrate feed which easylate. High VFA production is sufficient energy for livestock (Sakinah, 2005).

4. CONCLUSION

From the results of the study it can be concluded that the effect of the ratio of rumen degradable proteinand rumen undegradable protein in the diet has a different effect very significant ($P<0.01$) on VFA, and the effect that was different was not significant ($P>0.05$) to pH, and NH3. Where the pH and NH3 values are in normal conditions and VFA highest on P2 (55:45)

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