

Effectiveness Of Ruminant Feed Formula From The Fermented *Eichhornia Crassipes* To Produce The High Level Protein Of Goat Meat

Herlina Fitrihidajati^{1,2,3}, Isnawati^{1,2,3}, Evie Ratnasari^{1,2,3}

^{1,2,3}Department of Biology, Faculty of Mathematics and Science, University of Surabaya
Surabaya, East Java, Indonesia

In this research, before is applied the feed formulas that is created in this research, the nutritional value of the fermented Water hyacinth is measure by proximate analysis. In this research have applied three kinds of feed formulas to three groups of the goat. Then, the goat is taken it's meat and the protein level of the meat is measured too. The nutritional value of fermented Water hyacinth is feasible to use as the materials of the feed formulas. The weight gain of goats that is given feed formula I and II are 2,01 kg per month and the weight gain of goats with feed formula III is 2.13 kg per month. On the other hand, the weight gain of the goat with the conventional feed is 1.5 kg per month. Addition, the meat protein content of goat that is given three kinds feed formulas is made in this research are feed formula I=17.0198%, feed formula II=18.2870%, feed formula III=18.8037. The meat protein contains goat with the conventional feed is 16.6%. Actually, all three types of feed formulas are made in this research have high nutritional value and can trigger weight gain better than that conventional feed. The feed formula III is the best feed formula to increase the goat body weight and the goat meat protein percentage increase about 1- 1.5%.

Keywords: *Eichhornia crassipes* , the ruminant feed, and high level protein of meat.

1. INTRODUCTION

Eichhornia crassipes can grow so quickly in the water and disturb and damage the water environment (Anonymous, 2005). Because of that, some efforts should be made to handle it to protect the negative effect of water environment disturbing. One kind of the solution is utilizing the plant as an animal feed so that weeds waters become something of economic value. This is a possible item because of high nutrient content in the Water hyacinth. The plant contain dry matter of about 7%; 11.2% crude protein; 18.3% crude fiber; BETN 57%;

crude fat 0.9%; 12.6% ash; Ca 1.4%; and P of 0.3% (Fuskhah, 2000 in Tristiarti et.al, 2006).

Recently a lot of research is done on the using of Water hyacinth for animal feed. First, the research related to the using Water hyacinth for the ducks feed (Wahyono, et al., 2005), and the duck is given the feed produced the high levels protein eggs (Abadi, 2009). Water hyacinth is also good fish feed especially Nila (*Oreochromis niloticus*) (Muchtaromah, et al., 2009), as well as feed ruminant animals such as goats because of high protein and carbohydrate content in the plant-fermented (Fitrihidajati, et al., 2013). According to the Fitrihidajati, et al., (2014) biomass of goat that is given

the feed of Water hyacinth -fermented increased high. The protein content of the goat meat 1% higher than that is given with conventional feed (Suparno, et al., 2015).

The fermentation process is very important to be applied to the plant in order to the plant can be used as the feed that has a higher nutritional value and better of level digesting. Some studies fermentation in Water hyacinth was done. Purwanto (2005) in Tristiartiet al., (2006) reported that the best long fermentation of the plant with *Aspergillus niger* is 6 weeks, with PK levels of 18.84% and 15.73% SK levels. In this case, the *Aspergillus niger* is a probiotic. The addition of probiotics increases the acceleration of the fermentation process. Probiotics are living microorganisms that can improve the health and physiological benefits when consumed (Chestnut, 1999 in Wahyudi, 2004)

Several studies related to the using of probiotics was done. The research conducted by Isnawati (2007) has succeeded in developing a probiotic that can be used to decompose the materials is derived from plants quickly. The other researchers were successful to conducted the research related to rice straw, corn straw and soybean hay fermentation and implemented in ruminants (Isnawati, 2010). The using of a mixture of various types probiotics such as of cellulolytic, proteolytic and lipolytic microorganisms produced high quality feed for the cattle from the raw material of corn straw (Linda, 2010), from the raw materials of rice straw (Hardini, 2010) and from the raw materials of soybean straw (Romadlona, 2010). The using of a probiotic mixture of different types of microbes more advantageous than the using of a single microbial as the fermentation agents. In addition, the using of EM (Effective Microorganism) as the probiotics can also speed up the process of organic material decomposition of (Fitrihidajati and Ratnasari, 2005). Therefore, in this study will be used the ragi tempe (one kind of the yeast) as the fermentation agents of Water hyacinth fermentation process. The yeast is a mixture of various microorganisms.

The fermentation process will improve digestibility, increase nutrient absorption, improve rumen microflora balance, increase endurance, and eliminate or decrease pathogenic microorganisms (Chestnut, 1999 in Hendraningsih, 2004). In the fermentation process, the protein will turn into peptides, amino acids, ammonia, the fats will turn into volatile fatty acids, and carbon dioxide (Van Soest, 1984). There are several important points that must be had the probiotic bacteria that is normally present in the digestive tract. The bacteria must have a shorter regeneration time, produce substances to block the growth of pathogenic microorganisms and strong enough to withstand the packaging process (manufacturing) and distribution so that it can be moved into the intestine in a state live (Damry, 2009).

As a support to obtain these properties, in the fermentation process is added molasses, according to the opinion of Pond et al (1995) in Priyono (2009) which states that molasses are a major waste of sugar refining industry. Molasses has a crude protein content (PK) 3.1%, crude fiber (SK) 0.6%, extract materials without nitrogen (BETN) 83.5%, crude fat (LK) 0.9%, and ash 11.9 % so

as to improve the fermentation nutrients. Based on the nutritional content, there are two kinds of molasses: (1) Cane-molasses, molasses has a sucrose content of 25-40% and 12-25% reducing sugar with a total sugar content 50-60% or more. Levels of crude protein (CP) approximately 3% and ash content of about 8-10%, which is largely made up of potassium, calcium, chloride, and sulfate salts; (2) Beet-molasses a laxative feed which is normally given to cattle in small quantities of about 0.5% (Donald et al, 2001 in Priyono, 2009).

According to Guntoro opinion (2002) more and more types, the fresh feed of plants is given to the cows will be better, because the element of nutrients (carbohydrates, proteins, fats, vitamins, and minerals) will be more complete. Based on this study it was not good to apply the Water hyacinth as the singly animal feed. In this research, the plant was mixed with the other water plant namely "Kangkung" (*Ipomoea aquatic*). This plant contain some kinds of substances such as vitamin A, vitamin B1, vitamin C, protein, calcium, phosphorus, iron, with a protein content of 3% and energy 29 kcal (Bright, 2012). Increasing the protein content of the feed is done by adding ampas tahu (solid waste in the tahu production process) to the feed. Ampas tahu has a high nutritional content such as protein and carbohydrates to 17% to 67% (Bright, 2012) in addition to the substance of these nutrients, ampas tahu also have another nutrient content is 3.79% fat, water and ash 51.63% 1, 21%, it is possible pulp to be added into animal feed (East Java Provincial Animal Husbandry Department, 2011).

This study has been carried out by the manipulation of feed formulation levels of Water hyacinth-fermented, dried kale and ampas tahu. Fermentation techniques were applied following the best results of previous studies (Fitrihidajati, et al., 2013) so that the research will produce the best formula of ruminant feed that contains three ingredients as mentioned above. Furthermore, the feed formula is implemented to three groups of a goat. Each group has nine members of a goat. After ten days the biomass of goat and the protein level in its meat is measured.

2. METHOD

The materials are used in this research include the feed formula I (ampas tahu/pulp 30%, 35% Water hyacinth-fermented, dried kale 35%), the feed formula II (ampas tahu/pulp 35%, 30% Water hyacinth-fermented, dried kale 35%) and the feed formula III (ampas tahu/pulp 35%, 35% Water hyacinth-fermented, dried kale 30%), the three groups of goat (each group has nine members), balance and the tools and reagents for nutrient content analyze.

This study was an experimental study. Manipulation variables in this study were the percentage component of ruminant feed formula. There are three formulas, namely the formula I that contain (ampas tahu/ pulp 30%, 35% Water hyacinth-fermented, dried kale 35%), the formula II (ampas tahu/pulp 35%, 30% Water hyacinth-fermented, water spinach Rendeng 35%) and formula III / III ration

(pulp 35%, 35% fermented water hyacinth, dried kale 30%). The response variable in the research is biomass of goats and the level protein in the goat meat. Control variable of this research is the age and condition of Water hyacinth and kale, types of probiotics, goats gibas weighing 20-25 kg, and the probiotic inoculum as much as 0.15 grams for each treatment and conditions of ampas tahu. Then, the feed is applied to three group of goat (each group has nine members of goat) for 10 days, then the goat's weight and protein content is measured. The data is analyzed with qualitative and quantitative descriptive analysis to obtain the findings or conclusions.

3. RESULT

The first result of this research is the nutritional value of fermented Water hyacinth. The following table displayed this value.

Table-1. Nutritional value of fermented Water hyacinth for five days fermentation period

No	Sample Code	ANALYSIS RESULT(%)						
		Dried Material	D u s t	Crude Protein	Crude Lipid	Crude Cellulosa	KH	ME (Kcal/kg)
1	V0.L5	32.4970	8.1681	4.6958	2.4114	10.9431	17.2217	85
2	V1.L5	23.8642	6.2166	4.5914	2.2253	6.2500	10.8309	496.66
3	V2.L5	25.9936	5.7981	5.1146	2.7824	6.4569	12.29	601.07
4	V3.L5	28.8609	6.4102	4.8301	2.4662	7.3903	15.1544	641.78
5	V4.L5	25.6951	5.8889	4.8843	2.2343	6.8651	12.6876	554.22

Table-2. Nutritional value of fermented Water hyacinth for ten days fermentation period

No	Sample Code	ANALYSIS RESULT (%)							
		Dried Material	D u s t	Crude Protein	Crude Lipid	Crude Cellulosa	BE TN	ME (Kcal/kg)	KH
1	V0L10	40.0630	9.4630	3.6525	1.7091	16.629	8.6085	601.23	25.2384
2	V1L5 (C)	75.6872	17.7	10.1	5.8537	15.409	26.554	177.8	41.9637
3	V1L10	42.4818	10.8233	6.9862	2.2918	12.743	9.6374	782.82	22.3805
4	V2L10	40.4395	10.7599	7.1514	2.6139	10.035	9.8791	813.92	19.9143
5	V3L10	42.6386	10.3097	6.6413	1.5904	13.041	11.055	773.74	24.0972
6	V4L10	44.081	11.553	6.9251	1.4271	12.377	11.798	797.17	24.175

	7	6	5	4	9
--	---	---	---	---	---

Based on Table 1 and Table 2 can be stated that the fermented Water hyacinth is feasible to use the component of ruminant feed formulas. The protein contains fermented Water hyacinth high enough. Based on the data can be stated that the Water hyacinth which ferments for ten days have the nutritional value more high than Water hyacinth that ferment for five days.

The results that have been achieved in this research include application the feed to goat and measuring the goat weight and meat protein level of goat dafter 10 days application. The detailed description of each product is as follows. In this study, there are three kinds of feed formulas that contain three materials as mention in the materials and methods above.

The feed formulas then are applied as feed for goats for 10 days as an independent feed without any mixture or the addition of another feed. Each feed formula is given for nine goats with 2 times application daily at 09.00 and 17.00. The goat is maintained in Tegalrejo, Barend, Jombang. Calculation of weight gain of sheep is done by reducing the weight of sheep after treatment with lamb weight prior to treatment.

Table 3. Weight Gain of the goat which is given feeds formula I, II and III for 10 days

Treatment	Repeat	The prior goat weight (kg)	The last goat weight (kg)	The adding goat weight (kg)	The average adding goat weight (kg)
Feed formula I	1	24,5	25,17	0,67	0,67
	2	22	22,68	0,68	
	3	23,5	24,18	0,68	
	4	22	22,67	0,67	
	5	24	24,68	0,68	
	6	22	22,66	0,66	
	7	24	24,68	0,68	
	8	23	23,67	0,67	
	9	23,5	24,18	0,68	
Feed formula II	1	23	23,67	0,67	0,67
	2	23	23,67	0,67	
	3	22	22,66	0,66	
	4	24,5	25,18	0,68	
	5	22,5	23,16	0,66	
	6	24,5	25,17	0,67	
	7	23	23,67	0,67	
	8	24	24,67	0,67	
	9	23,5	24,16	0,66	
Feed formula III	1	24	24,7	0,7	0,71
	2	22,5	23,19	0,69	
	3	24	24,69	0,69	
	4	22	22,68	0,68	
	5	23,5	24,19	0,69	
	6	22	22,67	0,67	
	7	25	25,9	0,9	
	8	22,5	23,16	0,66	
	9	24,5	25,18	0,68	

After application of the feed formulas, the goats are

slaughtered to get their meat and then is analyzed the nutritional content of the meat.

Table-4. The nutritional value of goat meat

No	Sample Code	Nutritional value of (%)							
		Dr ied m ate ria	a s h pr ote in	Cr ud e pr ote in	Cr ud e fat	Cr ud e cel lul ose	Ca	B E T N	M E (K cal /K g)
1	Ransum 1	22,	1,1	17,	2,2	1,8	3,0	0,6	75
		92	41	01	51	73	04	38	7,3
		49	5	98	8	5	1	3	3
2	Ransum 2	30,	0,9	18,	2,3	1,7	2,6	7,1	10
		60	66	28	87	60	52	98	50,
		02	5	70	8	5	9	4	39
3	Ransum 3	28,	1,0	18,	2,2	1,2	2,3	4,9	97
		40	62	80	83	58	25	93	7,7
		2	9	37	3	4	1	5	8

Ruminants abdomen consists of four parts, namely the rumen, reticulum, omasum, and abomasum with the size of which varies according to age and natural food. Feed rumen capacity to accommodate as much as 80%, 5% reticulum, omasum 7-8%, and abomasum 7-8%. This division can be seen from the shape muscle spincter during contraction. When considered from the food storage capacity can be known that the major ingestion of food occurred in the rumen. Saliva is also important to keep the amount of water in rumen fluid (Purbajanti, 2013). The process of digestion in the stomach depends on rumen temperature 37-39°C and pH 6.0 to 6.7 and in the anaerobic state is the best condition for fermentation and the end of the fermentation process will be absorbed continuously by the reticulo rumen (Cunningham, 2002). In the rumen, there are a large number of microorganisms, which are primarily anaerobic who do a symbiotic mutualism with the host animal.

In the digestive system of cattle ruminasia, there is a process called cud (rumination). Food that has been chewed by an animal in his mouth then is swallowed to enter into the rumen. In the rumen occurs destruction of the cell walls of forage, then the nutrients locked inside the walls of cellulose can be overhauled by enzymes produced by microorganisms. The first reform process is certainly not perfect, it will spew ruminant animals back food contained in the rumen back into the mouth. The animal will repeat to chew food for a few moments.

Goat is one kind of ruminant digestion fermentative do. Fermentative digestion is done with the help of rumen microorganisms. Fermentation produces protein peptides, amino acids, ammonia, volatile fatty acids, and carbon dioxide (McDonald, 2002).

Based on the food digestion process then will be greatly assisted if the food consumed by animals exist in the form of "partially digested" therefore The Water hyacinth is used as one component of the feed formula should be fermented in advance to assist in the digestion of food is to mechanical or chemical, kale should be made rending be more subtle (mechanical aids digestion of food) and ampas tahu as a third component, add the protein content in feed formula and bring a distinctive aroma that stimulates appetite goats.

Provision of various types of feed formulas has created arole in this study have an impact on weight gain or animal biomass trials. Based on Table 1 on weight gain of goats, feed formula III gives the best average weight gain than that for formula I and II. Weight gain of goats with feed formula III is 0.71 kg within 10 days or 2.13 kg per month. While weight gain of goats that is given feed formula I and II 0.67 per 10 days or 2,01kg per month. When compared to weight gain with conventional feed goats (1.5 Kg per month) are actually three types of rations were formulated in this study is better than conventional feed, but the feed ration III is the highest weight gain results.

Feed formula III consists of components ampas tahu/pulp 35%, 35% Water hyacinth-fermented, dried kale 30% while the feed formula I contain ampas tahu/ pulp 30%, Water hyacinth-fermented 35%, 35% dried kale. Feed formula II consists of ampas tahu/pulp 35%, 30% Water hyacinth-fermented, dried kale 35%. When considered in the feed formula III the pulp out high and high Water hyacinth-fermented strongly supports the quality of feed. The ampastahu contains protein, Water hyacinth-fermented also highly nutritious and livestock are also high appetite with weight gain goat thus also the highest. The dried kale high percentage less supportive of growth in weight because it has not become fodder "partially digested" so that undernutrition can be taken to the maximum.

Actually, all three types of feed formulas are made in this research have high nutritional value and can trigger weight gain better than conventional feed. High nutritional value of afeed can definitely trigger weight gain faster. Mc Donald *et al.* (2002) states that the growth of live stock is controlled by the consumption of nutrients, especially energy consumption.

Weight gain, due to the dry ingredients in the feed requirements has been met, and also due to the results of protein and carbohydrate fermentation product which are higher than conventional feed so that the resulting growth is also better. This is consistent with the statement of Soepranianondo (2005), that if the process of metabolism in ruminant good, then the fermentation product in the form of amino acids, ammonia-N and volatile fatty acids in the rumen will be high. As we know that for the growth of livestock amino acid required for the formation of the protein network while volatile fatty acids are used as a source of energy that the rest will be used as a fat or energy reserves.

Boediono (1997) said that the increase in the rate of weight gain can be obtained by increasing the amount of feed composition, as is well known that the feed containing nutrients in sufficient quantities allowing livestock to grow. Therefore, the overall goat feed formulas in this study grew faster than those fed the conventional goat.

Based on Table 4 above it can be seen that the protein content of goat meat that is given three kinds feed formula is made in this research is higher (feed I = 17.0198%, ration II = 18.2870, ration III = 18.8037) when compared with the levels of protein goat meat with the conventional feed(16.6%) (Anonim5, 2012). In addition to increased protein content, the feed formulas developed in this study also produce goat meat is low-fat content. According Anonim (2012) the fat of meat goat generally contain up to 9.2%, while based on the results of the analysis of goat meat with feed formula I is 2.2518% fat content, the fat content of goat meat with feed formula II amounted to 2.3878% and ration III produce goat meat with fat content 2.2833%. Based on the results of the analysis of the

data obtained can be stated that the feed formulas were developed in this study has the potential to produce goat meat with the low fat and high protein.

Composition and nutritional value of feed are very influential on the physical and physiological condition of the goat. According to Socheh (2012), nutrient content of feed affects the quality of goat meat and goat hormonal conditions. Furthermore, the physiological processes that occur will affect the quality of meat especially level of protein and fat.

4. CONCLUSION

The fermented Water hyacinth is feasible as the component of ruminant feed formulas. Feed formulas were developed in this study resulted in weight gain of goats is larger (2:07 kg per month) than that of goats with a conventional feed (1.5 kg per month). Feed formula III is the best formula to trigger weight gain goat (2.13 kg per month) is compared with feed formulas I and II (2:01 kg per month). While the protein content of goat meat with feed formulas are developed in this study increase of about 1% when is compared to the goat meat with the feed conventional feed. The level of fat in the goat meat with the feed formula are developed in this study experienced a decline of about 7%.

ACKNOWLEDGMENT

The researcher would like to thank all person especially Bayu Sandika and other parties who have helped in this research

REFERENCES

- [1] Anonim.2005. 7 Februari 2012, at 13.00 wib.
- [2] Anonim1. 2009. *Jagung (Z. mays)*. Diakses melalui [http://id.wikipedia.org/wiki/jagung_\(Zea_mays\)](http://id.wikipedia.org/wiki/jagung_(Zea_mays)). Tanggal 15 Juli 2012, pukul 2Pemanfaatan Daun Eceng Gondok sebagai Bahan Pakan Unggas. Laboratorium Ilmu Makanan Ternak. Fakultas Peternakan Universitas Diponegoro Semarang. Diakses melalui <http://nutrisi.awardspace.com/ttg/ecgondok.pdf> 0.00 wib.
- [3] Anonim2, 2009. *Ransum Sapi Potong dan Formula Penyusunannya*. Surabaya: Dinas Peternakan.
- [4] Anonim3, 2009. *Hewan Memamah Biak*. Diakses melalui http://id.wikipedia.org/wiki/Hewan_memamah_biak. Tanggal 15 Juli 2012, pukul 19:46 wib.
- [5] Anonim4. 2009. *Perencanaan dan rumenansia*. Diakses melalui <http://animal-intelektual.blogspot.com/2009/06/perencanaan-dan-rumenansia.htcc>. tanggal 20 Februari 2012, pukul 17.12 wib.
- [6] Anonim5. 2012. *Isi Kandungan Gizi Daging Kambing – Komposisi Nutrisi Bahan Makanan*. Diakses melalui <http://www.organisasi.org/1970/01/isi-kandungan-gizi-daging-kambing-komposisi-nutrisi-bahan-makanan.html> tanggal 30 Juli 2015
- [7] Abidin, Z. 2008. *Penggemukan Sapi Potong*. Jakarta: PT AgromediaPustaka.
- [8] Cullison, A. E. 1979. *Feeds and Fedding*. Virginia. Reston Publishing Company.
- [9] Darmono. 1992. *Tata Laksana Usaha Sapi Kereman*. Bogor :Kanisius.
- [10] Fitrihidajati, Herlina dan Ratnasari, Evie.2005. *Pemanfaatan Limbah Blotong sebagai Pupuk Organik dengan Penambahan Effektive Microorganism (EM4)*. Surabaya: Laporan Penelitian Lemlit Unesa.
- [11] Fitrihidajati, Herlina, Isnawati, Gatot Suparno, 2013. “Pemanfaatan Eceng Gondok (*Eichornia crassipes*) untuk Pakan Ternak Ruminansia sebagai Salah Satu Cara Mengatasi Gulma Perairan”*Laporan Penelitian* Surabaya: LPPM.
- [12] Guntoro, S. 2002. *Membudidayakan Sapi Bali*. Bogor: Kanisius.
- [13] Hardianto, R. 2007. *Infotek Pertanian: Teknologi Pembuatan Pakan Lengkap untuk Kambing dan Domba*. Malang: BPTP Jawa Timur.
- [14] Hardini, Fatma. 2010. *Pengaruh Pemberian Berbagai Bioaktivator dan Lama Fermentasi Amoniasi terhadap Peningkatan Kandungan Protein Kasar (PK) dan Penurunan Serat Kasar (SK) Limbah Pertanian*. Skripsi tidak dipublikasikan. Universitas Negeri Surabaya.
- [15] Hendraningsih, L. 2010. *Mikroba Pencerna Lignin*. Diakses melalui http://74.125.153.132/search?q=cache:u12FCx4FFFMJ:ejournal.umm.ac.id/index.php/protein/article/viewFile/201/230_umm_scientific_journal.doc+mikroorganisme+pencerna+lignin&cd=6&hl=id&ct=clnk&gl=id. Tanggal 7 Maret 2012, pukul 16.45 wib.
- [16] Hendraningsih, L. 2004. *Pengaruh Cara Pemberian Pakan dan Penambahan Probiotik terhadap Kecernaan Serat Pakan Domba Ekor Gemuk (DEG)*. Malang: Unmu-Press.
- [17] Isnawati.2008. *Pembuatan probiotik dan pemanfaatannya pada dekomposisi berbau tumbuhan*. Surabaya: Laporan Penelitian Lemlit Unesa.
- [18] Isnawati.2010. *Pengaruh pemberian berbagai bioaktivator dan lama fermentasi Amoniasi terhadap peningkatan kandungan Protein kasar (PK) dan penurunan serat kasar (SK) Limbah pertanian untuk pakan ternak sapi*. Surabaya: Laporan Penelitian Lemlit Unesa.
- [19] Jasmal1. 2007. *Ketersediaan Jerami Jagung Sebagai Sumber Pakan Ternak Ruminansia di Sulawesi Selatan*. Diakses melalui <http://jasmal.blogspot.com/2007/09/ketersediaan-jerami-jagung-sebagai.htcc>. Tanggal 26 November 2012, pukul 11.12 wib.
- [20] Jasmal2. 2007. *Teknologi Pengolahan Jerami Padi sebagai Pakan Ternak*. Diakses melalui <http://jasmal.blogspot.com/2007/09/teknologi-pengolahan-jerami-padi.htcc>. Tanggal 26 November 2012, pukul 11.13 wib.
- [21] Jasmal.2009. *Daya Dukung Limbah Pertanian sebagai Sumber Pakan Ternak Ruminansia*. Diakses melalui <http://jasmal.blogspot.com/2009/05/daya-dukung-limbah-pertanian-sebagai.htcc>. tanggal 29 Mei 2012, pukul 17.21 wib.
- [22] Lubis, D.A. 1952. *Ilmu Makanan Ternak*. Jakarta : PT Pembangunan.
- [23] Ningsih S.Y. 2001. *Pengaruh Pemberian Jenis Konsentrasi Terhadap Konsumsi Pakan dan Pertambahan Bobot Badan Pada Steer dan Bull Brahman Cross*. Skripsi Tidak Dipublikasikan. Malang: Unmu.
- [24] Niniek dan Ahmad. 2009. *Jerami Jagung Segar, Kering, dan Teramoniiasi Sebagai Pengganti Hijauan Sapi Potong*. Diakses melalui <http://74.125.153.132/search?>

- q=cache:52hwp2Ys8kJ:usupress.usu.ac.id/files/Agripet%20Vol_%25202%2520No_%25203%2520Des_%25202006.pdf+jurnal+penelitian+cara+kerja+probiotik+pencerna+jerami+jagung&cd=4&hl=id&ct=clnk&gl=id&client=firefox-a. Tanggal 26 November 2012, pukul 11.09 wib.
- [25] Damry. 2009. *Poduksi dan kandungan nutrient hijauan padang pengembalan alamdi kecamatan Lore Utara*, Kabupaten Poso. J. Agroland (16): 296-300, Palu.
- [26] Poedjiadi, A dan F.M Titin, S. 2005. *Dasar – dasar Biokimia*. Jakarta: UI-Press.
- [27] Pradiptaparamitha. 2009. *Feed Additive*. Diakses melalui <http://pradiptaparamitha.com/feed-additive/-feed-additive-growbig.htm>. Tanggal 12 Januari 2012, pukul 18.15 wib.
- [28] Priyono. 2009. *Molase*. Diakses melalui <http://priyonoscience.blogspot.com/2009/03/molase.htcc>. Tanggal 17 November 2012, pukul 17.00 wib.
- [29] Rachdie. 2006. *Prinsip Pertumbuhan Bakteri*. Diakses melalui <http://rachdie.blogsome.com/2006/10/14/prinsip-pertumbuhan-bakteri/htm>. Tanggal 25 Januari 2012, pukul 17.00 wib
- [30] Romadlona, Ifitatur. 2010. *Pengaruh Probiotik dan Lama Fermentasi terhadap Kandungan Protein Kasar dan Serat Kasar Jerami Kedelai melalui Metode Fermentasi untuk Pakan Ternak Sapi serta Implementasinya*. Skripsi tidak dipublikasikan. Universitas Negeri Surabaya.
- [31] Sa'id, G. 1987. *Penerapan Teknologi Fermentasi*. Bandung: Msp.
- [32] Setyono. H, Kusrieningrum, dan Mustikoweni. 2006. *Prosedur Analisis Bahan Pakan Ternak*. Surabaya: Unair-Press.
- [33] Socheh, M. 2012. *Pengaruh Pakan Berbasis Produk Ketela Pohon terhadap Kinerja Reproduksi (pada Pemberian secara Flushing) dan Kinerja Produksi Kambing Kejobong*. Desertasi. Program Panca Sarjana Fakultas Peternakan Universitas Gadjah Mada. Yogyakarta.
- [34] Suparno, G., H. Fitrihidajati, E. Ratnasari. 2015. *Pemanfaatan Pakan Hasil Fermentasi Berbahan Campuran Eceng Gondok, Ampas Tahu Dan Kangkung Sebagai Formulasi Ransum Pakan Ternak Ruminansia*. Laporan Penelitian. LPPM Unesa. Surabaya
- [35] Supranto, J. 2004. *Analisis Multivariat*. Jakarta: PT Rineka Cipta.
- [36] Tejasari. 2005. *Nilai – Gizi Pangan*. Yogyakarta: Graha Ilmu.
- [37] Purbajanti, E. D. 2013. *Rumput dan Legum Sebagai Hijauan Makanan Ternak*. Graha Ilmu, Yogyakarta.
- [38] Tristiartiet, al. 2006. *Kecernaan Nutrien Eceng Gondok yang difermentasi dengan Aspergillus niger pada Ayam Broiler*. Diakses melalui [http://eprints.undip.ac.id/6888/1/oke31\(2\)2006p124-128.pdf](http://eprints.undip.ac.id/6888/1/oke31(2)2006p124-128.pdf), pukul 13.00 wib.
- [39] Cunningham JG. 2002. *Textboox of Vetirinary Physiology*. 3th. Philadelphia : WB. Saunders Company.
- [40] McDonald, P. R. Edwards and J. Greenhalg. 2002. *Animal Nutrition*. 6th Edition. New York.
- [41] Wahyudi, A. 2004. *Pengaruh Pemberian Probiotik Bakteri Selulolitik dan Metode Pemberian Pakan terhadap Konsumsi Bahan Kering dan Kecernaan Energi Pada Domba Ekor Gemuk*. Malang: Unmu-Press.
- [42] Winarno, G, dan Fardiaz. S. 1979. *Biofermentasi dan Biosintesa Protein*. Bandung: Angkasa.