QUALITY OF COMPLETE FEED SILAGE WITH THE ADITION OF CONCENTRATE CONTAINING RAMI WASTE OF DIFFERENT ENSILAGE TIME

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ABSTRACT

This study aimed to test the quality of complete feed consisted of field grass and concentrate containing ramie leaf waste in the balance and different length of ensilage time. The treatments of this study were forage to concentrate ratios; 40% of concentrate: 60% of silage; 50% of concentrate : 50% of silage and 60% of concentrate : 40% of silage, and duration of ensilage; 0, 1, 2, 3, and 4 weeks. The experimental design in this study was a completely randomized design of factorial pattern. Each research unit was repeated three times. Physical qualities that were observed were: color, aroma, texture, yield weight, fungus. Complete feed temperature did not show any interaction ($P > 0.05$) but it was highly significant at pH ($P < 0.01$). The interaction of both treatments had an effect on DM, CF, CP, Free-N extract and lactic acid ($P < 0.01$). Forage to concentrate ratio had a very significant effect on texture quality, DM, ash, CFt, CF, CP, N-free extract, and lactic acid ($P < 0.01$) and significant effect on color, aroma and texture ($P < 0.05$). The duration of ensilage had significant effect on all variables except on CFt and CP ($P > 0,05$). The interaction of forage treatment and the concentration of ensilage occurs in almost all chemical qualities but not on the physical quality of feed.

Key words: *forage, concentrate, ensilage, complete feed, ramie.*

INTRODUCTION

The goat's main feed is mainly forage. Forage production is very fluctuating when the rainy season of abundant production with low dry matter content (DM). On the contrary, during the dry season, production is low but with higher production of DM. The condition shows fluctuations in the quality of forage provided by the farmers, which resulted in the low quality of feed consumed by goats. The search for forage sources that can cope with fluctuations in the availability of forage feed is a responsibility that must be resolved soon. The settlement includes the use of feed technology. Forage crops that have such potential include ramie. The use of ramie plant waste can be as an alternative to improving the quality of goat feed because of its nutrient content.

Rami (*Boehmerianivea* L Gaud) is a bush-producing shrub with forage production of 93-97% of total crop production (Sastrosupadi et al., 2004) as waste. The composition of DM of ramie is; leaves 22.0%, CP 24.3%, CF 23.0%, CFt 2.9%, ash 2.5% and N-free extract 27.4% (DM basis) but deficient of methionine amino acid (1.27 %), P mineral (0.16%) and Cu (0.69 mg) (Duarte et al., 1997). Ramie plants are harvested once every 50 - 60 days throughout the year (Suratman, 1986). Production of fresh ramie leaf waste is 3.000kg / ha /

harvest (Santoso, 2003). Handling of ramie leaf waste requires technological applications because of its decaying nature. The character is caused by high levels of water, organic matter (OM) and CP of leaf.

Utilization of ramie leaf waste as the constituent of concentrate and then with the field grass formulated to be complete feed to have complete nutrient content according to the needs of livestock. Complete feeds are prepared using nutrient-rich ingredients so they can not be stored long after mixing. This resistance is similar to silage. Ensilage is a process of feed preservation by utilizing spontaneous microorganisms that exist in the plant and is beneficial ie lactic acid bacteria. Ensilage complete feed (Total Mixed Ration / TMR) is a simple method that potentially increases nutrient use and extends feed durability (Wongnen et al., 2009). Wongnen et al. (2009), further states that ensilage is a method that can maintain the quality of the complete feed during storage and its use can increase the intake (Yuangklang et al., 2004), and improve the digestibility of BK, BO, SK and non-structural carbohydrates (Vasupen et al. , 2005; 2006). Ensilage is a consideration of the preservation technique for forage with high PK content (Man and Wiktorsson, 2002) and is increasingly popular as an effective forage preservation method (Ozturk et al., 2006). The question is, how does the physical quality change of complete feed field grass silage with the balance of concentrate to silage and at different length of ensilage?

MATERIALS AND METHODS

The material used as the constituent of concentrate is leaf of ramie, cassava tuber waste, coconut meal, drops, urea, salt and mineral mix with PK 13,09 and TDN 71,47% and field grass. Complete feed was composed of forage balance: 60% concentrate: 40% (I1); 50%: 50% (I2) and 40%: 60% (I3) and ensilage for 0 (W1); 1 (W2); 2 (W3); 3 (W4) and 4 (W5) weeks. Complete feeds were placed in silos (polyethylene plastic bags). The experimental design was a Completely Randomized Design, 3X5 factorial pattern and 3 replications. The complete quality of the observed silage characters were the color, the aroma, the texture, the weight of the yield, the fungus, the pH, temperature and the chemical qualities of DM, CF, CP, CFt, ash, N-free extract,m and lactic acid. Concentrate formula and complete feed were presented in tables 1 and 2.

Table 1. Concentrate Formulation

Concentrate	%	DM	Ash	EE	CF	CP	N-free extract	TDN
			% of DM					
Rami waste	20.00	4.40	0.50	0.58	4.60	4.86	5.48	5.48
Caassava tuber waste	36.50	29.82	0.91	0.07	0.80	0.29	34.42	29.91
Coconut cake	30.00	25.80	1.92	3.06	3.63	6.48	14.91	25.86
Mollase	12.00	7.92	0.61	0.00	0.00	0.14	11.24	10.23
Urea	0.50	0.50	0.00	0.00	0.00	1.41	0.00	0.00
Mineral mix	0.50	0.48	0.45	0.00	0.00	0.00	0.00	0.00
Salt	0.50	0.47	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	69.38	4.39	3.71	9.03	13.19	66.05	71.47

Table 2. Complete Feed Silage Formulation

Feedstuff	%	DM	Ash	EE	CF	CP	N-free extract	TDN
			%BK					
Forage to concentrate of 50:40								
Field grass	60	13.20	7.09	0.82	20.18	4.91	27.00	32.95
Concentrate	40	27.75	1.76	1.49	3.61	5.27	26.42	28.59
Total	100	40.95	8.85	2.30	23.80	10.18	53.42	61.54
Forage to concentrate of 50:50								
Field grass	50	11.00	5.91	0.68	16.82	4.09	22.50	27.46
Concentrate	50	34.69	2.20	1.86	4.52	6.59	33.03	35.74
Total	100	45.69	8.11	2.54	21.33	10.68	55.53	63.20
Forage to concentrate of 40:60								
Field grass	40	8.80	4.73	0.55	13.45	3.27	18.00	21.97
Concentrate	60	41.63	2.64	2.23	5.42	7.91	39.63	42.88
Total	100	50.43	7.36	2.77	18.87	11.18	57.63	64.85

The physical quality test of aroma, texture and color of silage follows the instructions of Soekanto et al. (1980), pH Measurement using Naumann and Bassler (1997) procedures while proximate chemical analysis) following AOAC procedure (1994).

RESULTS AND DISCUSSION

The result of observation on the physical quality of complete feed silage with forage balance treatment: concentrate and the length of different ensilage presented in table 3.

Table 3. Physical quality of complete feed silage with forage balance treatment: concentrates and length of different ensilage

Treatment combinations	Color	Aroma	Texture	Randement (%)	Fungus appearance	Temperature (°C)	pH*
I1 W0	2,93±0,32	2.83±0.42	2,73±0,15	100±0	2,93±0,38	33,33±0,93	7.84±0.47
I1 W1	3,13±0,31	3.13±0.31	3,13±0,25	98.6±0.11	3,30±0,26	30,67±0,95	6.55±0.23
I1 W2	3,80±0,10	3.8±0.1	2,93±0,12	99±0.45	3,20±0,17	29,10±0,56	5.39±0.05
I1 W3	4,23±0,15	4.23±0.15	3,87±0,49	98.3±0.14	3,53±0,29	28,33±0,93	4.97±0.11
I1 W4	3,47±0,23	3.47±0.23	3,13±0,06	98.4±0.13	3,10±0,44	28,73±1,37	4.82±0.2
I2 W0	3,03±0,35	3.03±0.35	3,03±0,35	100±0	2,97±0,29	32,87±1,82	7.61±0.35
I2 W1	3,40±0,60	3.43±0.55	3,43±0,55	98.8±0.41	3,27±0,06	30,37±0,55	5.96±0.38
I2 W2	3,23±0,21	3.23±0.21	3,27±0,23	98.2±0.48	3,40±0,10	28,53±0,95	5.52±0.15
I2 W3	3,97±0,15	3.97±0.15	3,83±0,25	98.1±0.14	3,60±0,35	26,93±1,46	5.09±0.12
I2 W4	3,70±0,10	3.7±0.1	3,43±0,42	98.3±0.87	3,50±0,10	28,57±0,93	5.09±0.43
I3 W0	3,37±0,25	3.37±0.25	3,47±0,42	100±0	3,33±0,15	33,77±1,10	7.3±0.31
I3 W1	3,60±0,00	3.6±0	3,37±0,21	98.8±0.11	3,03±0,15	29,83±0,23	5.59±0.39
I3 W2	3,70±0,00	3.7±0	3,93±0,25	99.2±1.37	3,50±0,35	28,27±0,65	5.58±0.43
I3 W3	4,27±0,64	4.27±0.64	3,87±0,15	98.2±0.62	3,30±0,26	27,03±0,83	5.49±0.08
I3 W4	3,77±0,15	3.77±0.15	3,73±0,12	98.1±0.22	3,10±0,20	27,80±0,36	5.09±0.2

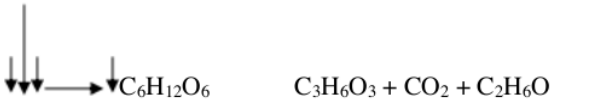
Description: * There were interaction of forage treatment: concentrate and different length of ensilage

The result of variance analysis of pH silage complete feed, showed that there is very real interaction (P <0,01) between concentration forage counter and long ensilage. Concentrate forage factor did not give significant effect (P> 0,05) and on old treatment ensilage had very real influence (P <0,01) to change pH value of complete feed.

Variance analysis showed a very significant interaction (P <0.01) between concentrated forage counterpart and long ensilage on pH silage complete feed changes. This suggests that the counterweight of concentrated forage and long ensilage factors directly affect the pH silage complete feed score change. The interaction of forage concentrates and the duration of the ensilage were tested using the BNJ test. The BNJ test results showed the highest pH silage complete feed score on I1W0 interaction (7.84) and the lowest score on I1W4 interaction (4.82).

Table 3. shows that in the balance interaction 60% forage 40% concentrate with long weeks ensilage (I1W0) has the highest pH score (7.84). These results do not vary much with the interaction of I2W0 and I3W0, this proves that in 0 weeks ensilage there is no lactic acid bacteria activity so that pH silage complete feed is still high. The interaction data of the concentration forage and the duration of the ensilage indicate that the longer ensilage pH silage complete complete feed is decreased, this is because during the ensilage process lactic

acid formation occurs by lactic acid bacteria utilizing fermentable carbohydrates contained in the concentrate and forage. Type of fermentable carbohydrates are often used in the process of fermentation of the type of glucose. The process of formation of glucose into lactic acid Winarno (2004), namely:



$C_6H_{12}O_6$ $C_3H_6O_3 + CO_2 + C_2H_6O$

Glucose Lactic Acid Ethyl Alcohol (Ethanol)

Carbon dioxide

The decrease in pH is relatively stopped after 3 weeks of ensilage because on the 21st day fermentation has reached a stable phase which means that lactic acid production is optimal and stop developing (Santi et al., 2012).

The result of observation on the physical quality of complete feed silage with forage balance treatment: concentrate and the length of different ensilage presented in table 5.

Table 5. Chemical quality of complete feed silage with forage balance treatment: Concentrate and different length of ensilage

Treatment combination	DM*(%)	Ash	CFt	CF*	CP*	N-free extract*	TDN**	Laktic acid*
		%BK						
I1W0	90,76	13,65	2,42	19,69	13,50	41,50	69,53	1,80
I1W1	90,19	9,84	2,09	20,87	13,25	44,14	71,81	1,80
I1W2	89,62	10,34	1,75	23,19	11,26	43,07	68,39	1,62
I1W3	88,79	11,99	1,90	21,44	13,01	40,46	68,07	2,76
I1W4	87,97	9,34	2,04	22,04	12,52	42,03	69,05	1,80
I2W0	89,80	12,78	1,79	22,09	9,87	43,27	66,31	1,56
I2W1	88,51	9,99	1,98	27,66	10,38	38,49	64,03	1,43
I2W2	87,22	9,33	2,18	21,29	10,13	44,29	67,60	3,12
I2W3	88,62	11,05	2,38	21,69	10,89	42,61	67,30	2,28
I2W4	90,02	10,65	2,59	33,23	11,91	31,64	61,46	1,92
I3W0	88,36	11,64	0,54	32,64	11,80	31,74	60,39	1,92
I3W1	88,17	9,38	0,53	40,70	11,55	26,01	56,66	2,40
I3W2	87,97	9,11	0,51	47,80	12,59	17,95	52,37	3,48
I3W3	88,22	10,38	0,68	38,56	11,30	27,30	57,05	4,26
I3W4	88,47	9,65	0,86	42,08	10,81	25,06	55,20	4,02

Description there were interaction of forage treatment: concentrate and length of ensilage in contrast to a confidence level of P <0.01 (*) or P <0.05 (**).

Dry matter (DM) is a nutrient whose quantity depends on forage balance: the concentrate at once undergoes a reshuffle during the ensilage process so that after ensilage process there is a decrease of BK percentage. The initial process of fermentation is related to

the enzymatic activity of plant cells or residual respiration (Owen et al., 2002), which uses carbohydrates, especially glucose and fructose with oxygen trapped in the feed (Shao et al., 2005). Aerobic microbial activity at baseline resulted in heat up to 12 hours after mixing resulting in loss of BK (Kung et al., 2005) even loss of BK during fermentation (Owen et al., 2002). Wongnen et al. (2009), reported the fermentation process in total mixed ration (TMR) containing wholecottonseed showed a decrease of BK from 63.8% (TMR) to 61.9% fermented TMR (FTMR). The same is reported by Nishino et al. (2004), the decrease of BK in total mixed ration (TMR) from 56.8% to 51.9% in fermented total mixed ration (FTMR).

Other nutrients, crude protein (CP) and nitrogen-free extract (N-free extract) showed a decrease in percentage after ensilage. Wongnen et al. (2009), TMR fermentation with whole cottonseed showed a decrease of CP 16.1% (TMR) to 15.7% (FTMR). The fermentation process involving microbial activity by producing proteolytic enzymes results in the degradation of proteins into ammonia (NH3-N). Microbial and plant proteolytic enzyme activity resulted in CP losses converted to NH3-N on grass silage (Kung et al., 2000).

The composition of crude fiber (SK) and lactic acid showed an increase in yield after ensilage process. The lactate acid enhancer is an indicator of the success of the ensilage as a product of lactic acid bacteria activity that grows optimally during the ensilage process. The concentration of lactic acid in the TMR was in the form of a bales of 10.4 g / kg BK (1.04% BK) to 38.0 g / kg DM (3.8% DM) at FTMR after 30 day fermentation. This ball-shaped total mixed ration decreased pH from 5.35 to 4.65 and loss of DM by 43 g / kg BK (4.3% BK) in forage proportions: concentrate of 40:60 (Wang et al., 2010).

CONCLUSION

The interaction of forage treatment with the concentration of ensilage occurs in almost all chemical qualities but not on the physical quality of the complete feed.

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