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The Concentrate to Forage Ratio of Complete Feed Silage on Nutrient Consumption

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Abstract. The aimed of this research to examine the effect of the concentrate to forage ratio of complete feed silage on crude protein, crude fiber, TDN and fat consumptions. Five types of the ensilage of complete feed treatments consisted of T_1 = concentrate 26% + A + Napier grass 70%, T_2 = concentrate 36% + A + Napier grass 60%, T_3 = concentrate 46% + A + Napier grass 50%, T_4 = concentrate 56% + A + Napier grass 40% and T_5 = concentrate 66% + A + Napier grass 30%, that is A = (molasses 1,5% + urea 0,5% + salt 0,5% + mineral mix 1,5%). Twenty of local male sheep with a body weight 12.5 – 22.5 kg divided into 4 blocks were used in this experiment. The parameters measured were the consumptions of crude protein, crude fiber, TDN and fat. The results showed that treatment had highly significant effect ($P < 0.01$) on consumptions of crude protein, crude fiber, and TDN, but had a significant effect ($P < 0.05$) on fat consumption. The conclusion of this study that the P3 treatment is the best concentrate to forage ratio of complete feed silage for fattening because it has the highest consumptions of crude protein 131.01 ± 4.05, crude fiber 103.06 ± 3.33, TDN 655.80 ± 18.74 and fat 55.84 ± 1.83 gram/day/head.

Keywords: complete feed silage, crude protein, crude fiber, TDN, fat

1. Introduction

The feed is all ingredients that can be eaten by livestock and do not interfere with their health for 24 hours. Feeds that have sufficient nutrient content and are suitable for sheep's needs will produce good productivity. The nutrient adequacy of ruminant feed is seen from the protein content. The functions of proteins include building substances and replacing damaged tissue cells, organs, providing energy in the body and providing amino acids [1]. Complete feed silage is fed that is designed from various feed ingredients to overcome the problem of low and expensive feed quality by fermentation. According to Lammers et al. [2] complete feed has the meaning as a type of feed designed for commercial products for ruminants and in it already contains forage ingredients and concentrates in adequate balance. Good silage is shown through several parameters such as pH, lactic acid, color, texture, temperature, damage percentage and nutrient content of silage. Making silage needs to be considered the water content of the material. According to Perry et al. [3] making silage in forages must contain a water content of around 60-75%. If the water content exceeds this provision, it will produce silage which is too acidic so that it is less favored by livestock. As much as the wetter the

material / forage that is censored, the more heat is needed to increase the temperature of the silage and the more speed of material loss. Therefore, to reduce the water content in making silage, one of them is mixing it with other feed ingredients that have low water content such as concentrates.

2. Methodology

The material used in the study was 20 local male sheep originating from the Banyumas Regency with weights ranging from 12.5-22.5 kg and complete feed silage. The composition of concentrates is presented in **Table 1**.

Table 1. The composition of concentrates

No	Feed ingredient	Proportion (%)
1.	Cassava waste	48
2.	Pollard	17
3.	Coconut cake	17
4.	Corn mill	3
5.	Salt	1
6.	Soyxyl	0.6
7.	Starvit	1
8.	Gupro	1.4
9.	Rice bran	8
10.	Dolomit	1
11.	Molasses	2

The materia in this study were individual cages measuring 1 meter long and 0.5 meters wide, silos where 20 complete feed units of silage were stored (drums). The experimental design used was Randomized Block Design (RBD) with 5 treatments (T) and 4 groups (G) based on sheep body weight as replications, namely : G1 : local male sheep weighing 12.5 - 13.5 kg, G2 : local male sheep weighing 15.5 - 16.5 kg, G3 : local male sheep weighing 18.5 - 19.5 kg and G4 : local male sheep weighing 21.5 - 22.5 kg. The treatments of ensilage complete feed were T1 : concentrate 26% + A + Napier grass 70%, T2 : concentrate 36% + A + Napier grass 60%, T3 : concentrate 46% + A + Napier grass 50%, T4 : concentrate 56% + A + Napier grass 40% and T5 : concentrate 66% + A + Napier grass 30%, that is A : (molasses 1.5% + urea 0.5% + salt 0.5% + mineral mix 1.5%). The variables measured in this study were consumptions of crude protein, crude fiber, TDN and fat.

3. Result and Discussion

The average crude protein, crude fiber and consumption of dry matter in the provision of concentrated and forage feed in complete feed silage is presented in **Table 2**.

Table 2. Crude protein, crude fiber and consumption of dry matter

Treatments	Crude protein (% DM)	Crude fiber (% DM)	Consumption of DM (g)
T_1	12.64	15.52	837.0 ± 43.17
T_2	13.25	13.46	870.0 ± 21.71
T_3	15.06	11.85	870.1 ± 25.62
T_4	15.32	10.28	742.6 ± 113.75
T_5	15.82	7.63	572.7 ± 66.20
Average			781.13

T1 : concentrate 26% + A + Napier grass 70%, T2 : concentrate 36% + A + Napier grass 60%, T3 : concentrate 46% + A + Napier grass 50%, T4 : concentrate 56% + A + Napier grass 40% and T5 : concentrate 66% + A + Napier grass 30%, that is A : (molasses 1.5% + urea 0.5% + salt 0.5% + mineral mix 1.5%).

The average consumptions of crude protein, crude fiber, TDN and fat in the provision of concentrated and forage feed in complete feed silage is presented in **Table 3**.

Table 3. Consumptions of crude protein, crude fiber, TDN and fat of local male Sheep

Treatments	CCP (g)	CCF (g)	CTDN (g)	CF (g)
T_1	105.92 ± 7.98^{a}	129.96 ± 8.48^{a}	615.07 ± 34.57^{ab}	45.09 ± 4.96^{b}
T_2	117.03 ± 3.51^{ab}	118.83 ± 2.36^{a}	643.38 ± 10.50^{a}	48.99 ± 4.13^{ab}
T_3	131.01 ± 4.05^{c}	103.06 ± 3.33^{b}	655.80 ± 18.74^{a}	55.84 ± 1.83^{a}
T_4	113.86 ± 18.11^{d}	75.94 ± 9.33^{c}	551.92 ± 82.79^{b}	50.97 ± 8.48^{ab}
T_5	90.63 ± 10.72^{d}	43.57 ± 3.88^{d}	437.88 ± 51.02^{c}	46.06 ± 6.31^{ab}
Average	111.69 ± 8.87	94,27 ± 5.48	2904.05 ± 167.40	246.95 ± 18.36

T1 : concentrate 26% + A + Napier grass 70%, T2 : concentrate 36% + A + Napier grass 60%, T3 : concentrate 46% + A + Napier grass 50%, T4 : concentrate 56% + A + Napier grass 40% and T5 : concentrate 66% + A + Napier grass 30%, that is A : (molasses 1.5% + urea 0.5% + salt 0.5% + mineral mix 1.5%). CCP : consumption of crude protein, CCF : consumption of crude fiber, CTDN : consumption of total digestible nutrient, CF : consumption of fat. Description: Superscript (difference in letters between treatments shows a distinct difference).

Consumption of Crude Protein (CCP)

The results of the study in Table 2 showed that the average consumption of crude protein local male sheep with body weight 12.5 - 22.5 kg was 111.69 ± 8.87 g/day. These results are rather low compared to NRC [4] that sheep with body weight of 10-20 kg need 127-167 g/day of protein for growth, these differences are influenced by several factors including the breed or animal genetic potential and production level. This research is almost the same as that reported by Haryanto [5] that sheep with a body weight of 10-20 kg need crude protein 73.7 - 135.8 g/day. The results of the variance analysis showed that the feed concentrate to forages ratio in complete feed silage had a very significant effect ($P < 0.01$) on consumption of crude protein.

The results of the honest significant difference (HSD) test showed that T3 was very significantly different ($P < 0.01$) to other treatments to the total consumption of crude protein, or in other words that the concentrate to forage ratio in complete feed silage responded differently to total consumption of crude protein . Based on the average total consumption of crude protein, HSD test it is known that T3 has the highest total crude protein consumption compared to all other treatments. It is known that the total consumption of crude protein is obtained from the consumption of complete feed silage in the form of dry ingredients multiplied by crude protein levels, the total consumption of crude protein is obtained. The treatment T3, the total average protein consumption is the highest because it has a higher average protein content than other treatment, which is 15.06%. The difference in results between treatments is likely to be caused by differences in the different types of concentrates and forages. Energy consumption in each treatment also affects protein consumption. According to Negesse et al. [6] state that the difference in consumption of dry matter is caused by the nutrient content, especially the protein and energy content of feed.

The higher energy consumption, the higher consumption of protein will be, this is because the use of proteins to be converted into body proteins requires sufficient energy availability. However, according to Suparwi [7] states that the protein content in feed is too high, it can cause disturbances in the digestive system in the form of decreasing rumen pH due to starch digesting bacteria increases while fiber digesting bacteria, namely cellolytic and hemispheric bacteria decreases dramatically, causing decreased consumption of crude protein. The results of the balance of forage and forage analysis in complete feed silage are in accordance with the hypothesis which states that the use of concentrates with a 50% balance and 50% forage (T3) in the manufacture of complete feed silage will increase consumption of crude protein.

Consumption of Crude Fiber (CCF)

The consumption of crude fiber was obtained from the consumption of complete feed silage for each treatment in the form of dry matter which was then multiplied by the crude fiber content of the

complete feed silage of each treatment can be seen in **Table 3**. The results of the variance analysis showed that there was a very significant effect (P <0.01) between the treatment of consumption of crude fiber in local male sheep. The treatment T1 with forage to concentrate ratio (70% : 30%) has the highest crude fiber consumption, seen from the crude fiber content in complete feed T1 silage containing crude fiber average of 15.52%, the highest among the other treatments, while the lowest crude protein content is 12.64%. According to Budiman et al. [8] the increase in protein from 12% to 15% does not significantly increase the digestibility of crude fiber. Therefore, the consumption of crude fiber is influenced by the crude fiber content in the complete silage of the feed.

Based on **Table 3** shows that from T1 to T5 there was a decrease in crude fiber consumption, Permana et al. [9] said that the increase in crude fiber in the diet caused an increase in the need for feed protein. The crude protein content T1 is lower than the other treatments, hence increasing protein will develop amylolytic and proteolytic bacteria, or other wider bacteria. They will contribute to metabolites needed for cellulolytic activity. To fulfill the nutrient requirements of sheep [8]. However, if the protein content in the feed is high it will decrease the rumen pH while the cellolytic and proteolytic bacteria will decrease and crude fiber consumption will decrease [7]. According to Wijayanti et al. [10] stated that the digestibility of a feed material was influenced by the percentage of crude fiber in it. Therefore, the higher the crude fiber content, the crude fiber consumption increases. Along with the addition of crude fiber content in the feed. If it is reviewed based on the physical aspects of feed, it takes a longer time to digest high crude fiber, thus causing longer feed lengths in the digestive tract and slowing down the digesta flow rate. As explained by Chuzaemi [11] feed with high crude fiber causes livestock to eat longer and ruminant and the rate of degradation in reticulo-rumen slows. The difference was very much shown in treatment P5 with the lowest crude fiber content of feed which was 7.63% which turned out to produce the lowest consumption value. In addition to differences in crude fiber feed, crude protein content of feed can be the cause of differences in consumption. As explained by Carvalho [12] states that the protein and crude fiber content in the feed used is very influential on feed consumption.

Consumption of Total Digestible Nutrient (CTDN)

The consumption of TDN is obtained from consumption of dry matter (DM) multiplied by TDN levels of each treatment [13]. The results of the study in **Table 2** show that T3 has the highest TDN consumption average of 655.80 ± 18.74g followed by T2 of 643.28 ± 20.50g, T1 of 615.07 ± 34.57g, T4 of 551,92 ± 82.79g, and T5 of 437.88 ± 51.02g. The treatment T3 feed treatment is the treatment with the highest TDN consumption level. This is in line with the consumption of dry matter (DM) and TDN in T3 treatment. The DM consumption of T3 was 863.15 g/head/day, while the T3, TDN was 75.98%. The average consumption of TDN in the study ranged from 437.88 – 655.8 g/head/day. NRC [14] states that the TDN needs of sheep with a body weight of 10-20 kg with daily body weight gain between 200-250 g/day which is 400-800 g/day.

TDN consumption in this study was also higher than sheep, which shows daily TDN consumption was 417.19 g/head/day. These results indicate that the consumption TDN sheep in this study has been fulfilled. The results of the variance analysis showed that the treatment had a very significant effect (P <0.01) on local male sheep consumption of TDN. The treatment has a very significant effect due to the high TDN content of each feed treatment (T1 : 73.49%, T2 : 72.91%, T3 : 75.98%, T4 : 76.23%, and T5 : 77.04%) but has a degree of palatability which is different. The results of consumption of TDN showed that T3 was the most higher than other treatment, 655.80 ± 18.74 g.

Consumption of Fats (CF)

Fat consumption obtained from consumption of BK multiplied by the fat content of each treatment. The results of the study in **Table 3** show that T3 has the highest average fat consumption of 55.84 ± 1.83 g followed by T4 of 50.97 ± 8.48 g, T2 is 48.99 ± 4.13 g, T5 is 46.06 ± 6.31 g, and T1 of 45.09 ± 4.96 g. Factors that influence fat consumption are consumption of feed DM. The average consumption of DM of T3 is 863.15 g/head/day and the average fat content of T3 feed is 6.47%. The highest average consumption of DM in the study was T3. This causes T3 fat consumption to be the highest, while T4 has an average consumption of DM of 723.89 g/head/day and fat content of 7.03%. T4 fat

content is higher than T3 fat content, but the average consumption of T4 of DM is lower, so the fat consumption is much smaller than T3. Consumption of DM of T3 is much higher than T4 because the characteristics of T4 feed are drier than T3. This causes T3 palatability to be higher than T4. This is in line with the statement of Tilman et al. [15] that feed consumption is influenced by the shape and physical properties of feed. The treatment of T4 feed has a form of crumbs and looks dry, while T3 feed has a rather wet physical form and is very popular with livestock.

The results of fat consumption in this study ranged from 45.09 g to 55.84 g. This shows that fat consumption of rams in this study is higher than fat consumption of rams in Gunawan [16] with fat consensus average of 31.12 ± 2.06 g/head/day. This shows that fat consumption in this study has met the fat requirements for sheep. Based on the results of the variance analysis, it was shown that the treatment had a significant effect ($P < 0.05$) on the consumption of male local sheep fat. The results of the HSD test of fat consumption showed that T1 was significantly different from T3 (T1 45.09 ± 4.96 g vs. T3 55.84 ± 1.83 g).

4. Conclusion

The highest consumption of crude protein is a balanced treatment of 40% concentrate and 60% forage amounting to 131.01 ± 4.05 gram/head/day, crude fiber consumption 103.06 ± 3.33 gram/head/day, TDN consumption 655.80 ± 18.74 gram/head/day and fat consumption 55.84 ± 1.83 gram/head/day.

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