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Utilization of Duckweed in Feed Goats on Availability of Protein and Energy Balance

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***Abstract* – Goat productivity is largely determined by the availability of cheap feed, available throughout the year and has a high quality. High quality feed into the primary feed source that can reduce feed costs. Purpose of this study is to investigate the use of aquatic weeds / duckweed into feed for protein and energy balance goats. The experimental design used was completely randomized design with 5 treatments with 3 replications, where each repetition consisted of 1 goats, so that the number of goats is 15 tail, where the study treatment consisted of: D1 = Grass field + (concentrates, 0 duckweed fermentation) D2 = grass field + (concentrate, 15% duckweed fermentation) D3 = grass field + (concentrate, 30% duckweed fermentation). D4 = (grass field + (concentrate, 45% duckweed fermentation). D5 = Grass field + (concentrate, 60% duckweed fermentation). Variables measured in: Observations in a cage experiment: Nutrient Consumption and digestibility of nutrients Nitrogen Balance and Energy Balance. The results showed the use dukweed to 45% in feed provide protein and energy balance in accordance required by goats. Concluded that the use of duckweed fermentation can increase the protein content of feed.**

***Keywords* – Duckweed, Energy, Fermentation, Goats, Nitrogen.**

I. INTRODUCTION

Goat farm is now a promising business activities in addition to the price as well as goats market is still very open and met only 10%. Although goat is quite efficient in the use of feed, but the productivity of goats at the farmer level is still low. Goat productivity is largely determined by the availability of cheap feed, available throughout the year and has a high quality. High quality feed into the primary feed source that can reduce the cost of feed, because it can reduce the use of concentrate increased costs. Concentrate prices are high and increasing one of them caused by the use of imported raw materials such as wheat bran and soybean meal.. Efforts to use local food resources become crucial to increase production efficiency and reduce dependence on imports. One source of forage widely in the waters of Indonesia and has not been used as animal feed goats is water weeds of Family Lemnacea ie duckweed.

Duckweed is one species of aquatic plants that grow in rivers, rice paddies, reservoirs or swamps. The existence of this plant is more often considered a weed that is very detrimental to humans because these plants can cause silting of rivers or reservoirs and cause a reduction / evaporation of water and nutrient elements great.

The use of duckweed as a source of feed is the availability and development of the plant is quite a lot throughout the year in addition to nutrient content is also not good enough to compete with humans. Dried duckweed protein content is 25.2 - 36.5% and protein concentrations ranging between 37.5- 44.7%, the content of essential amino acids from protein concentrate better when compared to standard FAO except the amino acid methionine (Rusoff et al, 1990).

Balance Protein and energy for ruminants very important effect on the efficiency of microbes in the rumen, deciding the composition of weight gain, and the synthesis of long-chain fatty acids (Butler-Hogg and Criscкhshank, 1987). Manipulation of nutrients which significantly affect the balance of protein and energy that is absorbed by livestock (Soeparno and Davies, 1987). Thereby making it necessary to find a solution in the manipulation of nutrients for livestock in order to get the appropriate protein balance livestock needs.

Purpose of this study is to investigate the use of aquatic weeds / duckweed into feed for protein and energy balance goats.

II. MATERIALS AND METHODS

Materials used are local goats aged one year as many as 15 tails, duckweed fermentation, field grass, rice bran and pulp, prepared rations isocalorific and isonitrogen. This study used male goat pea age 10-12 months as many as 15 tails with weight ranging between 11- 13 kg. Goat fold individual size of 1 mx 1.5 m as many as 15 pieces, while the tool used is a feed (basin), a bucket of drinking, and the label name.

The experimental design used was completely randomized design with 5 treatments with 3 replications, where each repetition consisted of 1 goats, so that the number of goats is 15 tail, where the study treatment consisted of: D1 = Grass field + (concentrates, 0 duckweed fermentation) D2 = grass field + (concentrate, 15% duckweed fermentation) D3 = grass field + (concentrate, 30% duckweed fermentation). D4 = (grass field + (concentrate, 45% duckweed fermentation). D5 = Grass field + (concentrate, 60% duckweed fermentation).

The ration given ad-libitum on all treatments based on the needs of dry matter as much as 3% goat BK. Ration

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treatment is given twice a day, morning and afternoon at 08.00 hours 15.00. The rest of the weighed feed and drinking water were given ad-libitum. Variables measured in: Observations in a cage experiment: Nutrient Consumption and digestibility of nutrients ***Nitrogen Balance and Energy Balance,.***

Nutrient digestibility: the digestibility of nutrients is determined based on the difference of nutrients consumed by incurred in the stool. The content of nutrients determined by proximate analysis.

The balance of protein and energy: protein retention is determined based on the amount of protein consumption reduced the amount of protein that is released along with feces and urine, are stated in formula:

$$Rp\ (g/h) = KP - (PF - PU)$$

Description :
RP = Retention protein
KP = consumption of protein
PF = protein in the stool
PU = protein in the urine (N uirin x 6:26)

While the Energy Balance is determined by the formula:
RE=(Rl xfat retention)+(Rp x RetentionProtein)

Description :
RE = Retention energy
RL = fat retention (calculated based on changes in the body)
RP = Retention Protein
Energy fat = 0.03767 MJ / g
Energy Protein = 0.01674 MJ / g

Implementation:

All the goats were placed in individual cages type of stage as much as 15 plots to make it easier to observe. Placement of goats in a pen plots were randomized to receive treatment. Prior to conducting the animal studies are given time to adapt to the environment and feed for 2 weeks (14hari) with all experimental rations. All goats dibeikan worming (panacur) during the previous adaptation research going all the goats were weighed weight to get data initial body weight. Do epilation, cutting nails and bathing cattle mixed with azuntol. Feeding time at 07.00 and 12.00 noon. Treatment of food remains weighed the next day to determine the consumption of these animals. Provision of drinking water continuously in cages in adlibitum.

Collection feces and urine is done for seven consecutive days after the observation period feed consumption and weight gain life ends. During the collection period cattle were placed in metabolic cages to reduce movement and ease in both feces and urine collection. Feces and food remains weighed every morning before the cattle fed. 10% of samples taken and dikomposit then stored in plastic bags and stored in the refrigerator prior to analysis. BK content analysis, ash, N, fat, and fiber using a procedure AOAC (2005).

Data were analyzed using analysis of variance. If there is a real difference then continued with Duncan test Mean Difference (DMRT) according to Steel and Torrie (1991).

III. Results and Discussion

Type Feed on Consumption and Nutrient digestibility At Goats

Livestock productivity is determined by the amount of feed consumed and digested by an animal. Consumption and feed digestibility is influenced by the quality of feed, palatability, digestibility and nutrient consumption average of each treatment are presented in Table 1.

Dry matter intake in this study (Table 1) ranged between 414-498 g / head / day. Meanwhile, according to Devendra & Mclerroy (1982) needs dry matter goat weighing 15-17 kg is 396-424 g / head / day, so the results have met the need for consumption of BK goats. BK on perlakun D4 consumption of 498 g / head / day higher ($P < 0.05$) of treatment D1, D2, D4 D5 maapun. This shows that the addition of fermentation duckweed plants as much as 45% of the feed can improve feed intake, this is purportedly due fermented feed can improve performance in the rumen microbes digest the feed consumed host. The addition of concentrates and fermented duckweed 45% can increase the consumption of protein are better at treatment D4, it is suspected to contribute energy and balance the concentration of ammonia and VFA in the rumen so that the performance of rumen microbes can be optimized (Rostini et al 2014), whereas (Yusran & Teleni, 2000: Satter & Slyter 1974) states that the growth and activity of rumen microbes is dependent upon the availability of N in the form of ammonia and energy (Rostini and Zakir, 2010). With the increase in the number of rumen microbial population there will be an increase in the process of fermentation in the rumen of cattle feed which is manifested by increasing feed digestibility and dry matter intake of feed. The ability of ruminants to consume food is influenced by genetic factors, environment, production levels, age and health of livestock, while the factors of feed that the frequency of administration and nutrition (Siregar 1994).

The average protein consumption ranged from 60-76 g / head / day. Total consumption of the treatment have exceeded adequacy standard crude protein requirement is based on body weight is 56-58 g / head / day (NRC 2006). Consumption highest protein at treatment (D4), it is influenced by the dry matter intake of feed, but it is supported by nutrients ration treatment where dietary protein D4 reached 14.7% in the form of duckweed fermentation and has a fiber content ration reaches 17:43% so that the protein consumption is higher and more efficient. Bamualim (1988) say that protein is an essential nutrient for the body of livestock and the availability of adequate protein will increase the activity and growth of microorganisms so that the digestive process and also increases consumption. Further Rostini et al., (2014) states the amount of crude protein intake affected the rate of degradation, where the faster destruction of food more easily livestock hungry and consume more food. While Sunarso (2012) proteins needed for basic life greatly depends on the type of ration, quality protein, energy levels and condition of livestock.

Digestibility of nutrients is one measure in determining the quality of feed ingredients, as well as the contribution of a feed for cattle (Despal and Permana, 2008). Dry matter digestibility of feed containing forages marsh in this study ranged between 65% - 74% (Table 1). The highest digestibility in treatment by the fermentation of duckweed as much as 45% (D4) than the treatment (D5) but not significantly different (P <0.05) when compared to treatment D1, D2 and D3. These results are not much different from the research Wirawan et al. (2012) reported that dry matter grass field goat given by 64.6 - 68.5%. and research Rostini et al,. (2014) goats fed fermented dry matter digestibility reaches 65% -77%, and the protein digestibility of 65% - 68%.

Protein Balance

The digested proteins are degraded Posted Livestock goat being several components including degraded hearts feces, urine and Its amino acids are absorbed being on feed the goats. Mean protein feces, urine protein and protein debt plus presented in table 2.

The balance of proteins in this study showed significant differences among treatments. wherein the D4 treatment showed the highest difference in both the urine protein or protein stool. This shows the amount of undigested protein are metabolized in the body of cattle to produce weight gain. Wherein the feed contains a lot of organic material that is easily metabolized.

Energy Balance

Goats growing requires more energy, which can be ingested energy that is wasted in the urine and gas (methane), while others belong to the energy metabolized. In this study ranged anatar energy undigested 6:23 to 7:13 MJ / day (Table 3), with the average energy consumption of 10:23 to 11:03 g / day (Table 1).

Energy balance in this study showed no significant differences among the treatments. this is where the energy balance shows the amount of energy that are metabolized in the body undigested cattle to produce weight gain. Wherein the feed contains a lot of organic material that is easily metabolized. In this study, the energy balance ranged between 86.51-86.88%, according to the research hail astute opinion (1995) that the balance of energy in growing goats ranged between 84-86%.

IV. Conclusion

Duckweed plants can improve the quality of feed thereby increasing consumption and digestibility as well as the balance of protein and energy feed for goats.

V. Acknowledgement

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Table 1. Effect of treatment of feed intake and digestibility of feed (g / head / hr)

Parameter	D1	D2	D3	D4	D5	EM
Consumption.g/ ekor/hr) Dry Matter	423.23	449.12	414.34	498.12	465.05	33.66
Crude Protein	60.87	62.11	65.23	76.12	66.24	6.01
Crude fiber	59.13	60.06	62.15	73.21	64.23	5.64
Crude fat	24.05	24.58	26.76	29.32	27.41	2.15
Energy	10.23	10.46	10.85	11.03	10.93	0.34
digestibility Nutrient (%)						
Dry Matter	65.75	69.66	70.16	74.52	73.43	3.46
Crude Protein	81.41	81.34	83.52	85.75	82.75	1.81
Crude fiber	22.13	23.42	23.64	24.01	23.87	0.75
Crude fat	68.75	67.98	68.92	71.09	70.64	1.33
Energy	59.01	59.34	60.05	61.12	60.83	0.91

Remarks: D1 = Grass field + (concentrates, 0 duckweed fermentation), D2 = Grass field + (concentrate, 15% duckweed fermentation) D3 = grass field + (Concentrate, 30% duckweed fermentation), D4 = (grass field + (concentrate, 45% duckweed fermentation), D5 = Grass field + (concentrate, 60% duckweed fermentation), different superscript on the line each show a significantly different effect (P <0.05)

Table 2. Mean Protein Balance (kg / day / head)

Variabel	D1	D2	D3	D4	D5	EM
Feces Protein	17.41a	17.99	18.86	22.06	19.16	1.80
Urine Protein (n x 6.25)	20.12	20.79	21.81	25.49	22.13	2.07
Protein Retention	22.47	23.22	24.34	28.46	24.72	2.31

Remarks: D1 = Grass field + (concentrates, 0 duckweed fermentation), D2 = Grass field + (concentrate, 15% duckweed fermentation) D3 = grass field + (Concentrate, 30% duckweed fermentation), D4 = (grass field + (concentrate, 45% duckweed fermentation), D5 = Grass field + (concentrate, 60% duckweed fermentation), different superscript on the line each show a significantly different effect (P <0.05)

Table 3. Mean Energy Balance (MJ / day)

Parameter	D1	D2	D3	D4	D5	Em
undigested energy	6.23	6.53	6.86	7.13	6.92	0.35
Urine Energy	0.84	0.87	0.9	0.94	0.91	0.04
energy termetabolis	5.39	5.66	5.96	6.19	6.01	0.32
heat production	4.62	4.64	4.65	4.67	4.66	0.02
Retention Energy	0.77	1.02	1.31	1.52	1.35	0.30
Balance Energi (%)	86.51	86.67	86.88	86.81	86.84	0.15

Remarks: D1 = Grass field + (concentrates, 0 duckweed fermentation), D2 = Grass field + (concentrate, 15% duckweed fermentation) D3 = grass field + (Concentrate, 30% duckweed fermentation), D4 = (grass field + (concentrate, 45% duckweed fermentation), D5 = Grass field + (concentrate, 60% duckweed fermentation), different superscript on the line each show a significantly different effect (P <0.05)

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