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Feed Consumption and Growth Dynamics of Sheep Fed Agro-industrial Waste with Hibiscus rosasinencis Flower and Urea Supplementation

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Abstract.

Optimizing the use of agro-industrial waste as an alternative feed ingredient for sheep requires the right strategy. The use of feed additives and supplements is needed to improve the performance of sheep in utilizing agro-industrial waste-based feed. The use of hibiscus flour as a source of saponins is important to optimize rumen microbial growth by suppressing the growth of protozoa. The addition of urea is used to supply nitrogen sources to optimize the performance of rumen microbes. This study used 15 thin tail sheep aged 8 months with an average weight of 13.98 ± 1.1 kg, the experimental design used was CRD (Completely Randomized Design) with 3 types of treatment and 5 times repetition, namely R1 (control / without supplementation), R2 (supplementation of 0.1 % hibiscus flower and Urea 0.5%), R3 (supplementation of 0.2% hibiscus flower and 1% Urea). The objective of this research was to measure feed consumption and growth dynamics. The results showed that the addition of hibiscus flour and urea to the feed formula had no significant effect on the feed consumption of sheep. The growth dynamics of sheep showed a decrease in the first week of the trial, and gradually showed an increase in the second week. The highest growth increase was achieved in R3 treatment at 6 weeks of the feeding trial. Based on the results of the study, it can be concluded that sheep fed with 0.2% hibiscus flour supplementation and 1% Urea (R3) showed the best ability in utilizing agro-industrial waste-based feed.

Keywords: Feed consumption, Growth Dynamic, Sheep, Agroindustrial waste, Supplementation

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1. Introduction

Agro-industrial waste is a potential alternative source for feed ingredients. However, the high potential availability is frequently does not paralel with the sufficient quality, therefore the optimization usage of agro-industrial waste as an alternative feed

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ingredients for sheep needs the right strategy. Feed additive and supplement usage are prominent to increase the sheep performance in order to utilize the agro-industry feed based. The major characteristic of agro-industry waste is that it has high crude fiber and low protein. Defaunation is a method which can be used to solve the high fiber feed problem by reducing the number of protozoa and increasing the amount of bacteria, hence the rumen fermentation process increased. The hibiscus flour usage as the source of saponin and antimicroba is necessary to accrete rumen microbes growth by pressing the protozoas growth.

Various research studies proved that the different parts of *Hibiscus rosasinensis* plants possesses Antioxidant, Antimicrobial, Antidiabetic, Antiulcer, Hepatoprotective, Antifertility, Antigenotoxic and Anti-inflammatory properties, which helps in treatment of many diseases. *Hibiscus rosa sinensis* has been used in many herbal mix and drinks. Many research studies conducted in animal model evaluated *Hibiscus rosa sinensis* flowers and leaves as antidiabetic and antioxidant compounds. *Hibiscus rosa sinensis* has been used in many herbal mix and drinks [3]. The *Hibiscus* flowers contain cyanidin diglucoside, flavonoids and vitamins, thiamine, riboflavin, niacin and ascorbic acid. The alcoholic extract of *Hibiscus* flowers reported to possess many potentially active antioxidants and anticancer constituents such as quercetin glycosides, riboflavin, niacin, carotene, malvalic acid, gentisic acid, margaric acid and lauric acid [4].

Urea is the most commonly used non protein nitrogen source as an alternative true protein feed ingredients, since it can help to press down the livestock feed cost [5]. Urea addition for supplement purpose may increase the nutrition value, mainly when ruminant livestock get forages or agriculture waste with a low quality as basal feed ingredient. This process used to supply nitrogen in order to optimize rumen microbes performance [6]. Depicted that the role of urea for feed supplement covered the increasement of dry ingredients digestibility, protein contents, dry ingredients intake, milk production and weight. Whereas, the interaction with the beneficial microorganism in the form of protein microbes synthesis efficiency, the incresement of rumen N microbe production, reducement methane gas production, and proteolytic, selulotic, and amiliotic bacteria population increasement as well. Nevertheless, urea can be harmful for livestock, because it can be toxic if used improperly. The toxicity can be avoided using the correct urea dosage. The urea level as supplement or additional ingredients to rise the nutrient value is between 3%-5% [7]. It stated that most of rumen bacteria used ammonia as their N source to grow. About 80% N microbes cell comes from ammonia, however the protozoa inside of rumen cannot use it. The purpose of this research is to examine the optimalization of hibiscus flour addition role and urea supplementation

of sheep fed with non conventional feed from agro-industry waste reviewed by feed consumption and growth rate.

2. Materials and Methods

The materials that used in this research were 15 eight-months old male thin-tailed sheeps with average weight $13,98 \pm 1,1$ kg each, agro-industry waste based trial rations, metabolis cage and equipments. Agro-industry waste feed ingredients were taken across Purwokerto, amonniation treatment in corn leaf and durian skin waste with 4% urea. All ingredients milled subtly but corn leaf, durian skin and tea dregs were milled crude. Feed ingredients mixed according to the formula. The trial arrangements used were RAL with three different treatments, there were R1 (control/without supplement), R2 (0,1% Hibiscus flower flour and 0,5% urea supplementation), R3 (0,2% hibiscus flower flour and 1% urea supplementation) with five times repetitions. The measuring variables were DM consumption, DM (%BW) consumption and growth rate. The data analyzed by anova (excel ver 2017) continued with BNJ test [8]. Before the research, all of the sheeps were given anthelmintic, vitamins, antibiotics and groomed. The sheeps treated inside individual metabolic cage with 1,2m x 0,7m x 1m in length, wide and height. The cages were made from wood provided with feed and water tub each. The stages consisted of 14 days of adaptation period, seven days of preliminary and 45 days of feeding trial. The trial feed given 4-4,5% DM/kg BB under TMR (Total Mix Ration) method. Water was given ad libitum. Feed consumption measured by counting the difference between feed giving (in DM) and feed residu (in DM) which measured during the feeding trial. DM (%BW) consumption measured by counting the growth delta twice a month. The table below shows the consumption and feed trial nutrient content.

3. Results and Discussion

3.1. Feed consumption

The results shows that sheep feed consumption is at the lowest range from $441,771 \pm 93,40$ gDM/sheep/day (R3) until the highest range in $460,937 \pm 66,85$ gDM/sheep/day (R2). Feed consumption shows a relatively lower range compared with another reasearch, that used high quality conventional feed as reported [10]. The local sheep feed consumption which fed with 42,3% forages complement and 57,7% concentrate contains 12% feed protein and 63% TDN is 580 DM/sheep/day and Average Daily Gain

TABLE 1: Composition and nutrient content of feed.

Feed Ingredients	F1	F2	F3
Ammoniated Corn Husk	30	30	30
Pineapple skin	10	10	10
Hibiscus Flower	0	0,1	0,2
Ammoniated Durian Skin	4	4	4
Tea Dregs	5	5	5
Ungrade Bread	15	15	15
Vermiceli Waste	29,5	29,5	29,5
Mineral mix	3	3	3
Molases	1,5	1,5	1,5
Urea	2	2,5	3
Total	100	100,6	101,2
Nutrient Content (%)*			
DM	85,80	83,00	83,58
Ash	5,27	7,18	5,54
Crude Protein	13,55	16,36	16,58
Crude Fat	2,73	2,36	2,89
Crude Fiber	16,03	18,41	18,42
TDN**	69,46	67,06	67,79

Information: * Feedstuffs Laboratorium of Animal Sciece Faculty Unsoed Analyze Result (2020), ** Counting Result [9]

(ADG) is 73,9 g/sheep/day. Feed Consumption during the feeding trial is showed on the table below.

TABLE 2: Feed Consumption Average.

Treatments	Feed Consumption (gDM)	Feed Consumption (%DM/kg BW)
R1	459.036 ± 121.84	3.26 ± 0.40
R2	460.937 ± 66.85	3.13 ± 0.22
R3	441.771 ± 93.40	3.05 ± 0.29

When reviewed by the feed ingredients ration composition, it can be assumed that the low sheep feed consumption during the research is caused by palability factor. It is very likely to happen since almost all of the ingredients are agro-industry waste that generally infrequently used as a feed. According to [11] who stated that the fluctuation of feed consumption was influenced by palability, in spite of [12] who confirmed that feed which has plenty protein content and slightly more subtle particles can increase the amount of food consumption. In this research, feed provided under Total Mix Ration method or Complete Feed, therefore the abominate of one of the feed constituent matter can affect the feed consumption accumulatively on the whole. This is supported by the

[13] experiment result which reported that the usage of unseparated cacao pod mixed with other ingredients like soybean meal, fine bran, and polard, made the livestock were unable to choose feed. The brief adaptation period for 14 days is also caused the low feed consumption treatment. The newly feed adaptation period is relatively needs sufficient time. Hibiscus addition up to 0,2% and 1% urea supplement marked a reduction of dry ingredients consumption per kg sheep weight, despite of statically it does not shows any difference. The result indicates that the dry ingredients consumption per kg weight is still under normal scale, as stated by [14] that DM consumption around 3-5% from alive weight. The degradation of dry ingredients consumption at normal limit represents the addition of supplement is efficient. Regardless, the content of tannin inside tea dregs which is a feed composition can affect the feed palability, supported by [15] report about saponin and tanin which are defaunation agents that frequently used on various researches. The giving of saponin at 2,5% level can demote palability due to its bitterness.

3.2. Growth dynamics

The growth rate is quite influenced by the livestock age, young livestock will experience self accelerating stage, as it older, the livestock will undergo self inhibiting or declarating stage when reached its peak of growth curve [16]. The results depicts that the growth rate shows a significant fall in the first week of feeding trial, and gradually increased by the fourth week. The highest increasement at week four was achieved by the sheep that given control treatment in the amount of 460 gr, while R2 and R3 treatments are lower approximately 356 gr and 360 gr. As a matter of fact, the acceleration growth of controlled sheep is likely to slope in the fourth until sixth week, contrary to the sheeps fed by hibiscus flour 0.2% and 1% urea supplement which increased 2,23 times. The highest rate achieved by R3 treatment in the sixth week feeding trial. On the other hand, the sheeps that R2 treated is decreased significantly. The growth and development are impacted by genetical factors, feed, gender, hormone, environment and also management [17]. There are several main factors that influenced the sheep growth after the off weaning, defined by the growth potential in each individual and feed availability[18]. From feed consumption prespective, it does not showed difference between treatments, despite of the growth rate indicated that R3 treated sheep shows the best nutrient respond. Reviewed from the nutrient density, R2 and R3 feed is relatively similar, empowering the notion of hibiscus flour supplement at 0,2% level and 1% urea have capable to rise the rumen performance, so that the nutrient digestibility become more

optimal. As reported by [19], the lowering sheep growth rate was mostly influenced by the antinutrition factors contained by the feed, such as tannin, the efficiency of feed utilization associated with increasement intake of antinutritional factors.

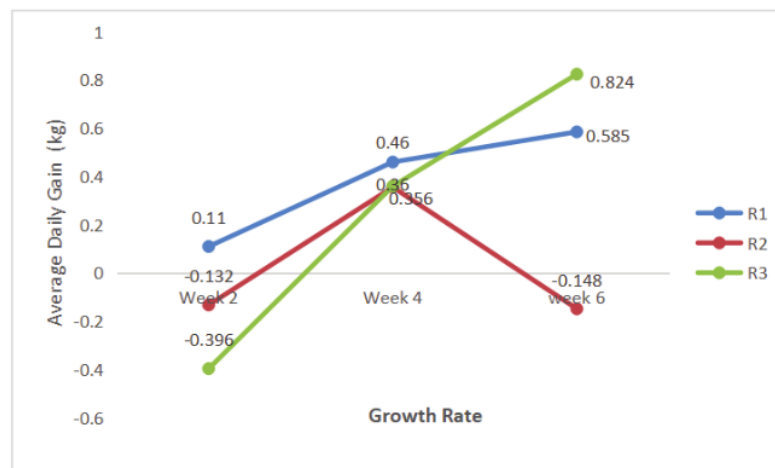


Figure 1: Growth Rate of Sheep During Experiment.

4. Conclusion

The supplementation of hibiscus flower flour and urea does not affect feed consumption. The highest growth was achieved by R3 treatment at 6 weeks of feeding trial. Based on the results of the study, it can be concluded that sheep fed with 0.2% hibiscus flour supplementation and 1% Urea (R3) showed the best ability in converting agro-industrial waste based feed.

5. Acknowledgement

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