Utilization of Fermented Complete Feed Based on Mixed Pennisetum Purpureum and Indigofera Sp on Performance of Garut Male Lambs

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Abstract. This research was aimed to find out the use of fermented complete feed based on mixed Pennisetum purpureum and Indigofera sp on performance of Garut male lambs during fattening. A completely randomized design was used to compare 5 different complete feeds containing different Pennisetum purpureum (60, 70, 80, 90 and 100%) and Indigofera sp (40, 30, 20, 10, 0%) mixtures using 5 replicates. The measurable parameters were dry matter consumption, body weight gain, as well as feed conversion efficiency. The results showed that different mixtures of Pennisetum purpureum and Indigofera sp had a significant effect (P<0.05) on dry matter consumption with the highest dry matter consumption was obtained by mixture of 80% Pennisetum purpureum and 20% Indigofera sp (1,313.4 gram /head /day). However, the mixtures had no significant effect (P>0.05) on body weight gain and feed conversion efficiency of the lambs.

1. Introduction

The ration of ruminant livestock such as sheep is the kind of forage which consists of grass and legumes. Most sheep farmers in Indonesia, especially traditional farmers, in West Java very rely on field grass for the sheep that maintained. The use of field grass to support the development of sheep farming has several constraints, such as the guarantee of the availability of relatively low, can only meet the needs of sheep farming on the scale of traditional livestock farming with the aim as a side business. Field grass is not specifically cultivated to support the development of sheep farms and only obtained on certain land such as rice field, riverbanks, and empty land that has not been utilized or among cultivated plants.

The continuity of sheep farming with a commercial-oriented business objective requires a guaranteed supply of forage feed continuously throughout the year according to the population of the sheep that are kept at a certain time and the projection of later sheep populations when the livestock business is further developed, the existence of forage cultivated into a necessary condition get attention. Various types of grass and cultivation legumes have been widely developed for the purpose of meeting the needs of forage for ruminant sheep such as Pennisetum purpureum grass or better known as elephant grass and legume Indigofera sp.

Elephant grass or Pennisetum purpureum is one type of grass that has good quality and is easy to grow and has a high production [1], it can be relied upon as a substitute forage grass field. But to meet the needs of sheep's nutrients required additional feed that is able to supply deficiencies in the elephant grass. Indigofera sp is one alternative that can be utilized as an additional feed, based on its high nutritional content [2]. Indigofera sp protein content based on some research results about 26%, and
expected can replace the concentrates that are relatively expensive. Use of Indigofera sp as animal feed has been done in some areas and produce good production. 

Indigofera sp is a type of legume plants of potential highly developed as forage because it has good nutritional value. According to Hassen [3], Indigofera sp legume has a crude protein content of 27% - 31%, crude fiber between 22% - 46% with a high dry matter digestibility value of 72% - 81%. However, the utilization of this plant is constrained by the tannins contained, that can bind to a protein forms a complex "tannin - protein" which resulted in the value of the benefits of protein disrupted due to the strength of the bond certain complex of a protein cannot be digested by the digestive system of ruminants. According to Abdullah and Suharlina [4], the tannin content on Indigofera sp legume is 0.027%. Utilization of Indigofera sp should be limited to a safe, so the protein in rations can be used efficient. According to Simanihuruk and Sirait [5], the use of Indigofera sp as goat feed ranges from 25% - 75% of total dry matter rations, then Tarigan and Ginting [2], states that Indigofera sp as much as 30% - 40% in goat rations low-quality grass yields a consumption response, optimal digestibility and optimal weight gain.

The quality of Indigofera sp as forage and as additional feed to complete the deficiency on the grass, is expected to support to achieve high productivity. However, in the fattening phase need the addition of concentrate that carcass quality is achieved as expected. As well-known meat quality of sheep is affected by breed, vegetation and feeding practice [6]. Average daily gains in forage finished lambs is usually lower than in lambs finished on high grain diets [7, 8]. The increased of slaughter weight will provide a good profit for farmers, and is expected on an ongoing basis, so it can be a reliable livestock business. The study discover the optimal effect of ration that can be beneficial for development of sheep farms, especially traditional farmers. This study will be basic information for researchers to uncover on the utilization of fermented complete feed based on Indigofera sp. and Pennisetum purpureum at different balances. Thus, a new theory may be arrived at.

2. Material and methods

2.1. Experimental Animals

About 25 Garut male lambs were used in this study and each of them was placed in an individual cage with free access to drinking water. The average age of the lamb are ten months and the average of weight are 23.76 ± 2.08 kg. A completely randomized design was used to compare five (5) different diet treatments based on Pennisetum purpureum and Indigofera sp. inclusion at various balances: T0 (Pennisetum purpureum 100%), T1 (Pennisetum purpureum 90% + Indigofera sp 10%), T2 (Pennisetum purpureum 80% + Indigofera sp 20%), T3 (Pennisetum purpureum 70% + Indigofera sp 30%), and T4 (Pennisetum purpureum 60% + Indigofera sp 40%).

Table 1. Composition of feedstuffs and their nutrient contents in each treatment based on dry mater.

| Feedstuff                  | Treatment | T0   | T1  | T2  | T3  | T4  |
|----------------------------|-----------|------|-----|-----|-----|-----|
|                            |           | %    |     |     |     |     |
| Indigofera sp              |           | 0    | 10  | 20  | 30  | 40  |
| Pennisetum purpureum      |           | 100  | 90  | 80  | 70  | 60  |
| Nutritional content        |           |      |     |     |     |     |
| Crude Protein              |           | 11.72| 12.91| 14.41| 15.29| 16.48|
| Crude Fiber                |           | 26.48| 26.37| 26.26| 26.15| 26.04|
| Nitrogen Free Extract      |           | 44.47| 43.89| 43.31| 42.73| 42.15|
| Fat                        |           | 1.19 | 1.46 | 1.72 | 1.99 | 2.25 |
| Ash                        |           | 16.14| 15.37| 14.61| 13.84| 13.08|
| Total Digestible Nutrient  |           | 59.12| 59.30| 59.48| 59.66| 59.84|
| Gross Energy (Kkal/kg)     |           | 3.098| 3.089| 3.079| 3.070| 3.060|
Each treatment was replicated five times. Concentrates were added every day as much as 500 g/head. Measurable parameters included dry matter intake, body weight gain, feed conversion rate and efficiency of feed utilization. The resulted data were analyzed by Duncan test. In addition, the composition of feedstuffs and their nutrient contents can be seen in Table 1.

2.2. Feeding Trial
Complete feed were prepared containing silage mixed Indigofera sp. and Pennisetum purpureum were composition according treatment, and concentrate were added. Concentrate is a commercial product with nutrients contents are Dry Matter 84.50%, Crude Fiber 16.50%, Crude Fat 7% and Nitrogen Free Extract 34%. The animals were place in individual pens during treatment. The ration were prepared according to the dry matter requirement of 4%. Silage and concentrate were prepared to the experimental lambs individually in plastic tray twice a day. Quantity of ration to lambs given daily was weighed and refusal in the next morning was weighed too. Feed consumption are amount of ration provided is reduced by remaining in dry matter and expressed in gr/head/da., while Body weight gain are final weight minus the first weight. The data were analyzed by Minitab 16 Statistic software.

3. Results and discussion

3.1. Consumption of dry matter
The results of statistical analysis showed that the complete ration based on mixture of Pennisetum purpureum and Indigofera sp. fermented gave a significant different effect (P<0.05) on dry matter consumption of male’s Garut lamb fattening phase. Measured nutritional value to determine the efficiency of the use of Garut males age d 8 - 10 months are arranged on various kinds of protein and energy balance, listed in Table 2.

The consumption of rations is physiologically controlled to meet maintenance and production needs that are restricted by the capacity of the gastrointestinal tract, the calculation based on the amount of consumption of dry matter rations [9]. Maintenance need is nutrition to meet the needs of life processes without any activity and production, while production need is the nutrients for growth, milk production and other activities.

| Table 2. Efficiency of Ration on Garut Male Lamb of Fattening Phase |
|---------------------------------|------|------|------|------|------|
| Measured Variables             | T0   | T1   | T2   | T3   | T4   |
| Consumption of Dry Matter g/head/day | 987.06<sup>a</sup> | 1,210.90<sup>b</sup> | 1,313.38<sup>c</sup> | 1,248.80<sup>b</sup> | 1,261.07<sup>b</sup> |
| Daily gain g/head /day          | 73.20 | 108.80 | 124.60 | 86.80 | 121.20 |
| Feed conversion %               | 16.15 | 15.21 | 11.03 | 18.21 | 10.65 |
| Feed efficiency %               | 7.28  | 8.76  | 9.48  | 6.94  | 9.66  |

Information :
* T0 = Complete Feed Fermentation-Based of Pennisetum and Indigofera sp (100%: 0%), T1 = Complete Feed Fermentation-Based of Pennisetum and Indigofera sp (90%: 10%), T2 = Completely Feed Fermentation Based of Pennisetum and Indigofera sp (80%: 20%), T3 = Completely Feed Fermentation Based of Pennisetum and Indigofera sp (70%: 30%), and T4 = Completed Feed Fermentation Based of Pennisetum and Indigofera sp (60%: 40%).
** the same letter to the direction lines shows non-significant

Parakkasi [10] states that the feed intake will go well if the animals are in suitable environmental conditions. Environmental factors that have direct impact on feed consumption, temperature, humidity, and sunlight, while not directly influence, such as the weather. At high environmental temperature, feed consumption will be less, as well as in humid conditions, consumption would decreased. According Kearl [11], the dry matter requirements for sheep weighing approximately 30 kg is 1.150 grams / head / day. The results of this study showed that the consumption of dry matter varies
between 836.53 to 1.404.00 gram/ head / day. Dry matter consumption in this study is higher than Rianto [12] 730 - 895 grams/head/day on local thin-tailed sheep that given polar, while Sayekti [13] 1,107.9 grams / head / day, on local sheep. The condition indicates that the amount of consumption of dry matter ration in Garut male lamb fattening phase is still in the range of dry matter requirement of sheep.

3.2. The effect of treatment on growth of body weight
The result of statistical test showed that complete ration based on mixture of Pennisetum purpureum and Indigofera sp gave no significant effect on the increase of body weight of Garut male lambs fattening phase. Weight gain is an increase in body size over a period of time as a result of growth, or it is a change in size that includes changes in life weights, shapes, linear dimensions, and body composition [14]. These changes include changes in body components such as muscles, fats, bones, and organs and chemical components especially water, fat, protein and ash in carcasses. Organ changes take place gradually so as to achieve the size and shape characteristics of each tissue.

According to Parakkasi [10], nutrients in the diet affects the growth, especially the energy content, that energy will accelerate weight gain in a phase of fattening, this condition occurs due to increased fat reserves inside the body. In addition to the influence of the energy content, weight gain in fattening also influenced by the protein, especially amino acids in the diet that will affect the formation of tissue proteins. The highest protein content in the ration, the development and increase of protein tissue in the body the faster, so the weight gain increases.

The results of this study indicated that the increase in body weight of male Garut lamb fattening phase ranged between 26 to 169 grams/head/day. Variations in body weight gain relative has a range of values that are very different, this condition occurs due to the influence of individual factors. According Petrovi[ć] [16], a great number of different factors influence the growth of lambs while nutrition, health condition and genotype belong to the most important ones. Daily weight gain in this study were close to Purbowati [17], 115.33-128.90 grams/ head/day, and Ekawati [18], 94 - 106.3 grams/ head/day.

3.3. The effect of treatment of feed conversion and efficiency
The result of statistical test showed that the complete ration based on mixture of Pennisetum purpureum and Indigofera sp gave no significant effect on the conversion value of Garut male lamb on fattening. Feed conversion is closely related to body weight gain. The feed conversion value is the number of rations required to produce 1 kilogram of livestock production, as can be reflected by weight gain. In this study body weight gain non-significant although dry matter consumption was significant different. This may be due to individual livestock factors that are less able to digest, so feed conversion in this study not significant too. The results of this study indicate that the feed conversion value of Garut male lamb on fattening obtained ranged from 9.27 to 35.67 whilst the efficiency of the use of ration on Garut male lamb on fattening phase ranged from 3.11% to 12.70%, while Mathius [19], feed efisiensi on sheep range on 6.78 – 13.72.

4. Conclusion
The results showed that complete ration based on mixture of fermented Pennisetum purpureum and legume Indigofera sp on Garut male lamb at fattening phase gave effect to the consumption of dry matter with the highest dry ingredient consumption obtained in the provision of complete ration based on mixture of Pennisetum purpureum and Indigofera sp on ratio 80% vs. 20%, that was equal to 1313.38 gram/head / day, whereas in body weight increase, ration conversion rate and efficiency of ration use did not give real effects.

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