Improving Feed Intake and Digestibility of Rations for Male Bali Cattle Fattened with Common Practice Meals, in Timor, by the Addition of a Complete Diet Containing Moringa oleifera Powder

Sukawaty Fattah¹, Yohanis Umbu Laiya Sobang¹, Frederic Dedy Samba²

¹Lecturer at the Faculty of Animal Husbandry, Nusa Cendana University; ²Student of Animal Sciences Post Graduate Program, Nusa Cendana University, Jl. Adisucipto/Penfui, PO Box 104 Kupang; INDONESIA

Article history: Received in revised form: Nov. 10, 2017  Accepted: Nov. 20, 2017  Available online Dec. 14, 2017

ABSTRACT

This research was carried out at Oeletsala village, Taebenu sub-district, the Regency of Kupang, for 16 weeks, comprised of four periods. Due to Latin Square design used, each period consisted of 1 week preliminary for adaptation, 2 weeks for collecting data, and followed by 1 week interval before the next period. The aims of the research were to study the effects of feeding a complete diet containing Moringa oleifera powder on feed intake and the digestibility of crude fiber, carbohydrate, and net energy (NEE) of Bali cattle fattened in commonly practiced by the local farmer. Four growing male Bali cattle of 1 – 1.5 years old with an average of body weight ranging from 82 - 124 kg, were employed in this study. Latin Square Design consisted four treatments and four periods as replicates. Those treatments were T₀ = local feeds as commonly fed by local farmers + 0% Moringa oleifera powder in the complete diet, T₁ = local feeds + 5 % Moringa oleifera powder in the complete diet, T₂ = local feeds + 10 % Moringa oleifera powder in the complete diet, and T₃ = local feeds + 15 % Moringa oleifera powder in the complete diet. Data collected were subjected to Analysis of Variance (ANOVA). Statistical analysis showed that there was no significant effect (P ≤ 0.05) found both on feed intake and the digestibility of crude fiber, carbohydrate, and NEE.

Keywords: Bali Cattle, Moringa oleifera, rations, common practice meals, cattle fattening

*Corresponding author: fattah-s@gmail.com, Telp.(0380) 881580. Fax (0380) 881674

1. Introduction

The beef fattening system in Timor Island is well known as paronisasi. In this kept system, feeds composition offered were variously and very depended on the kinds of feeds available surrounded farmer, without any consider on nutrients requirement of the animal which led to low energy content, with a P/E ratio of 1: 4.2, where this P/E ratio was not met yet the optimum P/E ratio requirement (1: 5.1) for animal production (Sobang, 2005). Ba’o (2016) found that content of crude fiber in the fattening ration as commonly fed by local farmers was achieved 23.86 % while the digestibility was only 38.86 %. This led to low energy which is needed by an animal for a production process. Based on this fact, efforts to improve the crude fiber digestibility through fed complete diets is needed. Consequently, the feeds would be comprised of degradable feed ingredients in other to increase digestibility of low-quality feed ingredients.

One of the very potential feed ingredients, which is rich in nutrients and easy to be degraded in the rumen, is Moringa oleifera Lam. (Jaiswal et al., 2009) leaves. The plant’ leaves contained 27.1% protein, 250 kcal/kg-metabolized energy (Fugli, 2001), and diverse vitamins and minerals (Witt, 2016; Gopalakrishnan et al., 2016). It leaves also have a balance amino acid, it contains all essential amino acids, Leu-Iso-Lys-Met-Phe-Thr-Trp and Val, which are not able to be synthesized by the cellular system, and the nonessential amino acids, Ala, Gly, Arg, Cys, Gly, Glu, His, Ser, Pro, and Tyr. Because of naturally synthesized by the Moringa oleifera plant/crop, the ingredients created might be easy to be degraded by rumen microbial (Makkar and Becker, 1996). Moringa oleifera leaves, therefore, meet the criterion to be used as an ingredient of a complete diet and hopefully be able to improve the digestibility of diet as commonly used by local farmers, which in turn meet the energy requirement of ruminants. This research was aimed to study the effects of feeding a complete diet containing Moringa oleifera powder on the feed intake and the digestibility of crude fiber, carbohydrate, and NEE of a ration of fattening Bali cattle as commonly practiced by the local farmers.

2. Materials and Procedures

2.1. Materials and research design

This research was conducted at Oeletsala village, Taebenu subdistrict, the regency of Kupang, for 10 weeks. It was arranged in Latin square design (4 x 4) consisted of 4...
treatments (Table 1 and Table 2). Those treatments were $T_0$ = local feeds as commonly fed by local farmers + 0 % $Moringa oleifera$ powder in a complete diet, $T_1$ = local feeds + 5 % $Moringa oleifera$ powder, $T_2$ = local feeds + 10 % $Moringa oleifera$ powder, and $T_3$ = local feeds + 15 % $Moringa oleifera$ powder. Four male Bali cattle of 1 – 1.5 years old with a body weight ranging from 82 – 124 kg, were employed in this study. All of the experimental animals were fed local feeds, the drinking water was offered ad libitum. Each of them was placed in an individual barn of 2.10 m x 1.20 m sizes, cement floor, coconut-leaves roofs, and completed by mangers both for feed and drinking water.

Table 1. Ingredient compositions of complete diet (%)

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>$T_0$</th>
<th>$T_1$</th>
<th>$T_2$</th>
<th>$T_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice brand</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Grinding maize</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Gliricidia sepium leaves meal</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Moringa oleifera leaves meal</td>
<td>-</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Fish meal</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Urea</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Table Salt</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Starbio</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Variables measured:

Variables measured as indicators pertaining to the effects of treatment which was applied in this study were:

Crude Fiber intake (CFI) =

\[
\text{[feed offered (g) \times (% Dry Mater DM) \times (% CF)] - [feed residual (g) \times (% DM) \times (% CF)]}
\]

Carbohydrate intake (CHOI) =

\[
\text{[feed offered (g) \times (% DM) \times (% CHO)] - [feed residual (g) \times (% DM) \times (%CHO)]}
\]

Net Energy Equivalent (NEEI) =

\[
\text{[feed offered (g) \times (% DM) \times (% NEE)] - [feed residual (g) \times (% DM) \times (%NEE)]}
\]

Digestibility

\[
\text{Nutrients Digestibility(ND %) =} \frac{Axa(\%) - Bxb (\%)}{Axa(\%)} \times 100\%
\]

\[
\text{Table 2. Nutrients content of the experimental ration}
\]

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>DM (%)</th>
<th>OM (%)</th>
<th>CP (%)</th>
<th>C Fat (%)</th>
<th>CF (%)</th>
<th>CHO (%)</th>
<th>BETN (%)</th>
<th>Energy MJ/kg DM</th>
<th>Energy Kcal/kg DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass</td>
<td>95.87</td>
<td>81.47</td>
<td>10.29</td>
<td>2.44</td>
<td>30.12</td>
<td>68.74</td>
<td>38.62</td>
<td>15.22</td>
<td>3,623.44</td>
</tr>
<tr>
<td>C. Petandra</td>
<td>96.69</td>
<td>86.46</td>
<td>14.33</td>
<td>3.16</td>
<td>28.43</td>
<td>68.97</td>
<td>40.54</td>
<td>16.48</td>
<td>3,924.53</td>
</tr>
<tr>
<td>L. Leucocephala</td>
<td>96.62</td>
<td>90.35</td>
<td>21.45</td>
<td>3.30</td>
<td>27.07</td>
<td>65.60</td>
<td>38.53</td>
<td>17.67</td>
<td>4,207.97</td>
</tr>
<tr>
<td>$T_0$</td>
<td>90.90</td>
<td>90.22</td>
<td>21.56</td>
<td>5.77</td>
<td>16.48</td>
<td>62.89</td>
<td>46.41</td>
<td>18.07</td>
<td>4,303.32</td>
</tr>
<tr>
<td>$T_1$</td>
<td>89.46</td>
<td>90.37</td>
<td>23.15</td>
<td>5.51</td>
<td>14.52</td>
<td>61.71</td>
<td>47.19</td>
<td>18.17</td>
<td>4,325.35</td>
</tr>
<tr>
<td>$T_2$</td>
<td>89.07</td>
<td>90.35</td>
<td>25.32</td>
<td>5.38</td>
<td>13.06</td>
<td>59.18</td>
<td>46.12</td>
<td>18.37</td>
<td>4,373.98</td>
</tr>
<tr>
<td>$T_3$</td>
<td>90.71</td>
<td>90.29</td>
<td>23.64</td>
<td>5.15</td>
<td>12.59</td>
<td>61.50</td>
<td>48.91</td>
<td>18.13</td>
<td>4,315.74</td>
</tr>
</tbody>
</table>

Note: Laboratory Analysis Results of the Laboratory of Nutrition and Feed, Faculty of Animal Husbandry, University of Brawijaya, Malang 2017 * DM = Dry matter, OM = Organic matter, CP = Crude protein, CF = Crude fiber

2.2. Experimental Procedures

2.2.1. Preparation

In this stage was initiated by preparing complete diet and four young male Bali cattle of 1-1.5 years old. This stage was prior to experimental conducted.

a. Experimental animals were weighed to know initial body weight, then numbered 1- 4.

b. The individual barn was numbered in order.

c. Experimental animals were taken at random, using lot number to be placed into individual barn each.

d. Treatments were applied at random to experimental animals by lottery.

2.2.2. On day 14:

The experimental animals were weighed to ending the first period. Entering the second period, data on feed intake and the rest every day was collected.

2.2.3. Feeding :

The feed was offered at 07.00 in the morning and at 04.00 pm in the afternoon.

2.3. Statistical Analysis

Data collected were subjected to Analysis of Variance (ANOVA) to investigate is there any effect of treatment on the variables observed and further test Least Significant Difference (LSD) according to Steel and Torrie (1993), if there any differences were found. Statistical significant was considered at $P \leq 5\%$.

3. Results and Discussion

3.1. Effect of treatment on the intake of Crude Fiber, CHO, and NEE

The mean intake of crude fiber (CF), carbohydrate (CHO), and NEE as the result of the addition of complete diet containing different level of $Moringa oleifera$ powder local farmers shown in Table 3. Compared to the To, addition of $Moringa oleifera$ powder to the common local food could improve the CFI, CHOI, and NEE as well as the digestibility of the CF and the CHO (Table 4).
The mean of digestibility of crude fiber, carbohydrate, and NEE as the result of the complete diet containing *Moringa oleifera* powder with some different levels in fattening Bali cattle diet as commonly fed by local farmers could be seen in Table 4.

Statistical analysis showed that treatment was not significantly (P ≤0.05) affected the digestibility of crude fiber, carbohydrate, and NEE of fattening Bali cattle. The results showed that the highest digestibility of crude fiber, carbohydrate, and NEE was found on treatment T₂, then followed by treatment T₃, treatment T₁, while the lowest was found on treatment T₀. This was because of the diet that commonly fed by the local farmers their cattle (T₀) have high crude fiber content caused difficult to be digested by fiber digester bacteria. Although the feed is added by complete diet, but not able enough yet to fulfill the requirement of rumen microorganisms to digestion process because the protein in the feed ingredients was inhibited and unable to be degraded in the rumen in ammonia form.

According to Crampton and Haris (1969), the higher crude fiber of feed ingredient the lower digestibility of the ingredient, and if diet protein resists to degradation, ammonia produced in the rumen was low and rumen microbes growth would be inhibited which in turn fermentation process not optimum. Meanwhile, the increasing digestibility of crude fiber, carbohydrate, and NEE on treatment T₂, was caused by the addition of *Moringa oleifera* powder into the complete diet which soluble and degradable in the rumen resulted in more crude fiber digested into carbohydrate and NEE to form energy for the animal. According to Arora (1995), the main factor influence N-NH₃ usage is carbohydrate availability in the diet that functions as the energy source of microbes for protein synthesis. Tillman *et al.* (2005) found that digestibility was affected by some factors nutrient content of feed ingredients, temperature, a rate of passage in the digestive tract, a physic form of feed ingredients, diet composition, rumen microorganism activity, sex, age, and other nutrients. In general, the addition of complete diet containing *Moringa oleifera* powder was able to improve intake and digestibility of crude fiber, carbohydrate, and NEE of Bali cattle diet because according to Schneider and

Table 3. Mean of feed intake of crude fiber (CF), carbohydrate (CHO), and NEE (gram/head/day)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatment</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF intake</td>
<td>T₀</td>
<td>542.93±50.61</td>
<td>672.93±44.97</td>
<td>696.36±36.84</td>
<td>700.59±66.46</td>
<td>0.221</td>
</tr>
<tr>
<td>CHO intake</td>
<td>T₁</td>
<td>1915.48±195.96</td>
<td>2358.99±185.57</td>
<td>2433.20±109.59</td>
<td>2447.54±197.44</td>
<td>0.216</td>
</tr>
<tr>
<td>NEE intake</td>
<td>T₂</td>
<td>1385.90±136.85</td>
<td>1699.80±157.92</td>
<td>1749.15±61.85</td>
<td>1758.08±110.28</td>
<td>0.246</td>
</tr>
</tbody>
</table>

Table 4. Mean of digestibility of crude fiber, carbohydrate, and NEE (%)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatment</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF digestibility</td>
<td>T₀</td>
<td>46.77±9.94</td>
<td>56.13±5.57</td>
<td>61.46±2.81</td>
<td>58.99±5.25</td>
<td>0.605</td>
</tr>
<tr>
<td>CHO digestibility</td>
<td>T₁</td>
<td>71.98±5.60</td>
<td>77.07±3.46</td>
<td>80.27±1.56</td>
<td>79.09±1.81</td>
<td>0.150</td>
</tr>
<tr>
<td>NEE digestibility</td>
<td>T₂</td>
<td>73.61±2.86</td>
<td>76.40±4.12</td>
<td>78.93±1.58</td>
<td>78.33±1.12</td>
<td>0.504</td>
</tr>
</tbody>
</table>
Flatt (1975); Nanda et al (2014), digestibility is called high if its value less than 50%.

4. Conclusion

Based on the discussion above, it is concluded that: The addition of complete diet containing Moringa oleifera powder was not significantly (P ≤ 0.05) affected feed intake and the digestibility of crude fiber, carbohydrate, and NEE of diet commonly used by local farmers in fattening Bali cattle.

References


Conflict of interest: Non declare