Short Communication

A Comparative Study on Some Selected Digestible Properties of Brachiaria humidicola and Pennisetum purpureum

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ABSTRACT

This study was conducted to compare some digestible properties between Pennisetum purpureum (Napier) and Brachiaria humidicola (Humidicola) grasses. The digestibility was obtained by conducting a 5-day digestibility experiment based on total-faeces-collection method. Two goats were used for each digestibility experiment. Napier and Humidicola grasses were fed fresh to the animals every day, and the forages were weighed before feeding to the goats. The feed residues and their faeces were collected the next day and weighed to estimate the amount of feed intake as well as the faeces. The samples of fresh feed, feed residues and faeces were brought to the laboratory for dry matter (DM) analysis. The DM digestibility for Napier and Humidicola were 87.89 and 87.31%, respectively. The DM content of Napier was a little lower than Humidicola grass, which was 35.91% and 49.04%, respectively. Although the results were not statistically significant, they were acceptable in view of the preliminary nature of this study. Further studies should be conducted by prolonging the time period according to the standard methodology of digestibility and by using a higher number of goats per treatment to obtain better distribution of means.

Keywords: Digestibility, dry matter, goats, Napier, Humidicola

ABSTRAK

yang lebih lama dan penggunaan lebih banyak jumlah kambing bagi setiap perlakuan, supaya memperoleh distribusi purata yang lebih baik.

**Kata kunci:** Kebolehcernaan, bahan kering, kambing, Napier, Humidicola

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**INTRODUCTION**

The animal industry in Malaysia is still in its infancy when compared to the more developed countries in the West. One of the hindrances to its development is the lack in feed resources in the country. There is very little land reserved by the government to raise animal feed crops, as other industrial crops (plantation crops like oil palm) are found to be more lucrative for the country. Malaysia also is not in the natural grassland zone as in the larger continents. As such even forage crops need to be planted and replanted every few years, requiring a high volume of investment, not like in the natural pasture zone, where forages are naturally seeded and seldom need to be replanted. Whatever land that is intended to be planted with forage crops in this country needs to be well-studied and to be planted with a forage species that not only produces larger volumes per hectare per year, but also ensures that the crop planted is more palatable and more digestible. This is so that the animals not only get more feed but they also get a feed that is able to be assimilated, digested and absorbed more efficiently and they get more nutrients out of it. This study is one attempt to find the forage species that would be able to sustain forage crop production all year round for the farmer, getting the most from the forage species chosen.

*Brachiaria humidicola* (Rendle) Schweick and *Pennisetum purpureum* Schumacher are among the common grasses used by the smallholders. *Brachiaria humidicola* originated from South Africa, and was introduced into Australia, Fiji and Papua New Guinea before spreading into most countries in South East Asia (*Cook et al.*, 2005). It is favored by many smallholders because it establishes readily and reliably and is very easily propagated by way of the stem cutting method, usually planted at 1 m x 1 m spacings (*Cook et al.*, 2005). In terms of production, its volume is inferior to other species, as it is a creeping crop. On the other hand, *Pennisetum purpureum*, which is commonly known as Napier grass, is widely used by smallholders to feed their livestock, as it is a standing crop and can grow up to six feet tall, producing higher volumes of feed. It is also known as elephant grass. It has bamboo-like clumps and it ages faster than other species, meaning that as it gets older the nutrient content deteriorates. It easily grows on many types of soil, is easy to establish, with larger mass per hectare resulting in it maturing faster, thus justifying the larger volume of production required. Napier grass is always used as a fodder crop in the cut-and-carry system, but *B. humidicola* can be used in both systems. Using this system would be more convenient and more productive for the farmers as they can just cut and harvest the grass and feed it to their livestock in the shed. This cut-and-carry system is said to be more efficient in using forages as it avoids wastage of feed due to trampling by animals as when they are let to graze.

It is important to feed goats with green forage as ruminants are well-adapted with forage-based diet. Goats, as well as other ruminants, have four stomach compartments, which are rumen, reticulum, omasum and abomasum. Green forage is needed by goats for microbial digestion of feed carbohydrate in the rumen. Microbes in the rumen are important to be maintained alive to constantly produce the fermented Volatile Fatty Acids (VFA) as the main energy source from fibre digestion in the rumen.

Digestibilities of forages are different as are their nutritive values. Napier grass and *B. humidicola* have different nutrient contents and differ in their morphology. Studies have shown the differences of these two grasses and their biomass productivity. This present study is expected to show the differences in digestibilities of these two grasses in terms of dry matter and would provide a distinct comparison to determine which of the two forages are more advantageous.
MATERIALS AND METHODS

Digestibility cages were used where the cages were equipped with feed troughs, separate urine and fecal collection troughs at the back and under the cages. The standing bays were arranged with sieves underneath them. Weighing scales (5 kg and 1 kg digital scales) were used to weigh the feed given, residues and the feces produced. A mechanical chopper was used to cut Napier grass into smaller pieces before they were given to the goats.

Four female goats of Jamnapari breed aged nine months were used in this study. The goats were brought to the UniSZA farm from the Cermin Kiri Veterinary Training Center, Jerangau, Terengganu, Malaysia. Two goats were given Napier grass and the other two were fed with Humidicola grass.

Digestibility Experimental Procedure

The experiment followed the typical method of total-faeces-collection (Pingxiang et al., 2003). Each goat was placed in an individual digestibility cage with access to water. Two goats were fed Napier grass while the other two were fed with Humidicola grass, with three day adjustment period in order to accustom the animals to the diet and to clear the gastrointestinal tract of residues from previous feeds.

For the experimental period, the goats were given their respective diets for five days. This was the period where the feed intake, feed residues and faecal outputs were recorded daily and both animals in their respective cages for each grass species were placed side by side. The next day, leftover grasses and faeces in the faecal collection troughs were weighed and samples were collected and sent for DM analysis. One sample set consisted of five each of fresh feed given, leftovers and faecal samples. The experiment was completed after the samples were analyzed following the procedures of the Malaysian Standards Methods of Tests for Animal Feedstuffs (first Revision), (1982). The DM digestibility of the two grasses by the two animals was calculated based on the following formula:

\[
\text{DM Digestibility (\%) } = \frac{(\text{Feed given}) (\text{Feed leftover}) (\text{Faeces})}{(\text{Feed given}) (\text{Feed leftover})} \times 100
\]

RESULTS AND DISCUSSION

The average daily feed intake and DM intake by the animals in each of the two treatments were calculated and were analyzed statistically using t-Test, and the result is as presented in Table 1. From Table 1, it is seen that the feed intake of Humidicola and Napier grass by the animals was not significantly different \((p > 0.05)\). Table 1 shows the daily DM intake of Humidicola and Napier grass was not significant, where the daily DM intake was 1.04 kg and 0.669 kg, respectively \((p > 0.05)\).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Grasses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Napier</td>
</tr>
<tr>
<td>Average daily feed intake (kg)</td>
<td>1.88 (±0.19)</td>
</tr>
<tr>
<td>Average daily DM intake (kg)</td>
<td>0.67 (±0.076)</td>
</tr>
</tbody>
</table>

Note: * Means were non-significant at \(p > 0.05\).
The DM digestibility was calculated based on the formula as stated earlier. The percentage of DM digestibility is as presented in Table 2.

Table 2. Comparative percentages of DM digestibility between Napier and Humidicola grasses

<table>
<thead>
<tr>
<th>Sampling number</th>
<th>DM digestibility of grasses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Napier (%)</td>
</tr>
<tr>
<td>1</td>
<td>88.82</td>
</tr>
<tr>
<td>2</td>
<td>83.71</td>
</tr>
<tr>
<td>3</td>
<td>88.15</td>
</tr>
<tr>
<td>4</td>
<td>87.50</td>
</tr>
<tr>
<td>5</td>
<td>92.26</td>
</tr>
<tr>
<td>Average</td>
<td>87.89</td>
</tr>
</tbody>
</table>

Table 2 shows both Napier and Humidicola grasses had nearly the same DM digestibility, where Napier and Humidicola had average DM digestibilities of 87.89% and 87.31%, respectively, but this result was not significant statistically as the sample number was small. In any case they tend to be almost similar. Ripperton (1948) mentioned the figures of 59.0% DM digestibility for Napier from his previous digestibility trial, but this could be as high as 71.1% when the grass was cut young (Orodho, 2005), while the digestibility of Humidicola grass ranged from 48.0-75.0% (Jimenez et al., 2010). The present results obtained were very different from both earlier studies as the digestibility varies according to several factors. The age of the plant and stage of growth affect the digestibility as it declines with maturity (Yusoff, 2010). Young plants will have high digestibility, but this declines during maturity. The differential climate of growth of the plant also affects the stage of maturity and its nutrient contents. Dry matter digestibility, crude protein and TDN content of tropical forage declines as age of the forage increases. The age of the animals also affects the digestibility, as well as the feed intake, particle size, chemical composition, feed processing, climate and exercise (Ajmal Khan et al., 2003).

Although the total-faeces-collection method had been proven as the most reliable method in determining the digestibility, it also has its own flaws. Ajmal Khan et al. (2003) mentioned that the result may become uncertain and sometimes it can be abnormally low. This case may occur as the animals may lose their appetite due to lack of movement in the digestibility cages that can lead to stress, becoming nervous and frightened to eat. Besides that, studies have proven that climatic factors such as temperature, water availability and high evaporative demand could lead toward differences in DM digestibility (Minson & McLeod, 1970; Minson, 1990). In fact, Dugmore et al. (2010) reported that the effect of temperature does occur and that it decreased digestibility by 4.4% and intake by 15% for every degree rise in temperature. The present study seems to differ from these previous reports, as our results showed very high digestibility values.

Table 3 shows statistical analysis using independent \( t \)-value of comparative DM digestibility between Napier and Humidicola grasses. The results show that there was no difference \( (p > 0.05) \) on comparative DM digestibility between Napier and Humidicola grasses.

Table 3. Comparative DM digestibility between Napier and Humidicola grass (%)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sampling number</th>
<th>DM digestibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Napier</td>
<td>5</td>
<td>87.89 (±1.36)</td>
</tr>
<tr>
<td>Humidicola</td>
<td>5</td>
<td>87.31 (±1.13)</td>
</tr>
</tbody>
</table>

\( t \)-value = 0.31

Note: * Means were non-significant at \( p > 0.05 \).

Accurate methods of determining digestibility are essential for evaluating nutrition of livestock to ensure that the selected forage gives benefits toward the livestock and the farmers themselves. Digestibility of forages is an important tool, since forage is the fundamental of any livestock’s diet. It is important because faeces represent the greatest loss of utilisable energy,
representing about 20% to 50% of energy loss (Mertens, 2002). The digestibility of a feed determines the amount of nutrients that is actually absorbed by an animal and therefore the availability of the nutrients for growth, reproduction and production. Digestibility of a feed material is one of the factors that determine animal performance and the feed quality and it varies with species, size, production level of the feed and feed intake of the animals consuming it.

Napier and Humidicola are two tropical grasses that are mostly used by farmers to feed their livestock. They have several characteristics required in pasture plants that are suitable for the tropical environment. They have broad adaptation to regional climate and soil conditions. The total DM yield is an important characteristic determining the carrying capacity of a pasture. Besides that, farmers should know the digestibility of the selected forage and their biomass production in order to gain more benefits. An earlier study conducted by Aminah and Wong (1999) confirmed that the biomass production of Napier grass is higher than Humidicola, whereby the biomass production of Napier and Humidicola grasses are 20-30 ton/ha/year and 11-18 ton/ha/year, respectively, with basal dressing of 200-400 kg N/ha/year in nitrogen application.

CONCLUSION

The preliminary results obtained in this study showed that both Napier and Humidicola had similar digestibility. However, the results may be different had the study been carried out using standard procedures for digestibility with a 7-day adjustment period for the animals and 10-day trial period. Likewise, the number of animals used in this study could be expanded to get a better distribution of the means.

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