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Production potentials and cow feed value of *Brachiaria humidicola* grown in Thua Thien Hue province, Central Vietnam

Bui Van Loi* **and Ho Thi Thanh Huong**

Address: Hue University, 03 Le Loi, Hue 490000, Vietnam

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Bui Van Loi, https://orcid.org/0000-0002-4493-2702
Ho Thi Thanh Huong, https://orcid.org/0009-0008-1026-9595
* Corresponding author: Email: bvloi@hueuni.edu.vn

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Abstract

Brachiaria humidicola, a new grass species, was successfully grown in Thua Thien Hue province as a potential food source for the buffalo and cow breeding industry. The pilot study, conducted on 5 land slots with an area of 30 m2/plot, demonstrated the grass's excellent vitality, adaptability, and growth on the land in Thua Thien Hue province. The *B. humidicola* cultured grass reached a height of 96.66 cm on average, with a regenerative capacity green matter yield, dry matter yield, and protein yield of 13.17 - 14.36 tons/ha/batch, 2.96 - 3.76 tons/ha/batch, and 1.07 - 1.24 tons/ha/batch, respectively. The percentage of dry matter accounted for 20.45 %. The nutritional DM is composed of 7.68% (CP), 1.78% (EE), 32.50% (CF), 38.35% (ADF), 62.77% (NDF), and 8.53% (Ash). The most reasonable amount of *B. humidicola* that cows consumed was 25.36 ± 1.04 kg of fresh food/day/head, equivalent to 5.10 ± 0.21 kg of dry food/day/head, accounting for 1.98 ± 0.08% of body weight. These promising results indicate that *B. humidicola* could be grown on a large scale to serve as food for the development of buffalo and cow farming.

Keywords: *Brachiaria humidicola*, green matter yield, dry matter yield, protein yield.

1. Introduction

Cow farming is one of the agricultural production sectors that plays a vital role in the agricultural and rural economic development strategy of many regions and the whole country. However, the biggest obstacle of the cow husbandry industry is that the grazing land area is day by day shrinking due to various reasons. In contrast, cow farming still depends on natural grass, forage and nutrient-poor agricultural by-products. The current high-yielding intensive grass only meets about 10% of the forage demand for cattle (Le Xuan Dong et al. 2012). Therefore, the cow farming industry faces difficulties in solving cow feed supply, which is not developed commensurate with its potential and advantages. The *B. humidicola* grass is a new species that has solid and thriving roots that allow for the rapid improvement of soil porosity. *B. humidicola* grass can be planted with seeds or regenerated by branches, splitting clusters. The grass survives in many different soil types, such as acidic soils and poor soils with high pH. It has suitable growth characteristics and adaptability to growing conditions on waterlogged lands

(Nguyen Thi Giang 2016). Some provinces in our country have grown B. humidicola for cattle feed, achieving high economic efficiency. However, *B. humidicola* grass has not been studied yet. Thus, research on production potentials and cow feed value of B. humidicola grown in Central Vietnam aims to assess the feasibility and propose solutions to improve the efficiency of cow grass cultivation at farmer households, develop production, and contribute to raising their income.

2. Materials and methods

Experiment design

The experiment was conducted from January 2021 to December 2022 in fields in Thua Thien Hue province. It was arranged completely randomly with 5 different types of land. On every kind of land, 5 field plots were selected to grow *B. humidicola* (Figure 1), with an area of 30 m2/plot (5x6m). The time of planting, cutting, collecting, and the regime of care and fertilization on these 5 field plots were all the same.

Figure 1. *Brachiaria humidicola*

The soil in the experimental area was sampled and analyzed using the diagonal method. Soil samples were taken at 5 spots from each slot, mixed well, and sub-samples were taken for analysis.

Techniques for planting, caring and harvesting

Soil preparation: Before planting, the soil was cleared of weeds, thoroughly ploughed, completely loosened, and fertilized with manure; land slots were allocated for the experiment, and rows were made at intervals of 30cm. When the soil was ready, planting started. As for cuttings preparation, grass varieties were collected in the wild for segmental cutting. Cuttings were taken 30cm long from the root, corresponding to about 3-4 knots on the stem.

Planting technique: The grass was grown using cuttings and planted in rows 30 cm apart, with bushes 3 cm apart. Three interlocking cuttings were transplanted and inserted deep into the soil, about 7-10 cm in rows; the root was about 30 cm from each other. Dead bushes were replaced 5-20 days after being planted; weeds were cleared twice before the grass completely covered the land. The first batch was harvested after being planted for 60 days. The following batches were harvested after every 40 days. The cuts were close to the root, 3-5cm from the ground. After each harvest, fertilization, weeding, and top-dressing were done.

Monitoring indicators

Time and sites of taking indicators: The indicators were monitored before the first harvest, 60 days after planting, and following harvests, which are 40-day-old batches. In each slot, 5 points were selected according to the diagonal method for tracking indicators.

Assessment of the green matter yield of Brachiaria humidicola

- *Number of living plants/shrubs:* The number of living plants/shrubs was counted 20 days after planting and before harvest.
- *Height of the highest plant*: The height measured from the plant's root (close to the ground) up to the growth point. How to identify and measure plants: In each lot, the height of 5 tallest plants selected at the time of monitoring was measured. The leaf stroking method calculated the distance from the ground to the highest point.

Grass bed height: Five random points on two diagonals of each lot were selected. A straight ruler was used to measure perpendicular to the ground. The height was measured from the ground to the point (or plane) where more than 70 per cent of the leaves were.

- *Green matter yield*: The entire amount of *B. humidicola* in the experiment slots, including withered branches, were cut down and weeds removed. Cutting was done when it was not raining, all the dew had dried (about 5-10cm from the ground), weight was scaled right after cutting on the experimental field to determine the volume of green matter on a plot and yield was calculated, from which can be converted into tons/ha/batch. Green matter yield was converted into tons/ha/batch using the formula: Green matter yield (tons/ha/batch) = kilograms of plants/m^2/ ×10,000 m^2/1000
- *Dry matter yield*: Dry matter yield = Green matter yield × % DM.

The DM ratio was determined by drying samples at a temperature of 105oC until a constant mass to determine the percentage of dry matter.

- *Protein yield:* Protein yield = the dry matter yield × % of Protein present in DM.

Assessment of nutritional value of Brachiaria humidicola

B. humidicola samples were analyzed for dry matter (DM), total nitrogen and crude protein (CP) (N x 6.25), total minerals (Ash) according to AOAC (1990); neutral detergent insoluble fibre (NDF) according to Van Soest et al. (1991), at the Laboratory, Analytical Center, Faculty of Animal Husbandry and Veterinary Medicine, University of Agriculture and Forestry, Hue University.

Assessment of the maximum intake of beef cattle when feeding with Brachiaria humidicola

- *Experiment site:* The experiment was conducted at the Center for Animal Husbandry and Veterinary Medicine Vocational Training and Practice, under the Faculty of Animal Husbandry and Veterinary Medicine, University of Agriculture and Forestry, Hue University, Thua Thien Hue Province.

Preparation of feed ingredients: B. humidicola was harvested before flowering. After harvesting, all the grass was brought to the Center for Animal Husbandry and Veterinary Medicine Vocational Training and Practice for feeding cows.

Conducting the experiment: The experiment was conducted on 5 bulls, Brahman hybrids with an average weight of 257 ± 0.20kg, who were allowed to adapt this feeding diet for 7 days. Then, samples were collected for 7 consecutive days when the cows were fed only experimental grass and ate freely.

The grass was weighed before feeding; cows were fed 6 times daily (7:00, 10:00, 13:00, 16:00, 19:00, 22:00), and excess feed was weighed the next morning. Intake was calculated in kilograms of dry matter per day and % of body weight.

Analysis

The collected data was managed by Microsoft Excel software and processed by Minitab software version 19.0.

3. Results and Discussion

3.1. Nutrient characteristics of soil at test sites

Soil quality analysis showed that the soil is within the average nutrient limit, the soil has a slight acidity, suitable for growing rice and some other grasses and crops. The pHKCl, H^+, and Al3+ (ldl /100g of soil) were 5.85, 1.03 and 1.05, respectively. The indicators for humus, K_2O, nitrogen, phosphate, P, K, and CEC fertility were 2.95%, 0.62%, 0.19%, 0.09%, 10.25 (mg/100g soil), 0.07 (mg/100g soil), 9.00 (mg/100g soil), respectively (Table 1). This result showed that nutrients are average. pH acidity is one of the critical factors determining soil fertility, affects physicochemical and biochemical processes in the soil and has considerable effects on crops. Most crops tolerate soils with a neutral to less acidic pH (pH=6-7) except for a few crops that can tolerate acidic soils, such as tea (pH= 4.5-5.5) and potatoes (pH=4.8-5.4). The experimental soil had a moderate pH acidity of 5.85 (Van Huu Tap 2016). Humus is an important indicator of soil fertility, determining the physical, chemical, biological properties of the soil. Through Table 1, we see that the humus is 2.95%, which is average (<1%: very poor; 1-2%: poor; 2 – 3%: average; 3-5%: substantial; >5%: rich) (Van Huu Tap, 2016). When cultivating, we need to apply more manure to increase the soil's humus.

Table 1. *Quality characteristics of soil at test sites*

Parameters	Soil quality	Parameters	Soil quality
pH_{KCl}	5.85	P (mg/100 g soil)	10.25
Humus (%)	2.95	K (mg/100 g soil)	0.07
K_2O	0.62	CEC (mg/100 g soil)	9.00
Protein %	0.19	H^+	1.03
Phosphorus %	0.09	Al^{3+} (ldl/100 g soil)	1.05

In the life and growth of plants in general, nitrogen is the most important nutritional element, affecting the yield and quality of the plant; The amount of nitrogen in the soil is related to the soil's humus. Nitrogen in the experiment is 0.19%. This level is indicated as nutrient-poor in the assessment frame (<0.1%: poor; 0.1-0.2%: average; >0.2%: rich) (Van Huu Tap 2016). Therefore, in the process of cultivation, it is necessary to supply more nitrogen to the soil so that the crop achieves high yields.

The phosphate nutrient element is second only to the nitrogen element in the nutritional composition of plants. % of phosphorus analyzed in soil is 0.09%, which is within the medium threshold (<0.03%: very poor; 0.03-0.06%: poor; 0.06-0.1%: average; >0.1%: rich) (Van Huu Tap, 2016). Potassium is a nutrient element second only to nitrogen and phosphate for plants. According to the analysis, the potassium content in soil is 0.07 (mg/100g soil) in an average range of 0.05 (Van Huu Tap 2016). CEC fertility is the parameter reflecting the soil's ability to hold nutrients. CEC depends on 2 indicators: content and property of humus and clay grain grade. CEC in soil was 9.00 (mg/100g soil). This indicator in the experimental soil was in the low range (<10: low; 10-20: medium; >20: high) (Van Huu Tap 2016). Thus, we found that both soils in the experiment have average nutritional value, low ability to hold nutrients, and medium acidic soil. Therefore, in the cultivation process, we should not forget to apply more manure and chemical fertilizers and improve the soil's acidity with lime to achieve high yields.

3.2. Growth capacity of the experimental grass

3.2.1. Survival rate of experimental grass varieties

One of the critical indicators closely related to the vitality, resistance, adaptation and development of grass to soil conditions, weather, climate, later lawn density and the composition of grass productivity is the survival rate of the grass. The survival rate of plants is calculated from planting to budding after about 20 days. According to Ho Van Trong et al. (2021) results, ghine grass and mulato II grass, when grown in Dien Bien, Vietnam, after planting for 30 days, survival rate was 96.56% and 92.31%, respectively. The Guatemala grass survival rate was 82.2%, the elephant grass survival rate was 85.7 – 96.1%, and the Panicum maximum TD58 grass survival rate was 98.2% (Nguyen Xuan Cu and Dao Ba Yen 2017). During planting and monitoring, we realized that the survival rate of *B. humidicola* grass was 95%. Compared to other studies on other grass varieties, the survival rate of *B. mutalo* II was 91.1%, Panicum varieties were 81 – 94.4%, legume varieties were 82.2 – 96.1% (Hoang Van Tao and Tran Duc Vien, 2012), the survival rate of *B. humidicola* in this experiment is higher. The results of Nguyen Thi Giang (2016) proved that in waterlogging conditions, the survival rate of *B. humidicola* grass is the highest, higher than the following varieties in descending order, Ruzi grass, Mulato grass, D58 grass and elephant VA06. Thus, it can be seen that the vitality, adaptability and growth of the *B. humidicola* were high, which initially somehow reflected the growth potential and close relation to the uniformity of the grass and the high ability to adapt to the experimental soil.

Table 2. *The height of the tallest Brachiaria humidicola grass through growth milestones*

Variables / Time	Height (cm) M ± SE	Increase in height (cm) M ± SE	Height rate (cm/day) M ± SD
After planting (0 days)	3 ± 0[f]	0 ± 0[f]	0 ± 0[f]
Growth after 10 days	38.76 ±0.93 [e]	35.76 ± 0.93[a]	3.58 ± 0.93[a]
Growth after 20 days	56.90 ± 0.56[d]	18.14 ± 1.36[b]	1.81 ± 1.36[b]
Growth after 30 days	69.19 ± 2.08[c]	12.29 ± 2.12[c]	1.23 ± 2.12[c]
Growth after 40 days	78.19 ± 1.04[b]	9 ± 1.98[d]	0.9 ± 1.98[d]
Growth after 50 days	81.79 ± 1.17[b]	3.6 ± 2.06[e]	0.36 ± 2.06[e]
Growth after 60 days	92.66 ± 1.35[a]	10.87 ± 1.86[c]	1.09 ± 1.86[c]
F	677.332	51.078	51.078
P	< 0.001	<0.001	<0.001

The values in the column represent the Mean value ± the error. Lowercase letters in the same column indicate the differences between experimental formulas using One-way analysis of variance and Turkey's test.

3.2.2. Growth characteristics of Brachiaria humidicola grass

The height of the tallest grass

The indicator of increasing grass height over the growing period (after 10, 20, 30, 40, 50 and 60 days) was rapid and had a statistically significant difference (p<0.001), of which the period 20 days after planting had the fastest growth rate; in the period from after 40 after 60 days, the growth rate of height per day, there was a statistically significant difference (p<0.001) (Table 2). The highest-grown grass was 92.66cm. The average height of such experimental *B. humidicola* plants was relatively high compared to those planted elsewhere. The types of waterlogging did not affect the height development of the *B. humidicola* grass variety (Nguyen Thi Giang 2016); the average height of grass planted in Quang Binh, Vietnam, was 60.0 – 89.5cm (Nguyen Anh Dung 2017). The Guatemala grass height was 110.0 cm, and the *Panicum maximum* TD58 grass height was 80.2cm (Nguyen Xuan Cu and Dao Ba Yen 2017). The shine grass height and Mulato II grass were 82.61cm and 90.87 cm, respectively (Ho Van Trong et al. 2021). *Stylosanthes guianensis* CIAT 184 grass when grown in Thai Nguyen, Vietnam, at the time after planting for 30, 60, 90 and 105 days, respectively: 14.4cm, 51.5cm, 83.8cm and 94.9cm high (Tu Quang Hien et al. 2017). To conclude, Restionaceae in the study is of moderate height compared to other herbaceous plants.

Table 3. *Brachiaria humidicola lawn height through growth timelines*

Growth váiables / Time	Height (cm) M ± SE	Increase in height (cm) M ± SD	Height rate (cm/day) M ± SD
After planting (0 days)	3 ± 0[f]	0.00 ± 0.00[e]	0.00 ± 0.00[e]
Growth after 10 days	27.73 ± 0.59[e]	24.73 ± 0.60[a]	2.47 ± 0.60[a]
Growth after 20 days	39.49 ± 0.52[de]	11.76 ± 0.62[b]	1.17 ± 0.62[b]
Growth after 30 days	43.98 ± 0.50[d]	4.50 ± 0.83[c]	0.45 ± 0.83[c]
Growth after 40 days	45.98 ± 0.68[c]	1.99 ± 0.60[d]	0.19 ± 0.60[d]
Growth after 50 days	51.91 ± 0.82[b]	5.93 ± 1.24[c]	0.59 ± 1.24[c]
Growth after 60 days	71.81 2.25[a]	19.90 ± 2.92[a]	1.99 ± 2.92[a]
F	448.399	52.247	0.00 ± 0.00[e]

P	< 0.001	< 0.001	24.73±0.60[a]

The values in the column represent the Mean value ± the error. Lowercase letters in the same column indicate the differences between experimental formulas using a One-way analysis of variance and Turkey's test.

Lawn height

The growth rate of lawn height through the growth timelines was quite fast, specifically: the period from after planting to after 20 days has the highest growth rate was 1.17 – 2.47cm/day, then from 30 days to 50 days the growth rate decreases was 0.19 – 0.59cm/day with a statistically significant difference (p<0.001) (Table 3). The height of the lawn after 60 days was 71.81 ± 2.25cm. Thus, the *B. humidicola* grass in the experiment was taller than other grasses. For an example of the height of*B. ruziziensis*, *B. decumnens*, and *B. brizantha* grasses was 50-56 cm, 45-46cm and 57-65cm, respectively (Le Xuan Dong *et al* 2012). The height of large-leave lemongrass, small-leave lemongrass, *Paspalum atratum*, and Setaria were: 40.8 – 42.5cm, 40.4 – 41.5 cm, 41.4 – 41.9 cm and 41.0 – 42.5 cm, respectively (Nguyen Xuan Ba *et al.* 2010).

Table 4. *Number of branches/bush of Brachiaria humidicola grass through growth timelines*

Growth indicators / Time	Number of branches/bush M ± SE	Increase of the number of branches/bush M ± SE	Rate of increase of branches/bush M± SD
After planting (0 days)	0 ± 0[d]	0.00 ± 0.00	0.00 ± 0.00
Growth after 10 days	0 ± 0[d]	0.00 ± 0.00	0.00 ± 0.00
Growth after 20 days	6.22 ± 0.19[c]	6.22 ± 0.20	0.62 ± 0.20
Growth after 30 days	17.81 ± 0.18[b]	11.59 ± 0.34	1.16 ± 0.34
Growth after 40 days	43.77 ± 2.28[a]	25.96 ± 2.15	2.60 ± 2.15
Growth after 50 days	44.91 ± 0.52[a]	1.14 ± 2.39	0.11 ± 2.39
Growth after 60 days	42.58 ± 0.47[a]	-2.34 ± 0.50	-0.23 ± 0.50
F	537.521	64.639	64.639
P	< 0.001	< 0.001	< 0.001

The values in the column represent the Mean value ± the error. Lowercase letters in the same column indicate the differences between experimental formulas using a One-way analysis of variance and Turkey's test.

Number of branches/bushes

The number of branches/bush of *B. humidicola* did not increase within 10 days, which was the period when the plant adapted to the soil and weather conditions as well as developed the root system, accumulated energy. During the period after 20 days, it began to increase and the rate increased rapidly until the period after 50 days of planting. After 60 days, the number of branches decreased due to aging of the lawn (Table 4). Therefore, harvesting grass not later than 60 days after planting is recommended to achieve highest grass yield and quality. The number of branches/bush in the experiment after 50 days reached 40.79 – 44.91 branches/bush. This result shows that *B. humidicola* in the experiment was lower than in some other studies. The number of branches/bush of *Humidicola* was 56.2 branches/bush, higher than Ruzi, Mulato II, TD58, Paspalum and VA06 (Nguyen Thi Giang 2016).

3.3. Productivity of experimented grass

3.3.1. Green matter yield

The green matter yield of *B. humidicola* increased through 4 batches, of which batches 2 and 3 increased higher than those of batch 4. The analysis results showed that the green matter yield of the experimental *B. humidicola* ranged from 13.17 ± 1.22 to 14.36 ± 0.76 tons/ha/batch. This result indicates that the green matter yield of *B. humidicola* in the experiment was higher than in other studies on other grasses. *B. humidicola* grown in Quang Binh, Vietnam, had an average green matter yield of 8.67 - 29.87 tons/ha/batch

(Nguyen Anh Dung 2017). The green matter yield of *B. ruziziensis, B. decumbent and B. brizantha* was 6.2 - 8, 10.4 - 13.5 and 10.5 - 13.1 tons/ha/batch, respectively (Le Xuan Dong *et al.* 2012). In the previous studies, the green matter yield of *B. Mulato* II grass and legumes was 38.81 and 4.33 – 31.17 tons/ha/batch (Hoang Van Tao and Tran Duc Vien 2012). Paspalum at various planting distances had a green matter yield of 16.64 – 26.56 tons/ha, dry matter 4.05 – 6.26 tons/ha, and protein 0.32 – 0.62 tons/ha (Nguyen Thi Hong Nhan et al. 2011). The green matter yield of ruzi grass and ghine grass ranged from 15.3 and 13.6 tons/ha/batch, respectively (Phan Thi Hong Nhung *et al.* (2020)), *Stylosanthes guianensis*CIAT 184 grass ranged from 10.6 – 33.7 tons/ha/batch, average 19.4 tons/ha/batch (Tu Quang Hien *et al.* 2017).

3.3.2. Dry matter yield

The dry matter yield of the second harvest of *B. humidicola* was from 2.96 – 3.76 tons/ha/batch. The highest dry matter yield was the second generation. The dry matter yields of 4 harvests of *Humidicola* grown in the experiment on Thua Thien Hue soil were: 2.26 ± 0.26; 3.76 ± 0.07; 3.34 ± 0.18 and 3.08 ± 0.12 (tons/ha/batch), respectively (Table 5), average dry matter yield was 3.29 (tons/ha/batch). The dry matter yield of *B. ruzi*, B. *dcumben, B. brizantha, B. mulato, B. setaria, B. multica* was 18.6 – 34.0 tons/ha/year, Ghine grass 24.1 – 25.5 tons/ha/year, stylo grass 11.5 – 17.0 tons/ha/year (Nguyen Thanh Nghi *et al.* (2008)). The survey results of Nguyen Xuan Ba *et al.* (2010) showed that the average dry matter yield (8 batches/year) for large-leaved lemongrass, small-leaf lemongrass, *Paspalum atratum*, Setaria grass was 12.1 - 18.1, 17.7 - 22.1, 30.7 - 39.9, 10.0 - 15.1, 18.3 - 28.9 tons/ha/year, respectively. Therefore, we conclude that *B. humidicola* grown in Thu Thien Hue province had a high dry matter yield.

Table 5. *Green matter yield of different batches of Brachiaria humidicola* (tons/ha/batch)

Batch \ Parameters	Green matter yield M ± SE	Dry matter yield M ± SE	Protein yield M ± SE
From planting to 40 days	13.17 ± 1.14	2.96 ± 0.26[b]	0.99 ± 0.09[b]
After 1st harvest to 40 days	14.36 ± 0.76	3.76 ± 0.07[a]	1.24 ± 0.02a
After 2nd harvest to 40 days	14.12 ± 0.58	3.34 ± 0.18[ab]	1.07 ± 0.04[ab]
After 3rd harvest to 40 days	13.91 ± 0.55	3.08 ± 0.12[ab]	1.09 ± 0.04[ab]
F	0.417	4.314	3.774
P	0.743	**0.021**	**0.032**

The values in the column represent the Mean value ± the error.

3.3.3. Protein yield

In animal husbandry, protein is an essential component that increases the biological value of feed and provides amino acids for the growth and development of cattle, increasing livestock productivity. Crude protein yield is calculated by dry matter yield and protein ratio. The protein yields of four batches of *B. humidicola* were 0.99 ± 0.09, 1.24 ± 0.02, 1.07 ± 0.04, and 1.09 ± 0.04 tons/ha/batch, respectively (Table 5). The average protein yield of *B. humidicola* was 0.68-2.43 tons/ha/batch (Nguyen Anh Dung 2017). Therefore, *B. humidicola* had a high protein yield in the experiment. Intensive grass cultivation aims to produce pastures with higher yields per area unit than other crops. The grown *B. humidicola* had a high green matter yield, high dry matter yield, and high protein yield, which will be used as a source of food for the development of buffalo and cow farming.

3.4. Nutritional value

The nutritional value of *B. humidicola* was relatively high among forage plants. The results showed that DM, CP, EE, CF, ADF, and NDF chemical compositions were relatively high (Table 6). The amount of feed ingested by cattle depends on many factors, including the occupancy of feed in the stomach. DM content plays a vital role in affecting the ability of FI. Feed with high moisture reduces the feed ingested by cattle; it is also difficult to store and process. The DM content of *B. humidicola* was 20.45 %. This ratio shows that the DM content of *B. humidicola* grass was either equal or higher than other grass varieties (Table 6). According to the following research on some other plants: DM of Elephant grass VA06 was 15.52% (Tran Van Thang *et al.* (2019)); Ghine Hamil grass with 21.54%; Decumben grass with 21.63%; Ruzi grass with 25.58%; TD58 grass with 23.70%, Mulato II grass with 22.33% and Paspalum grass with 20.63% (Nguyen Thi Mui *et al* 2017). Herbaceous grass varieties (Lemongrass, Elephant grass, Paspalum, Ruzi grass, sweet Sorghum grass) had DM ranging from 10.57 – 19.22% (Nguyen Nhut Xuan Dung *et al.* 2007).

Table 6. *Nutritional Facts of B. humidicola (% DM)*

Parameters	DM	CP	EE	CF	ADF	NDF	Ash
Values	20.45	7.68	1.78	32.50	38.35	62.77	8.53

DM (%): dry matter, CP (%DM): crude protein, EE (%DM): ether extract, CF (%DM): crude fiber, ADF (%DM): acid detergent fiber, NDF (%DM): neutral detergent fiber.

Table 6 also shows that the CP content of *B. humidicola* grass was 7.68% (%DM). Thus, the CP content of*B. humidicola* grass was lower than other grass varieties such as natural grass of 12.3%, however higher than rice straw of 5.4% (Nguyen Huu Van *et al* 2012). According to Nguyen Xuan Ba *et al.* (2010), the protein content for large-leaved lemongrass, small-leaved lemongrass, Paspalum atratum, Setaria grass was: 11.5; 10.5; 10.8; 11.6; 11.5%, respectively. The protein content of *B. Mulato* II grass was 11.3% (Hoang Van Tao and Tran Duc Vien 2012). Thus, compared to other herbaceous grass varieties, *B. humidicola*had a higher percentage of dry matter, but a lower protein composition. When *B. humidicola* is used as feed for cows, protein-rich concentrates should be supplemented to balance the nutritional composition for cows.

The crude fat content of *B. humidicola* grass was 1.78% (Table 6). This result was higher than Ghine Hamil grass of 1.32%, Decumben grass of 1.52%, Ruzi grass of 1.45% (Tran Van Thang *et al* 2019), however lower than some other feed plants such as lemongrass, elephant grass, paspalum, ruzi grass, sweet sorghum grass which ranged from 1.99 – 7.03% (Nguyen Nhut Xuan Dung *et al* 2007).

The crude fiber content was 32.5 % (Table 6). The CF ratio of the *B. humidicola* grass was relatively high compared to other grass varieties. The CF ratio of Elephant grass VA06, Ghine Hamil, Decumben grass, Ruzi d grass ranges from 20.17 – 30.83% (Tran Van Thang *et al* 2012).

The content of acid detergent fiber ADF (%DM) of *B. humidicola* grass was 38.35% (Table 6). The ADF ratio of *B. humidicola* was higher than in the study results of Tran Van Thang *et al.* (2012) when analyzing the ADF rate of Elephant grass VA06, Ghine Hamil, Decumben grass, Ruzi grass, ranging from 27.93 – 33.93%; and also higher than in the results of Nguyen Nhut Xuan Dung *et al.* (2007) on the ADF ratio of lemongrass, elephant grass, Paspalum, Ruzi grass, sweet Shrrgho grass, ranging from 29.60 – 38.88%.

The content of neutral detergent fiber (%DM) obtained was quite high at 62.77%. This NDF was lower than Ruzi grass NDF of 65.81%, lemongrass NDF of 69.55%, Paspalum grass NDF of 68.57% and Elephant grass NDF of 74.10% (Nguyen Nhut Xuan Dung*et al* 2007). According to Meissner *et al.* (1991), the ingested dry matter decreases when the NDF in tropical grass is higher than 60%. The NDF of *B. humidicola* was higher than 60%, if used as feed, it is necessary to combine with other feeds to increase the amount of dry matter ingested.

The Ash of *B. humidicola* obtained was 8.53%. This number was lower than the Ash content of other grass varieties (Elephant grass VA06, Ghine Hamil, Decumben grass and Ruzi grass were 9.25%, 7,05%, 9,17%; 8.93%, respectively) (Tran Van Thang *et al.* 2019); lemon grass, Paspalum grass, Ruzi grass and sweet Sorgho were 10.10%, 12.07%, 8.67% and 12.06%, respectively (Nguyen Nhut Xuan Dung et al. 2007).

3.5. Maximum intake of beef cattle when feeding Brachiaria humidicola

B. humidicola grass was collected at harvest times, including pre-flowering, and taken to the Veterinary Husbandry Vocational Training and Practice Center to feed 4 male

Brahman breed cows, weight average at 257 ± 0.20 kg, free feeding. Intake results were monitored and evaluated (Table 7).

Table 7. Survey of beef cattle' maximum intake of *Brachiaria humidicola*

Quota	n	Mean ± SE
Cow mass	5	257 ± 0.20
Fresh food ingested (kg/day/animal)	5	25.36 ± 1.04
Ingested dry matter (kg/day/animal)	5	5.10 ± 0.21
Ingested crude protein	5	0.42 ± 0.02
% body mass	5	1.98 ± 0.08

The values in the column represent the Mean value ± the error.

For cattle, intake is a significant indicator of feed ration quality and is closely related to husbandry productivity and efficiency; on the other hand, it reflects the rumen's capacity and the quality of the grass. The average dry matter intake per cow in 7 days was 5.10 kg/head/day with a corresponding protein intake of 0.42 kg/head/day. That average intake compared to the average body weight of the 4 cows accounted for 1.98%. According to McDonald et al. (2002), beef cattle's dry matter intake was estimated to be 2.2 per cent of their body weight, while dairy cows' intake was about 2.8 per cent, higher at the beginning of the lactation cycle and 3.2 per cent at peak intake. However, heifers (200kg) took in about 2.8-3% of their body weight (Preston and Willis 1970). Thus, the amount of *B. humidicola* intake in this experiment was inconsistent with the above recommendations (1.93 – 1.98 % of body weight). Therefore, if B. humidicola grass is used as feed for cows, supplementing other concentrates is recommended to improve the efficiency of the obtained feed. Vu Duy Giang *et al* 2008) estimated the amount of feed intake by cows to assess feed quality. Accordingly, we proposed 5 recommended levels of dry matter daily intake (% of body mass): 3.0 – perfect, 2.5 – good, 2.0 – average, 1.5 – bad and 1.0 – very bad. Thus, according to the above assessment frame, the amount of B. humidicola ingested by cows is average (1.93 – 1.98% of body weight).

Conclusions

B. humidicola had high vitality, adaptability and growth on soil in Thua Thien Hue province, Vietnam. The highest height of *B. humidicola* grass was 96.66 cm. The grass lawn height was 71.81cm. The regenerative capacity green matter yield, dry matter yield, and protein yield of B. humidicola grass were 13.17 – 14.36 tons/ha/batch, 2.96 – 3.76 tons/ha/batch, and 1.07 – 1.24 tons/ha/batch, respectively. The percentage of dry matter accounted for 20.45 %. The nutritional DM composed of 7.68% (CP), 1.78% (EE), 32.50% (CF), 38.35% (ADF), 62.77% (NDF) and 8.53% (Ash). The most reasonable amount of B. humidicola that cows consumed was 25.36 ± 1.04 kg of fresh food/day/head, equivalent to 5.10 ± 0.21 kg of dry food/day/head, accounting for 1.98 ± 0.08% of body weight. *B. humidicola* could be grown on a large scale to serve as food for the development of buffalo and cow farming.

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