EVALUATION OF BIOMASS AND NUTRITIVE VALUES OF *LEPTOCARPUS DISJUNCTUS* FOR CATTLE IN CENTRAL VIETNAM

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Abstract

Leptocarpus disjunctus Mast. is grown in the provinces of Central Vietnam. The results of the evaluation of the growth, yield, and nutritional value of this plant grown on the sandy coastal area of Central Vietnam showed a survival rate was 85 - 90%; at 150 days of age, the tallest plant was 106.62 ± 0.82cm, the grass bed height was 80.99 ± 0.09 cm. The growth rate peaked in the period of 120 days after planting, then gradually decreased; The green matter yield, dry matter yield, and protein yield were: 11.7 – 14.2 tons/ha, 4.9 – 5.7 tons/ha, 0.8 – 0.9 tons/ha, respectively; Regarding nutritional composition, DM was 41.73%, CP was 5.88% in DM, EE was 1.80%, NDF was 70.10%, and Ash was 2.37%, respectively. The cattle ingested *L. disjunctus*: 13.93 ± 0.35kg of fresh/day/head, equivalent to 5.61 ± 0.14kg of dry feed/day/head, accounting for 2.19 ± 0.05% of body weight. *L. disjunctus* well-using feedstuff ruminants to increase the dietary fiber.

Keywords: Growth, nutrition, dry, cattle, yield.

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1. INTRODUCTION

Leptocarpus disjunctus, synonymous with *Dapsilanthus disjunctus*, belongs to the family (*Restionaceae)* [1]. In the regions between Australia and Asia, *Leptocarpus* has three species in Northern Australia, of which two species also present in New Guinea and Aru Islands, also extending to Malaysia, Cambodia, and Thailand, to the Southeastern Chinese island of Hainan and their species of the family Restionaceae are typically found in heathlands, shrublands, and forested areas on nutrient-poor soils and dry regions, especially in coastal and inland sandy areas [1]. In practice, the plant are presented more in coastal regions of North Central Vietnam (Quang Binh, Quang Tri and Thua Thien Hue). This species to the salt tolerance enables strong growth and is consumed as a local vegetable, however, local warnings about its side effects include drowsiness after ingestion [2]. There were conductions by Watchara (2016) was that *L. disjunctus* exhibits high levels of vitamin C. They primarily contain linoleic acid and linolenic acid, and high levels of potassium and phosphorus [2]. In addition to the advantage of protecting and stabilizing the sandy terrain, *L. disjunctus* has greatly contributed to protecting the sustainable ecological environment in the central Vietnam coastal sandy area [3], and Ham Rong Mountain belonging to Phu Quoc National Park [4]. In North Central Vietnam, *L. disjunctus* plant in arid sandy areas for environmental protection, sand barrier, and as forage for cattle and buffaloes in dry season. Although, there was no any publications and study on this plant, since we found the possibilities to dicorvering on nutrive for ruminant and adapted in arid sandy and dry season. "Evaluating biomass and nutritional value of *L. Disjunctus* for cattle in Central Vietnam", aiming to increase the potential plant for ruminants in dry seasons, poor soil and nutritive values. Development of the beef cattle industry in Vietnam has been constrained by limitations in forage supply and quality. In recent years numerous high-yielding forage species have been imported and evaluated for adaptation, biomass yield and quality across Vietnam (Phan Thi Phan et al. 1999; Truong Tan Khanh 1999), but there is little evidence of their widespread adoption by farmers. Improving feeding options by utilizing locally available feed resources and introducing new forages remains a key strategy for improving beef cattle production (Nguyen Xuan Ba et al. 2010).

2. MATERIALS AND METHODS

2.1. Research site

The experiment was conducted from April 2021 to August 2022, in the sandy coastal land of Quang Thai commune, Quang Dien district, Thua Thien Hue Province. The land areas were allocated to households with the goal of attaining self-sufficiency in local consumption. The dry land area and by site of Tam Giang lagoon, most of land areas was still planted species as sweet potato, chili and grass, L. Disjunctus also was developing as wild plant and cover the arid dry land. Rain fall average in dry season, from April to August, is 1500 mm, The climatic conditions of Quang Thai are tropical in nature. Precipitation even during the driest month. According to Thua Thien Hue's weather forcast. The average temperature in Quang Thai in dry period 35.5 °C. This area, situated near the lagoon and coastal line, is characterized by difficult to growth more plants.

2.2. Materials, animals and experimental design

* Sorting:
- Regnum: Plantae
- Ordo: Restionales
- Familia: Restionaceae
- Genus: Leptocarpus
-Species: *Leptocarpus disjunctus* Mast a synonym of *Dapsilanthus disjunctus*

Figure 2.1. Leptocarpus disjunctus

The experiment was randomly arranged with trials (ecah trial with 5 lots for replecated 2 times in dry season), each slot cover 30 m^2/plot (5 x 6 m). Then *L. disjunctus* seedlings were planted on these 5 lots. The time of planting, collecting and the regime of care and fertilization in these 5 lots are the same.

Figure 2.2. Soil prepared for planting

Figure 2.3. L. disjunctus newly planted

The soil in the experimental area was taken for sampling and analysis. Each trail, soil samples were taken at 5 points, mixed well were taken for analysis and soil before planting was cleared of weeds, loosened, and plotted for the experiment at 30 cm from each other. When the soil was ready, planting was followed. *L. disjuncts* were planted in rows, clusters 30 cm apart, planted with cuttings about 3-5 cm long, taken from the root, corresponding to about 3-4 knots on the stem. Cuttings were transplanted together and planted about 7-10 cm deep in the soil, in rows, 30 cm from each other. 20 days after planting, dead bushes were replaced, and weeds were cleared twice before the crop completely covered the land. The first batch was harvested after being planted for 120 days. The cuts were close to the root, 3-5 cm from the ground. After each harvest, fertilization, and top-dressing were done.

2.3. Measures and methods

Time and sites of taking samples: the indicators were monitored after planting for 10 days, 20 days, 30 days, 40 days, 50 days, 60 days, 90 days, 120 days, and 150 days. On each lot, 5 points were selected and sampled, according to the diagonal method for tracking indicators.

2.3.1. Growth and yield of L. disjunctus

- *Number of living plants/shrubs:* the number of living plants/shrubs was counted 20 days after planting and before harvest. *Survival ratio:* Calculated by the formula:

Survival ratio = (Number of living plants or shrubs/ Total number of plants or shrubs) x 100%

- *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: The height of the 5 tallest plants selected at the monitoring time was measured in each lot. The distance measured from the ground to the highest point by leaf stroking method.
- *Grass bed height:* 5 random points on 2 trials were selected, the height was measured from the ground to on top.
- *Green matter yield:* The amount of *L. disjuncts* 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, cutting was not too high (about 5-10 cm from the ground), and eight 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 105^0C until a constant mass to determine the percentage of dry matter.
- *Protein yield:* Protein yield = the dry matter yield × % of Protein present in DM.

2.3.2. Nutritional values

The samples of the *L. disjunctus* plant collected were sent to the laboratory to be dried, then finely ground with the size of 1 mm, and then analysed for chemical composition, including DM, CP, EE, ADF, NDF, and Ash. Grass samples were analyzed for dry matter (DM), total nitrogen and crude protein (CP) (N x 6.25), total minerals (Ash) according to AOAC (1990) [5]; neutral detergent insoluble fiber (NDF) according to Van Soest et al. (1991) [6], at the Laboratory, Analytical Center, Faculty of Animal Husbandry and Veterinary Medicine, University of Agriculture and Forestry, Hue University.

2.3.3. Feed intake

-*Experiment location:* 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: L. disjunctus* was collected before flowering. All grass after harvesting was brought to the Center for Animal Husbandry and Veterinary Medicine Vocational Training and Practice for feeding cows.

- *Experimenting:* The experiment was conducted on 4 bulls, Brahman hybrids with an average

weight of 253.25 ± 3.20 kg, which was allowed were adapted to their feeding diet for 21 days, then samples were collected for 7 consecutive days when the cows were fed only experimental grass and ate freely. At the end of the experimental period, the cows were weighed to calculate the weight gain of the cows. The grass was weighed before feeding, and cows were fed 6 times daily (7:00, 10:00, 13:00, 16:00, 19:00, 22:0, and 0). Excess feed was weighed the next morning. Intake was calculated in kilograms of DM per day and % of body mass.

2.3.4. Data and calculation

The collected data was managed by Microsoft Excel software (2010) and processed by Minitab software version 19.0 using the ANOVA analysis method.

3. RESULTS AND DISCUSSION

3.1. Soil characteristics

The results of soil nutrient characteristics analysis at the experiment sites are shown in Table 1.

Table 1. *Soil nutritive variables(n=5)*

Variables	Unit	M ± m
Total nitrogen	mg/kg	420.4 ± 21.5
Easily digestible nitrogen	mg/kg	13.7 ± 1.25
Total P_2O_5	mg/kg	14.3 ± 1.84
Easily digestible P_2O_5	mg/kg	11.2 ± 0.89
Total K_2O_5	mg/kg	66.7 ± 5.28
Easily digestible K_2O_5	mg/kg	10.0 ± 0.75
Organic carbon	mg/kg	3.2 ± 0.22
Calcium Exchanger ($^{Ca2+}$)	mgdlCa^{2+}/100g	0.81 ± 0.10

It is clearly shown in Table 1 that the soil in the experiment was poor and sandy. Nitrogen, Phosphate, Potassium, and Calcium indicators were assessed to be much lower than the average. According to the assessment and analysis of soil environmental indicators by Van Huu Tap (2016), total nitrogen <0.1%: poor [7]; Easily digestible nitrogen < 4mg/100mg soil: poor; Total P_2O_5 < 0.03%: poor; P_2O_5: 5-10 mg/100g soil: poor; Easily digestible K_2O_5 <10 mg/100g soil: poor. Nitrogen is the most important nutrient to plants; Nitrogen content is strongly correlated with humus content. Table 1 shows that the soil's total nitrogen content and easily digestible nitrogen were 420.4 mg/kg and 13.7 mg/kg, respectively. The nitrogen content in the assessed soil was very poor. The nutrient Phosphate is only behind nitrogen in the nutritional composition of plants. The total P2O5 and easily digestible P2O5 content in the test soil was 14.3 mg/kg and 11.2 mg/kg, respectively. Compared to the research results of Van Huu Tap (2016), phosphate content was assessed to be very poor [7]. Potassium is a nutrient essential to plants, second only to nitrogen and phosphate. According to the analysis, the content of total K_2O_5 was 66.7 mg/kg. This figure shows that the soil had an average total potassium content, equivalent to about 0.0067% of the total soil. However, the easily digestible K_2O_5 content was only 10.0mg/kg. Compared to the research results of Van Huu Tap (2016), potassium content was assessed to be poor [7]. Calcium Exchanger is an important indicator for assessing soil fertility but often receives little attention. Regarding fallow and arable land, Calcium exchanger below $2m^2$/100 g of soil is very poor, 4-8 m^2 is average, and above $8m^2$/100 g of soil is considered sufficient [7]. From the results in Table 1, the calcium exchanger (Ca_2+) in the experimental soil is 0.81 mgdl Ca_2^+/100g. This is very nutrient-poor soil. Thus, according to Van Huu Tap (2016), regarding the nutritional rating of the soil, the soil for the *L. disjunctus* in the experiment is a very nutrient-poor sandy soil [7].

The temperature, humidity, rainfall, and number of sunshine hours of the study area in Quang Thai commune, Quang Dien district, Thua Thien Hue province, are shown in Table 2 and provides the temperature, humidity, rainfall, and hours of sunshine at the area between January 2021 and December 2021. The values in the table were measured and recorded in the corresponding months April to August, the rainfall and huminity are less and sunshine and temperature are higher. According to the table above, some of the following points are noticeable. The temperature gradually increased from January to June, August and then decreased until December 12 to March.

3.2. Weather and climate characteristics of the experiment regions

Table 2. Temperature, humidity, rainfall, and hours of sunshine in the study area

Index / Month	Temperature (° C)	Humidity (%)	Sunshine (hours)	Rainfall (mm)
1	19.8	80.7	77.1	115.4
2	20.4	79.3	129.6	26.6
3	23.1	78.6	157.4	30.4
4	27.1	60.0	146.7	97.6
5	29.8	56.4	164.2	88.2
6	32.0	55.0	169.3	65.3
7	33.8	45.9	152.2	64.8
8	34.7	47.0	137.1	56.7
9	28.3	83.7	125.6	219.9
10	26.7	80.9	102.9	393.9
11	23.6	77.6	117.1	244.8
12	21.4	77.1	90.4	80.7
M ± m	25.3 ±	81.1 ±	123.3 ±	179.0 ±

3.3. Growth ability of *L. disjunctus*

3.3.1. Survival rate

One of the important 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 was 85 - 90%, and the plant had vitality, adaptability, and high growth on coastal sandy lands. According to the research results of Ho Van Trong et al. (2021), Ghine grass and Mulato II grass when grown in Dien Bien at the time after planting for 30 days, survival rate was 96.56% and 92.31%, respectively [8]. The Guatemala grass survival rate is 82.2%, the elephant grass survival rate from 85.7 – 96.1%, the *Panicum maximum* TD58 grass survival rate is 98.2%, and the Mulato II survival rate is 96.5% [9]. Thus, it can be seen that the vitality, adaptability and growth of the *L. disjunctus* Mast. were high, which initially reflected the growth potential and close relation to the uniformity of the grass and the high ability to adapt to the experimental soil.

3.3.2. Growing

Plant height is one of the important indicators of the growth and development of food plants. For grass, the taller the plant is, the greater the green matter biomass is. Grass bed height is related to productivity, covering ability, and picking convenience. The height difference through the stages of growth is presented in Table 3. *L. disjuncts* is a herbaceous plant, with standing stems, and average plant height compared to grassy plants with standing stems. Table 3 shows the aver that the average height of L. disjunctus plant at 150 days of age is 106.62 cm, equivalent to ghine grass of about 80.9 – 111.3 cm and grass of about 90.2 cm [11]. The Guatemala grass height is 110.0 cm, the elephant grass height is 113.4 – 148.0 cm, and the *Panicum maximum* TD58 grass height is 80.2 cm [9]. According to the research results of Ho Van Trong et al. (2021), the grass height is 82.61 cm, and in trial 2, the grass height was 90.87 cm [8]. According to the research results of Tu Quang Hien et al. (2017), *Stylosanthes guianensis* CIAT 184 grass when grown in Thai Nguyen at the time after planting for 30 days, 60 days, 90 days, and 105 days, respectively: 14.4 cm, 51.5 cm, 83.8 cm and 94.9 cm high [10]. To conclude, *L. disjunctus* in the study is of moderate height compared to other herbaceous plants.

Table 3. The height of the tallest L. disjunctus plant through growth timelines (cm/day)

Growth Time (days)	Height M ± m	Height growth M ± m	Height growth M ± m
0	1 ± 0	0 ± 0^{e}	0 ± 0^{f}
10	15.38 ± 0.51^{i}	14.38 ± 0.5^{b}	1.44 ± 0.05^{a}
20	19.35 ± 0.56^{h}	3.98 ± 0.10^{de}	0.39 ± 0.01^{d}
30	23.58 ± 0.42^{g}	4.23 ± 0.19^{de}	0.42 ± 0.02^{d}
40	30.27 ± 0.36^{f}	6.69 ± 0.32^{d}	0.67 ± 0.03^{c}
50	38.79 ± 0.27^{c}	8.52 ± 0.47^{c}	0.85 ± 0.05^{b}
60	48.24 ± 1.72^{d}	9.45 ± 0.57^{c}	0.95 ± 0.06^{b}
90	88.26 ± 1.26^{c}	40.02 ± 0.91^{a}	1.33 ± 0.03^{a}
120	102.50 ± 1.08^{b}	14.25 ± 0.68^{b}	0.48 ± 0.03^{d}

150	106.62 ± 0.82^{a}	4.11 ± 1.1^{de}	0.14 ± 0.04^{e}
F	2894.937	370.442	184.928
P	<0.001	<0.001	<0.001

The values in the column represent the mean and error. The column letters represent the difference between experimental formulas by single-factor variance analysis and the T-Test.

Increases in plant height and height increase rate over different growth milestones were different and statistically significant (P < 0.001). The highest increase in plant height and the highest rate of increase was in the period after planting to 10 days of age (1.44 cm/day). According to the research results of Ho Van Trong et al. (2021), shine grass's highest increase rate is 1.34 cm/day, and Mulato II grass's highest increase at 1.49 cm/day [10]. This could be due to plant physiological characteristics and forced growth because the plant was grown from seed bushes. The plant grew at a high speed while struggling for survival so that the plant could survive and develop further.

From 10 days after planting to 30 days, the plant height increased slowly (0.39 – 0.42 cm/day), and there was no statistically significant difference. At the time, the plant's main activity was to form and finish forming vegetative organs such as roots, stems, leaves, and branches. According to the research results of Tu Quang Hien et al. (2017), *S. guianensis* CIAT 184 grass, when grown in Thai Nguyen from 15 days after planting to 30 days, the plant height increased slowly 0.35 – 0.61 cm/day [10]. From 30 days old to 90 days old, the plant grew faster, and this was the time when the plant grew fastest (0.67 – 0.95 cm/day); *S. guianensis* CIAT 184 grass when grown in Thai Nguyen from 30 days after planting to 90 days, the plant height increased 0.61 – 0.97 cm/day [10]. In the period from 90 to 120 days of age, the height of the plant increased insignificantly, this was the period when the plant concentrated nutrition to develop stems and complete plant physiological functions. According to the research results of Tu Quang Hien et al. (2017), *S. guianensis* CIAT 184 grass when grown from 90 days after planting to 105 days, the plant height increased (0.74 – 0.97 cm/day [10]. In the period of 120 to 150 days old, the plant's growth rate decreased sharply (0.14 cm/day). This was also when the plant began to perfect plant physiological functions and flower.

3.3.3. Grass bed height

Table 4. Grass bed height of L. disjunctus through growth timelines (cm/day), n=5

Growth / Time (days)	Height M ± m	Height Increased M ± m	Height M ± m
0	1 ± 0^{e}	0 ± 0^{f}	0 ± 0^{f}
10	7.76 ± 0.16^{f}	6.76 ± 0.16^{d}	0.67 ± 0.02^{d}
20	8.82 ± 0.14^{f}	1.06 ± 0.29^{f}	0.11 ± 0.03^{e}
30	10.19 ± 0.05^{ef}	1.37 ± 0.09^{f}	0.14 ± 0.01^{e}
40	11.67 ± 0.05^{ef}	1.48 ± 0.00^{f}	0.15 ± 0.00^{e}
50	12.94 ± 0.02^{e}	1.27 ± 0.03^{f}	0.13 ± 0.01^{e}
60	23.25 ± 0.05^{d}	10.30 ± 0.06^{c}	1.03 ± 0.01^{a}
90	47.33 ± 0.60^{c}	24.08 ± 0.64^{b}	0.80 ± 0.02^{c}
120	77.09 ± 1.05^{b}	29.7 ± 0.80^{a}	0.99 ± 0.03^{a}
150	80.99 ± 0.09^{a}	3.89 ± 1.02^{e}	0.13 ± 0.03^{e}
F	5832.927	500.413	467.839
P	<0.001	<0.001	<0.001

The values in the column represent means and errors. The column letters represent the difference between experimental formulas by single-factor variance analysis and the Turkey test.

The grass bed height represents the uniform growth of plants, reflecting yield. The results of assessing the height of the *L. disjunctus* grass bed are shown in Table 4 and had a rather high grass bed height, of which the average at 150 days old was 80.99 cm. According to Tu Quang Hien et al. (2017) research results, *S. guianensis* CIAT 184 grass when grown in Thai Nguyen height of 68.3 cm [10]. Increasing grass bed height and increase rate was consistent with increasing the tallest plant height. Grass bed height had statistical significance ($p < 0.001$) in which grass bed height increased over time, and reached the highest growth index at 150 days at 80.99 cm. However, the grass bed height growth rate had a statistically significant difference during the monitoring period. The grass bed's height increase and the growth rate is highest from planting to 10 days of

age. As analyzed above, this was the strongest growth period for *L. disjunctus* to ensure its survival and development. In the period from 10 days to 50 days of age, the growth rate in the height of the grass was from 0.11 to 0.15 nm/day, and there was no statistically significant difference. This shows that the height increase of the grass bed of *L. disjunctus* is quite uniform and suitable for crop growth. The period from 50 to 60 days of age was when grass bed height increase rates were highest (1.03 cm/day), and the difference is statistically significant at all times of growth, except at 120 days of age and then gradually decreased. Therefore, in cultivation, harvest should be at 120 days of age to obtain the highest fresh biomass.

3.4. Production and yield

Green matter yield, dry matter yield, and protein yield of grass are important foundations for assessing the plant's potential, thereby developing development strategies in animal husbandry. The average green matter yield, dry matter yield, and grass protein yield of postharvest regenerated grass are shown in Table 5.

Table 5. Green matter yield, dry matter yield, protein yield in different lands (tons/ha/batch)

Monitoring indicators / Harvesting	FM M ± m	DM M ± m	CP M ± m
Batch 1	11.7 ± 0.03^{b}	5.00 ± 0.00^{b}	0.80 ± 0.00^{b}
Batch 2	14.2 ± 0.03^{a}	5.70 ± 0.01^{a}	0.90 ± 0.00^{a}
Batch 3	12.8 ± 0.05^{ab}	4.90 ± 0.02^{b}	0.80 ± 0.00^{b}
F	10.422	462.211	8.092
P	0.002	<0.001	0.006

The values in the column represent the mean and error. The column letters represent the difference between experimental formulas by single-factor variance analysis and the Turkey test.

3.4.1. Biomass (FM)

The experiment results showed that the green matter yield of *L. disjunctus* obtained at the study site had an average value of 11.7 – 14.2 tons/ha/batch. According to the research results of Phan Thi Hong Nhung et al. (2020), the green matter yield of *ruzi* grass ranged from 15.3 tons/ha/batch, and the green matter yield of *ghine* grass ranged from 13.6 tons/ha/batch [11]. According to Tu Quang Hien et al. (2017) research results, *S. guianensis* CIAT 184 grass ranged from 10.6 – 33.7 tons/ha/batch, an average of 19.4 tons/ha/batch [10]. The green matter yield of *Paspalum atratum* grass ranged from 16.64 – 26.58 tons/ha/batch [12]. The green matter yield of some dairy feed plants grown in Nghe An such as the *Croatataria* plant was 4.7 tons/ha/batch, the *Burgady bean* plant was 9.00 tons/ha/batch, the *Sardy ten* plant was 1.57 tons/ha/batch and *Ebody cowpean* plant was 13 tons/ha/batch [13]; The grass ranged 3.09 tons/ha/batch, Mulato II, grass ranged 3.66 tons/ha/batch [10]. According to the research cultivation of Twanese nappies grass by Nguyen Thi Hoa Binh (2017) at the Vietnam Institute of Agriculture, the result is 79.43 tons/ha, for elephant grass 61.57 tons/ha, purple elephant grass 61.75 tons/ha, VA06 grass is 73.94 tons/ha [14]. This research showed that the green matter yield of *L. disjunctus* is low compared to the grasses mentioned above. Because the composition of the soil was nutrition-poor and ecological conditions in the study area were harsh, green matter yield is lower than grasses grown under favorable conditions.

3.4.2. DM

The dry matter yield obtained in this study was 4.9 – 5.7 tons/ha/batch (Table 5). The dry matter yield of *P. atratum* grass ranged from 4.05 – 6.26 tons/ha/batch [12]. The dry matter yield of some dairy feed plants grown in Nghe An such as *Croatataria* was 0.96 tons/ha/batch, *B. bean* was 4.61 tons/ha/batch, *S. ten* was 0.43 tons/ha/batch, and *E. cowpean* was 5.47 tons/ha/batch [13]. Compared with Nguyen Thi Hoa Binh's study, the dry matter yield of *L. disjunctus* was lower than that of other grasses such as Taiwanese nappies grass (14.97 tons/ha), Elephant grass (9.34 tons/ha), Purple Elephant grass (9.85 tons/ha), VA06 grass (12.15 tons/ha) [14].

3.4.3. Protein

Similar to the green and dry matter yields, the protein yield of *L. disjunctus* grown in the study area was 0.8 – 0.9 tons/ha (Table 5), which was lower than that of other grass varieties namely Twanese nappies, Elephant grass, Purple Elephant grass, VA 06 grass which was 1.08 tons/ha; 0.86 tons/ha, 0.92 tons/ha and 1.37 tons/ha, respectively [14]. The protein yield of *Paspalum atratum* grass ranged from 0.32 – 0.62 tons/ha/batch [12]. The protein yield of some dairy feed plants grown in Nghe An such as *Croatataria* was 0.2 tons/ha/batch, *B. bean* was

1.0 tons/ha/batch, *S. ten* was 0.1 ton/ha/batch and *E. cowpean* was 1.2 tons/ha/batch [13].

3.5. Nutritional values

The results of the analysis of the composition and nutritional value of the *L. disjunctus* grown in Thua Thien Hue are presented in Table 6.

Table 6. Chemical ompostion (%DM), n=5

Variables	DM	CP	EE	CF	ADF	NDF	Ash
M ± m	41.73 ± 2.42	5.88 ± 0.57	1.80± 0.25	43.58 ± 3.41	41.83 ± 3.21	70.10 ± 5.34	2.37 ± 0.18

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

Table 6 shows that the study's nutritional value of *L. disjunctus* was quite high among forage plants. According to the results of the analysis, the chemical composition of *L. disjunctus* such as dry matter (DM), crude protein (CP), ether extract (EE), crude fiber (CF), acid detergent insoluble fiber (ADF), neutral detergent insoluble fiber (NDF) was quite high (Table 6). For the DM indicator, the average result was 41.73% (Table 6). The feed intake by cattle depends on many factors, including the occupancy of the feed in the stomach. Analysis of the dry matter content in the grass plays a very important role because dry matter affects the ability of cattle to absorb feed. Food containing a lot of water reduces the feed ingested by cattle and is difficult to store and process. The DM of *L. disjunctus* was quite high. The DM of Elephant grass VA06 was 15.52% [15]; Hamil grass was 21.54%; was 21.63%; Ruzi grass was 25.58% [11]; TD58 grass was 23.70%, VA06 grass was 15.70%, Mulato II grass was 22.33% [9], Ruzi grass was 23.20% and Paspalum grass was 20.63%, the CP content of *L. disjunctus* was 5.88% (% DM) [16]. Thus, the CP content of the obtained *L. disjunctus* plant is lower than that of some other forages, specifically: according to the analysis results, the CP content of ruzi grass was 12.7%, Elephant VA05 grass was 10.0%, Elephant grass was 7.2%, the grass was 14.3% ơ; Hamil grass was 9.72%, Decumben grass was 10.96% [18]; western grass was 8.75% (Nguyen Van Thu (2010) [17]; TD58 grass was 7.28%, Mulato II was 9.54% [16]. However, compared to rice straw and some other forages, the CP content of *L. disjunctus* improved significantly, and the CP content of *S. guianensis* CIAT 184 grass when grown in Thai Nguyen was 3.59% [10]. Therefore, when using the *L. disjunctus* as feed for ruminant cattle, it is necessary to add CP-rich concentrates to balance livestock nutrition.

The EE content (%DM) of *L. disjunctus* was 1.80%. This number is higher than Ghine Hamil grass at 1.32%, Decumben grass at 1.52%, Ruzi grass at 1.45% [18], *Stylosanthes guianensis* CIAT 184 grass of 0.45% [10]. The CF content (%DM) of *L. disjunctus* was relatively high. According to Tran Van Thang et al. (2018), the CF ratio of Elephant grass VA06, Ghine Hamil, Decumben grass, and Ruzi grass ranged from 20.17 – 30.83% [18]. In contrast, the NDF content (%DM) of *L. disjunctus* in all three periods was quite high, and there was a statistically significant difference ($P < 0.001$). The pre-flowering NDF was 68.50%, and during the flowering phase was 70.14%. The ADF content (% DM) of *L. disjunctus* was 41.83%. The ADF content of *L. disjunctus* in all 3 stages was higher than the ADF content of Elephant grass VA06, Hamil, Decumben grass, and Ruzi grass, ranging from 27.93 – 33.93% in the study of Tran Van Thang et al. (2018) [18]. The Ash rate (%DM) of *L. disjunctus* obtained in the study was 2.37%. This number was lower than the Ash content of other grass varieties (Elephant grass VA06, Hamil, and Ruzi grass were 9.25%, 7,05%; 9,17%; 8.93%, respectively) in the study published by Tran Van Thang et al. (2019) [15]; *Stylosanthes guianensis* CIAT 184 grass of 1.93% [10].

3.6. Feed Intake

The experiment was conducted on 4 individual Brahman and showed that cows could digest *L. disjunctus* well. The *L. disjunctus* Table 7., intake was 13.29 – 14.43 kg of fresh feed/day/head, equivalent to the amount of ingested dry feed of 5.35 - 5.81 kg/day/head, accounting for 2.12 - 2.33% of body weight. According to McDonald et al. (2002), beef cattle's DM intake is estimated to be 2.2 % of body weight, while dairy cows' intake is about 2.8 %, higher at the beginning of the lactation cycle and 3.2 % at peak intake [19]. Thus, this experiment's amount of L. disjunctus intake is consistent with the above recommendations (2.12 – 2.33% of body weight). The estimated amount of feed intake by cows to assess feed quality. Accordingly, the author proposed 5 recommended levels of dry matter daily intake (% of body mass): 3.0 – very good; 2.5 – good. 2.0 – average; 1.5 – bad and 1.0 –

very bad. Thus, according to the above assessment frame, the amount of *L. disjunctus* ingested by cows is good (2.12 – 2.33% of body weight).

Table 7. Feed maximum intake and growth performance of L. disjunctus

Indicators	n	M ± m
Initial weight (kg)	5	253.25 ± 3.20
After feeding (kg)	5	262.25 ± 0.35
Growth g/day	5	321.43 ± 0.12
FM (kg/day/head)	5	13.93 ± 0.35
DM (kg/day/head)	5	5.61 ± 0.14
CP	5	0.86 ± 0.21
% BW	5	2.19 ± 0.05

4. CONCLUSIONS

- The survival rate was 85 - 90%, and the plant had vitality, adaptability, and high growth on coastal sandy lands in 150 days. The long size was 106.62 ± 0.82cm, and the grass height was 80.99 ± 0.09cm and then gradually decreased afterward, obtaining the highest fresh biomass. Green matter yield, dry matter yield, and protein yield were 11.7 – 14.2 tons/ha/batch, 4.9 – 5.7 tons/ha/batch, and 0.8 – 0.9 tons/ha/batch, respectively.
- Nutritional value composition: DM was 41.73%, CP was 5.88% (% DM), EE was 1.80% (% DM), NDF was 70.10% (%DM) and Ash was 2.37% (% DM). Cows ingested 13.93 ± 0.35kg of fresh feed/day/head, equivalent to 5.61 ± 0.14 kg/day/head of dry food and 2.19 ± 0.05% of body weight.

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