# AGRONOMIC EVALUATION OF FORAGE GRASSES UNDER MATURE RUBBER PLANTATION

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## Abstract

The agronomic performance of seven forage grasses, under a mature rubber plantation, was assessed in a cutting trial carried out at Porto Velho, Rondônia. During the rainy season, the higher dry matter yields were obtained with *B. brizantha*, *P. atratum* BRA-9610 and *B. humidicola*. During the dry season, the grasses more productive were *B. brizantha* and *P. atratum* BRA-9610. In both seasons, magnesium and potassium contents did not vary among grasses. During the rainy season, the higher nitrogen and phosphorus contents were obtained with *P. regnelli* BRA-0159 and, *P. guenoarum* BRA-3824 and *B. humidicola*, respectively, while *P. atratum* BRA-9610 and *B. humidicola* provided higher contents of calcium. During the dry season, *P. regnelli* BRA-0159 showed the highest nitrogen content, while *B. humidicola* and *B. brizantha* gave the highest phosphorus and calcium contents. In order to obtain greater forage yields with better quality, the grasses more promising for pasture establishment in a silvipastoral systems were *B. brizantha*, *B. humidicola* and *P. atratum* BRA-9610.

**Keywords**: calcium, phosphorus, magnesium, dry matter, nitrogen, potassium

## Introduction

In Rondônia, Brazil, about four million hectares, originally under forests, are now occupied with cultivated pastures. Of this area, about 40% is presenting degraded pastures, what turns necessary knocked down her of great areas for the maintenance of the herds, resulting in an itinerant cattle raising. This way, alternative systems that take in consideration the peculiarities of the natural resources of the area and that they are technical and economically viable, they should be conceived and tested in way to turn the activity agricultural more productive, maintainable and less ecological harmful. The systems silvipastoral, to the they increase the efficiency of use of the natural resources, for the complementary among the different involved explorations (fruitful, forest and industrial species), they appear as an alternative to contain the current ecological impacts of the knocked down of forests for the pastures formation.

The state of Rondônia possesses great conditions for the development of silvipastoral systems, in function of the great areas planted with fruitful, forest and industrial cultures. The participation of the small producers, in the activity cattle raising is quite significant and the forages use associated with cultures can favor the readiness of protein of animal origin, increasing the income of the producers, decreasing the costs with the cultural treatments of the cultures, besides reducing the opening of new areas under vegetation of forests.

The trees exercise several effects on the ecosystem of the pastures, most of the which beneficial for the animals, to the own pastures or for the environment. For tolerant tropical grass to the shading, the production and the quality of its forage can be increased (Belsky, 1992). Besides, the shading produced by the trees can reduce the

thermal stress of the animals, providing the obtaining of better indexes of acting animal production.

This work had for objective to evaluate the agronomic acting of forage grasses established under shading of adult rubber.

**Material and Methods**

The trial was conducted at Embrapa Rondônia's Experimental Field, located in the Porto Velho county (96 m of altitude, 8º46 ' of south latitude and 63º5 ' of longitude west), during the period of October 1996 to April 1998. The climate of the area is tropical humid of the type Am, with a dry season (June to September), annual rainfall ranging from 2.000 to 2.500 mm; annual medium temperature of 24,9ºC and relative humidity of the air of 89%.

The soil of the experimental area is a Yellow Latosol, loamy textured, with the following chemical characteristics: pH in water (1:2,5) = 4,8; Al = 1,9 cmol/dm$^3$; Ca + Mg = 1,4 cmol/dm$^3$; P = 2 mg/kg and K = 71 mg/kg.

The experimental design was in randomized blocks with three replicates. Seven grasses were evaluated: *Brachiaria brizantha* cv. Marandu, *B. humidicola*, *Paspalum atratum* BRA-9610, *P. guenoarum* BRA-3824, *P. regnelli* BRA-0159, *P. plicatulum* BRA-9661 and *Hemarthria altissima*.

Grasses were sown during the first fortnight of October 1996, in a 12 years old rubber plantation, in the spacing of 3 x 7 m. The fertilization for establishment consisted of 50 kg of P$_2$O$_5$/ha, as triple superphosphate. The sowing density was of 15 seeds.ha$^-$$^1$.kg (Cultural Value = 40%). Each grass plot consisted of four rows of 4,0 m length, spaced at 0,5 m. The harvest were performed mechanically at 12 and 16 weeks frequency, respectively for the rainy and dry seasons; after each harvest, returned the

biomass cutting to the plots. Parameters evaluated were plant height, percentage of soil cover, dry matter (DM) yields and mineral content composition of the forage (contents of nitrogen, phosphorus, calcium, magnesium and potassium). During the experimental period six evaluations were realized, four during the rainy season and two in the dry season.

**Results and Discussion**

Twelve weeks after sowing, the species that achieved larger percentages of soil cover (90 to 100%) were *B. brizantha* and *B. humidicola*, while *P. regnelli* BRA-0159 presented the lowst rate of establishment, with just 35% of covering. The tallest of plants, independently of season, were registered in *B. brizantha*, *H. altissima* and *P. atratum* BRA-9610. For both evaluation periods, the species that reached 100% of covered area were *B. brizantha* and *B. humidicola*, while *P. regnelli* BRA-0159 had the smallest percentage of soil cover, evidencing its poor adaptation to the conditions of imposed shading (Table 1).

During the rainy season, the higher (P < 0.05) DM yield came from by *B. brizantha* (3.128 kg/ha), followed by *P. atratum* BRA-9610 (1.987 kg/ha) and *B. h*umidicola (1.678 kg/ha), which didn't differ to each other (P > 0.05). During the dry season, the grasses most productive were *B. brizantha* (1.651 kg/ha) and *P. atratum* BRA-9610 (1.478 kg/ha) (Table 1). All the appraised species presented seasonal growth, being this characteristic more accentuated in *P. plicatulum* BRA-9661 and *P. regnelli* BRA-0159, which, during the dry season, contributed with just 38 and 48% of the annual forage production. *P. atratum* BRA-9610 and *B. humidicola* presented the best forage DM yield over the year (Table 1). Several reports have demonstrated a differential behavior of the forage grass when submitted to shading. In Paraná,

Schreiner (1987) observed that DM yield of *B. decumbens* were remarkably reduced by the shading, however, even so it was the most productive grass in comparison to the *H. altissima* and *Paspalum notatum*. The forage productions verified in this work were, on the average, 40% inferior than those replated by Costa et al. (1989) evaluating the same grasses under full light.

Independently of the season, magnesium and potassium contents did not differ (P > 0.05) among appraised grasses. During the rainy season, the highest nitrogen content was obtained by *P. regnelli* BRA-0159; in relation to phosphorus, *P. guenoarum* BRA-3824 and *B. humidicolai* recorded higher contents, while *P. atratum* BRA-9610 and *B. humidicola* provided the higher calcium contents. In the dry season, the contents of all the mineral were superiors to the registered in the rainy season as a consequence of a concentration effect, as function of the smallest forage production. The higher nitrogen content was registered with *P. regnelli* BRA-0159, while *B. humidicola* and *B. brizantha* provided the highesr phosphorus and calcium contents (Table 2). The concentrations reported in this work are inferior than those reported by Castro et al. (1998) for several tropical grass submitted to the artificial shading; however, they are similar to the reported by Schreiner (1987) for *H. altissima* and *B. decumbens*, submitted to different shading levels (30, 50 and 80%).

The appraised grasses responsed distinctly to the shading conditions of mature rubber plantation. In order to obtain greater forage yields with better seasonal ditribuition, chemical composition and soil cover, the grasses most promising for pasture establishment in silvopastoral system were *B. brizantha* cv. Marandu, *B. humidicola* and *P. atratum* BRA-9610.

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**Table 1** - Planta height, soil cover and dry matter yields of forage grass, established under shading of mature rubber plantation.

| Grass | Rainy period | | | Dry period | | |
|---|---|---|---|---|---|---|
| | Height (cm) | Covering (%) | Dry matter[1] (kg/ha) | Height (cm) | Covering (%) | Dry matter[2] (kg/ha) |
| *B. brizantha* cv. Marandu | 93 | 100 | 3.128 a | 84 | 100 | 1.651 a |
| *B. humidicola* | 47 | 100 | 1.678 b | 39 | 100 | 987 b |
| *H. altissima* | 89 | 65 | 986 cd | 78 | 70 | 507 cd |
| *P. atratum* BRA-9610 | 81 | 90 | 1.987 b | 72 | 85 | 1.478 a |
| *P. guenoarum* BRA-3824 | 65 | 75 | 1.080 c | 51 | 65 | 629 c |
| *P. plicatulum* BRA-9661 | 54 | 70 | 845 cd | 44 | 60 | 321 de |
| *P. regnelli* BRA-0159 | 48 | 45 | 532 d | 37 | 30 | 254 e |

Means followed by the same letter in each column are not significantly different at the 5% level of probability by Tukey test

1 – Averages of four cuts 2 - Averages of two cuts

**Table2 -** Contents of nitrogen, phosphorus, calcium, magnesium and potassium of forage grass, established under shading of mature rubber plantation.

| Grass | Rainy period | | | | | Dry period | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | P | Ca | Mg | K | N | P | Ca | Mg | K |
| | ------------------------------------------------- g/kg ------------------------------------------------- | | | | | | | | | |
| *B. brizantha* cv. Marandu | 15,7bc | 1,22b | 5,1bc | 2,2a | 14,3a | 17,8b | 1,54ab | 6,1b | 3,0a | 16,2a |
| *B. humidicola* | 13,2d | 1,28ab | 6,3a | 3,4a | 13,3a | 15,3c | 1,67a | 6,9a | 3,4a | 17,1a |
| *H. altissima* | 16,1b | 1,07c | 4,7cd | 2,6a | 13,0a | 17,9b | 1,39c | 6,0bcd | 2,9a | 15,3a |
| *P. atratum* BRA-9610 | 14,9c | 1,11c | 5,6ab | 2,8a | 15,2a | 16,7bc | 1,49bc | 5,9cd | 2,4a | 16,3a |
| *P. guenoarum* BRA-3824 | 13,4d | 1,32a | 4,4cde | 2,5a | 14,0a | 14,0d | 1,51bc | 6,3bc | 3,6a | 17,0a |
| *P. plicatulum* BRA-9661 | 15,5bc | 1,03cd | 4,0de | 3,1a | 14,7a | 16,9b | 1,43bc | 5,7d | 3,2a | 17,4a |
| *P. regnelli* BRA-0159 | 17,2a | 0,98d | 3,7e | 2,9a | 13,9a | 19,3a | 1,12d | 5,2e | 3,3a | 15,8a |

Means followed by the same letter in each column are not significantly different at the 5% level of probability by Tukey test