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Effect of Plant Spacing and Cutting Height on the Growth of Atra Grass (*Paspalum Atratum*) Growing In Dry Season

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Abstract **Original Research Article**

The research to evaluate the effect of plant spacing and cutting height on growth of *Paspalum atratum* under dry season, was done at Fapet Farm and Business Unit of Animal Husbandry Faculty of University of Jambi. Split plot design was arranged with plant spacing (30 X 30; 45 X 45 and 60 X 60 cm) as main plot and cutting height (5; 10 and 15 cm) as sub plot. Observed parameter were plant height, number of tiller, number of leaf, fresh weight and dry weight of atra grass. Plant spacing and cutting height was not significantly affected (P>0.05) plant height, number of tiller, number of leaf and dry weight of atra grass. No interaction (P>0.05) between plant both treatments on all parameters. In conclusion, plant spacing and cutting height did not increase plant height, number of tiller, number of leaf, fresh weight and dry weight of atra grass, yet.

Keywords: Atra grass, plant spacing, cutting height, growth.

INTRODUCTION

Plant growth including grasses is strongly influenced by several factors both internal and external factors. One internal factor that influences plant growth is the season. Indonesia knows two seasons, namely rainy season and dry season. The fact that there is abundant forage production in the dry season, whereas in the dry season it experiences a deficit. Atra grass (*Paspalum atratum*) is a type of grass that has the potential to be developed as a forage forage. Atra grass is suitable for planting in humid, low-lying areas that can adapt to waterlogged conditions; growing at various soil pH (including acid soils), fast growth, good growth, but not resistant to drought [1]. Atra grass is one of the grasses as an introduced crop whose production is quite high with good environmental adaptation and its development can be done in almost all agro-ecosystems. This grass has been developed and has become a germplasm forage in the Sei Goat Research Station. Putri Sumatera Utara, Indonesia [2]. Compared to local grasses, superior types of grass grow faster, produce higher dry matter, have higher crude protein content and are very responsive to fertilization.

In Jambi Province, atra grass is found to grow on unproductive land, such as along the edge of roads and in unused land. In general, a small proportion of farmers have utilized this type of grass as a green source of animal feed they have. This type of grass is generally used by farmers who do not have special land for growing animal feed, so they collect more forage by utilizing grasses that grow on unused land with a cut and carry system. In some areas this grass has been cultivated, such as Bali and other Eastern Indonesian regions [3, 4]. In Thailand, atra grass has long been cultivated and developed with the aim of being a source of forage and as a producer of commercial seeds [5].

Like other tropical countries, Indonesia have two seasons, the rainy season and the dry season. Both seasons affect the productivity and quality of tropical plants, as well as grasses. During the rainy season, the productivity of harvested grass is higher compared to the dry season. The factor of high temperature and low humidity in the dry season tends to reduce the productivity of grasses.

In an effort to meet the forage sources of fodder originating from local resources, it is necessary to study opportunities to cultivate atra grass. Efforts to cultivate this grass, of course, need to be done thoroughly covering aspects related to morphology, planting and maintenance management as well as conducting an assessment of the nutritional content. The productivity and quality of forage fodder is highly

dependent on the management of planting and maintenance. Therefore, it is necessary to conduct research on the regulation of planting distance and intensity of cutting and its effect on the growth of atra grass.

MATERIAL AND METHOD

Experimental site and Plant Materials

The field research was done in Fapet Farm and Business Unit, Animal Husbandry Faculty, University of Jambi, located in $1^0$36'40.8" South, $103.3^0$1'12.2" East from May to Augut 2019. Drying of plant samples to determine plant weight performed at the Feed and Animal Nutrition Laboratory of the Faculty of Animal Husbandry, University of Jambi.

Experimental Design and Procedures

Split plot design with two factors was arranged in this research. Plant spacing (30x30 cm; 45x45 cm and 60x60 cm) as main plot and cutting height (5 cm; 10 cm and 15 cm above ground) as subplot, with three groups as replication.

Grasses were planted according to the treatment in 27 of 2.5x2.5 m plots. There were no fertilizer treatments for all the plots used in this study. Cutting uniformity (trimming) was done to ensure the effect of the treatment on the growth characteristics of atra grass. Cutting for data collection was done 60 days after trimming.

Observed Parameter

The parameters observed were the characteristics of atra grass growth including plant height, number of tillers, number of leaves, fresh weight and dry weight. Plant height was obtained by measuring plant height from the ground level to the highest part of the plant. The number of tillers was obtained by counting the number of tillers arising from the clump. The number of leaves was obtained by counting the number of leaves that have appeared perfectly on each stem. Weighing the fresh weight of the grass was done immediately after cutting. Dry weight of the grass was obtained by drying the grass in an oven at 60^0C for 48 hours.

STATISTICAL ANALYSIS

Data of growth parameters of atra grass was analysed by Oneway-ANOVA using SPSS ver. 21 [6].

RESULTS AND DISCUSSION

Climate Condition

Average daily temperatures during the course of the study ranged from $27,5^0$C with a minimum temperature $22,8^0$C and a maximum temperature range $33,8^0$C found in August. Humidity ranges from 75% to 85,8% with the lowest air humidity found in August. The highest rainfall occurred in May was 129 mm, which in the classification of Schimidt and Ferguson categorized as wet months. While July to August rainfall was below 60 mm and categorized as a dry month [7]. Table-1 Showed the climate characteristics during experiment.

Table-1: Climate parameters during esperiment

Parameter	Month			
	May	June	July	August
Suhu Minimum (^{0}C)	23,9	23,8	22,8	22,8
Suhu Maksimum (^{0}C)	33,2	32,0	32,9	33,8
Suhu Rata-rata (^{0}C)	27,5	27,5	27,1	27,8
Kelembaban relative (%)	85,8	85,3	82,3	75,5
Curah Hujan (mm/bulan)	129	97,4	59,5	0,00

Source: http://dataonline.bmkg.go.id/data_iklim (2019)

Effect of plant spacing and cutting height on the growth of *Paspalum atratum*

Growing characteristic of atra grass (*Paspalum* atratum*)* treated by plant spacing and cutting height in dry season shown in Table-2.

Table-2: Growth parameter of *Paspalum atratum* in different plant spacing and cutting height growing under dry season

Plant spacing (cm)	Cutting heigh (cm)	Plant height (cm)	Number of tiller	Number of leaf	Fresh Weight (g/plot)	Dry Weight (g/pot)
30 X 30	5	62.70	4.83	12.55	224,22	76.59
	10	72.41	4.38	15.96	238,89	108.27
	15	74.05	3.54	14.21	126,96	67.48
45 X 45	5	72.67	4.83	16.89	195,41	108.81
	10	78.31	4.08	15.00	193,01	94.79
	15	79.16	5.64	21.44	199,66	89.26
60 X 60	5	75.21	4.42	17.25	177,85	63.77
	10	75.60	8.17	28.00	201.27	88.99
	15	63.63	5.25	18.92	88.42	51.63

Both plant spacing and cutting height had no effect (P>0.05) on plant height, number of tiller, number of leaf, fresh weight and dry weight of *Paspalum atratum*, and no interaction (P>.05) between plant spacing and cutting height on all observed parameters.

The average of plant height was 69.72; 76.71 and 71.48 cm for the planting distance of 30 X 30; 45 X 45 and 60 X 60 cm, respectively. The number of tillers obtained was 4.25; 4,85 and 5, 94 tillers each for spacing of 30 X 30; 45 X 45 and 60 X 60 cm. The number of leaves for each treatment of spacing obtained 14.24; 17.78 and 21.39 leaves per cluster for each planting distance of 30 X 30; 45 X 45 and 60 X 60 cm. While for the planting distance of 30 X 30; 45 X 45 and 60 X 60 cm, obtained fresh weights 196.69; 199.66 and 153.85 g/plot and for the dry weight obtained 84.11 respectively; 97.62 and 68.13 g/plot.

The treatment of cutting intensity resulted in plant height of 70.19; 75.44 and 72.28 cm for cutting 5; 10 and 15 cm. Number of tillers obtained for cutting 5; 10 and 15 cm respectively 4.69; 5.56 and 4.81 tillers, while the number of leaves was 15.56; 19.65 and 18.19 strands / clump. Fresh weight and dry weight are 202.21 g / plot; 211.86 g/plot and 136.13 g/plot of fresh weight and 83.06; 97.35 and 69.46 g/plot of dry weight.

The results obtained in this study were similar to the results of study penelitian [8] which reported plant height, number of tillers, number and leaf area of wild elephant grass (Pennisetum polystachion) not affected by drought conditions or water stress. Hajibabaee M *et al.*, [9] also reported that drought conditions did not affect the number of leaves of corn plants. Meanwhile [10] reported that water stress conditions decreased plant height and leaf area in *Hydropogon contortus* grass.

The results showed that both the treatment plant spacing and cutting height as well, did not increase the growth of atra grass. This situation is influenced by the root system of the atra grass that is not yet optimal. The planting material used in the form of division of clump requires a longer time for root development. Plant roots that have not grown optimally will cause the ability of roots to absorb nutrients from the soil, especially macro nutrients such as nitrogen, phosphorus and calcium. These three nutrients play a role in the vegetative growth of plants. Nitrogen is one of the nutrients that limits the crop production in most agro-ecosystem. Nitrogen plays many key roles in plant biochemistry, including being an important element of enzymes, chlorophyll, amino acids, cell walls and other components [11]. Mineral nutrient supply can greatly affect root growth, morphology and distribution of root systems on the substrate (soil profile). This effect is characterized by a reduction in nitrogen, and usually not present with other nutrients, except for magnesium. In the responsive zone an increase in nitrogen supply increases both shoot and root growth, but usually shoot growth is more than root growth, which leads to a decrease in the root/canopy dry weight ratio with an increase in nitrogen supply [12].

External factors, the weather also affect the results of this study. Drought conditions that occur from July to August 2019 cause a reduction in water content in the soil. Low water content will cause a decrease in nutrient uptake by plant roots. In this condition, the air temperature tends to be higher than the rainy season, as presented in Table-1. Temperature affects photosynthesis, water and nutrient absorption, transpiration, respiration, and enzyme activity. These factors regulate germination, flowering, pollen viability, fruit formation, maturation and aging rates, yields, quality, harvest duration, and shelf life. Serrano L J P *et al*., [13] reported state, plant responses to drought stress include changes in cellular and molecular levels such as changes in plant growth, cell volume becomes smaller, decreases in leaf area, leaves become thick, hairs in leaves, increase in root-canopy ratio, stomatal sensitivity, decreased photosynthesis rate, changes in carbon and nitrogen metabolism, changes in enzyme and hormone production, and changes in gene expression. Drought stress can inhibit plant growth, one of which can be seen in leaf expansion. Decrease in leaf area is the plant's first response to drought. Limited water will inhibit cell elongation which will slowly inhibit the growth of leaf area. The small leaf area will cause low transpiration, thus reducing the water supply from the roots to the leaves. If this condition is allowed to continue over time there will be a leaf abscess [14].

CONCLUSION

Arrangement of plant spacing and cutting interval did not increase the growth of *Paspalum atratum* growing in dry season.

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REFERENCES

1. Prawiradiputra BR, Sutedi E, Sajimin S, Fanindi A. Hijauan Pakan Ternak untuk Lahan Sub-optimal (Fodder for Sub-Optimal Land) Jakarta: IAARD Press. 2012.
2. Hutasoit R, Sirait J, Tarigan A. Plasma nutfah hijauan pakan ternak sebagai sumber bibit dan visitor plot (Forage germplasm for fodder as a source of seeds and visitor plots) Pastura, 2015; 5(1):46-50.
3. Kaca IN. Pemberian Pupuk Nitrogen Untuk Meningkatkan Produksi Dan Kualitas Hijauan Rumput Pasapalum Tratum. Singhadwala. 2011;44:30-34.

4. Suarna IW, Kusumawati NN, Duarsa MA. Produksi Dan Kualitas Hijauan Pakan Pada Lahan Pasca Tambang Di Kabupaten Karangasem. Pastura; Journal of Tropical Forage Science. 2015;4(2):74-77.
5. Hare MD, Tatsapong P, Phengphet S. Herbage yield and quality of Brachiaria cultivars, Paspalum atratum and Panicum maximum in north-east Thailand. TG: Tropical Grasslands. 2009 Jan 1;43(2):65-72.
6. Gomez A, Gomez K. Statistical Procedures for Agricultural Research 2nd ed., 6 John Wiley & Sons. 1984.
7. Roosli R, Rusdi M, Ahamad MS. An Indonesian Study of Mixed Methods: An Example of Methodological Triangulation. Cambridge Scholars Publishing; 2018 Nov 14.
8. Alwi, Y, N. Jamarun, A. Rahman Sy and M. Zein. 2018. Effect of NPK Fertilizer and Water Stress on Growth and Proline Content of Wild Elephant Grass (*Pennisetum polystachion*). Scholar Journal of Agriculture and Veterinary Science. 2018 Mar 16;5(3):124-129.
9. Hajibabaee M, Azizi F, Zargari K. Effect of drought stress on some morphological, physiological and agronomic traits in various foliage corn hybrids. Am Eurasian J Agric Environ Sci. 2012;12(7):890-896.
10. Wang JP, Bughrara SS, Nelson CJ. Morpho-physiological responses of several fescue grasses to drought stress. HortScience. 2008 Jun 1;43(3):776-83.
11. Fageria NK. The use of nutrients in crop plants 105, 1 CRC Press, Taylor & Francis Group. 2009.
12. Marschner H. Mineral Nutrition of Higher Plants Elsevier Science Publishing Co Inc. 1993.
13. Serrano LJP, Pugnaire FI. Constraints by Water Stress on Plant Growth, in Handbook of Plant and Crop Stress M. Pessarakli, Ed. (CRC Press), 1999; 271-283.
14. Taiz L, Zeiger E. Plant Physiology Sinauer Associates Inc., Publishers Sunderland, Massachusetts U.S.A. 2002.