Production of *Brachiaria decumbens* Grass at Various Levels of Drought Stress Treatment

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Abstract. This study aims to determine effects of production of Brachiaria decumbens grass on different drought stress treatments. Research was conducted at the Greenhouse Faculty of Agriculture University of North Sumatera from Desember 2016 until April 2017. The design used was Completely Randomized Design (CRD), with three treatments and seven replications. The treatment consisted of three levels of drought stress which were control (100% field capacity=fc), medium drought stress (25% fc), and heavy drought stress (50% fc). The variable were fresh weight production, dry weight production and plant height.
The results showed that drought stress treatment control (100% fc) significantly ($P<0,05$) affect fresh weight production, dry weight production, but not plant height. It is concluded that increasing water volume of field capacity increase production Brachiaria decumbens grass.

1. Introduction

Drought stress is the condition of the environment of the plant is not receiving enough water intake, so the plant can not do the process of growth and development optimally as well as production declined.
Drought stress is the state of the environment drought causes water shortages for the plant. Stress water on plants can be caused by two things: (1) water shortage in the area of rooting, (2) evapotranspiration rate higher than the rate of absorption by plant root so that the needs of the water on the leaves is higher. The absorption of water by plants is affected by environmental factors and plant. Enviromental factors that influence is the moisture content of the soil, soil temperature and air humidity. Crop factor is the efficient use of diffusion pressure difference, rooting soil water to the roots, and the state of the protoplasm of plants.
Drought stress affects all aspects of plant growth and metabolism of membrane integrity, including the content of osmotic balance, pigments, photosynthetic activity, decrease in water potential of protoplasm, decreasing growth and decline the diameter of the rod. If the water needs are not met then the plant growth will be hampered, because water serves to dissolve the Fund helps nutrient metabolic processes in plants [1].
Physiological disorders resulting from stress of the water can be either inhibited mineral nutrient, transpiration and photosynthesis. Visually it looks great setback due the existence or scroll leaf so that inhibits photosynthesis. Plants that are more tolerant of drought stress has a relatively less inhibited growth in drought conditions compared to the more sensitive plant growth [2].

It is therefore necessary to consider animal feed plants which are tolerant and adaptable on dry land Conditions, for example *Brachiaria decumbens*. According to Prawiradiputra et al. (2012), *Brachiaria decumbens* resistant to drought for six months. It grows well in any soil type include the sandy soils or acidic soils, very responsive to nitrogen fertilization, are able to grow on steep slopes, do not hold standing water [3].
The nutrient content of the grass is high and best palatability but depending on soil fertility. This grass digestibility can reach (50-80%), crude protein from 9-20% depending on soil fertility and management, but may decrease by rapidly depending on age and environmental conditions. The nutrient content of the grass is cruide protein (PK) 7%, ash 6,5% and crude fiber (SK) 35,1% [4].

2. Materials and Methods

This research was conducted at the Greenhouse Faculty of Agriculture University of North Sumatra. This study lasts for 4 months starting from December 2016 to April 2017.
The material used is *Brachiaria decumbens* grass, water and latosol soil. The tool used is polybags, gembor, sieve, digital scales, oven, meter gauge, knife, data book and envelopes.
The research method used was complete randomized design (RAL) with 3 treatments and 7 replications. The treatment under study is as follows:
C1 = Control (100% field capacity = 1,1 liter of water volume)
C2 = Medium drought stress (50% field capacity = 0,55 liter of water volume)
C3 = Heavy drought stress (25% field capacity = 0,275 liter of water volume)

Calculate the field capacity (FC) of soil using the formula :

$$FC = \frac{\text{wet weight of soil-dry weight of soil}}{\text{dry weight of soil}} \times 100\%$$

The results of calculations from observations of the field capacity is as follows:

$$FC = \frac{731,4-547}{547} \times 100\%$$

FC = 0,3371
FC = 33,71% ≈ 34 ml

KL = 34 ml in 500 g planting media, so for 8 kg of planting medium required water volume as much as 0,55 litres. So the required volume of watering two times in a day is morning at 08.00 pm and in the afternoon at 17.00 pm on the treatment control (100% fc) as much as 1,1 liter, medium drought stress (50% fc) as much as 0,55 litres, and heavy drought stress (25% fc) as much as 0,275 liter.

Obseved variabels were fresh weight production, dry weight production and plant height.

2.1. Fresh Weight Production

Fresh weight production is obtained from the weighing of each treatment in fresh condition. The fresh weight production is done every 40 days.

2.2. Dry Weight Production

Dry weight production is obtained from fresh of grass after weighing. From the weighing results taken as much as 200 grams of sample oven with temperature 60^0C for 24 hours. Then take out from the oven at a temperature of 105^0C for 8 hours, then weighed the dry weight of the grass. Fresh weight production is converted into dry weight to determine the dry weight production. The dry weight production can be calculated the formula:
Production of dry matter = % BK 60^0C x % BK 105^0C x fresh production

2.3. Plant Heigt

The measurement of plant height is done every 10 days by measuring the height of the plants from the ground up to the top of the plant. Measurement of plant height using roller tape with centimeter unit.

3. Results and discussion

3.1. Fresh Weight Production

Table 1. Mean fresh weight production of *Brachiaria decumbens* grass (g/polybag)

Treatment	Deuteronomy							Average
	1	2	3	4	5	6	7	
C1	130	105	105	130	120	115	145	121,43[a]
C2	90	125	95	115	105	150	80	108,57[ab]
C3	95	80	120	80	110	90	70	92,14[b]

Info: Different letter notation in the mean column of shows significantly different (P <0,05)

Table 1. showed that fresh weight production treatment of C1 (control: 100% field capacity) of 121,43 g is significantly different from C3 (heavy drought stress: 25% field capacity) of 92,14 g but not significantly different of C2 (medium drought stress: 50% field capacity) of 108,57 g and C2 was not significantly different from C3 treatment. The best drought stress treatment was at C1 (control: 100% field capacity) of 121,43 g and C2 (medium drought stress: 50% field capacity) of 108,57 g and lowest was in treatment C3 (heavy drought stress: 25% field capacity) of 92,14 g.

The caused by to the volume of water provided more than on the volume of the water C3 less so that sufficient grass growth needs. Whereas if the water in the ground is still higher than the capacity of the land will still be roomy moist, is due to capillary water (ground water which is retained by the soil) can always replace water loss on the process of evaporating. Roots will form the branches more, lengthening it faster to get water. It is also in accordance with the statement Kurnia (2015), the roots of plants that grow on the soil moisture content below that capacity will always airy branches. Airy capacity also means that it is very important because it can show the maximum content of soils and may determine the amount of water needed to moisten the soil to layer underneath [5].

3.2. Dry Weight Production

Table 2. Mean dry weight production of *Brachiaria decumbens* grass (g)

Treatment	Deuteronomy							Average
	1	2	3	4	5	6	7	
C1	111,748	90,258	90,258	111,748	103,152	98,854	124,642	104,38 [a]
C2	76,482	106,225	80,731	97,727	89,229	127,47	67,984	92,264 [ab]
C3	80,313	67,632	101,448	67,632	92,994	76,086	59,178	77,897 [b]

Info: Different letter notation in the mean column of shows significantly different (P <0,05)

Table 2. showed that dry weight production treatment of C1 (control: 100% field capacity) of 104,38 g significantly different from C3 (heavy drought stress: 25% field capacity) of 77,897 g but not significantly different of C2 (medium drought stress: 50% field capacity) of 92,264 g and C2 was not significantly different from C3 treatment. The best drought stress treatment was at C1 (control: 100% field capacity) of 104,38 g and C2 (medium drought stress: 50% field capacity) of 92,264 g and the lowest was at C3 (heavy drought stress: 25% field capacity) of 77,897 g. The caused by the control of water at the treatment available to plants, so that it is capable of dissolving nutrient elements optimally. Metabolic processes in the body of the plant will develop, including photosynthesis.

This has resulted in the increasing rate of photosynthesis, so the more fotosintat the resulting vice versa when water is not available to plants. It is also in accordance with the statement of Nahar (2011), which stated that the availability of water in conditions very roomy capacity sufficient for the roots to

nutrient elements and other necessary substrate for plant metabolism, so the dry weight will be higher, than when experiencing drought stress [6].
In line with the statement of Islami and Utomo (1995), plants that suffer water stress generally has a smaller size compared to plants that don't suffer from droughts stress. Drought stress affects all aspects of plant growth, physiological and biochemical processes, namely the plant and cause modification of plant morphology and anatomy [7].

3.3. Plant height

Table 3. Mean plant height of *Brachiaria decumbens* grass (g)

Treatment	Deuteronomy							Average^{tn}
	1	2	3	4	5	6	7	
C1	100,25	99,25	99,75	104,5	101	95	91,5	98,75
C2	118,25	79,75	96,5	110,75	90,25	95,5	90	97,29
C3	87	97,25	101,75	96,75	93,25	101,75	96,75	96,36

Info: tn = no real difference

Table 3 showed the drought stress has different effect which was not significant (P>0,05) on the height of the *Brachiaria decumbens* grass. The highest treatment of C1 (control: 100% field capacity) of 98,75 cm not significant with other treatments. Where in the treatment of C2 (medium drought stress: 50% field capacity) of 97,29 cm and C3 (heavy drought stress: 25% field capacity) of 96,36 cm. This is because the growth of *Brachiaria decumbens* grass grow sideways so as inhibit the development of the grass. This is in accordance with statement Sinaga (2008), suggesting that morphological changes at the plant drought stress among others, the growth obstruct of root, diameter system, plant height, number of leaves and broad leaves. High plant is one of the indicators of growth as well as the parameters used to measure growth by the influence of the environment because of the easily visible and non destructive measurements plants. That drought is one of the environmental drought stress can cause stunted growth and development, as well as crop productivity. Plant growth is also influenced by moisture content. It is due to high plant, which begins with the process of formation of the bud is the process of cell division and enlargement process. Second was influenced by cell turgor. The process of cell division and enlargement will happen when cells undergoing tugridity the main element is the availability of water (Samanhudi, 2010). The plant is experiencing a water shortage or limited water availability (drought stress) then the plant will experience high growth stunted [8].

4. Conclusions

The growth of *Brachiaria decumbens* grass decreased in heavy drought stress (25% field capacity) and medium (50% field capacity) compared to field capacity conditions. The Brachiaria decumbens grass can grow and produce in heavy drought stress (25% field capacity) although experienced decreased fresh weight production, dry weight production and plant height compared to field capacity conditions. The increased volume of water field capacity increase production *Brachiaria decumbens* grass.

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