Growth and Productivity of *Brachiaria brizantha cv* MG 5 under the effect of different dose of NPK fertilization

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ABSTRACT: This research aimed to investigate the influence of a different dose of NPK fertilization to growth, productivity, and nutrient content of *Brachiaria brizantha cv.* MG 5. The research was conducted at the Green House of Faculty of Animal Science Universitas Gadjah Mada. Regosols added with manure as basic fertilizer was placed in the poly bag with diameter 25 cm and capacity up to 10 kg. Germination was performed on the poly tray then its results were moved to the poly bag. NPK fertilization was treated on three levels with five replications. The treatment was as follows: given NPK fertilizer level 0 kg ha-1 (P0), 150 kg ha-1(P1) and 300 kg ha-1 (P2), respectively. Fertilization was performed twice during the cultivation period on the 15 and 30 days old. The primary and secondary tillers, the plant's height, and length were observed once a week in 60 days. Devoliation was performed on the 60th day, with the plants' height of 10 cm from the soil surface. The variable observed was the plants' height and length, root biomass production, the ratio of stem and leaves, and dry and organic matter contents. The data was analyzed using analysis of variance. Further, the significantly different result was tested with Duncan's New Multiple Range Test. The research data showed that the average of the growth of the plants' length per week for *Brachiaria sp* age 60 days fertilization level 300 kg/ha resulted the longest plant of 130.7 cm and different ($P<0.1$) than the others. The number of tillers resulted in no difference, but the biomass production showed that fertilization 150 kg/ha and 300 kg/ha resulted in higher production than 0 kg/ha ($P<0.1$). The research showed that fertilization 150 kg/ha resulted in higher biomass production than 0 kg/ha, but that of 300 kg/ha did not show a significant difference.

Keywords: *Brachiaria sp* grasses, NPK fertilizer dose, nutrient content, growth, production

INTRODUCTION

Brachiaria brizantha grasses are very productive and suitable for continuous or rotational grazing. *Brachiaria brizantha* is resistant to animal's step and chomp, and also resistant to drought. Miles *et al*. (1996) states that the nutrient value of *Brachiaria brizantha* grass depends on the soil fertility, fertilizing and the plant regrowth. The crude protein content of *Brachiaria brizantha* in the tropics is 7 to 16%, and the digestibility is 51 to 75%. This grass grows well in the dry season with DM production about 8 to 20 tons/ha/year.

Brachiaria brizantha grass is very responsive to nitrogen fertilizer, grows well at an altitude of 0 to 1200 m above sea level with an annual rainfall of over 1500 mm, but is not resistant to waterlogging. This grass grows quickly and forms a vertical and horizontal stretch with the high reaches 60 to 150 cm, resistant to drought, have high productivity and palatable (Ishigaki *et al*., 2012). Hartadi *et al.* (2005) reports that *Brachiaria brizantha* contains nutrients 10.9% of

ash, 1.35% of ether extract, 32.2% of crude fiber, 49.1% of BETN and 6.6% of crude protein. Tekletsadik *et al.* (2004) finds that devoliation of *Brachiaria brizantha* with the remaining 10 cm above the ground can affect the nutritional value of the grass. It is in agreement with who states that leaving the grass 1 to 10 cm above the ground provides 20% rather than of that 15 to 20 cm above the ground.

The success of forage cultivation depends on several factors such as the type of forage, climatic conditions, water and soil fertility. Soil fertility is one of the factors that determine whether the forage results will be good or not. Soil fertility can be identified by the availability of nutrients in the soil. The availability of nutrients in the soil can be fulfilled with fertilization. Marassing (2013) states that the amount of fertilizer given to the plant depends on its response to fertilizer. The complete nutrient supplied in the right amount, the better and maximum the results will be.

Fertilization improves the soil fertility by supplying nutrient content to the soil. This opinion is in agreement with Hardjowigeno (1987) who states that fertilization is the addition of materials that is used to improve the soil fertility. Novizan (2007) states that nutrients N, P, and K in the soil is not sufficiently available and continuously reduced for the plants growth and taken away at the harvest time, washed, evaporated and erosion. By this reason, fertilization is necessary to be conducted. N, P, and K contents are absolute macro nutrients in the soil that is beneficial for the plants growth.

Production of *Brachiaria sp* grass will result in better production when it is planted on the right and appropriate dose of fertilizer. Therefore, a study on the effect of doses of NPK fertilizer to the growth, production, and nutrient content of some varieties of *Brachiaria sp* that has not previously been conducted is necessary. The results of this study are expected to provide information for the farmers about the ideal dose of fertilizer for *Brachiaria brizantha*.

MATERIAL AND METHODS

Some seeds were germinated in the pot tray filled with soil. *Brachiaria brizantha cv MG 5* was germinated for two weeks. During those weeks, the plants were watered and observed the days of their germination, the leaves emerge, the plant height and number of leaves. The soils were filled into polybags and randomly divided into three treatments with five replications. The soils were put into the polybags as much as ¾ capacities of the polybags with diameter 25 cm. The row spacing used was 50 x 50 cm.

After the preparation for planting medium was completed, planting process was carried out. The germination results were then moved into the polybags 5 cm from the soil surface and then closed again with soil. One polybag contained one plant. Watering was done every day once in the morning. Weeding was done every week.

Fertilization was done twice during the period of cultivation on 15 and 30 days after planting. The treatment consisted of a combination of the level of NPK fertilizer (25-5-7), which consisted of: not given or 0% NPK fertilizer as control (P0) (0 g/polybag), given NPK fertilizer with a dose of 150 kg/ha (P1) (3.75 gram/polybag), and given NPK fertilizer with a dose of 300 kg/ha (P2) (7.5 gram/polybag). Fertilization was made after weeding process.

Harvesting was carried out on the 60th day after planting with the cutting length of 10 cm from the ground. Plants in each polybag were weighed immediately to obtain the fresh weight of biomass canopy. The roots were also weighed to measure the root biomass. The stems and leaves were separated then weighed and chopped and put in the paper bags. The dried samples were weighed, stems and leaves samples were ground using Willey mill equipped with a 1 mm porosity of sieve.

Stem and leaf samples were mixed then proximately analyzed including the dry matter, organic matter, crude protein, crude fiber and crude fat (AOAC, 2005). The variables measured were growth (the height of germinated plant, the number of germinated leaves, the day of germination and leaf germination, the height of the plant, the number of leaves); productivity (production of fresh plants, dry matter production of stem, organic matter production of leaf, production of dry matter and organic matter) and chemical composition.

RESULTS AND DISCUSSION

The quality of the soil that used in the research contained nutrients (C, OM, total-N, total-P, and C/N) had a low value. The variable of the soil quality is usually determined by the content of organic matter and total-N in the soil so that it can increase the productivity of the plant biomass.

The values of total-N, total-P and total-K contained in the soil were 0.26%, 18.75%, and 1.26% respectively. The nutrients value N, P and K in the soil was relatively low. The addition of NPK fertilizer 25-5-7 was expected to increase the nutrient content of the soil for growing *Brachiaria* grass. Element N is an element that is easily leached and evaporates into the air so that it may take the element N in greater numbers. This is in agreement with Novizan (2007) who finds that nutrients N, P, and K in the soil is not sufficiently available and continuously reduced for the plants growth and taken away at the harvest time, washed, evaporated and erosion. By this reason, fertilization is necessary to be conducted. Nitrogen is the element that is most absorbed by the plants and provides a real and rapid effect on the plant growth such as increasing the number of tillers.

The growth rate of the plant height, leaf numbers and plant length of *Brachiaria brizantha* CV. MG5 per week until the age of 60 days given NPK fertilizer with a dose level of 0 kg/ha, 150 kg/ha and 300 kg/ha, listed in Table 1.

Table 1. The average growth of the plant height, leaf numbers and plant length per week several varieties of *Brachiaria sp* with different levels of fertilization.

Parameter	Fertilization level			Mean[ns]
	0 kg/ ha	150 kg/ ha	300 kg/ ha	
Plant height (cm)	6.74±1.56	7.86±1.16	10.13±1.69	8.24±2.0
Number of leaves	4.87±1.38	6.62±0.78	10.12±1.98	7.21 ±2.64
Plant length (cm)	12.32±1.4	12.4±1.95	14.02±1.88	12.91 ± 1.79

[ns] : non significant

Based on statistics analysis of NPK fertilization with different levels, it showed a not real difference to the length of the plant, number of leaves and the plant height per week. Supporting a research that was conducted by Karti *et al.* (1999), she suggests that *Brachiaria decumbens cv Basilisk* is responsive to phosphate fertilizer, so that at the level of 300 kg/ha, it has the highest rates of the plant height increment.

The Production of the Plants

The Production of fresh plants, dry matter production of *Brachiaria brizantha* cv MG 5 under different levels of fertilization is shown in Table 2.

Table 2. Average production of fresh, dry matter, Brachiaria sp under different levels of fertilization (ton/ha)

Parameter	Fertilization levels			Mean
	0 kg/ha	150 kg/ha	300 kg/ha	
Production of fresh plants (ton/ ha)	5.02±1.59	6.85±3.16	7.64±1.43	6.5±2.33[a]
Production of dry matter	0.78±0.35	1.13±0.53	0.99±0.28	0.97±0.39[b]

From the research results, it shows that production of fresh plants with level of 300 kg/ ha provides production of fresh plants with different results (P <0.05) rather than the level 0 kg/ Ha. It because the nutrients contained in the NPK fertilizer were absorbed by the root so that it can increase the production of the fresh *Brachiaria brizantha* MG 5. Phino (2014) suggests that the concept of NPK fertilization can increase the production and nutrient levels as it contains nutrients that are absorbed by the plant roots. Sondari (2011) states that the concept of the flow of nutrients to the root is composed of three mechanisms: interception, mass flow, and diffusion. NPK fertilization of 150 kg/ ha resulted in the highest production of dry matter. On the other hand, giving NPK fertilizer of 300 kg/ha to *Brachiaria brizantha* cv MG 5 resulted in the decrease in its ability to absorb nutrient as it contains high phosphor and potassium. Novizan (2007) states that many factors determine the availability of phosphorus and potassium in the soil, but the most important is the soil pH. At low pH soil (acid), phosphorus ions will react with iron and aluminum. This reaction forms iron phosphate or aluminum phosphate that are difficult to dissolve in the water, so plants cannot absorb it. The land with a high pH (alkali), phosphorus reacts with calcium ions, and this reaction forms calcium phosphate that are soluble and cannot be absorbed by plants too. Thus, without considering the pH, phosphorus fertilization won't be effective for the plant growth.

CONCLUSIONS

Based on the research results, it can be concluded that fertilization under different levels of the dose of fertilizer to *Brachiaria brizantha* MG 5 can increase the dry matter production and dry matter of Brachiaria grass.

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