Ann. For. Res. 65(1): 4527-4535, 2022
ISSN: 18448135, 20652445

ANNALS OF FOREST RESEARCH
https://www.e-afr.org/

# APPLICATION OF CATTLE MANURE COMPOST ENRICHED WITH AZOLA MICROPHYLLA ON MORPHOLOGY, PRODUCTION AND QUALITY OF KING GRASS (PENNISETUM PURPOIDES)

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**Abstract:** This research aims to determine the use of beef cattle dung compost biofertilizer added with Azola to the morphology and production of plants with flat green grass quality. The research was conducted using experimental methods, with a completely randomized design (CRD). The present study conducted at the Animal Husbandry Faculty Experiment Sub Station in Purwokerto one of the districts of the Central Java Province. The data obtained were analyzed by analysis of variance (ANOVA). The results of soil analysis in-dicate that the class of the soil texture is sandy loam soil. The results revealed that the height of the king grass was one of the aspects that could be observed for the value of its growth quality. Further, the results also showed that the combined treatment of compost with azolla could affect the height of the king grass plant. ANOVA test showed that the higher the dose given, the higher the plant height. It is concluded that increasing the number of leaves on the king grass after compost and azolla fertilizer can reduce the density of the plant-ing medium besides that azolla compost.

**Keywords:** Agriculture, Animal Husbandry, Azola Microphylla, Cattle Manure and Compost

## 1 Introduction

Animal husbandry development, cannot be separated from integration with other fields. Increased produc-tion is closely related to the quality of feed. Forage as a feed ingredient for ruminants in Indonesia plays an important role because forages contain almost all the za needed. Efforts to increase livestock production quickly can only be achieved if it is supported by the provision of quality feed. Forage ingredients play a spe-cial role because they are the main food source for livestock to survive and produce. High livestock produc-tion needs to be supported by the availability of adequate and continuous forage (Kalangi et al., 2014).

Overcoming the problem of shortage of forage has introduced and developed various types of forage, one of the main sources of forage is grass. Grass that is very potential and is often given to ruminants is king grass (Pennisetum purpupoides). This grass is the result of a cross between elephant grass (Pennisetum pur-pureum) and barja grass (Pennisetum thypoides). King grass is a perennial plant, grows upright to form clumps. Deep roots, similar in shape to sugar cane, 2-4 m high and if allowed to grow upright can reach 7 m, thick and hard trunk. The king grass has a very fast beat growth. elephant grass. King grass production is very high, reaching 1,076 tones of fresh grass / ha / year (Suyitman et al., 2003).

Animal manure is one type of organic fertilizer which can be used directly from the manure to the crop land to increase crop production (Astuti, 2005; Eck et al., 1990). Manure can provide conservation value to the soil while urea as an artificial fertilizer is a practical fertilizer with nitrogen content that is commonly applied to plants by breeders but does not have a conservation

value in the soil so that long-term use causes the soil to become thin (Hendarto et al., 2019). The combination pattern of manure and urea is a strategy that can be taken in plant cultivation, especially for superior grass.

Azolla is a type of floating aquatic fern, found in stagnant waters, especially in rice fields and in ponds, which are considered by farmers as weeds or agricultural waste, have soft leaf surfaces, develop quickly. Azolla has a fairly wide distribution and is able to anchor N2 from the air. As a source of nitrogen nutrients, Azolla can be given as organic fertilizer, composted or as green manure. Azolla has been widely used as an organic ferti-lizer because it contains high nitrogen. Azolla is widely found in rice fields in Indonesia, so it is promising to make it a source of biological nitrogen derived from natural, renewable biological bodies.

According to Hendarto et al. (2019) plant growth rates can be observed from several aspects including plant height, stem or twig diameter, number of tananana, number of leaves. Based on the description above, the research aims in this study to determine the use of beef cattle dung compost biofertilizer added with Azola to the morphology and production of plants with flat green grass quality.

## 2 Methodology

The research was carried out at the Animal Husbandry Faculty Experiment Sub Station, Unsored Purwoker-to. Province of Central Java. The results of soil analysis indicate the class of sandy loam soil. King grass (Pen-nisetum purpureophoides) planted on a 2 x 1.5 square meter plot with a spacing of 40 x 80 cm so that each plot contains 8 grass seed stalks. For uniformity, each seedling has 3 nodes or nodes or buds.

### Research design

The research was conducted using experimental methods, with a completely randomized design (CRD). The types of treatment applied are as follows:

K0A0: compost 0 (tonnes / ha / defoliation) and Azolla 0
K0A1: compost 0 (tonnes / ha / defoliation) and Azolla 10
K0A2: compost 0 (tonnes / ha / defoliation) and Azolla 20
K1A0: compost 10 (tonnes / ha / defoliation) and Azolla 0
K1A1: compost 10 (tonnes / ha / defoliation) and Azolla 10
K1A2: compost 10 (tonnes / ha / defoliation) and Azolla 20
K3A0: compost 20 (tonnes / ha / defoliation) and Azolla 0
K3A1: compost 20 (tonnes / ha / defoliation) and Azolla 10
K3A2: compost 20 (tonnes / ha / defoliation) and Azolla 20

Each treatment was repeated 3 (three) times, the spraying was aimed at the leaves of the king grass, carried out once every two weeks

### 2.1 Research Procedure

The study lasted for 4 defoliations which included the first defoliation at 60 days of plant age, 2,3 despoliations, and 4 40 days of plant age. The data analyzed was the average of the four defoliations. The implementation technique of taking the variables studied included plant height, stem diameter, number of leaves, fresh production, dry matter production, dry matter, and crude fibre.

The diameter of the stem is measured by the largest stem size in the sample clump which is measured at a position of 5 cm from the ground. Number of plants, counted the number of plants per clump of the sample clump. Fresh forage production, the weight of fresh forage per plot is weighted at harvest time.

The production of dry matter is calculated by multiplying the weight of fresh forage with the dry matter content. Nutritional quality by taking plant samples at a weight of about 100 grams, then cut into pieces, put in an oven at 100oC for 24 hours to obtain data on dry matter content. The dry material obtained is entered into the Animal Feed Science Laboratory to be tested for levels of crude protein, crude fiber and crude fat.

The quality of king grass forage includes plant height, stem diameter, number of leaves, fresh production, dry matter production, dry matter, and crude fibre.

### 2.2 Data analysis

The data obtained were analyzed by analysis of variance (ANOVA), if there was an effect of the treatment, it was continued with the BNJ (Honestly Significant Difference) test using SPSS. Results and Discussion. Statistical analysis shows that the measurement parameters are plant height, stem diameter, number of leaves, fresh production, dry matter production, dry matter, and crude fiber. In this regard, the research location is suitable for obtaining good growth of the king grass plant (Pennisetum purpureophoides) so that the treatment tested is expected to get the conditions according to the research objectives.

## 3. Results and Discussion

### 3.1 King Grass Plant Height

The results showed that the height of the king grass was one of the aspects that could be observed for the value of its growth quality. Plant growth is a condition in which the size of the plant is followed by an in-crease in dry weight, while the increase in question takes place from time to time. The results showed that the height of the king grass plant was different from the dosage of compost and addition with azello. The yield of plant height is as in Table 1.

Table 1. Morphological Data on King Grass Plants

| Treatment | Compost Dosage | Azolla dosage | Plant height | Rod Diameter | Number of Leaves |
|---|---|---|---|---|---|
| K0A0 | 0 | 0 | 168a ± 1.73 | 16.26a ± 0.22 | 168a ± 1.73 |
| K0A1 | | 10 | 178ab ± 2.00 | 18.21b ± 0.87 | 177ab ± 2.00 |
| K0A2 | | 20 | 185bc ± 4.58 | 18.31b ± 0.95 | 185bc ± 4.58 |
| K1A0 | 10 | 0 | 178ab ± 6.43 | 18.14b ± 0.55 | 177ab ± 6.43 |

| | | | | | |
|---|---|---|---|---|---|
| K1A1 | | 10 | 185bc ± 9.00 | 19.07b ± 0.54 | 185bc ± 9.00 |
| K1A2 | | 20 | 194cd ± 8.14 | 20.37c ± 0.49 | 194bc ± 8.14 |
| K2A0 | | 0 | 188bcd ± 1.73 | 17.68ab ± 0.59 | 188abc ± 1.73 |
| K2A1 | 20 | 10 | 193bcd ± 6.03 | 21.45d ± 0.77 | 192bcd ± 6.03 |
| K2A2 | | 20 | 202d ± 3.21 | 22.09d ± 0.57 | 202d ± 3.21 |

Information; different letters behind the numbers indicate a significant change in the confidence value ($P < 0.05$).

The results showed that the combined treatment of compost with azolla could affect the height of the king grass plant. Anova test showed that the higher the dose given, the higher the plant height. The combination of the two fertilizers, namely sapid and azolla compost can provide nutrients to the king grass, so that the re-sulting plant height increases and the nutrients provided can meet the nutritional needs for the growth of the king grass. Use of natural materials such as compost as organic fertilizer for plants. The use of compost as organic fertilizer can restore soil fertility, this is because the type of compost can restore the physical prop-erties of the soil's biological conditions. The addition of azolla is a source of nitrogen that is needed by plants (Violita et al, 2015) thus providing quite high benefits in increasing the availability of soil nutrients, improv-ing plant growth, and stimulating the activity of soil microorganisms. According to Subowo (2010) and Sismiyanti, et al (2018), organic matter given to the soil will help reduce erosion, maintain soil moisture, reg-ulate soil pH, drainage, reduce the hardening effect and cracks on the soil, increase ion exchange, and activity. soil biology and soil fertility.

Azolla has the ability to decompose soil microbes and increase the rate of microbial respiration, thus provid-ing benefits for soil fertility. Utilization of Azolla pinnata as compost material can be used to increase the ac-tivity of soil organisms which at a later stage will improve and maintain soil fertility. The level of activity of soil microorganisms will be reflected in the continuous respiration process, where this process indicates the activity of microbial life in the soil, including reproduction.

### 3.2 Rod Diameter

The results showed that the application of compost and Azolla fertilizer showed a significant effect on plant diameter, the higher the dose given, the greater the diameter of the king grass plant. The highest diameter was obtained in treatment with compost 20 and Azolla 20, namely 22.09. This is because compost has a role in improving the physical condition of the soil, so that root growth is better, while stem growth can be influ-enced by plant genetic factors. The nutrients that can be composted are able to provide nutrient needs so as to increase the plant diameter.

Phosphorus is one of the macro nutrients that can support the growth of stem diameter. Phosphorus nutri-ents can be derived from organic materials in the form of fertilizers or plant residues and artificial fertilizers. According to Hardjowigeno (2010), the function of the phosphorus nutrient is cell division, strengthening the stems so they don't collapse easily and root development. Phosphorus is part of the cell nucleus which is very important in cell division and also for the development of meristem tissue. Stem diameter is one of the important parameters used to see the

growth of a plant. Diameter growth takes place when the needs of photosynthesis for respiration, leaf replacement, root growth and height have been met.

Azolla can be an alternative combination with inorganic N fertilizers in the supply of N in plants. Poer-wowidodo (1992), Shekhfani (1993), and Novizan (2002) stated that N is an element that has a rapid effect on plant vegetative growth, and if N sufficiency is then the plant leaves will grow large and expand their sur-face. Azolla has a high N nutrient content due to its symbiosis with Anabaena in fixing free nitrogen in the air. Azolla is often found in rice fields and fish ponds. Because it is considered a weed, the farmers get rid of it, stack it up and throw it away. After Azolla undergoes a decomposition process, humus will form so that it can increase the water stress capacity of the soil to improve drainage and wateration in the soil (Kotpal and Bali, 2003). Besides that, applying Azolla can increase soil fertility by increasing the availability of nitrogen, or-ganic carbon, availability of P and K elements (Lehocká et al, 2009). Nitrogen from Azolla organic fertilizer will only be available for rice after mineralization in the soil.

### 3.3 Number of Leaves

The results of the research in Table 1 show that the combination of compost and azolla fertilizer has a signif-icant effect on the number of leaves of king grass. The highest number of leaves in the treatment of high dos-es of compost and azolla were 194 leaves. Leaves in general are the main photosynthate-producing organs. Observation of the number of leaves is needed as an indicator of growth. Leaves are generally the main pho-tosynthate-producing organ. Observation of the number of leaves is needed as an indicator of growth.

Application of Azolla compost to the planting medium causes greater soil aeration so that the supply of nu-trients N, P, K in liquid organic fertilizers applied to chili plants can be absorbed properly by the plants to form vegetative parts such as roots, stems and leaves. This is supported by the opinion of Pontes et al (2007) that N is contained in protein and is useful for leaf shoot growth, as well as to fertilize the parts of the leaf stalks. Fertilizers that contain sufficient N, P, K elements to meet plant nutrient needs are one of the im-portant factors needed by plants for growth. The density in the planting medium causes growth in the roots to be stunted as well as the leaves and stems of the chili plants, the density that occurs in the growing medium causes liquid organic fertilizer to be not absorbed optimally in chili plants so that the availability of nutrients is quite small. This is in accordance with what Nur (2018) states, which states that the lack and excess of nitrogen causes stalk and leaf growth to be stunted because cell division and enlargement is inhibited, so that it can cause stunted plants and lack of chlorophyll.

Increasing the number of leaves on the king grass after compost and azolla fertilizer can reduce the density of the planting medium besides that azolla compost also has a high N content so that it helps early vegetative growth in chili plants, the loose planting media will accelerate absorption when applying liquid organic ferti-lizer so that enough nutrients to fulfill the growth process in plants.

According to Mooney et al. (1995), the increasing availability of nitrogen will increase the synthesis of car-bohydrates which is converted into protein, so that the number of leaves formed

will increase. The number of leaves is closely related to the nitrogen composition of nutrients that are absorbed through compost or organic fertilizers.

**Table 2. Production Data on King Grass**

| Treatment | Compost Dosage | Azolla dosage | Fresh Production | Dry Material Production |
|---|---|---|---|---|
| K0A0 | 0 | 0 | 56.67a ± 1.62 | 1.08ab ± 0.02 |
| K0A1 | | 10 | 58.34abc ± 1.24 | 1.09ab ± 0.04 |
| K0A2 | | 20 | 59.34abc ± 2.52 | 1.09ab ± 0.06 |
| K1A0 | 10 | 0 | 57.67ab ± 3.00 | 1.05a ± 0.05 |
| K1A1 | | 10 | 61.67abc ± 2.59 | 1.10ab ± 0.06 |
| K1A2 | | 20 | 63.42c ± 1.82 | 1.09abc ± 0.05 |
| K2A0 | 20 | 0 | 62.99bcd ± 1.18 | 1.13abc ± 0.02 |
| K2A1 | | 10 | 71.07d ± 2.31 | 1.24d ± 0.03 |
| K2A2 | | 20 | 71.19d ± 2.54 | 1.19bcd ± 0.05 |

Information; different letters behind the numbers indicate a significant change in the confidence value ($P < 0.05$).

### 3.4 Fresh Ingredients Production

The results showed that the use of compost with a combination of Azolla could affect the production of fresh king grass. The higher the dosage, the fresh products you get. The highest production was obtained in the treatment of 20 compost fertilizer with Azolla, namely 71.19 grams of fresh king grass. This shows that the use of compost and Azolla fertilizers provides adequate nutrition and nutrient needs so that it can affect the production of king grass. Novizan (2005) reports that dry solid cow manure is included in slow decomposing fertilizer so that the heat released in the process is relatively small so that it is safe to use on plants, this opin-ion is supported by Rachmawati and Manshur (2000). Pujisiswanto et al. (2008) reported that cow dung contains nitrogen and potassium which are good for use as manure.

Based on the research of Satata and Kusuma (2014) using cow fecal fertilizer with a fertilizer dose of 30 tonnes / ha at 8 weeks of cutting age on Brachiaria humidicola grass production with an average wet weight production of 0.452 kg / m2 or 4.52 tonnes / ha. The use of cow fecal fertilizer is also based on research by Ako (1997) using elephant grass the average dry matter production is 186.31 g / m² with a fertilization dose of 10 tonnes / ha with a cut age of 2 months and a fresh weight of up to 300 tonnes / ha. According to Ifradi and Elsifitriana (2003) manure can retain soil organic matter, increase biological activity and also increase groundwater availability. The higher the groundwater content, the better absorption and transfer of nutrients and water.

### 3.5 Dry Material Production

The results showed that the use of compost with a combination of Azolla was found to have a significant ef-fect on the dry matter production of king grass. Based on Table 2. It shows that the highest production of king grass was obtained in the treatment of compost and azolla 20 with a

value of 1.9 grams of king grass. This shows that the higher the dosage of compost and azolla, the higher the dry matter production of king grass. According to Syofiarni (1982) in Sapkota (2012) the production of a plant is always due to the growth of grass such as height increases and the number of tillers. Hakim et al. (2016), giving complete nutrients to plants has an effect on the productivity and growth of a plant. This opinion is supported by Rismunandar (1993) that soil fertility can determine the capacity of plant production because soil fertility has an im-portant role in determining the level of plant productivity. Dapa (2016) states that in addition to nutrients, the production of king grass is also influenced by environmental and climatic factors. The different letters behind the numbers indicate a significant change in the confidence value.

## Conclusion

The results showed that the application of compost and Azolla fertilizer showed a significant effect on plant diameter, the higher the dose given, the greater the diameter of the king grass plant. It shows that the highest production of king grass was obtained in the treatment of compost and azolla 20 with a value of 1.9 grams of king grass.

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