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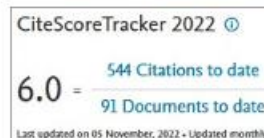
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Production and King Grass Nutritional Quality Number of Sources of Nitrogen Fertilizer

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Abstract

The aim of this study was to obtain the best nitrogen source and level of information on plant growth, production, and nutritional quality of king grass forage (*Pennisetum Purpureophoides*). The source of nitrogen comes from natural fertilizers (chicken and cow manure) and artificial fertilizers (urea and NPK). The method was completely randomized with the BNJ further test with a confidence interval of <0.05. The research plan consisted of 2 factors: the type of fertilizer (organic; cow and chicken manure); inorganic fertilizers (NPK and urea + nitrogen); and the second factor, the dosage (50, 75, and 100 kg/ha/defoliation). Observation parameters were plant height, stem diameter, number of plants per clump, fresh forage production, dry matter production, dry matter content, crude protein content, crude fibre content, and crude fat content. The results of the study using modifications in fertilizing king grass to increase carbon sources and nutrients obtained significant results. The average plant height was obtained between 60-263 cm. The largest size was at defoliation 1, and the lowest was at defoliation 4. Plant diameter increased between 9.97–12.43 mm, with tiller production in plants increasing to 18.5–25.8 planting. The increase was also followed by the number of fresh leaves and a decrease in the number of dry leaves. Protein content increased with the higher dose given at 11.78% BK, with a crude fiber value of 34.41% BK. King Grass contains a good source of carbon nutrients and can affect the increase in plant growth with a higher plant height and a higher number of leaves.

Keywords: King Grass; Nitrogen Source; Cow Dung; Urea; Growth and Nutritional Quality; Nitrogen Level.

1. Introduction

Livestock population improvement programs are always associated with improving the quality and quantity of forage. This is because forage is the main food for livestock. The provision of quality forage feed that is available throughout the year is one way to increase livestock productivity [1]. However, this business still faces obstacles; the land that is usually developed for forage crops is non-productive land, such as marginal/dry land [2]. Efforts to increase forage production in densely populated areas is difficult, so the supply of forage is also reduced as a result of the lack of land that can be used to grow forage crops because it competes with food crop agriculture [3].

One of the forages that is quite productive when given good treatment is king grass (*Pennisetum Purpureophoides*). King grass is a perennial plant that grows upright to form clumps [4]. The roots are in a shape similar to sugar cane, 2-4 m high, and if allowed to grow upright, it can reach 7 m in a thick and hard trunk. King grass has fast growth. King grass production is so high, reaching 1,076 tons of fresh grass/ha/year [5]. King Grass has a fairly wide tolerance for various types of soil, especially on soil with a crumb structure that will give satisfying results, and its production will increase

along with the increase of soil wetness [6]. To maintain good plant growth, plant nutrient availability is absolutely necessary [7]. In marginal areas, an intensive system consisting of the use of superior plant species and the use of fertilizers is carried out to reduce nutrient limitations or mineral deficiencies on plant growth [8].

One of the fertilizers that can be used to increase soil fertility is urea. The chemical, physical, and biological properties of soil greatly affect the growth, yield, and quality of plants [9]. These properties can be improved through processing and applying organic and inorganic fertilizers. Urea (NH_2CONH_2) is able to stimulate vegetative growth and increase the color of the leaf [10]. The nitrogen conversion efficiency increases with increasing nitrogen levels. The application of nitrogen fertilizers can increase the uptake of N, P, and K nutrients so that it is very good for growth [11, 12]. The provision of organic matter is expected to increase the availability of water and nutrients in the soil, especially on land planted with forage so that it can overcome the lack of forage in dry conditions [13]. This study aims to find out the best nitrogen source and level of information on plant growth, production, and nutritional quality of King Grass (*Pennisetum Purpureophoides*).

2. Research Materials and Methods

The research was conducted at the Experiment Sub Station of the Faculty of Animal Husbandry, Universitas Jenderal Soedirman, Purwokerto, Central Java (Indonesia). The results of soil analysis showed that the soil texture class was sandy loam. The available nitrogen content is 0.112, the available phosphorus is 9.6 ppm P_2O_5, while the degree of soil acidity is 6.01, which indicates neutral. The material used was king grass (*Pennisetum Purpureophoides*) planted on a $2 \times 1.5 = 3$ m^2 plot with a spacing of 40×80 cm so that each plot contained 8 grass seedlings. For uniformity, each seedling has 3 nodes, or buds.

2.1. Research Design

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

A1N1 = Chicken Manure and Nitrogen 50 kg/ha/def

A1N2 = Chicken Manure and Nitrogen 75 kg/ha/def

A1N3 = Chicken Manure and Nitrogen 100 kg/ha/def

A2N1 = Cow Dung and Nitrogen 50 kg/ha/def

A2N2 = Cow Dung and Nitrogen 75 kg/ha/def

A2N3 = Cow Dung and Nitrogen 100 kg/ha/def

A3N1 = NPK and Nitrogen 50 kg/ha/def

A3N2 = NPK and Nitrogen 75 kg/ha/def

A3N3 = NPK and Nitrogen 100 kg/ha/def

A4N1 = Urea and Nitrogen 50 kg/ha/def

A4N2 = Urea and Nitrogen 75 kg/ha/def

A4N3 = Urea and Nitrogen 100 kg/ha/def

Each treatment was repeated three times. The spraying was aimed at the leaves of the King Grass and carried out once every two weeks. The dosage calculation is shown in Table 1.

Table 1. Use of Nitrogen Levels in Various Nitrogen Sources

No.	Nitrogen Levels	Chicken manure		Cow dung		NPK		Urea	
		1 Ha	3 m^2	1 Ha	3 m^2	1 Ha	3 m^2	1 Ha	3 m^2
1	50 kg/ha/def	5.165 Kg	1.5 Kg	12.131 kg	3.6 Kg	333 kg	100 gr	111 kg	33 gr
2	75 kg/ha/def	7.747 Kg	2.25 Kg	18.196 kg	5.4 Kg	500 kg	150 gr	167 kg	50 gr
3	100 kg/ha/def	10.330 kg	3 Kg	24.262 kg	7.2 Kg	667 kg	200 gr	222 kg	68 gr

2.2. Research Procedure

The study took place following four defoliations, which included the first defoliation at 60 days of plant age, the 2nd, 3rd, and 4th defoliations at 40 days after. The data analyzed was the average of the four defoliations. The implementation technique of taking the variables studied included, for plant height, the measured plant height from the ground to the

highest leaf size of sample plants. The diameter of the stem is measured by the largest stem size in the sample, which is measured at a position of 5 cm from the ground. Then, the number of plants and the number of plants per clump of the sample clump were counted. For 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 cutting them into pieces and putting them 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. Figure 1 shows the flowchart of the research methodology through which the objectives of this study were achieved.
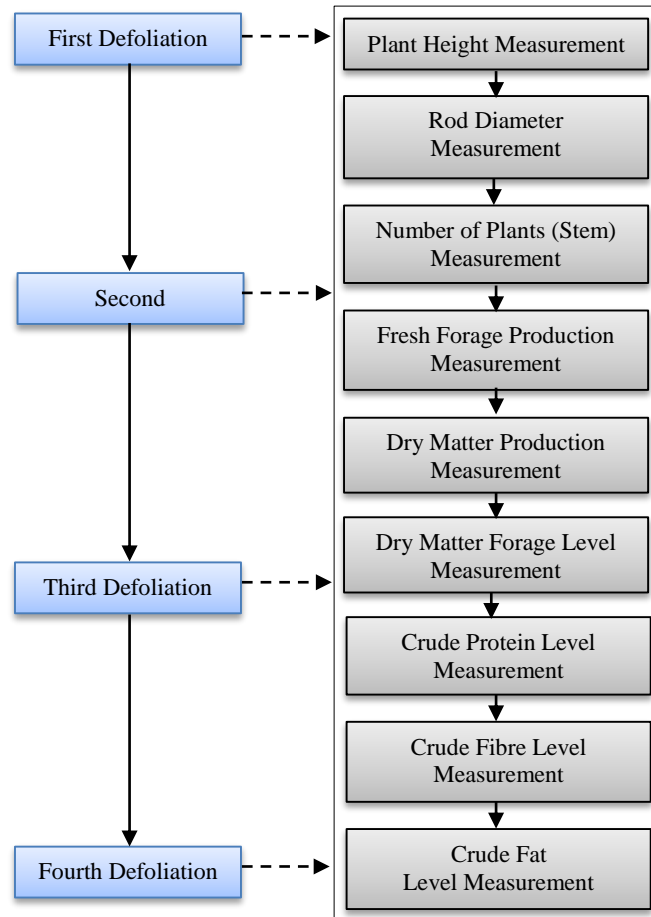
Figure 1. Flowchart of the Research Procedure

2.3. Research Parameters

Agronomic aspects which include plant height, stem diameter, and number of plants per clump, production aspects include fresh forage production and dry matter production, nutritional quality aspects include dry matter content, crude protein content, crude fiber content and crude fat content of king grass forage.

2.4. 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 showed that the measurement parameters of plant height, number of leaves, stem diameter, fresh forage production, dry matter production, dry matter content, crude protein content, crude fiber content, crude fat content of king grass gave significant growth. The results of the analysis show that the physical properties of the soil are easy to cultivate with the land structure supporting plant growth. Soil aeration is good. The degree of acidity (pH) of 6.01 is a very good category for plant growth so that the research location shows the availability of nutrients that support plant growth [14].

3. Results and Discussion

3.1. Height of King Grass Plants (*Pennisetum Purpureophoides*)

The average height of the plants obtained during the 4 defoliations was 196.17 cm. These sizes lie in the range of 160 to 263 cm. The highest size for defoliation 1 and the lowest at defoliation 4. The average height of the king grass

(*Pennisetum Purpureophoides*) along the 4 defoliations is shown in Table 2 which shows that nitrogen originating from artificial fertilizers, NPK and Urea, has given higher average yields than nitrogen coming from natural fertilizers (chicken and cow manure). At the addition of the nitrogen level up to 100 kg per hectare per defoliation, this indicates an increase in the size of the plant. Adding a dose of nutrients to a certain limit will increase plant growth and production [15].

Table 2. Average Research Results

Notation	Origin of Fertilizer	Nitrogen Levels (Kg/ha/def)	Plant Height (cm)	Rod Diameter (mm)	Number of Plants (stem)	Forage Prod. (Kg / 3 m^2)	Dry Matter Prod. (Kg / 3 m^2)
A1N1	Chicken Manure	50	184a ± 2.45	10.27a ± 0.12	19.3a± 2.36	10,25a± 1.24	1.66a± 0.22
A1N2		75	194ab ± 1.41	11.33abc± 0.25	25.7b± 1.25	11,50ab± 1.14	1.79ab± 0.15
A1N3		100	205bc ± 3.74	11.80def± 0.22	31.3b± 1.25	13.00ab± 0.54	1.95ab± 0.08
Average			194.67	11.13	25.43	11.58	1.80
A2N1	Cow dung	50	178ab ± 2.05	9.97ab± 0.21	18.0a± 0.82	10.08a± 0.31	1.68a± 0.04
A2N2		75	189bc ± 1.25	10.6cde± 0.39	25.0b± 0.82	11,50ab± 0.35	1.78ab± 0.08
A2N3		100	193ef ± 4.71	11.5def± 0.24	26,7cd± 2.36	12.17bc± 0.42	1.82abc± 0.08
Average			186.67	10,710	23.23	11.25	1.76
A3N1	NPK	50	199ab ± 1.63	10.97abc± 0.42	20.3a± 1.25	11.42ab± 0.85	1.91ab± 0.10
A3N2		75	207de ± 0.47	11.80def± 0.42	28.3bc± 0.47	12.92abc± 0.59	2,05abc± 0.14
A3N3		100	213ef ± 2.83	12.43ef± 0.42	34.7d± 1.25	15.50cd± 0.54	2.40cd± 0.06
Average			206.44	11.73	27,	13.28	2.12
A3N1	Urea	50	187cd ± 0.47	10.67abc± 0.26	19.3a± 1.89	10.75ab± 0.20	1.75ab± 0.03
A3N2		75	199de ± 0.82	11.77def± 0.17	27.7bc±, 1.25	11.92abc± 0.12	1.87abc± 0.02
A3N3		100	204ef ± 1.41	12.27ef± 0.25	33.3d± 1.70	13.92cd± 0.85	2,21cd± 0.09
Average			196.89	11.57	26.77	12.19	1.94
	Average Treatment		196.17	11.29	25.80	12.08	1.91

Note: Unequal superscripts in the same column show a significant effect (P <0.05).

The results showed that by giving artificial fertilizers such as NPK and high urea, king grass obtained a high enough value. Meanwhile using the provision of natural fertilizers and chicken and cow manure fertilizers, it is obtained an increase in plant height values. The higher the dose given, the higher the value obtained. The results of the study showed a significant difference between the treatments used on plants. Provision of chemical fertilizer shows that the value of plant growth is higher. The application of organic fertilizer from animal manure shows an effect on the growth of king grass as well. Application with additive compounds can affect plant growth hormones [3]. Plant growth hormones or growth regulators (ZPT) are a group of naturally occurring organic substances that have the ability to influence the physiological processes of plant growth, differentiation and development, stress response, cell division and low reproductive activity. Active compounds that affect the quality of plant growth are in dole 3 acetic acid compounds, Gibberellins and cytokines which have the greatest potential to affect plant growth which can prolong the presence of nitrogen in the soil and reduce volatilization [16]. Farmers use nitrogen fertilizers, especially urea, to eliminate deficiencies in crop damage [17].

At the highest nitrogen level, up to 100 kg per defoliation, the highest plant height was also (203.75 cm), while the lowest (50 kg nitrogen per defoliation) was the shortest (187.00 cm). Influence of natural and artificial fertilizers, will respond to plant growth including plant height. On the other hand, in plots with the use of natural fertilizers, nitrogen nutrients can stimulate plant growth, while according to Suarna et al. (2019) is useful in soil conservation efforts while artificial fertilizers are only for plant growth through the nitrogen content in them [8]. At the level of 50 kg/ha/defoliation, there will be a plant height of 187.87 cm, at the level of 75 kg/ha/defoliation, a plant height of 196.17 cm will be found [8]. Meanwhile, at the level of 100 kg/ha/defoliation, a plant height of 204.47 cm will be found. This size is a reasonable measure for king grass plants that grow on fertile, well-irrigated soil and have a good fertilizer management pattern [8]. Figure 2 shows that the dose given also affects the growth of the king grass, the higher the dose given, the higher the plant growth process. This can be due to the fact that the more doses are given, the more nutrients in the plant will also increase and help nourish plant growth. This was most probably caused by the sufficient application of liquid organic fertilizer from water hyacinth and Siam weed in fulfilling the plant's nutrient needs. The nutrient content of water hyacinth and Siam weed are considered to be mutually complementary. This is in line with that the supplementation of organic liquid fertilizer could provide both necessary macro and micronutrients for plants to sustain plant's growth [18]. It is also supported by the study performed by Ferreira et al. (2015) which indicated that the application of liquid organic fertilizer (Chromolaena odorata) in tropical grasses was capable of boosting plant growth especially plant height [19].
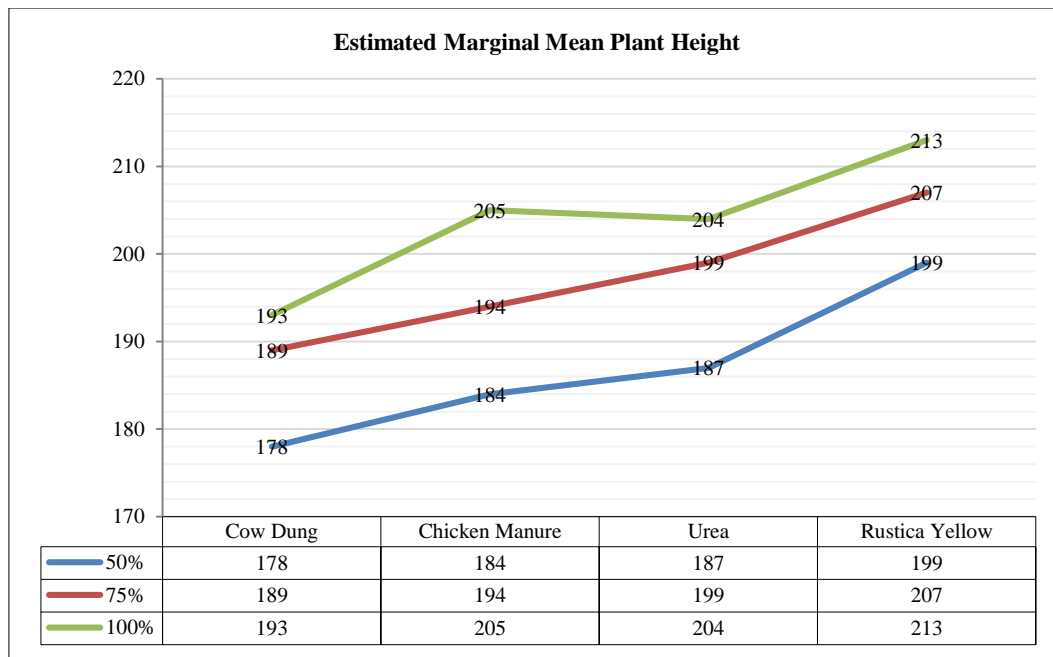
Figure 2. Effect of Nitrogen Sources and Levels on the Height of the King Grass

Fertilization systems using king grass have important potential in the development of livestock systems, production of biofuels, composts and substrates for bio-digestion [20, 21]. The addition of king grass has an increase in the ability to absorb the amount of nitrogen needed for plant growth needs which is also influenced by environmental conditions and plant changes in the presence of a substrate that has sufficient nutrient content. Recommendations for N fertilization can affect plant quality and provide a fairly high source of nutrients [22, 23].

The provision of manure which contains complete macro and micro nutrients can meet the growth needs of the king grass [24]. The application of manure makes the soil fertile physically, chemically and biologically. Physically, manure forms a stable soil aggregate. This situation has a big influence on porosity and aeration of water supplies in the soil, so that it affects the development of plant roots. Chemically, manure as organic material can absorb toxic materials such as aluminum (Al), iron (Fe) and manganese (Mn) and increase soil pH. Biologically, applying manure to the soil will enrich the microorganisms within the soil. These organisms are helpful in the breakdown of organic matter so that the soil matures faster.

3.2. Diameter of King Grass Plants (*Pennisetum Purpureophoides*)

The average diameter of the stems of king grass (*Pennisetum Purpureophoides*) at various sources and the nitrogen level was 11.29 mm in the range of mean size 9.97 to 12.43 mm. The source of nitrogen from NPK at a nitrogen level of 100 kg per hectare per defoliation has shown the largest stem diameter size of king grass, which is 12.43 mm. According to Fageria (2016) states that the provision of fertilizers containing N elements will increase the vegetative growth of plants, are able to encourage the metabolism of other elements such as P and K, and vice versa, thus providing fertilizers containing elements of N, P and K completely both from balanced organic and inorganic fertilizers can increase growth activity and good plant production [25]. The elements of N, P, and K closely related to plant growth, because N, P and K function to stimulate overall plant growth [26]. The main role of nitrogen for plants is to stimulate overall plant growth, especially stems, branches and leaves. Nitrogen also plays an important role in the formation of forages which are useful in the process of photosynthesis, forming proteins, fats, and various other organic compounds. The element of phosphorus for plants is useful for stimulating root growth, especially the roots of seeds and young plants. Helps assimilation and respiration as well as accelerates the formation, ripening of seeds and fruits, especially stems, branches and leaves. Nitrogen also plays an important role in the formation of forages which are useful in the process of photosynthesis, forming proteins, fats, and various other organic compounds. The element of phosphorus for plants is useful for stimulating root growth, especially the roots of seeds and young plants. Helps assimilation and respiration as well as accelerates the formation, ripening of seeds and fruits. Especially stems, branches and leaves. Nitrogen also plays an important role in the formation of forages which are useful in the process of photosynthesis, forming proteins, fats, and various other organic compounds. The element of phosphorus for plants is useful for stimulating root growth, especially the roots of seeds and young plants. Helps assimilation and respiration as well as accelerates the formation, ripening of seeds and fruits.

Based on Figure 3, it shows that the application of chemical fertilizers and organic fertilizers from cow and chicken manure shows a significant effect. Application of fertilizer can accelerate the development of plant diameter. The higher

the dose given, the more nutrient composition that enters and the development of the king plant will be higher. Nitrogen administration can significantly affect shoot morphology and nutritional status during nursery [27]. The increase in plant growth is due to the presence of nitrogen which can increase the production of cytokines which in turn will affect the plant cell walls [28]. Fertilization using nitrogen can also increase seedling height and root diameter [29]. The results showed that the presence of N had an effect on plant growth parameters, while the P element can affect optimal plant production and quality [3].

Estimated Marginal Mean Plant Stalk Diameter

	Cow Dung	Chicken Manure	Urea	Rustica Yellow
50%	9.97	10.27	10.67	10.97
75%	10.6	11.33	11.77	11.8
100%	11.5	11.8	12.27	12.43
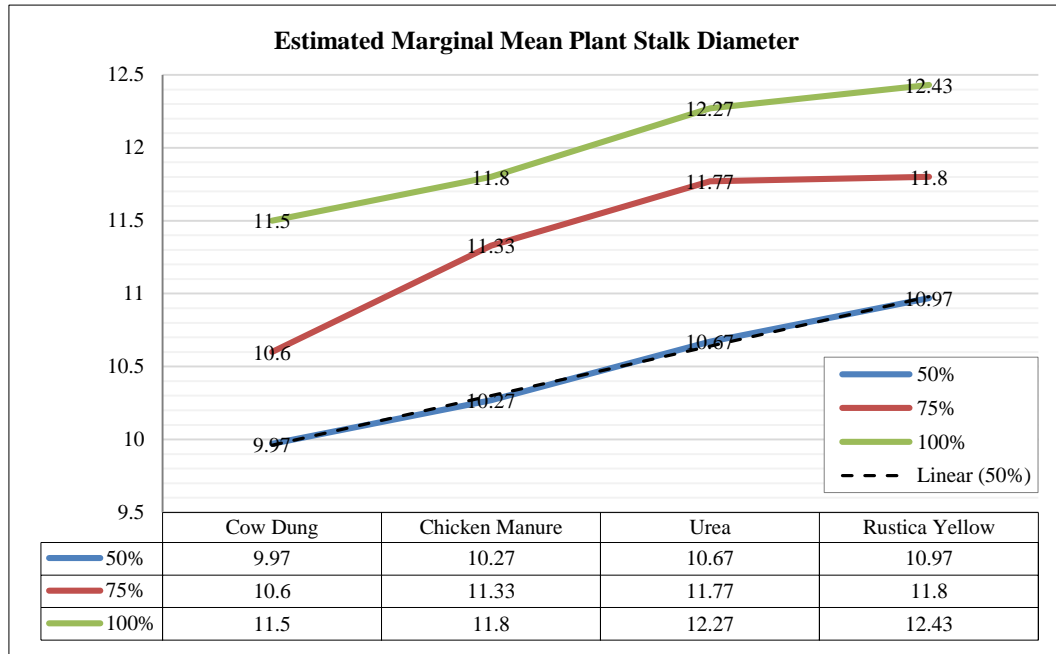
Figure 3. Relationship between Nitrogen Levels and Height of King Grass

3.3. Number of King Grass Plants (*Pennisetum Purpureophoides*)

The average number of king grass (*Pennisetum Purpureophoides*) under the treatment of various nitrogen sources and levels, was found on an average of 25.8 plants per clump (Figure 4). The conditions in the field show that at each vegetative growth period, the king grass plant can increase the number of plants per clump at a range of at least 6 plants in the first defoliation to 49 plants per hill in the 4th defoliation. In the A3N3 treatment, the application of NPK fertilizer as much as 100 kg nitrogen per hectare per defoliation (34.7 plants) and at least 18 plants per clump in A2N1 treatment (giving cow dung as much as 50 kg nitrogen per hectare per defoliation, according to Gordeyase et al. [30].

Estimated Marginal Mean of Grass Field

	Cow Dung	Chicken Manure	Urea	Rustica Yellow
50%	18	19.3	19.3	20.3
75%	25	25.7	27.7	28.3
100%	26.7	31.3	33.3	34.7

Figure 4. Nitrogen Sources Effect and Levels on the Number of King Grass

Analysis of variance showed that the treatment, source and level of nitrogen had a significant effect (P <0.01) on the number of plants per clump of king grass (*Pennisetum Purpureophoides*). The addition of nitrogen from natural and artificial fertilizers has encouraged the growth performance of king grass (*Pennisetum Purpureophoides*), including the number of plants parameters, but there is a difference between available and not available nitrogen from different nitrogen sources. Aminudin & Hendarto (2000) emphasized that the nitrogen nutrient as a growth trigger found in fertilizers may support plant growth, including in terms of producing the number of king grass (*Pennisetum Purpureophoides*) [31, 32]. It is suggested that the dosage increase of fertilizer on the grass is one of the aspects in determining the plant growth that contributes to high production. The supplementation of Siam weed liquid organic fertilizer could ensure the availability of nutrients in the soil. Both the application of liquid and solid organic fertilizer are undoubtedly able to increase the production of vegetables and fruits [32].

The results of research by Hendarto et al. (2014) show that the addition of fertilizers level both organic and inorganic fertilizers on Nevalensis grass will increase plant growth [33]. King grass (*Pennisetum Purpureophoides*) which is able to produce a large number of plants and always increases from 1 to 4 defoliation, according to Liu et al., (2011) there will be more every time, there is an increase in the level of elemental nitrogen [34]. Every plant growth, which among others is marked by an increase in the number of plants according to Abdullah, et al. (2011), will have an effect on better forage production and supply [35]. Ferreira et al, (2015) added that the focus on plant production through fertilization management is an important factor in the cultivation of forage plants [19].

3.4. Fresh Forage Production of King Grass (*Pennisetum Purpureophoides*)

The average amount of fresh forage production of king grass (*Pennisetum Purpureophoides*) was 12.08 kg per plot or 4.027 kg square meters along 4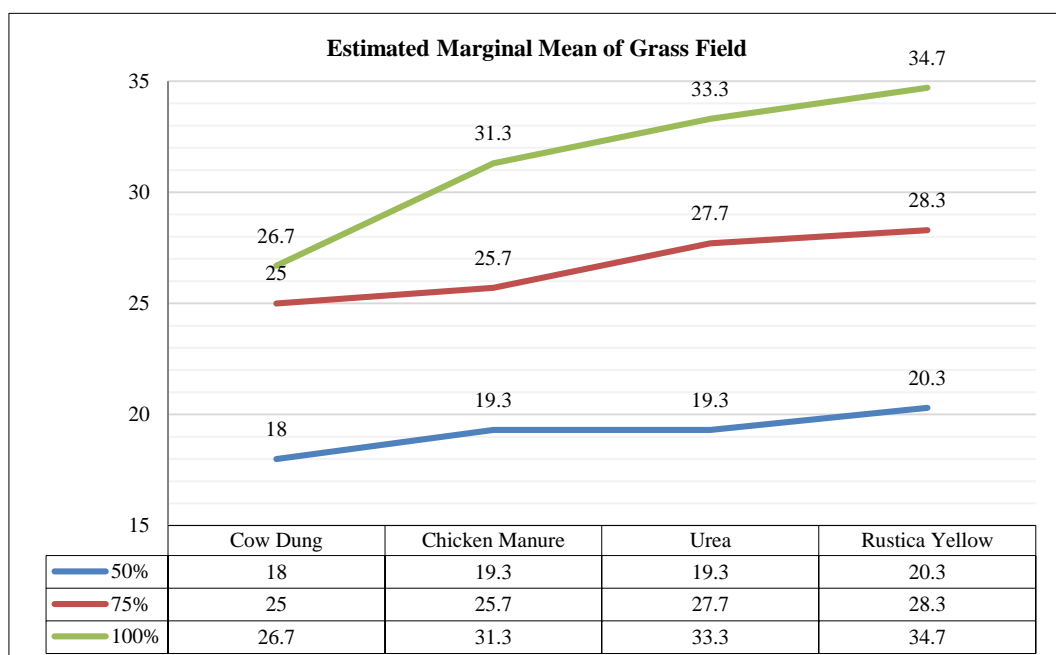 defoliations. The average production obtained continues to increase from 1 to 4 defoliation, the highest is the production weight of 5.92 kg per square meter (Figure 5). The amount of production obtained is estimated to increase in the next defoliation, although it will not be too sharp anymore. The highest production average was found in the A3N3 treatment, king grass fertilized with NPK fertilizer at a nitrogen level of 100 kg per hectare of defoliation, on the average fresh production of 15.5 kg per plot or 5.17 kg per square meter. As an effort to support ruminant livestock activities, the above treatment can be applied in the field to king grass (*Pennisetum Purpureophoides*). At the age of the plant is 40 days, so that in a year it is harvested 9 times, you will find fresh forage as much as 465,300 kg per hectare. If one cow is given fresh forage as much as 40 kg per day, it can provide an overview of the livestock capacity of 32 Livestock Units (UT). The production shown, according to Aminudin and Hendarto (2000), there are many potential plant genetic sources that can support the development of ruminant farms [31].

Based on the nitrogen source used, artificial fertilizers from NPK gave the highest production, followed by king grass (*Pennisetum Purpureophoides*) fertilized with Urea, while fertilizer from cow dung showed the lowest production. It is possible that the highest production of NPK is a compound fertilizer which has the same properties as natural fertilizers, but its nutrients are available for plant growth and production. The appearance of crop production fertilized with nitrogen from livestock manure has a significant difference compared to artificial fertilizers. Application of N can affect soil conditions in biological processes for plant growth. The period of fresh leaves or plants can be used as an index to evaluate changes in genotype [36].

Estimated Marginal Mean of Green Fresh Foliage

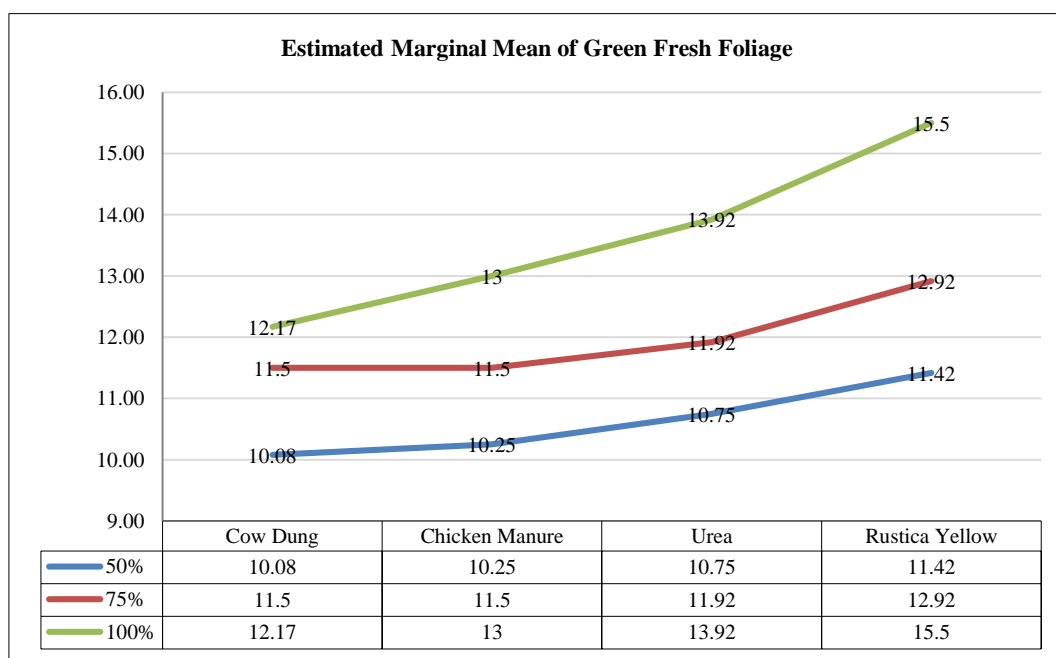|	Cow Dung	Chicken Manure	Urea	Rustica Yellow
50%	10.08	10.25	10.75	11.42
75%	11.5	11.5	11.92	12.92
100%	12.17	13	13.92	15.5

Figure 5. Nitrogen Sources Effect and Levels on Fresh Forage Production of King Grass

The results of research conducted by Hendarto et al., (2014) that the addition of a combination of organic and inorganic fertilizers in Nevalensis grass will increase plant growth [33]. Plant mulato grass is capable of producing a large number of plants, according to Liu, et al. (2011) will focus more on the addition of nitrogen elements supplied from dairy cow dung which has undergone decomposition [34]. The existence of growth is indicated by the addition of the number of plants according to Abdullah, et al. (2011), will affect the production of grass, as well as the quality and quantity, together with the continuity of good production [35]. Ferreira et al. (2015) added that the technical pattern of plant management with fertilization is basically an important factor in the effort to produce more growth and production [19].

3.5. Production of Dry Matter Forage of King Grass (*Pennisetum Purpureophoides*)

The calculation of dry matter production is related to the content of dry matter forage, resulting in an average dry matter production of 1.91 kg per plot or 0.637 kg per square meter or 6,367 kg per hectare (Figure 6). If each adult cow consumes between 6 to 10 kg per day then this production can feed 16 to 26 head of cattle in one year. The average production of the dry matter forage of the king grass (*Pennisetum Purpureophoides*) continues to increase until the fourth defoliation, even if it is still possible to increase in the next growth, although not too intense. The highest production average was found for king grass given NPK fertilizer at a rate of 100 kg nitrogen per hectare per defoliation, which was 2.4 kg per plot or 0.8 kg per square meter. The treatment conditions are the same as fresh production which shows the best treatment. Observing this shows that the dry matter content in all treatments is relatively uniform.

Estimated Marginal Mean of Dry Matter Production

	Cow Dung	Chicken Manure	Urea	Rustica Yellow
50%	1.68	1.66	1.75	1.91
75%	1.78	1.79	1.87	2.05
100%	1.82	1.95	2.21	2.4
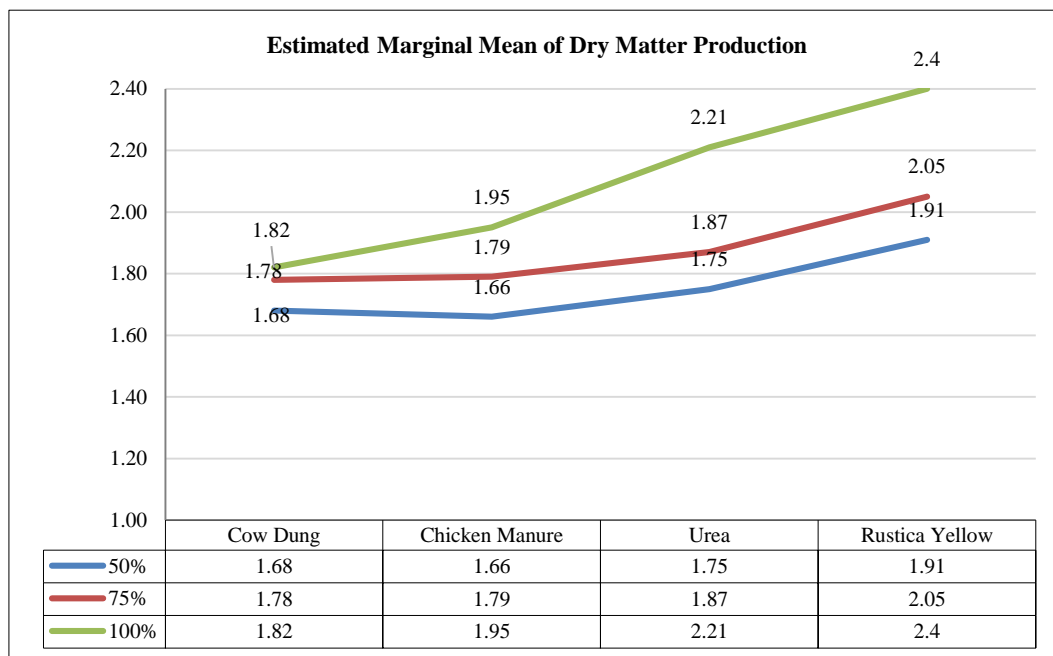
Figure 6. Nitrogen Sources and Levels on Dry Matter Production

The highest dry matter production is shown by the king grass (*Pennisetum Purpureophoides*) which is fertilized from a nitrogen source of artificial NPK fertilizer, followed by urea, chicken manure and cow manure. Artificial fertilizer from NPK has a higher production than Urea because it is a compound fertilizer, while chicken manure is higher than cow manure because the nitrogen content of chicken manure is higher. In line with the display of fresh forage production, plants fertilized with nitrogen from livestock manure have a significant difference compared to artificial fertilizers in the display of dry matter production.

3.6. Dry Matter Production of King Grass (*Pennisetum Purpureophoides*)

The production of forage dry matter is influenced by the amount of fresh production and the level of dry matter forage from king grass. Table 1 shows that the average forage dry matter production of king grass as much as 0.4221 kg in an area of 3 square meters per defoliation or 0.1407 kg/m^2 or 1.407 kg per ha per defoliation or in one year harvested 9 times will produce 12,663 kg. Based on the existing average results, for a cow weighing 300 kg and requiring dry matter of 9 kg per day per head, in a year the production of dry matter for king grass can be used to raise 3.7 or 4 heads of cattle. Cows can consume forage as much as 100 percent of their feed needs.

The results of data analysis showed that all the treatments given did not produce any difference (P> 0.05) in the dry matter production of Raja grass. This results in a provisional conclusion that all the treatments given can be applied.

However, with regard to the efficiency of the material to be used, it is possible that treatment with liquid fertilizer from traditional market organic waste which is given an additional water mixture of 3 times can be applied. This is in accordance with research III) that the liquid fertilizer in plant growth research is added with a mixture of water 3 (three) times as much.

The increase in organic matter production was in line with the increase in dry matter production, where the highest organic matter production was found in the N15M8 treatment of 1.73 tones / ha, which was different from other treatments. The results of this study explain that the higher the level of fertilizer, the higher the production of organic plant material. The results of this study are in accordance with the opinion of Salisbury and Ross (1995) cited by Koten (2013) that the main components in dry weight plant are polysaccharide and lignin compounds in the cell wall, plus cytoplasmic components such as proteins, lipids, amino acids and organic acids [37]. This occurs because an increase in N fertilizer with an optimal harvest age will increase plant biomass, and the increase in biomass will increase the content of crude fiber and crude protein [38].

3.7. Content of Dry Matter Forage of King Grass (*Pennisetum Purpureophoides*)

The results of data collection show that the average dry matter content is forage King Grass (*Pennisetum Purpureophoides*) as much as 15.84 percent (Table 3) which indicates a fairly low-level condition. This illustrates that nitrogen fertilizer levels can increase the development of new seedlings of S. nitidum plants. It is considered that the S. nitidum plant is an annual plant so that it is able to form new tillers as long as nutrients are still available in the soil, although it gradually decreases when it enters the generative phase. The results of this study agree McLaughlin et al., (1996) that plants that have been damaged can grow back to replace parts that have been lost or their parents [39] and it is confirmed by Leghari et al. (2016) that the increase in plant growth rate from the beginning of planting generally takes place in three phases, starting with slow growth, fast then slow again [40].

Based on Figure 7, the results are not significant, which shows that the application of organic or chemical fertilizers does not have an effect on the dry matter of king grass. The effect of fertilizer application occurs in the process of plant growth. Furthermore, Suarna et al. (2019) stated that Ca and Mg together with N are needed in the formation of chlorophyll which can increase the ability of leaves to carry out photosynthesis [8]. The ability of king grass to absorb nutrients is better than elephant grass with an optimal dose of 15.89 t ha-1, the production of fresh weight reaches 231.80 g pot-1, while elephant grass with an optimal dose of 18.09 t ha^{-1} produces 207.86 g pot^{-1}. However, the stems of king grass are more succulent than elephant grass, so that at the optimal dose the dry weight production of king grass is lower than that of elephant grass.

Estimated Marginal Mean of Dry Matter Content

	Cow Dung	Chicken Manure	Urea	Rustica Yellow
50%	16.71	16.24	16.28	16.73
75%	15.55	15.6	15.74	16.74
100%	14.98	15.04	15.87	16.04

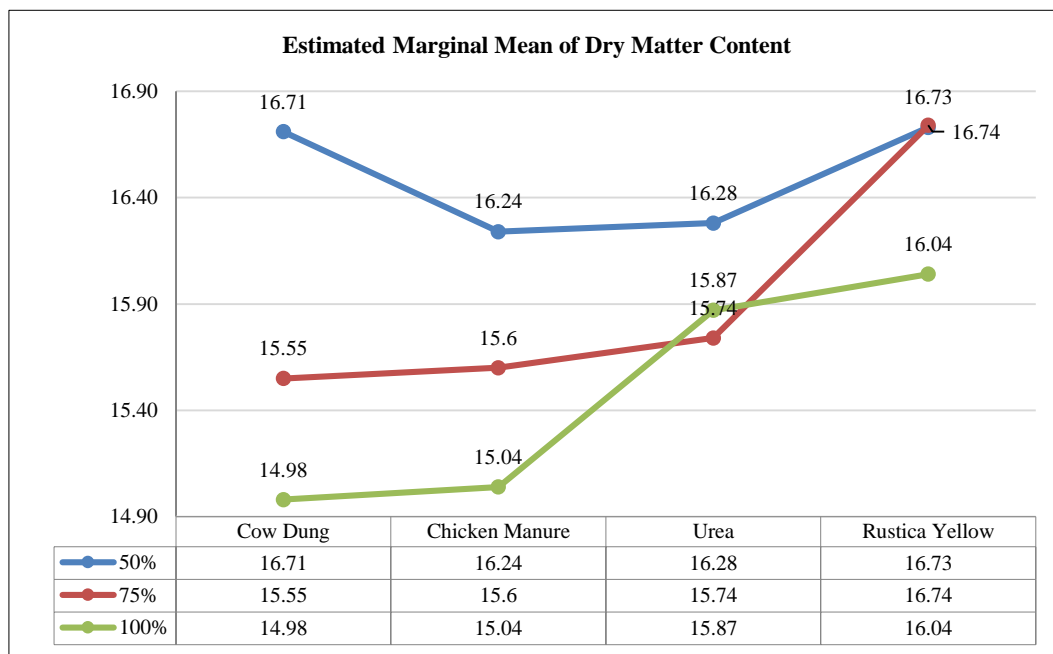**Figure 7. Nitrogen Sources Effects and Levels on Dry Matter Content**

3.8. Crude Protein Level of King Grass (*Pennisetum Purpureophoides*)

Table 3 shows that the average level of crude protein forage grass up to 10.22 percent. The results of the study show high heat content of king grass protein (*Pennisetum Purpureophoides*), nitrogen content has provided support on plant growth (Figure 8).

Table 3. Average results of the research

Notation	Fertilizer	Nitrogen Level (Kg/ha/def)	Dry Matter Forage Level (%)	Crude Protein Level (%BK)	Crude Fibre Level (% BK)	Crude Fat Level (% BK)
A1N1	Chicken Manure	50	16.24c±0.22	9.05 a±0.39	33.74c±0.37	3.70ab±0.21
A1N2		75	15.60ab±0.15	10.53ab±0.69	33.3bc±0.61	3.45ab±0.27
A1N3		100	15.04a±0.08	11.78bc±0.57	32.57abc±0.35	3.14ab±0.28
Average			15.62	10.45	33.20	3.44
A2N1	Cow Dung	50	16.71bc±0.04	9.07a±0.42	34.41abc±0.54	3.58b±0.28
A2N2		75	15.55ab±0.08	9.95bc±0.18	33.88abc±0.10	3.35ab±0.32
A2N3		100	14.98a±0.08	10.68c±0.06	33.31ab±0.22	2.95ab±0.24
Average			15.75	9.9	33.87	3.29
A3N1	NPK	50	16.73bc±0.10	9.03a±0.61	34.39c±0.59	3.63b±0.27
A3N2		75	16.74abc±0.14	10.58ab±0.12	33.44abc±0.29	3.38ab±0.18
A3N3		100	16.04abc±0.06	11.83bc±0.46	32.04a±0.68	2.81ab±0.15
Average			16.04	10.48	33.29	3.27
A4N1	Urea	50	16.28bc±0.03	9.13a±0.26	34.62c±0.51	3.75ab±0.13
A4N2		75	15.74abc±0.02	10.05bc±0.50	33.74abc±0.09	3.30ab±0.24
A4N3		100	15.87abc±0.09	10.88c±0.31	32.20ab±0.59	2.93a±0.11
Average			15.96	10.02	33.52	3.33
	Average		15.84	10.22	33.47	3.33
	BNJ %			3.35%		
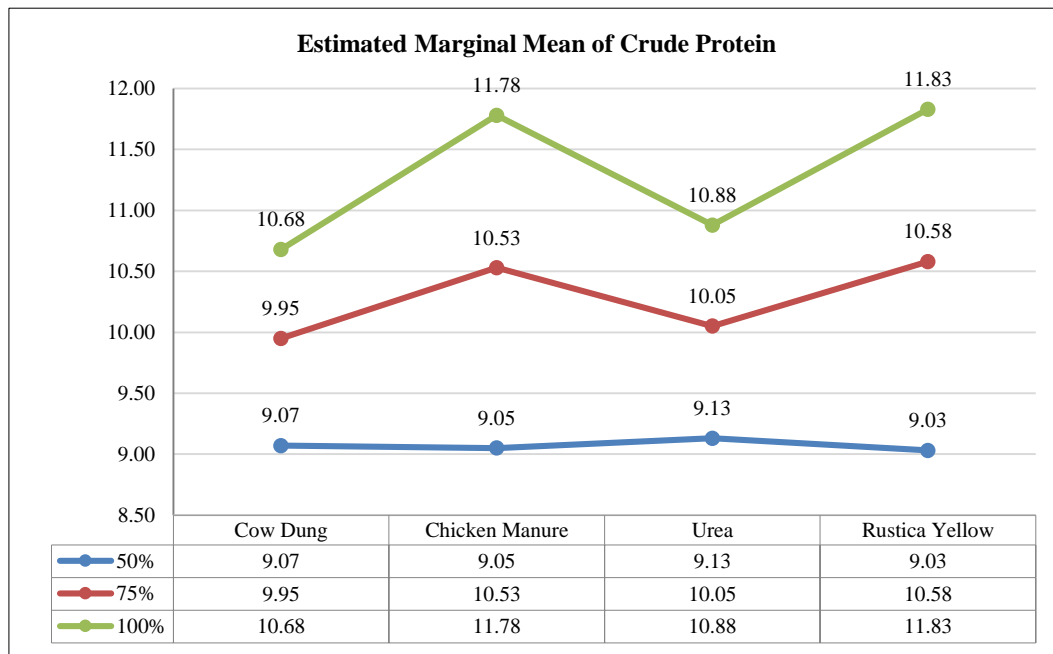
Figure 8. Nitrogen Sources Effect on Crude Protein Levels

The highest level of crude protein shown by the nitrogen administration of the NPK fertilizer in the 100 kg per hectare per defoliation, while in the treatment of nitrogen administration of 50 kg per hectare per defoliation of the NPK fertilizer source produces the average level of the lowest protein. This shows that the source of nitrogen of compound fertilizers such as NPK has provided the ability of nutrients that excel in the forage of king grass (*Pennisetum Purpureophoides*), but in high nitrogen levels. It can be observed in low levels, even produce the lowest level of protein content than other treatments.

The treatment is not indicating the difference ($p > 0.05$) in the level of crude protein forage of king grass (*Pennisetum Purpureophoides*), but the NPK administration as an artificial fertilizer having obvious content as, per the need of plants, can be applied in the field by considering the needs of nitrogen nutrients that will impact the best of crude protein. Panicum Maximum and Cenchrus Cililis can be categorized as medium quality forage to high and potentially useful as complementary substance and substitute for natural plantations and natural meadows in mixed farming / plant / livestock Ethiopia system [41]. Supplementation of liquid organic fertilizer can increase the availability and absorption of

important nutrients for the organic compound forms such as carbohydrates, proteins and lipids. These compounds play an important role in forming the plant's organ. Moreover, organic fertilizers have raised not only their impact on soil quality but also because of their role in carbon sequestration [42].

Increasing the age of plants and fertilizer levels followed by increased production of dry materials, organic materials and crude protein. Subagio and Kusmartono (1988) were quoted by Mansyur et al. (2006) that the production of dry materials will increase along with cutting age [43]. In the old plants results of photosynthesis activity in addition to being used for growth is also stored as food reserves so that the content and production of dry material increases with age of cutting. King grass has low nutritional contents (low protein and high fiber contents) compared to high nutritional quality grasses such as *Pennisetum Clandestinum* (21.9, 62.2, and 27.4% of crude protein, NDF and ADF respectively, and *Lolium Perenne* (17.6, 36, and 22% of crude protein, NDF and ADF respectively. However, its high biomass production and carrying capacity (25.5 livestock units per hectare, at T6) makes it a plant with a great potential to increase productivity and land use. The use of King Grass in systems combined with forage plants of high nutritional quality (*Tithonia Diversifolia, Morus Alba, Moringa Oleifera, Alocasia Macrorrhiza, Sambucus Nigra, Boehmeria Nivea*, etc.) or its establishment in farms of small- and medium-sized beef cattle producers would allow achieving production models with high carrying capacity and adequate nutritional intake [30].

Purbajanti et al. (2009) states that the number of largest nutrient elements required by the plant is nitrogen as well as the main components of various compounds within the plant; Amino acids, Amida, protein, chlorophyll and alkaloid 40-45% protoplasm is composed of compounds containing *N* [44]. Furthermore, it is explained that the availability of nitrogen for the plant depends on mineralization depending on the microbial activity changing N organic to NH4 and further oxidized into the NO3 required by the plant. Increased production of organic matter and crude protein in this study follows increased production of dry materials, so even though the ability of protein proteins decreases but because the dry content of the material increases with increased age and level of fertilizer N, then the production of crude protein is still increasing. It is supported by Koten (2013) opinion that the more dose of urea fertilizer, the more nations of the nitrogen are available to maximize the photosynthesis process and increase the accumulation of plant photosynthesis [37]. Photosynthesis is influenced by the power of the photosynthesis equipment including chlorophylls because chlorophyll contains nitrogen.

3.9. Crude Fiber Level of King Grass (*Pennisetum Purpureophoides*)

King grass under the influence of various sources and nitrogen levels has resulted in a mortality rate of 33.47 percent, which shows higher content than another king grass (*King Splendida*) with a crude fiber as much as 31.75 percent. The results showed enough high-grade fiber content of king grass, alleged structure stem and leaf plant was hard (Figure 9). The difference between the two is not fuel by the use of microbial fertilizers but only occurs due to the difference in grass species with different crude fiber. Crude fiber in Benggala grass is 36.89% [44], crude fiber on grass elements of mini elephants is a kind of superior grass that has a productivity and content of nutrients that are quite high [45].

Estimated Marginal Mean of Crude Fibre

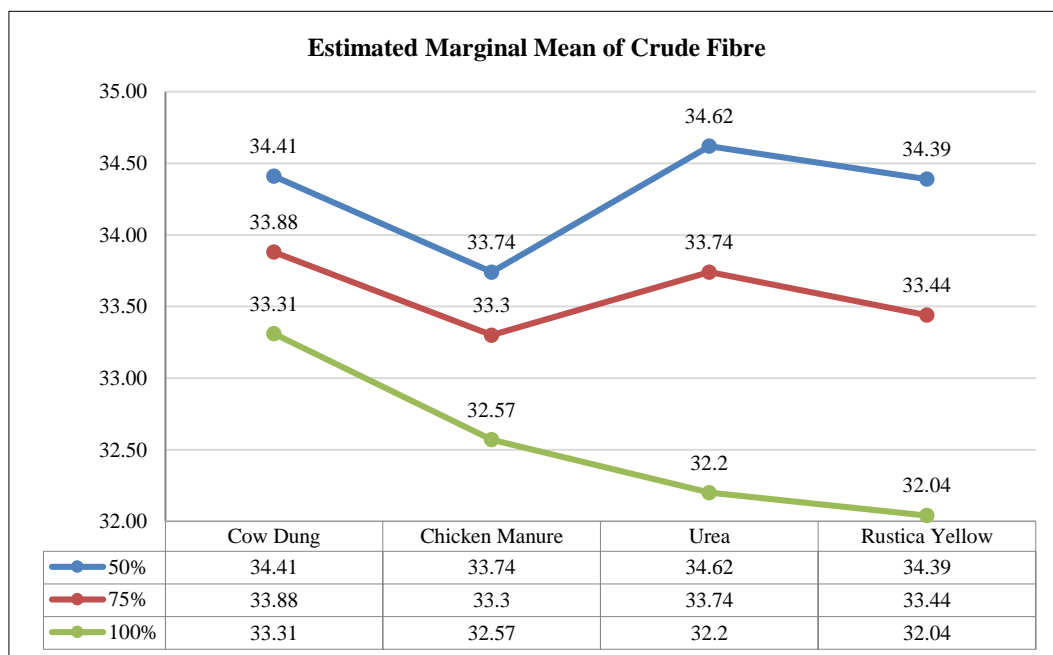|	Cow Dung	Chicken Manure	Urea	Rustica Yellow
50%	34.41	33.74	34.62	34.39
75%	33.88	33.3	33.74	33.44
100%	33.31	32.57	32.2	32.04

Figure 9. Nitrogen Sources' Effects and Levels on Crude Fiber

Table 3 shows that the lowest crude fiber level is found on the administration of NPK fertilizers with 100 kg per hectare per defoliation (32.04 percent), while the highest crude fiber levels in the administration of urea fertilizers with a dose of 50 kg per hectare per defoliation. These conditions show that nitrogen levels affect the level of crude fiber of king grass (*Pennisetum purpureophoides*). Liman et al., (2018) stated that plants at young age are better because the crude fiber is lower, while the protein level is higher [46]. The longer the age of plant crops then the content of the tiny fibers is higher, on the contrary, too early or the harvesting at the short life, the forage will always be in a young state so that the protein content and the moisture content is high but the fiber level is low. The average level of crude fat of king grass (*Pennisetum Purpureophoides*), in Table 3 shows 3.33 percent in level. As a material, the crude content is included in a high category having 1.48 percent crude fat.

3.10. Crude Fat Level of King Grass (*Pennisetum Purpureophoides*)

Figure 10 shows the administration of NPK fertilizers as a source of nitrogen as much as 100 kg of nitrogen per hectare per defoliation, resulting in the lowest-level fatty level (2.81 percent of dry material), while the administration of urea fertilizer of 50 kg of nitrogen per hectare per defoliation produces the highest level of fat rough (3.75 percent). The condition shows the addition of nitrogen levels has lowered the levels of crude fat. Based on the results of the variety analysis showed the treatment and nitrogen showed a real effect ($P < 0.05$) in the level of king grass' crude fat, while the nitrogen source was not influential ($p > 0.05$). This means there are treatments that can be applied in the field on king grass. This is caused by the older age of the plant, which has more energy reserves in the form of crude fat stocked in the leaves.
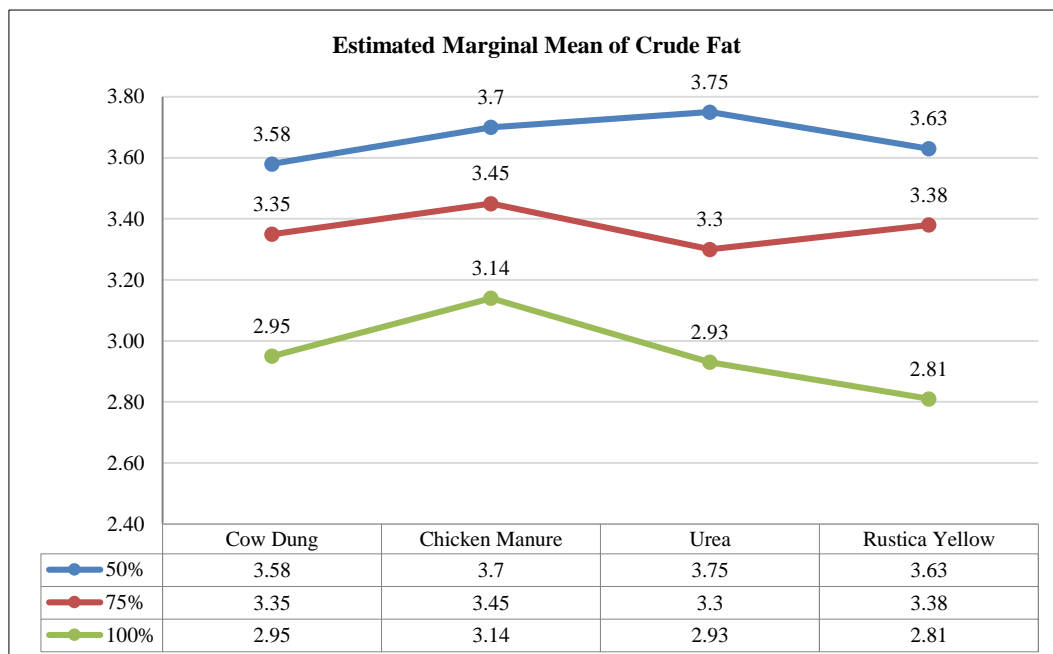
Estimated Marginal Mean of Crude Fat

	Cow Dung	Chicken Manure	Urea	Rustica Yellow
50%	3.58	3.7	3.75	3.63
75%	3.35	3.45	3.3	3.38
100%	2.95	3.14	2.93	2.81

Figure 10. Nitrogen Sources Effects and Levels on Crude Fat of King Grass (*Pennisetum Purpureophoides*)

The use of animal manure-based fertilizer provides higher levels of crude fat when compared with using no treatment of fertilizers. This is due to the nitrogen content contained in influencing the crude fat. This is in accordance with the opinion of Nurdiawati et al. (2018), stating that nitrogen contained in the fertilizer is instrumental in the formation of organic compounds such as proteins and fat [47]. The results of the research show the highest level of crude fat achieved at the treatment of the chicken manure fertilizer because the nitrogen contained in its manure is able to stimulate plant growth and increase photosynthesis activity [42]. The nutrients within the fertilizer are used by the plant for the process of metabolism of the plant in producing crude fat [48]. Permanent cutting systems without fertilization lead to continuous nutrient uptake, resulting in a progressive loss in the soil's ability to provide nutrients to the plant and, consequently, a progressive reduction in biomass and nutrient production. Additionally, the application of fertilizers (NPK) stimulates the absorption of other nutrients, achieving a more than twofold increase in absorption after 60 days compared to treatments without fertilization. This guarantees high yields but could also lead to soil fertility losses [49].

4. Conclusion

Based on the discussion that has been done, it can be concluded that the administration of dairy fertilizer diamond mixed with urea within king grass (*Pennisetum Purpureophoides*) the adherent dairy to a dose of 24 tons per hectare per defoliation mixed with urea of 225 kg per hectare per defoliation leads to plant growth and good grass production. The

results revealed that the use of organic fertilizers from cow dung and chicken manure may affect the growth of king grass, but the provision of inorganic fertilizers faster affects the growth of the king grass. This study, using modifications in fertilizing king grass to increase carbon sources and nutrients, obtained significant results. The average plant height was obtained between 160-263 cm. The highest size was at defoliation 1, and the lowest was at defoliation 4. Plant diameter increased between 9.97-12.43 mm with tiller production in plants increasing to 18.5–25.8 mm. The increase was also followed by the number of fresh leaves and a decrease in the number of dry leaves. Protein content increased with the higher dose given at 11.78% BK, with a crude fiber value of 34.41% BK. King Grass contains a good source of carbon nutrients and can affect the increase in plant growth with a higher plant height and a higher number of leaves.

5. Declarations

5.1. Author Contributions

All authors have equally contributed to the writing of this paper right from conceptualisation to its final copy as it appears now. We also wish to emphasize that all authors have read and agreed to the published version of the manuscript.

5.2. Data Availability Statement

The data presented in this study are available in article.

5.3. Funding

5.4. Informed Consent Statement

Not Applicable.

5.5. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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