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THE FORAGE PRODUCTION OF *Brachiaria mutica* UNDER COCONUT TREE CANOPY

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Abstract

Forage availability remains a major limiting factor in developing commercial farms in Indonesia. The land under coconut trees as found in North Sulawesi Indonesia, is potential to be a cultivation area of Brachiaria forage as a good fodder crops for ruminants and pseudoruminants. Brachiaria mutica is one of the very well-adapted forage under coconut trees in wet tropical climate zones. However, the constraints factors is the lack of scientific information regarding the effects of solar radiation intensity levels in forage crops under coconut trees on the quality of forage production needs for ruminants and pseudoruminansia ruminant feed. Researchs who have implemented intended to address this challenge is of assessing the effects of restrictions on the transmission of solar radiation in the range shade of coconut trees of various age levels, combined with the effects of level of nitrogen fertilizer on the quality aspects of the production of organic matter of Brachiaria mutica, include the fresh and dry matter production and crude protein.

Key words: *Brachiaria mutica*; animal feed; canopy of coconut trees

INTRODUCTION

Biomolecul synthetic as energetic transformation effects on *Brachiaria mutica,* as protein and crude fiber, allowing it as forage crops for ruminants. Energetic transformation can take place on forage crops under a canopy of coconut trees at the time when solar radiation reach the ground, the age and canopy coconut tree height will be a restriction factors of the solar light energy transmission [4]. The reaction of solar light, will be catalyzed by the enzyme in the thylakoid in the chloroplast stroma [5]. Radiation levels on forage crops has an impact on nutrient quality. Early studies concerning the plants production under the canopy on the utilization of solar energy in the coconut trees indicate that there is an important variation in the activities formation of the canopy according the age of the coconut trees [3]. *Brachiaria mutica,* is a type of spread grass with stolon that well tolerate to the dry or wet growing medium [7]. That is why suitable cultivated as a forage crop under coconut trees because it is easy to grow in wet tropical environments and well used as a cover crop. This species is able to form a dense layer, woody and effectively suppress the weeds, and also tolerance to drought; resistant to diseases and pests [1]. In coconut plantations, grow well in the presence of shade, and can prevent erosion. As a forage, the height of grass are between 60-120 cm [2]. The effects of the intensity of solar radiation within the limit shade under the coconut trees of various age levels, combined with the effects of nitrogen fertilizer levels can affect the quality of the production of organic matter of *Brachiaria mutica:* the formation of total leaf chlorophyll formation, dry matter production and crude protein material; the crude fiber of the cell wall.

MATERIAL AND METHOD

Research Method

This experiment was conducted by using split plot design based on randomized group design. The main factor devided into several ages of coconuts trees (N_1, N_2, N_3 and N_4) and the sub factors were urea (P) in several levels (P_0, P_1, P_2, P_3). The treatments of this experiment was realized by three replications in each group (3X4X4). The mathematic

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model was $Y_{ijk} = \mu + K_k + K_i + P_j + E_{ij} + N_{pij} + E_{ijk}$. The further test was statistical analyzed by using the honesty significant different (HSD) [9].

Procedure of research: The pols of *Brachiaria mutica* were use and were treated in the same manner in order to get the uniform results.

The land area of this experiment was maintained the soil structure in order to be ready for planting and for anticipating the development of plant roots. The soil around the palm trees, with a radius of 2 meters, were not dismantled so the roots of coconut trees did not damaged. The seedlings were planted at a space of 30 x 30 cm and planted in holes that have a depth of about 5 cm.

Fertilization: in this experiment the plants were basically fertilized with the phosphate SP3 (TSP) 36% and KCl (60%). SP3 (TSP) is given as much as 100 kg / ha equivalent to 138.88 grams / subplot and KCL: 50 kg / ha is equivalent to 41.66 grams / subplot.

The basic fertilizer was given immediately after tilling the soil by means of distributed above the soil surface.

Urea fertilizer (45%) was given as much as two times in the first week; first at the time of planting, and the second of 11th week - after trimming the plants. Urea was given by putting it in the drill at a distance of 10-15 cm from the plant and given appropriate treatment as follows : 0 kg / ha (without urea); 75 kg / ha; 150 kg / ha and 225 kg / ha.

Table 1 Mean Production of Fresh Grass *Brachiaria mutica* weight (g / cm ^{2} footage)

Shade Factor	Nitrogen fertilization (kg / ha)				Total
	0	75	150	225	
N1 (5 years)	1654.63	2529.65	2622.91	2578.21	2346.35[a]
N2 (20 years)	1874.8	2550.52	2667.98	3846.46	2734.93[a]
N3 (35 years)	1865.7	4321.89	4617.7	4298.32	3775.90[b]
N4 (50 years)	1900.8	6274.57	6701.13	7521.41	5599.48[b]
Mean	1823.97[a]	3919.16[b]	4152.43[b]	4561.1[b]	3614.17

From Table 1, fresh weight production of *Brachiaria mutica* grass showed that the lowest levels found in the canopy shade of coconut aged 20 years, which is relatively higher trees compared to the 5 years coconut tree. This is caused by the light restriction at age 20 years was higher, because the coconut leaves are compact and restricted the transmission of light; can be a major cause to blocked the biological conversion of forage. The nitrogen content in the fertilizer are different, according to the application; but at the highest nitrogen level (225 kg/ha), whereas without the addition of nitrogen resulted in the production of fresh material to be decreased.

In this study, the production of fresh weight of *Brachiaria mutica* increase as the level shades decrease at various age of the coconut trees. *Brachiaria mutica* production was obtained at the lowest fresh plants growing in the shade of five years old coconut trees. The *Brachiaria mutica* fresh production under N3 and N4 are tend to increase when compared with N1 and N2 shade factor. Performance can be supported by the solar radiation. The solar radiation received by coconut trees aged 5 and 20 years in which radiation under the canopy of plants range only of 20% [10], or nearly the same as at the level of N1 and N2.

Judging from the level of the highest fresh matter production fertilization occurs at the level of nitrogen fertilizer 225 kg / ha and the lowest are in the control treatment were not getting additional fertilization (0 kg of Nitrogen). HSD test showed up from all the provision of fertilization was not significantly different in the production of fresh weight, but a tendency to increase with decreasing shade. In accordance with these results, provision of a high enough nitrogen will increase the production of fresh plants because nitrogen will result in the provision of cell wall thinning, many cells contain

protoplasm protoplasm which is a lot of water binding so the plant contains a lot of water in the fresh state [11].

Production of Dry Matter

Dry matter production data showed that treatment of various age levels shade of coconut trees and each nitrogen fertilization showed a significant influence while the interaction between the age levels and nitrogen fertilization, has no significant effect.

Table 2 Mean Production Dry Grass *Brachiaria mutica* (g / cm ^{2})

Shade Factor	Nitrogen fertilization (kg / ha)				Total
	0	75	150	225	
N1 (5 years)	476.97	974.64	1353.12	1 376.51	1 045.31 a
N2 (20 years)	243.86	742.86	1184.65	1 232.17	850.89 b
N3 (35 years)	798.65	933.25	1448.72	2065.50	1 311.53 a
N4 (50 years)	846.96	1774.51	2301.53	2684.76	1 901.94 a
Mean	591.61 b	1106.3 A	1572.05 A	1839.74 A	1,277.42

Dry matter production increased with decrease levels of shade as shown in the Table 2. The highest dry matter production, from the shade level achieved in the treatment of age 50 years and the lowest production level achieved in the treatment of shade age of 20 years. The higher dry matter production, when the shade level increased. Meanwhile, the highest dry matter production achieved in the treatment of 225 kg fertilizer N / ha and the lowest production generated in the control treatment 0 kg / ha.

There is a significant relationship between radiation intercepted by the plant canopy; dry matter accumulation rate when nutrients and water are not limiting growth [8]. Dry matter production increased according to the enhancing of the plant's heavy shade. The N fertilizer materials will increase the dry matter production of the plant to an extent; that in this study the highest are in the shade of coconut trees age 50 years with 225kg N fertilization level / ha [6].

Crude Protein Production

Analysis of variance showed the crude protein production materials, that nitrogen fertilizer treatment gave a significant influence whereas treatment of various age levels shade of coconut plants did not show significant effects and the interactions between them, does not significantly affected the production of crude protein. Later, in the Table 3, the HSD test on crude protein production of *Brachiaria mutica.*

Table 3 The average Production of Crude Protein of *Brachiaria mutica* (g / cm ^{2})

Shade Factor	Nitrogen fertilization (kg / ha)				Total
	0	75	150	225	
N1 (5 years)	27.67	47.78	56.81	65.22	49.37 a
N2 (20 years)	41.23	79.51	65.01	72.07	64.46 b
N3 (35 years)	42.01	89.21	98.72	75.50	76.36 b
N4 (50 years)	65.29	89.53	93.53	94.76	85.78 b
Mean	44.05 a	76.5 b	78.52 b	76.89 b	68.99

The effects of shade treatment and the level of nitrogen fertilization on crude protein production of *Brachiaria mutica* can be seen in Table 3, with the increasing level of nitrogen fertilization. Production of crude protein found in plants with the highest level of fertilization 225 kg / ha; while the lowest

production was found in the control treatment (without Nitrogen).

The role of nitrogen fertilization on crude protein production is important for plants; because it is an element of the preparation of proteins and nucleic acids as well as the protoplasm as a whole, is also required for the formation of chlorophyll, which very important in the process of photosynthesis in which ammonium and carbohydrates biosynthesized in leaves and other plant parts [10]. Nitrogen fertilization can increase the forage production and forage protein content, as proven in the treatment of *Brachiaria mutica* in this research [6].

Production of Crude Fiber

From the available data indicate that fertilizer treatment has an effect on production of crude fiber, while the treatment of various age coconut plants shade level have no effect.

Average production of crude fiber *Brachiaria mutica* of each treatment gave different results as shown in the Table 3. The average production of crude fiber showed the highest production (784.76 g) were obtained from the grass grown under the age of 50 years coconut tree while the lowest crude fiber (365.22 g) were obtained from grass grown under the 20 years coconut trees. In the production of nitrogen fertilizer treatment the highest crude fiber (784.76 g) obtained at the level of fertilization 225 kg / ha and the lowest production (365.22 g) was obtained at 0 kg N fertilizer / ha. The average production of crude fiber increased as the nitrogen fertilization increased, up to 225 kg / ha.

The crude fibers was high, associated with the increased of lignin content, because lignin is a component of plant stems. The crude fiber content of forage can be affected by nitrogen fertilization, especially limited at cellulose and lignin components shown in this research [11].

CONCLUSIONS

From these results, it can be conclude such an under production of fresh ingredients, dry ingredients, from *Brachiaria mutica* grass in the shade of coconut trees, has a tendency to decline in the shade of coconut trees aged 20 years, and increases in the shade of coconut aged 35 and 50 years. While the crude protein was not affected by the shade treatment of coconut trees until the age of 50 years. The nitrogen fertilization can increase the production of fresh, dry matter, crude protein and crude fiber than without fertilization. N fertilization up to 225 kg / ha produced fresh ingredients, dry matter, chlorophyll content, crude protein and crude fiber were similar (there is not significantly different).

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