

**PENGARUH PEMBERIAN ABU SEKAM PADI DAN KOTORAN  
KAMBING TERHADAP PERTUMBUHAN BAYAM  
MERAH (*Amaranthus Gangeticus*)**

**THE EFFECT OF RICE HUSK ASH AND GOAT MANURE ON  
THE GROWTH OF RED SPINACH (*Amaranthus Gangeticus*)**

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**ABSTRAK**

Penelitian ini bertujuan untuk menentukan dosis abu sekam padi dan dosis pupuk kandang serta interaksi dosis yang optimal untuk pertumbuhan dan hasil bayam. Penelitian ini dilakukan di Mas Graha Village, Kabupaten Labuhanbatu yang berada pada ketinggian 26 meter diatas permukaan laut pada bulan agustus sampai bulan desember 2020. Penelitian menggunakan rancangan kelompok faktorial yang terdiri dari dua faktor. Faktor pertama abu sekam padi (A) terdiri dari 4 taraf, yaitu : A<sub>0</sub> = 0 ton/ha (kontrol), A<sub>1</sub> = 1 ton/ha setara dengan 50 g/m<sup>2</sup> (dosis anjuran), A<sub>2</sub> = 1,5 ton/ha setara dengan 75 g/m<sup>2</sup> Faktor kedua yakni pemberian kotoran kambing (K) dengan tiga taraf yaitu : K<sub>0</sub> = 0 ton/ha (kontrol) K<sub>1</sub> = 2 ton/ha setara dengan 200 g/m<sup>2</sup> (dosis anjuran), K<sub>2</sub> = 4 ton/ha setara dengan 400 g/m<sup>2</sup>, K<sub>3</sub> = 6 ton/ha setara dengan 600 g/m<sup>2</sup>. Adapun Parameter yang diukur adalah tinggi tanaman (cm), jumlah daun (helai) , berat per Tanaman Sampel (g). Hasil penelitian menunjukkan bahwa pemberian kotoran kambing 4 ton/ha setara dengan 400 g/m<sup>2</sup> mampu meningkatkan tinggi tanaman, jumlah daun dan berat per tanaman bayam sedangkan aplikasi 1,5 ton/ha abu sekam padi setara dengan 75 g/m<sup>2</sup> mampu meningkatkan tinggi tanaman, jumlah daun tanaman bayam Merah.

Kata Kunci : Abu Sekam Padi, Bayam Merah, Kotoran Kambing

**ABSTRACT**

*This study aims to determine the dose of rice husk ash and goat manure as well as the interaction of dosage that is optimal for the growth and yield of spinach. This research carry out in Mas Graha Village, Labuhanbatu District with an altitude of 18 meters above sea level from August to December 2020. Research design using group factorial consisting of two factors. The first factor of rice husk ash (A) consists of 4 levels, namely : A<sub>0</sub> = 0 ton/ha (control), A<sub>1</sub> = 1 ton/ha equivalent to 50 g/m<sup>2</sup> (the recommended dose), A<sub>2</sub> = 1.5 tons/ha, equivalent to 75 g/m<sup>2</sup>. The second factor, namely the granting of goat manure (K) with three levels, namely : K<sub>0</sub> = 0 ton/ha (control) K<sub>1</sub> = 2 ton/ha, equivalent to 200 g/m<sup>2</sup> (the recommended dose), K<sub>2</sub> = 4 ton/ha, equivalent to 400 g/m<sup>2</sup>, K<sub>3</sub> = 6 ton/ha, equivalent to 600 g/m<sup>2</sup>. The Parameters measured were plant height (cm), number of leaves, (strands) Weight per Plant (g). The results showed that the provision of goat manure 4 ton/ha, equivalent to 400 g/m<sup>2</sup> can increase plant height, leaf number, and weight per plant of spinach while the provision of 1.5 ton/ha rice husk ash, equivalent to 75 g/m<sup>2</sup> can increase plant height, number of leaves plant spinach*

*Keywords: Rice Husk Ash, Red Spinach, Goat manure*

## **INTRODUCTION**

The market demand of Spinach (*Amaranthus gangeticus*) is increasing so it makes the high prospect of the development of spinach to grow optimally because the soil type is dominated by inceptisol and ultisol which has a low soil fertility. Organic material application can improve soil fertility through improvement of the physical, chemical, and biological soil so that it is able to support the growth of red spinach (Rauf and Harahap, 2019).

Spinach planted at the beginning of the dry season on less fertile clay soil can produce promising results if the soil is given sufficient manure. Red spinach cultivation areas that are less porous provide air by circulating air through the ports between the roots (Agoesdy *et al.*, 2013).

Fertilizer like organic fertilizer often used to improve physical soil properties and its enriched with materials that cannot strengthen the soil fertility (Walida *et al.*, 2020). One type of manure commonly obtained by traditionally farmers is goat manure or cow manure. Syawal (2008), applying goat manure at a dose of 5 tons/ha on inceptisol land increase organic C and CEC of the land compared to the control.

The results of Syawal and Rauf (2010) research show that the applying 10 tons/ha of goat manure will provide better weight fresh lettuce plants if followed by the addition of inorganic fertilizer. A part from applying manure, a source of nutrients from the organic material which can also improve the properties of the soil are rice husk ash. When burned rice husk will produce ash containing high level of silica and certain elements (Solar *et al.*, 2019). According to Harahap *et al.*, (2020), rice husk ash contents silica of 0,23%, potassium oxide ( $K_2O$ ) of 0.39%, alumina ( $Al_2O_3$ ) of 2.54%, carbon of 2,23%, calcium oxide ( $CaO$ ) of 1.58%, magnesium oxide ( $MgO$ ) of 0.53 %. Applying rice husk ash to the soil can help aerate the soil thereby facilitating the movement of air and water in the soil and really help the plant root system (Harahap and Walida, 2019).

Rice husk ash is the result of the burning of rice husk before they burn out. Rice husk

ash white to grey-brown, has a high content of cellulose, lignin, hemicellulose and if burned can produce ash with silica are quite high 87%-97%, and contains the nutrient N 1% K and 2% (Harahap and Sari, 2019). Provision of rice husk ash on the tomatoes significantly affect the growth rate of plant height and suppress the attack of pests and diseases (Harahap *et al.*, 2020).

Physically, rice husk ash has a light texture so that it can help improve the physical properties of soil textured clay and a shortage of organic elements. In addition rice husk ash can improve the porosity of the soil so that the soil has aeration is better and is helpful to the growth and development of plant roots, especially for plants that have roots that are shallow and soft like tomato plants and pepper (Abdul *et al.*, 2020).

This study aims to determine the optimal dose of goat manure and rice husk ash and their interaction for the growth of Red Spinach (*Amaranthus Gangeticus*).

## **MATERIALS AND METHODS**

This research carried out in Mas Graha Village, Labuhanbatu District with an altitude of 18 meters above sea level from August to December 2020. The material used are red spinach seeds, rice husk ash, water, chemical used for soil and plants analysis in the laboratory. The tool used are 35x40 polybags, cutting knives, analytical scales, rulers, scissors, mortar, measuring flask, bucket, caliper, neat ropes, hoes, measuring tape, scales, and a number of tools that are used in the laboratory for analysis soil and plant chemistry. The study will be conducted with the RBCD (random block complete design) Research design using group factorial consisting of two factors. The first factor of rice husk ash (A) consists of 4 levels, namely :  $A_0 = 0$  ton/ha (control),  $A_1 = 1$  ton/ha equivalent to 50 g/m<sup>2</sup> (the recommended dose),  $A_2 = 1.5$  tons/ha, equivalent to 75 g/m<sup>2</sup>. The second factor, namely the applying goat manure (K) with three levels, namely :  $K_0 = 0$  ton/ha (control)  $K_1 = 2$  ton/ha, equivalent to 200 g/m<sup>2</sup> (the recommended dose),  $K_2 = 4$  ton/ha, equivalent to 400 g/m<sup>2</sup>,  $K_3 = 6$  ton/ha, equivalent to 600 g/m<sup>2</sup>. The number of

treatment combinations is twelve combinations. (Gomes and Gomes, 1995). The Parameters measured were plant height, number of leaves, weight per plant sample.

**RESULTS AND DISCUSSIONS**

The growth response of red spinach with the application of goat's manure and rice husk ash on the parameters of plant height number of leaves, weight per plant sample of red spinach plant is presented in Table 1

*Plant height of red spinach plant*

The results of different effect from application goat manure and rice husk ash on plant Height are presented in Table 1. Based on the results of the average difference test in Table 1, it shows that the application of goat manure and rice husk ash was significantly affect on the height of spinach while the interaction between the goat manure and rice husk ash was not significantly affect on the height of spinach. Based on the results of

different test average in Table 1 shows that the no goat manure application (K0 or control) significantly different with all other treatments (K1, K2, and K3). The K1 treatment was significantly different from the K2 and K3 treatments, while the K2 treatment (4 tons/ha, equivalent to 400 g/m<sup>2</sup>) was not significantly different from K3 treatment (6 tons/ha, equivalent to 600 g/m<sup>2</sup>). In goat manure treatment, the highest red spinach plant height was at the K2 level (24,68 cm) and the lowest was at the K0 level (21,63 cm).

While the provision of rice husk ash i.e. A0 (control) was significantly different with all other treatments (A1 and A2). The A1 treatment was not significantly different from the A2 on the plant height of red spinach. In rice husk ash treatment, the highest red spinach plant height was at the A2 level (23.69 cm) and the lowest was at the A0 level (22,57 cm).

Table 1. The Combination Effect of Goat Manure and Rice Husk Ash Application on the height (cm) of red spinach plants (*Amaranthus gangeticus*)

Goat Manure	Rice Husk Ash			Average
	A <sub>0</sub>	A <sub>1</sub>	A <sub>2</sub>	
K <sub>0</sub>	20,67	21,27	22,13	21,36 c
K <sub>1</sub>	22,22	22,43	23,45	22,70 b
K <sub>2</sub>	23,16	23,59	23,91	23,55 a
K <sub>3</sub>	24,23	24,55	25,25	24,68 a
Average	22,57 b	22,96 a	23,69 a	

Remarks : The same letter behind values of mean of treatment indicates no significant differences among the mean treatment based on DMRT test at 5 % level of probability.

The results of the analysis of variance showed that the dose of rice husk ash had a significant effect on plant height. Plant height is a plant measurement that is often observed, both as an indicator of growth and as a parameter used the plant are often observed, both as an indicator of growth as well as the parameters used to measure environmental influences. This is based on the fact that plant height is the easiest measure of grow to see (Rahmwyaty *et al.*, 2020).

This is presumably because rice husk ash is able to provide the availability of nutrient

nitrogen sufficient for the growth of generative plants. Results of the study Luta *et al.*, (2020), treatment with the addition of manure had no significant effect on plant height. The sustainable use of manure fertilizer provide a positive impact on the fertility of the soil. Fertile soil will facilitate the development of plant roots. Plant roots can grow well so they can easily absorb water and nutrients available in the soil so that plant can grow and develop optimally and produce high yields (Solar *et al.*, 2019).

*Number of leaves of red spinach plant*

The results of different effect from application goat manure and rice husk ash on number of leaves are presented in Table 2. Based on the results of the average difference test in Table 2, it shows that the application of goat manure and rice husk ash had significantly affect on the number of spinach leaves (strands) while the interaction between the goat manure and rice husk ash had not significantly affect on the number of spinach leaves. Based on the results of different test

average in Table 2 shows that the no goat manure application (K0 or control) significantly different with all other treatments (K1, K2, and K3). The K1 treatment was significantly different from the K2 and K3 treatments, while the K2 treatment (4 tons/ha, equivalent to 400 g/m<sup>2</sup>) was not significantly different from K3 treatment (6 tons/ha, equivalent to 600 g/m<sup>2</sup>). In goat manure treatment, the highest number of red spinach plant leaves was at the K2 level (8,77 strands) and the lowest was at the K0 level (5,00 strands).

Table 2. The Combination Effect of Goat Manure and Rice Husk Ash Application on number of leaves of red spinach plants (*Amaranthus gangeticus*)

Goat Manure	Rice Husk Ash			Average
	A <sub>0</sub>	A <sub>1</sub>	A <sub>2</sub>	
K <sub>0</sub>	5,00	6,00	7,00	5,00 c
K <sub>1</sub>	7,00	6,00	8,00	7,00 b
K <sub>2</sub>	7,00	10,00	9,00	8,77 a
K <sub>3</sub>	8,00	8,00	9,00	8,33 a
Average	6,75 b	7,50 b	8,25 a	

Remarks : The same letter behind values of mean of treatment indicates no significant differences among the mean treatment based on DMRT test at 5 % level of probability.

While the provision of rice husk ash i.e. A<sub>2</sub> significantly different with all other treatments (A<sub>0</sub> and A<sub>1</sub>). The A<sub>1</sub> treatment was not significantly different from the A<sub>0</sub> on the number of leaves red spinach plant. In rice husk ash treatment, the highest number of red spinach plant leaves was at the A<sub>2</sub> level (8,25 strands) and the lowest was at the A<sub>0</sub> level (6,75 strands).

This shows that there is a significant difference in treatment with all the treatments. This is because the red spinach plant optimally absorbs nutrient from the soil so that they have a direct effect on leaf growth. Blanco *et al.*, (2013) stated that elements (N), (P) and (K) plays a role in stimulating cell division at the top of the meristem tissue which will stimulate cell elongation so that the plant will grow tall, cell division in shoot meristem will also followed division of leaf primordia cells that will form leaves later.

*Weight Per Plant Sample Of Red Spinach Plant*

The results of different effect from application goat manure and rice husk ash on Weight Per Plant Sample are presented in Table 3. Based on the results of the average difference test in Table 3, it shows that the application of goat manure had significantly affect on weight per plant sample but application of rice husk ash had not significantly affect on weight per plant sample as well as the interaction between the goat manure and rice husk ash. Based on the results of different test average in Table 3 shows that the no goat manure application (K0 or control) significantly different with all other treatments (K1, K2, and K3). The K1 treatment was significantly different from the K2 and K3 treatments, while the K2 treatment (4 tons/ha, equivalent to 400 g/m<sup>2</sup>) was not significantly different from K3 treatment (6 tons/ha, equivalent to 600 g/m<sup>2</sup>). In goat manure

treatment, the highest weight of red spinach plant per plant sample was at the K3 level (18,04 g) and the lowest was at the K0 level (16,56 g). In goat manure treatment, the highest weight of red spinach per Plant was at K3 level (18,04 g) and the lowest was at the K0 level (16.56 grams).

While the provision of rice husk ash i.e. A0 (control) was not significantly different with all other treatments (A1 and A2). In rice husk treatment, the highest weight of red spinach plant was at the A2 level (17,66 g) and the lowest was at the A0 level (17,12g).

Table 3. The Combination Effect of Goat Manure and Rice Husk Ash Application on Weight per plant sample (g) of red spinach plants (*Amaranthus gangeticus*)

Goat Manure	Rice Husk Ash			Average
	A <sub>0</sub>	A <sub>1</sub>	A <sub>2</sub>	
K <sub>0</sub>	16,47	16,53	16,67	16,56 c
K <sub>1</sub>	16,89	18,02	17,44	17,45 b
K <sub>2</sub>	16,88	18,65	17,56	17,70 ab
K <sub>3</sub>	18,23	17,45	18,43	18,04 a
Average	17,12	17,66	17,53	

Remarks : The same letter behind values of mean of treatment indicates no significant differences among the mean treatment based on DMRT test at 5 % level of probability.

This is presumably because the growth rate of spinach increases because the provision of goat manure and rice husk ash can meet the plant's nutrient content needs. The more doses of goat manure and rice husk ash given, the better the plant growth, thus increasing the production of red spinach plants. Where the provision of the goat manure and rice husk ash will increase the growth of green spinach plants and physiological processes in the plant tissue will run well, so that the result of photosynthesis are translocated into the plant. This is in accordance with the statement of Pane *et al.*, (2014), which states that to form plant tissue nutrient are needed, with the presence of balance nutrient it will increase plant weight.

**CONCLUSIONS**

The application of goat manure 4 ton/ha, equivalent to 400 g/m<sup>2</sup> increase plant height, leaf number and weight per plant of red spinach plant. The application of rice husk ash 1.5 tons/ha, equivalent to 75 g/m<sup>2</sup> increase plant height, number of leaves of red spinach plant.

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