

The Effect of Rice Husk Ash and Goat Manure on the Growth of Spinach (*Amaranthus gangeticus*)

Pengaruh Pemberian dan Abu Sekam Padi dan Kotoran Kambing Terhadap Pertumbuhan Bayam (*Amaranthus Gangeticus*)

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ABSTRACT

In the period of the last ten years increased market demand for spinach makes the outlook very promising so it is less optimal for the growth of spinach caused by the soil fertility is low so that the provision of organic material can improve soil fertility through the improvement of soil chemical to support the growth of red spinach. This study aims to determine the dosage of rice husk ash and dose of manure as well as the interaction of dosage that is optimal for the growth and yield of spinach. this research, land villa, Pasir mas which failed to compass with a height of 26 meters above sea level labuhanbatu district in August until December 2020. Research design using group factorial consisting of two factors. The first factor of rice husk ash (A) consists of 4 levels, namely : $A_0 = 0$ ton/ha (control), $A_1 = 1$ ton/ha equivalent to 50 g/m² (the recommended dose), $A_2 = 1.5$ tons/ha, equivalent to 75 g/m². The second factor, namely the granting of goat manure (K) with three levels, namely : $K_0 = 0$ ton/ha (control) $K_1 = 2$ ton/ha, equivalent to 200 g/m² (the recommended dose), $K_2 = 4$ ton/ha, equivalent to 400 g/m², $K_3 = 6$ ton/ha, equivalent to 600 g/m². The Parameters measured were plant height (cm), number of leaves (strands), Weight per Plant Sample (g). The results showed that the administration of goat manure 4 ton/ha, equivalent to 400 g/m² can increase plant height, leaf number, and weight per plant of spinach while the provision of 1.5 ton/ha, equivalent to 75 g/m² can increase plant height, number of leaves plant spinach

Keywords: Rice Husk Ash, Red Spinach, Goat manure, Plant Growth

ABSTRAK

Dalam kurun waktu sepuluh tahun terakhir peningkatan permintaan pasar bayam membuat prospek sangat menjanjikan sehingga kurang optimal untuk pertumbuhan bayam disebabkan oleh kesuburan tanah rendah sehingga pemberian bahan organik dapat meningkatkan kesuburan tanah melalui perbaikan kimia tanah sehingga mampu mendukung pertumbuhan bayam merah. 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 lahan villa pasir mas keluarahan urung kompas dengan ketinggian 26 meter diatas permukaan laut kabupaten labuhanbatu 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 : $A_0 = 0$ ton/ha (kontrol), $A_1 = 1$ ton/ha setara dengan 50 g/m² (dosis anjuran), $A_2 = 1,5$ ton/ha setara dengan 75 g/m² Faktor kedua yakni pemberian kotoran kambing (K) dengan tiga taraf yaitu : $K_0 = 0$ ton/ha (kontrol) $K_1 = 2$ ton/ha setara dengan 200 g/m² (dosis anjuran), $K_2 = 4$ ton/ha setara dengan 400 g/m², $K_3 = 6$ ton/ha setara dengan 600 g/m². 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/m² mampu meningkatkan tinggi tanaman, jumlah daun dan berat per tanaman bayam sedangkan pemberian 1,5 ton/ha setara dengan 75 g/m² mampu meningkatkan tinggi tanaman, jumlah daun tanaman bayam

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

INTRODUCTION

The market demand for spinach (*Amaranthus gangeticus*) is increasing, making the prospect of developing spinach (*amaranthus gangeticus*) very promising (Harahap et al., 2021). Less optimal for growth of spinach (*amaranthus gangeticus*) because it is dominated by inceptisol and ultisol soil types where ultisol soil has low soil fertility (Harahap et al., 2020). Provision of organic matter can increase soil fertility through physical, chemical, and biological improvements to the soil so that it can support the growth of red spinach (Rauf and Harahap, 2019).

Another advantage of the plant red spinach is the age of which is relatively short so that the farmers quickly feel the results of the harvest. Spinach is a plant whose leaves can be consumed as a vegetable. This plant comes from the American tropics but is now spread throughout the world so that this vegetable also has high economic value compared with some kind of spinach other (Oesman et al., 2020).

Spinach beginning of the season kemarau pad land yang is lush and fertile, and I can't purchases pad land liat asalkan land tersebut diberi fertilizer cages yang enough. Rice cultivation area of spinach merah lick of yang lu, the procurement of air be performed dengan mengalirkan air through the port yang ada di between bendengan (Agoesdy et al., 2013).

Fertilizer loft is one organic fertilizer yang often used untuk the political habits of physical land and a highway enriched the han yang I can't reinforces the fertility of the land (Walida et al., 2020). One kind of fertilizer cages yang goose used get the farmers is fertilizer stud goat ataupun cattle traditionally Syawal,F (2008) the provision of fertilizer loft of the goat with a dose of 5 tons/ha pad land inceptisol boosts C-organic dan KTK land compared to the balkans control.

The results of the research of Shawwal and Rauf (2010), shows that the application of manure of goats as much as 10 tons/ha will give the weight of the berangkasan fresh lettuce plants which is better if followed by the addition of inorganic fertilizer. In addition to the provision of manure, source of nutrients from the organic material which is also able to improve the properties of the soil are rice husk ash. Rice husk when burned will produce ash that contains high silica and certain elements (Beidaghy et al.,2019). According to Harahap et al., (2020), rice husk ash has a silica content of t-sar 90,23%, Potassium oxide (K₂O) 0.39 percent, Alumina (Al₂O₃) Of 2.54%, Carbon 2,23%, Calcium oxide (CaO) Of 1.58%, Magnesium oxide (MgO) is 0.53 %. Provision of rice husk ash on the soil can help the soil aeration so that it will facilitate the movement of air and water in the soil and really help the rooting system of the plant (Harahap and Walida, 2019).

Rice husk ash is the result of the burning of the chaff before it is burned. 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 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 dose of manure, the dosage of rice husk ash as well as the interaction of dosage that is optimal for

the growth of Red Spinach (*Amaranthus Gangeticus*).

MATERIALS AND METHOD

This research, carried out land June sand ,mas graha village failed to compass with a height of 18 meters above sea level Labuhanbatu District in the month of August until December 2020. The material used is red spinach seeds, rice husk ash, water, chemical substances used for the purposes of analysis of soil and plants in the laboratory. The tool used is a poly bag size 35x40, knife cutter, analytical scales, a ruler, scissors, mortar, measuring flask, bucket, caliper, tali rapih, hoes, poly bag, tape measure, scales, and a number of tools that are used in the laboratory for chemical analysis of soil and plant. The study will be conducted with the design group factorial. Research design using group factorial consisting of two factors. The first factor of rice husk ash (A) consists of 4 levels, namely : A₀ = 0 ton/ha (control), A₁ = 1 ton/ha equivalent to 50 g/m² (the recommended dose), A₂ = 1.5 tons/ha, equivalent to 75 g/m². The second factor, namely the granting of goat manure (K) with three levels, namely : K₀ = 0 ton/ha (control) K₁ = 2 ton/ha, equivalent to 200 g/m² (the recommended dose), K₂ = 4 ton/ha, equivalent to 400 g/m², K₃ = 6 ton/ha, equivalent to 600 g/m². The number of treatment combinations is 12 combinations. (Gomes and Gomes, 1995). The Parameters measured were plant height, leaf number , Weight per Plant Sample (g).

The response of the growth of red spinach (*Amaranthus gangeticus*) with the provision of goat's manure and rice husk ash on the parameters of plant height, leaf number, weight per plant sample (g) plant spinach red disajikam in Table 1, 2 and 3.

Plant height of spinach (*Amaranthus Gangeticus*)

The results of different test average influence of goat manure and rice husk ash on plant Height are presented in Table 1. Based on the results of different test average in Table 1 shows that the application of goat manure and rice husk ash significantly affect the plant height of spinach while the interaction of the goat's manure and rice husk ash significantly affect the plant height of spinach. Based on the results of different test average in Table 1 shows that the granting of goat manure K₀ (control) significantly different with all the standard of the other (K₁, K₂, and K₃). The level of K₁ differ markedly with the level of K₂ and K₃, while the level of K₂ (4 tons/ha, equivalent to 400 g/m²) was not significantly different with a level of K₃ (6 tons/ha, equivalent to 600 g/m²).

In goat manure frequency plant spinach red is highest at the level of K₂ (24,68 cm) and the lowest at the level of K₀ (21,63 cm). While the provision of rice husk ash A₀ (control) significantly different with all the standard of the other (A₁ and A₂). Level A₁ is not significantly different with a level A₂ on the plant height of spinach. On treatment of rice husk ash frequency plant spinach red is highest on the level A₂ (were 23.69 cm) and the lowest at the level of A₀ (22,57 cm).

RESULTS AND DISCUSSIONS

Table 1. The influence of a combination of goat manure and rice husk ash to the height (cm) plant spinach (*Amaranthus Gangeticus*)

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

Description : Numbers followed by the same letter mean different not real (5%) according to the test DMRT

Results of analysis of variance showed that the dosage of rice husk ash effect is very real at high planting spinach, plant Height is a measure of the plant are often observed, both as an indicator of growth as well as the parameters used to measure the influence of the environment or the applied treatment. This is based on the fact that plant height is a measure of growth that is most easily seen (Rahmwyat *et al.*, 2020).

This is presumably because rice husk ash is able to provide the availability of nutrients sufficient for the growth of generative plants. Results of the study Luta *et al.*, (2020), treatment with the addition of manure had no apparent effect on plant height. The use of manure fertilizer in a sustainable manner provide a positive impact on the fertility of the soil. Fertile soil will facilitate root development of the plant. The roots of the plants that can grow well so it is easy to absorb water and nutrients tersedoia in the soil so that plants can grow and develop optimally and produce high yields (Solar *et al.*, 2019).

The number of leaves (strands) plant spinach (*Amaranthus Gangeticus*)

Results of different test average influence of goat manure and rice husk ash on Number of leaves (strands) are presented in Table 2. Based on the results of different test average in Table 2 show that the application of goat manure and rice husk ash significantly affect the Number of leaves (strands) spinach while the interaction of the goat's manure and rice husk ash did not significantly affect Number of leaves (strands) of spinach. Based on the results of different test average in Table 2 show that the granting of goat manure K₀ (control) significantly different with all the standard of the other (K₁, K₂, and K₃). The level of K 1 differs markedly with the level of K 2 and K 3, while the level K₂ (4 tons/ha, equivalent to 400 g/m²) was not significantly different with the level of K₃(6 tons/ha, equivalent to 600 g/m²).

Table 2. The influence of a combination of goat manure and rice husk ash on number of leaves (strands) spinach (*Amaranthus Gangeticus*)

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

Description : Numbers followed by the same letter mean different not real (5%) according to the test DMRT

In goat manure number of leaves (strands) red spinach is highest at the level of K 2 (8,77 strands) and the lowest level K 0 (5,00 strands). While the provision of rice husk ash. A₀ (control) significantly different with all the standard of the other (A₁ and A₂).Level A₁ is not significantly different with a level A₂ on the Number of leaves (strands) of spinach. On treatment of rice husk ash the Number of leaves (strands) plant spinach red is highest on the level A₂ (8,25

strands) and the lowest at the level of A₀ (of 6.75 strands). This shows the different treatment of the real with all the treatment this is due to the growth of the roots of the plant spinach red already optimum so that the absorption of nutrient elements from the soil can be running well so influential right against the growth of leaves Blanco *et al.*, (2013) stated that elements (N), (P) and (K) plays a role in stimulating cell division in tissue meristem apex that will stimulate the

elongation of cells so that the plants will grow high, cell division in the meristems of the apex also will be followed by cell division primordia of leaves that will form the leaf will be.

Weight Per Plant Of Spinach (*Amaranthus Gangeticus*) (g)

The results of different test average influence of goat manure and rice husk ash on Weight per Plant (g) are presented in Table 3. Based on the results of different test average in Table 3 show that the application of goat manure and rice husk ash significantly affect the Weight per Plant (g) spinach while the interaction of the goat's manure and rice husk ash did not significantly affect the Weight per

Plant (g) of spinach. Based on the results of different test average in Table 3 show that the granting of goat manure i.e. L0 (control) significantly different with all the standard of the other (K₁, K₂, and K₃). The level of K₁ differs markedly with the level of K₂ and K₃, while the level K 2 (4 tons/ha, equivalent to 400 g/m²) was not significantly different with the level of K₃(6 tons/ha, equivalent to 600 g/m²). In goat manure Weight per Plant (g) red spinach is highest at the level of K 3 (18,04 g) and the lowest at the level of L0 (to 16.56 grams). While the provision of rice husk ash Weight per Plant (g) plant spinach red is highest on the level A2 (17,66 g) and the lowest at the level of A0 (17,12 g).

Table 3. The influence of a combination of goat manure and rice husk ash on Weight per Plant Sample (g) red spinach (*Amaranthus Gangeticus*)

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

Description : Numbers followed by the same letter mean different not real (5%) according to the test DMRT

This is presumably because the growth rate continues to increase with the presence of goat manure and rice husk ash so that meet the needs of nutrient content to the plants, increasing doses of goat manure and rice husk ash then the growth of the plants the better thus increasing the production of plant red spinach. Where the administration of the goat's manure and rice husk ash, will increase the growth of plants green spinach and physiological processes in the plant tissue will go well, so the result of photosynthesis is translocated into the plant. This is in accordance with the statement of Pane *et al.*, (2014), which states that to form the tissues of plants needed nutrient elements, with the elements that is balanced will add to the weight of the plant.

CONCLUSIONS

The treatment of goat manure 4 ton/ha, equivalent to 400 g/m² is able to increase plant height, leaf number and weight per Plant of amaranth red. The provision of 1.5 tons/ha, equivalent to 75 g/m² is able to increase plant height, number of leaves plant red spinach (*Amaranthus Gangeticus*)

REFERENCES

Blanco-Canqui H, Shapiro CA, Wortmann CS, Drijber RA, Mamo M, Shaver TM, Ferguson RB. 2013. Soil organic carbon: the value to soil properties. J Soil Water

- Conserv. 68(5).
Doi:10.2489/Jswc.68.5.129a.
- Beidaghy Dizaji, H., Zeng, T., Hartmann, I., Enke, D., Schliermann, T., Lenz, V., & Bidabadi, M. (2019). Generation of high quality biogenic silica by combustion of rice husk and rice straw combined with pre-and post-treatment strategies—A review. *Applied Sciences*, 9(6), 1083.
- Fadhillah, W. and Harahap, F.S., 2020. Pengaruh Pemberian Solid (Tandan Kosong Kelapa Sawit) Dan Arang Sekam Padi Terhadap Produksi Tanaman Tomat. *Jurnal Tanah dan Sumberdaya Lahan*, 7(2), pp.299-304.
- Fitria, F., Harahap, F.S. and Walida, H., 2020. Derajat Infeksi Mikoriza Pada Persiapan Lahan Dan Pengelolaan Gulma Di Tiga Kabupaten Di Provinsi Sumatera Utara. *Jurnal Tanah dan Sumberdaya Lahan*, 7(1), pp.177-180.
- Harahap, F.S., Walida, H. and Arman, I., 2021. *Dasar-dasar Agronomi Pertanian*. CV. Mitra Cendekia Media.
- Harahap, F.S., Walida, H., Oesman, R., Rahmaniah, R., Arman, I., Wicaksono, M., Harahap, D.A. and Hasibuan, R., 2020. Pengaruh Pemberian Abu Sekam Padi Dan Kompos Jerami Padi Terhadap Sifat Kimia Tanah Ultisol Pada Tanaman Jagung Manis. *Jurnal Tanah dan Sumberdaya Lahan*, 7(2), pp.315-320.
- Gomez, K. A, Gomez Aa. 1995. *Prosedur Statistika untuk penelitian pertanian edisi kedua*.
- Luta, D.A., Siregar, M., Sabrina, T. and Harahap, F.S., 2020. Peran Aplikasi Pembenh Tanah Terhadap Sifat Kimia Tanah Pada Tanaman Bawang Merah. *Jurnal Tanah dan Sumberdaya Lahan*, 7(1), pp.121-125.
- Oesman, R., Harahap, F.S., Rauf, A. and Rahmaniah, R., 2020. Pengaruh Pemberian Pupuk Organik Dan Pupuk Anorganik Terhadap Serapan N, P, K Oleh Tanaman Jagung Pada Ultisol Tambunan Langkat. *Jurnal Tanah dan Sumberdaya Lahan*, 7(2), pp.393-397.
- Pane M, Damanik M, Sitorus B. 2014. Pemberian bahan organik kompos jerami padi dan abu sekam padi dalam memperbaiki sifat kimian tanah ultisol serta pertumbuhan tanaman jagung. *J Agroekoteknologi Univ Sumatera Utara*. 2(4):101546. Doi:10.32734/Jaet.V2i4.8438.
- Rahmawaty, R., Frastika, S., Rauf, A., Batubara, R. And Harahap, F.S., 2020. Land suitability assessment for *Lansium domesticum* cultivation on agroforestry land using matching method and geographic information system. *Biodiversitas Journal of Biological Diversity*, 21(8).

- Rauf, A.H., FS 2019. Optimalisasi Lahan Pertanian Menggunakan Agen Biomassa.
- Surya, E., Hanum, H., Hanum, C. and Harahap, F.S., 2019. Pengaruh Pemberian Kompos Bunker Diperkaya Dengan Limbah Cair Pabrik Kelapa Sawit Pada Pertumbuhan Bibit Kelapa Sawit Di Bibitan Utama. *Jurnal Tanah dan Sumberdaya Lahan*, 6(2), pp.1281-1289.
- Surya, E., Hanum, H., Hanum, C., Rauf, A., Hidayat, B. and Harahap, F.S., 2019. Effects of Composting on Growth and Uptake of Plant Nutrients and Soil Chemical Properties After Composting with Various Comparison of POME. *International Journal of Environment, Agriculture and Biotechnology*, 5(6).
- Syawal, F. and Rauf, A., 2017. Upaya Rehabilitasi Tanah Sawah Terdegradasi Dengan Menggunakan Kompos Sampah Kota Di Desa Serdang Kecamatan Beringin Kabupaten Deli Serdang. *Jurnal Pertanian Tropik*, 4(3), pp.183-189.
- Syawal, F., 2017. Tingkat Degradasi Serta Upaya Rehabilitasi Tanah Sawah Menggunakan Kompos Sampah Kota Di Kecamatan Beringin Kabupaten Deli Serdang.
- Syawal, F., Rauf, A., Rahmawaty, R. and Hidayat, B., 2017, November. Pengaruh Pemberian Kompos Sampah Kota Pada Tanah Terdegradasi Terhadap Produktivitas Tanaman Padi Sawah Di Desa Serdang Kecamatan Beringin Kabupaten Deli Serdang. In *Prosiding SEMDI-UNAYA (Seminar Nasional Multi Disiplin Ilmu UNAYA)* (Vol. 1, No. 1, pp. 41-51).
- Walida, H., Harahap, F.S. and Dalimunthe, B.A., 2019. Isolasi Dan Uji Antagonis Mikroorganisme Lokal (MOL) Rebung Bambu Terhadap Cendawan *Fusarium* sp. *Jurnal Agroplasma*, 6(2), pp.1-6.
- Walida, H., Harahap, F.S., Dalimunthe, B.A., Hasibuan, R., Nasution, A.P. and Sidabukke, S.H., 2020. Pengaruh Pemberian Pupuk Urea Dan Pupuk Kandang Kambing Terhadap Beberapa Sifat Kimia Tanah Dan Hasil Tanaman Sawi Hijau. *Jurnal Tanah dan Sumberdaya Lahan*, 7(2), pp.283-289.
- Walida, H., Surahman, E., Harahap, F.S. and Mahardika, W.A., Respon pemberian larutan mol rebuffing bambu terhadap pertumbuhan dan produksi cabai merah (*Capsicum annum* L) jenggo F1.