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Research Paper

Increasing growth of sorghum using vermicompost and dolomite planted in tidal soil

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Abstract

Sorghum is a cereal food that can be grown on marginal land and is suitable for cultivation in dry or warm areas. The objective of this study is to investigate the effects of vermicompost, dolomite, and their combination on soil NPK content, NPK uptake, growth, and yield of sorghum plants (Sorghum bicolor L. Moench) grown on tidal soil. The research was conducted at the Greenhouse, and soil and plant NPK analysis was performed at the Soil Chemistry Laboratory, Department of Soil, Faculty of Agriculture, Sriwijaya University. The study utilized a completely randomized factorial design with two factors. The first factor consisted of three levels of vermicompost application: 0 ton ha^{-1} (V0), 2.5 ton ha^{-1} (V1), 5 ton ha^{-1} (V2), and 7.5 ton ha^{-1} (V3). The second factor included two levels of dolomite application: 0 ton ha^{-1} (K1) and 0.404 ton ha^{-1} (K2). The results indicated that the application of vermicompost, dolomite, and their combination did not have a significant effect on soil N, P, K content, as well as N, P, K uptake, wet weight, dry weight, plant height, number of leaves, and sorghum panicle weight.

Keywords

Tidal Soil, Vermicompost, Dolomite, Sorghum

1. INTRODUCTION

Tidal land is a land which has a direct effect of water runoff from the ebb and flow of sea water or only affects the ground water level. Tidal land has enormous prospects for development and is a strategic choice in taking on the challenges of increasing the agricultural sector which is increasingly complex. However, tidal swamp land also has various obstacles such as difficulty in controlling water management (bad drainage), formation of pyrite, high soil acidity or very low soil pH, as well as low availability of nutrients and salt water intrusion that triggers the cause of tidal land when it has not been used optimally. Therefore, to improve soil conditions and increase productivity in tidal soils, it is necessary to apply fertilizers such as organic fertilizers and ameliorants or soil improvement materials. According to Amir et al. (2012), organic fertilizers can be used to overcome the low content of soil N, P, and K. In addition, the utilization of organic fertilizers can improve the physical, chemical, and biological properties of the soil (Pangaribuan et al., 2017)).

Vermicompost is one of the organic fertilizers that can be produced from the process of decomposing organic matter by utilizing the activity of earthworms (Rohim et al., 2012). Vermicompost can be used to improve soil chemical properties, such as increasing the ability to absorb cations as a source of macro and micro nutrients, increasing pH in acid soils, and increasing soil fertility. According to Kusumawati (2011), vermicompost contains high nutrients, and the manufacturing process is faster. The type of vermicompost used is vermicompost made from cow dung.

Dolomite is a fertilizer from secondary mineral deposits that contains a lot of Ca and Mg elements with the chemical formula $CaMg(CO_3)_2$ (Asmi, 2013). The origin of dolomite is from dolomitic limestone, which is widely used as liming material on acid soils to increase soil pH. Dolomite is able to improve the chemical properties of the soil without leaving a residue that is detrimental to the soil. If the soil pH has increased, the aluminum cations will settle as gibbsite so that it is no longer detrimental to plants. In addition, dolomite is often used because it is relatively cheap and easy to obtain (Trenggana, 2018).

Sorghum (*Sorghum bicolor (L.) Moench*) is a food crop that is able to grow on marginal land, has wide adaptation, does not require a lot of water, and is suitable for planting on dry or warm land. The increase in domestic sorghum production needs special attention because Indonesia has the potential for the development of sorghum (Subagio and Aqil, 2014). However, the cultivation and development of sorghum in South Sumatra is still very limited, although sorghum has great potential to be developed because of its advantages, particularly its drought resistance. Efforts that

Table 1. Initial soil properties

Variable	Unit	Value	Note*
pH H2O	-	3.89	Very Acidic
C-Organic	%	4.70	High
N-Total	%	0.43	Medium
P-Bray	mg kg^{-1}	13.65	High
K-exchangeability	cmol(+)kg^{-1}	0.32	Low
Na-exchangeability	cmol(+)kg^{-1}	0.54	Medium
Ca-exchangeability	cmol(+)kg^{-1}	2.49	Low
Mg-exchangeability	cmol(+)kg^{-1}	0.51	Low
CEC	cmol(+)kg^{-1}	13.05	Low
Al-exchangeability	cmol(+)kg^{-1}	1.31	-
H-exchangeability	cmol(+)kg^{-1}	0.61	-
Pyrite	%	0.22	-
Texture	-	Loam	-
Sand	%	28.53	-
Dust	%	46.00	-
Clay	%	25.47	-

can be made for the development of sorghum cultivation are by selecting superior seed varieties and adding organic fertilizer or compost to increase pH and soil fertility (Asmi, 2013). The availability of nutrients is also one of the important factors that need to be considered to achieve good results in plant cultivation. N, P, and K nutrients are needed for sorghum plants. The results of Maulida's research (2014) stated that the utilization of vermicompost as much as 5 tons ha^{-1} was the best dosage that was able to improve soil chemical properties and increase the growth and yield of sorghum plants (Manuhuttu et al., 2014). Based on the description above, a study was conducted.

Table 2. Soil Analysis Results

Variable	Unit	Value	Min*	Max*	Description
pH	-	5.64	6.80	7.49	Not Qualify
C-Organic	%	19.1	20	58	Not Qualify
Organic Materials	%	32.9	20	28	Qualify
N	%	0.61	0.40	-	Qualify
P	%	0.116	0.10	-	Qualify
K	%	0.127	0.20	-	Not Qualify
C/N Ratio	%	31.31	10	20	Not Qualify

*) Compost Quality Standards (SNI: 19-7030-2004)

2. EXPERIMENTAL SECTION

The pot experiment was conducted from June to September 2021 at the Greenhouse, Department of Soil, Faculty of Agriculture, Sriwijaya University. The research employed various tools including destruction apparatus, distillation apparatus, titration apparatus, stationery, aspirator bulb, sieve, hoe, Erlenmeyer flasks of 50 ml and 250 ml, flamephotometer, glass measuring instruments of 10 ml, 25 ml, and 100 ml, hot plate, camera, sack, filter paper W 42, Kjeldahl flasks of 50 ml and 500 ml, distillation flask, meter, mortal, analytical balance, treatment board, 10 ml measuring pipette, polybag, spectrophotometer, and test tube.

The materials used in the study consisted of ammonium acetate 1 N, ammonium molybdate, Aquadest, sorghum seeds of Bioguma 3 Agritan variety, H_2SO_4 0.1 N, H_3BO_3 2% and 4%, HCl 0.5 N, dolomite lime, extract solution (PA), NaOH 40%, NH_4F 1 N, K standard 100 ppm, tidal swamp soil, and vermicompost.

A completely randomized factorial design (RALF) with two factors was employed. The first factor consisted of vermicompost with three dosage levels: 0 ton ha^{-1} (V0), 2.5 ton ha^{-1} (V1), 5 ton ha^{-1} (V2), and 7.5 ton ha^{-1} (V3). The second factor involved dolomite with two dosage levels: 0 ton ha^{-1} (K1) and 0.404 ton ha^{-1} (K2)

2.1 Variables Observed

Variables observed in the study the initial Soil Characteristics, Vermicompost Content, Soil NPK Content, NPK Uptake, Height, Number of Leaves, Wet Weight, Dry Weight, Panicle Weight of Sorghum.

2.2 Data Analysis

Data were tested using statistical analysis of variance (ANOVA). If the calculated F is greater than the F table at the 5% level, it is declared to have a significant effect. The results of the analysis of variance were real and very significant for several variables, so further tests were carried out with the 5% level Lsd test.

3. RESULTS AND DISCUSSION

3.1 Tidal Soil Characteristics

The soil used in this study is typology C tidal soil in Bangun Sari Village, Tanjung Lago District, Banyuasin Regency. The initial soil analysis was conducted to determine the soil fertility level, which can be categorized as low, medium, or high. The results of the initial soil analysis are shown in Table 1. The tidal soil used in this study has a pH of 3.89 H_2O (very acid), a C-organic content of 4.70% (relatively high), medium total N content of 0.43%, and high available P content of 13.65 mg kg^{-1}. The base saturation criteria indicate low K-dd (0.32 cmol(+) kg^{-1}) and moderate Na content (0.54 cmol(+) kg^{-1}), possibly due to the influence of seawater salts in the tidal soil (Auditha et al., 2019). The soil also has low Ca (2.49 cmol(+) kg^{-1}) and Mg (0.51 cmol(+) kg^{-1}) content, low CEC (13.05 cmol(+) kg^{-1}), 0.22% pyrite content, and loam texture (28.53% sand, 46.00% silt, 25.47% clay).

The tidal soil used in this research is still classified as very acidic due to the high content of pyrite and soil salinity, resulting in low soil fertility. Acidic soil can be improved by fertilization and liming to increase its productivity (Riandi, 2013).

3.2 Characteristics of Vermicompost

The vermicompost used in this study was made from cow dung and litter. Table 2 presents the characteristics of this vermicompost, including its N content (0.61%), P content (0.116%), K content (0.127%), organic materials (32.9%), and C/N ratio (31.31). The vermicompost has a pH of 5.64. However, the vermicompost's C-organic content is low, which is not suitable for plant application as it may lead to the death of beneficial microorganisms involved in the composting process when the pH is low (Kusumawati, 2011). C-organic content is closely related to the decomposition process of organic matter in composting and compost maturity (Mirwan, 2015).

3.3 Effect of Treatment on Soil NPK, NPK-Uptake, Growth and Production of Sorghum

The variance analysis results in Table 3 indicate that the vermicompost, dolomite, and their interaction treatments did not have a significant effect on soil NPK, NPK uptake, growth, and production of sorghum. The vermicompost dosage that tends to yield the best results is presented in Table 4, where the treatment with 5 tons ha^{-1} of vermicompost showed the highest NPK uptake, plant height, number of leaves, production of sorghum, and tidal soil NPK. Similarly, Table 5 shows that the dolomite treatment tends to yield the best results, with the 0 tons ha^{-1} dosage of dolomite showing the highest NPK uptake, plant height, number of leaves, production of sorghum, and tidal soil NPK.

3.4 Soil NPK Contents

3.4.1 Soil N-Total

The results of N-total soil analysis are presented in Table 6. The vermicompost, dolomite, and their combination treatments did not have a significant effect on soil N-total. The nitrogen content in the vermicompost varies depending on the type, as stated by Sofyan et al. (2009). The highest N-total content was obtained with the 7.5 tons ha^{-1} vermicompost treatment (1.41%), while the highest N-total content with dolomite treatment was obtained at 0 tons ha^{-1} (1.29%). The combination treatment of 7.5 tons ha^{-1} vermicompost and 0.404 tons ha^{-1} dolomite showed the highest average N-total content (1.42%). However, both vermicompost and dolomite treatments increased the N-total content compared to the initial tidal soil (0.45%), which was classified as moderate. The increase in soil nitrogen content after planting may be attributed to plants receiving sufficient nutrients. This results in a higher remaining soil nitrogen level in the polybags as it is not fully utilized by the plants (Eskawidi et al., 2005).

3.4.2 Soil P-Extractable

The results of P-extractable soil analysis are shown in Table 7. The vermicompost, dolomite, and their combination treatments did not have a significant effect on P-extractable soil. The vermicompost treatment showed the highest P-extractable content at 0 tons ha^{-1} (25.5 mg kg^{-1}), while the dolomite treatment showed the highest content at 0 tons ha^{-1} (23.12 mg kg^{-1}). The combination treatment of 0 tons ha^{-1} vermicompost and 0 tons ha^{-1} dolomite had the highest average P-extractable content (27.15 mg kg^{-1}).

P-extractable content is generally low in acidic soils. The maximum P-extractable content is typically found in the pH range of 5.5-7. P-extractable content decreases when the soil pH is lower than 5.5 or higher than 7. The application of vermicompost with high P content can reduce P adsorption in the soil (Fitria et al., 2018). Vermicompost also contains microbes that can mobilize and mineralize P through phosphatase enzymes during earthworm digestion (Hindersah et al., 2019).

3.4.3 Soil K-Extractable

The results of soil K-extractable analysis are presented in Table 8. The vermicompost, dolomite, and their combination treatments did not have a significant effect on soil K-extractable. The vermicompost treatment showed the highest K-extractable content at 2.5 tons ha^{-1} (0.33 cmol kg^{-1}), while the dolomite treatment showed the highest content at 0 tons ha^{-1} (0.33 cmol kg^{-1}). The combination treatment of 2.5 tons ha^{-1} vermicompost and 0 tons ha^{-1}

Table 3. Effect of Treatment on Soil NPK, NPK-Uotake, Growth and Production of Sorghum

Variable	F-test		
	Vermicompost	Dolomit	Interaction
Plant Height	0.03926	0.03236	0.02359
Number of Leaves	0.1111	0.33333	0.11111
N Uptake	0.06054	0.00141	0.09232
P Uptake	0.06447	0.12145	0.0986
K Uotake	0.0646	0.05001	0.07185
Wet Weight	0.02886	0.00678	0.18534
Dry Weight	0.05717	0.06935	0.06184
Panicle Weight	0.011	0.00039	0.15326
Soil N	0.21073	0.04488	0.0748
Soil P	0.922	0.23267	0.06397
Soil K	0.0155	0.13953	0.13953

Table 4. Vermicompost Analysis Results

Vermicompost (ton/ha)	Vermicompost Dosage										
	Height (cm)	Number of leaves	Uptake			Wet weight (g)	Dry weight (g)	Panicle weight (ton/ha)	Soil Contents		
			N (mg)	P (mg)	K (mg)				N (%)	P (mg/kg)	K (cmol/kg)
0	99.22	7.5	63.5	3.67	31.9	15.74	2.77	1.446	1.25	25.5	0.32
2.5	95.59	8	49.8	2.59	20	14.07	1.99	1.496	1.16	17.3	0.33
5	100.22	8	75.5	4.13	27.7	16.69	2.82	1.446	1.25	21.7	0.32
7.5	101.14	7.5	71.4	3.31	29.9	15.11	2.99	1.459	1.41	20.4	0.32

Table 5. Effect of Dolomite on Observed Variable

Dolomite (ton/ha)	Dolomite Dosage										
	Height (cm)	Number of leaves	Uptake			Wet weight (g)	Dry weight (g)	Panicle weight (ton/ha)	Soil Contents		
			N (mg)	P (mg)	K (mg)				N (%)	P (mg/kg)	K (cmol/kg)
0	100.15	8	65.9	3.87	29.6	15.67	2.88	2.928	1.29	23.1	0.33
0.404	97.94	7.5	64.2	2.98	25.1	15.14	2.4	2.919	1.25	19.4	0.31

dolomite had the highest average K-extractable content (0.36 cmol kg^{-1}).

The average K-extractable soil content is relatively low according to the analysis results in Table 8. Low potassium content in the soil can lead to potassium deficiency in plants, resulting in stunted growth (Rauf, 2007). Organic fertilizers can increase the availability of potassium in the soil (Kaya, 2014).

3.5 Nutrient NPK Uptake

3.5.1 Nitrogen Uptake

Nutrient uptake refers to the plant's ability to absorb nutrients from the soil (Syaprullah, 2017). The vermicompost, dolomite, and their combination treatments did not have a significant effect on nitrogen uptake in sorghum. The vermicompost treatment showed the highest nitrogen uptake at 5 tons ha^{-1} (75.50 mg plant^{-1}), while the dolomite treatment showed the highest uptake at 0 tons ha^{-1} (65.94 mg plant^{-1}). The combination treatment of 7.5 tons ha^{-1} vermicompost and 0 tons ha^{-1} dolomite had the highest average nitrogen uptake (69.54 mg plant^{-1}).

Increased nitrogen availability due to vermicompost application can enhance plant nitrate reductase activity, leading to improved plant growth (Eskawidi et al., 2005). However, nitrogen is prone to leaching and evaporation, often resulting in its deficiency in plants (Suarni and Subagio, 2013).

Table 6. Effect Vermicompost and Dolomite on Soil N-Total

Vermicompost Dose (tons ha^{-1})	Soil N-Total (%)		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	1.3	1.21	1.25
2.5	1.12	1.21	1.16
5	1.34	1.16	1.25
7.5	1.4	1.42	1.41
Average	1.29	1.25	

Table 7. Effect Vermicompost and Dolomite on Soil P-Extractable

Vermicompost Dose (tons ha^{-1})	Soil P-Extractable (mg kg^{-1})		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	27.15	23.85	25.5
2.5	17.8	16.95	17.3
5	26.4	17.1	21.7
7.5	21.15	19.8	20.4
Average	23.12	19.42	

3.5.2 Phosphorus Uptake

The results of phosphorus uptake analysis are presented in Table 10. The vermicompost, dolomite, and their combination treatments did not have a significant effect on phosphorus uptake in sorghum. The vermicompost treatment showed the highest phosphorus uptake at 4.13 mg plant^{-1}, while the dolomite treatment showed the highest uptake at 0 tons ha^{-1} (3.87 mg plant^{-1}). The combination treatment of 7.5 tons ha^{-1} vermicompost and 0 tons ha^{-1} dolomite had the highest average phosphorus uptake (4.91 mg plant^{-1}).

The application of organic fertilizer or compost can contribute phosphorus to the soil through decomposition, thereby increasing plant phosphorus uptake, although not significantly different. Increased soil phosphorus availability leads to increased phosphorus uptake by plants (Habi et al., 2018).

Table 8. Effect of Vermicompost and Dolomite on Soil K-extactable

Vermicompost Dose (tons ha^{-1})	Soil K-extactable (cmol kg^{-1})		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	0.32	0.32	0.32
2.5	0.36	0.3	0.33
5	0.32	0.32	0.32
7.5	0.32	0.32	0.32
Average	0.33	0.31	

3.5.3 Potassium Uptake

The results of potassium uptake analysis are presented in Table 11. The vermicompost, dolomite, and their combination treatments did not have a significant effect on potassium uptake in sorghum. The vermicompost treatment showed the highest potassium uptake at 0 tons ha^{-1} (31.92 mg plant^{-1}), while the dolomite treatment showed the highest uptake at 0 tons ha^{-1} (29.69 mg plant^{-1}). The combination treatment of 7.5 tons ha^{-1} vermicompost and 0 tons ha^{-1} dolomite had the highest average potassium uptake (38.9 mg plant^{-1}).

The application of organic fertilizers can increase potassium uptake by plants (Kaya, 2014). Potassium plays an important role in the opening and closing of leaf stomata. Potassium deficiency in plants can cause stomata to close due to decreased turgor pressure, limiting nutrient absorption through leaves (Jamilah, 2016).

Table 9. Effect of Vermicompost and Dolomite on N Uptake

Vermicompost Dose (tons ha^{-1})	N uptake (mg plant^{-1})		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	63.91	63.16	63.53
2.5	47.63	51.97	49.80
5	61.21	89.80	75.50
7.5	91.04	51.95	71.49
Average	65.94	64.21	

Table 10. Effect of Vermicompost and Dolomite on P Uptake

Vermicompost Dose (tons ha^{-1})	P uptake (mg plant^{-1}) Dolomite Dose (tons ha^{-1}) 0	0.404	Average
0	4.05	3.30	3.67
2.5	2.65	2.54	2.59
5	3.90	4.37	4.13
7.5	4.91	1.72	3.31
Average	3.87	2.98	

Table 11. Effect of Vermicompost and Dolomite on K Uptake

Vermicompost Dose (tons ha^{-1})	K uptake (mg plant^{-1}) Dolomite Dose (tons ha^{-1}) 0	0.404	Average
0	35.39	28.46	31.92
2.5	20.88	19.20	20.04
5	23.60	31.92	27.76
7.5	38.90	20.90	29.90
Average	28.69	25.12	

3.6 Growth and Production of Sorghum

3.6.1 Plant Height

Plant height was measured from 2 weeks after planting (WAP) until the end of the vegetative phase at 6 WAP. The vermicompost and dolomite treatments did not have a significant effect on sorghum plant height. Table 12 shows the plant height results at 6 WAP for each treatment.

Based on Table 12, the vermicompost treatment at a dose of 7.5 tons ha^{-1} showed the highest average plant height (101.14 cm). The dolomite treatment at a dose of 0 tons ha^{-1} showed a height of 100.15 cm. The combination treatment of 7.5 tons ha^{-1} vermicompost and 0 tons ha^{-1} dolomite resulted in a height of 102.52 cm.

The growth of sorghum in this research was suboptimal, with an average height of around 100 cm, whereas the Bioguma Agritan 3 variety can grow up to 250-260 cm. This could be due to the slow-release nature of vermicompost, where nutrient release decreases over time. Additionally, certain nutrients may be bound by organic acids in the vermicompost, resulting in slower nutrient availability. Environmental factors can also impact plant growth (Yuka et al., 2017).

3.6.2 Number of Leaves

The number of leaves was measured from 2 WAP to 6 WAP. The vermicompost and dolomite treatments did not have a significant effect on the number of leaves in sorghum plants. Table 13 presents the number of leaves at 6 WAP for each treatment.

Based on Table 13, the vermicompost treatment at doses of 2.5 tons ha^{-1} and 5 tons ha^{-1} resulted in the highest average number of leaves (8). The dolomite treatment at a dose of 0 tons ha^{-1} also resulted in 8 leaves. The combination treatments of vermicompost and dolomite at various doses showed 8 leaves as well.

The number of leaves increases with each treatment. The number of leaves is directly proportional to plant height, with taller plants typically having more leaves (Fahriani, 2007). Adequate nutrient supply can contribute to an increase in the number of leaves (Riandi, 2013).

3.6.3 Wet Weight

Wet weight represents the development of plant tissues, including water and nutrient content. The vermicompost and dolomite treatments did not have a significant effect

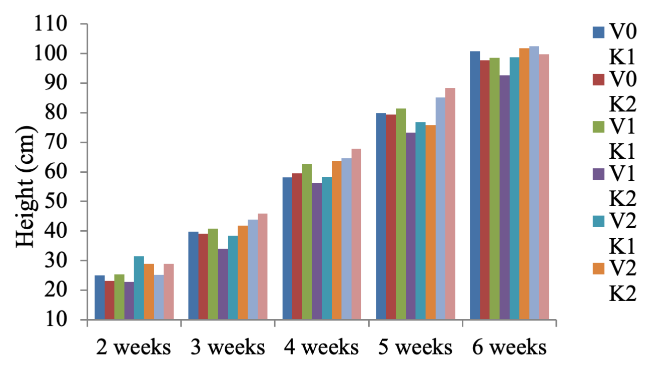

Figure 1. Histogram Average of Sorghum Plant Height During Growth. V_0 = control; V_1 = Vermicompost 2.5 tons ha^{-1}; V_2 = Vermicompost 5 tons ha^{-1}; V_3 = Vermicompost 7.5 tons ha^{-1}; K_1 = control; K_2 = Dolomite 0.404 ton ha^{-1}

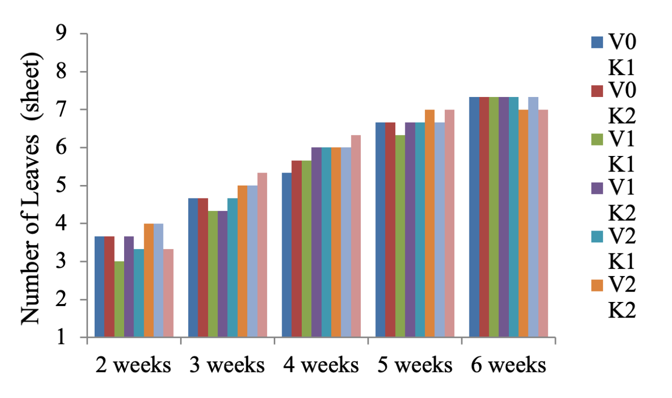

Figure 2. Histogram Average of Number of Sorghum Leaves During Growth. V_0 = control; V_1 = Vermicompost 2.5 tons ha^{-1}; V_2 = Vermicompost 5 tons ha^{-1}; V_3 = Vermicompost 7.5 tons ha^{-1}; K_1 = control; K_2 = Dolomite 0.404 ton ha^{-1}

on the wet weight of sorghum plants. Table 14 presents the wet weight results for each treatment.

Based on Table 14, the vermicompost treatment at a dose of 5 tons ha^{-1} resulted in the highest average wet weight (16.69 g plant^{-1}). The dolomite treatment at a dose of 0 tons ha^{-1} resulted in a weight of 15.67 g plant^{-1}. The combination treatment of 7.5 tons ha^{-1} vermicompost and 0 tons ha^{-1} dolomite had the highest average wet weight (19.46 g plant^{-1}).

Wet weight is influenced by plant height and the number of leaves. As height and leaf count increase, wet weight also tends to increase. Wet weight reflects the vegetative growth of plants and their ability to utilize solar energy through photosynthesis (Nurdin et al., 2009).

3.6.4 Dry Weight

Dry weight represents the accumulation of weight in stems and leaves without water content. The vermicompost and dolomite treatments did not have a significant effect on the dry weight of sorghum plants. Table 15 shows the dry weight results for each treatment.

Based on Table 15, the vermicompost treatment at a dose of 7.5 tons ha^{-1} resulted in the highest average dry weight (2.99 g plant^{-1}). The dolomite treatment at a dose of 0 tons ha^{-1} resulted in a weight of 2.88 g plant^{-1}. The combination treatment of 7.5 tons ha^{-1} vermicompost and 0 tons ha^{-1} dolomite had the highest average dry weight (3.89 g plant^{-1}).

Plant height and the number of leaves also contribute to dry weight, as optimal growth and photosynthesis processes lead to increased organic compound production and translocation to plant organs (Nurdin et al., 2009).

Table 12. Effect of Vermicompost and Dolomite on Plant Height at 6 WAP

Vermicompost Dose (tons ha^{-1})	Sorghum Height 6 WAP (cm)		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	100.77	97.67	99.22
2.5	98.59	92.60	95.59
5	98.72	101.73	100.22
7.5	102.52	99.77	101.14
Average	100.15	97.94	

3.6.5 Panicle Weight

Panicle weight represents the weight of the sorghum panicles. The vermicompost and dolomite treatments did not have a significant effect on panicle weight. Table 16 presents the results of panicle weight for each treatment.

Based on Table 16, the vermicompost treatment at a dose of 2.5 tons ha^{-1} resulted in the highest average panicle weight (1.496 tons ha^{-1}). The dolomite treatment at a dose of 0 tons ha^{-1} resulted in a weight of 2.928 tons ha^{-1}. The

Table 13. Effect of Vermicompost and Dolomite on Number of Sorghum Leaves at 6 WAP

Vermicompost Dose (tons ha^{-1})	Sorghum Leaves 6 WAP (sheet)		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	8	7	7.5
2.5	8	8	8
5	8	8	8
7.5	8	7	7.5
Average	8	7.5	

Table 14. Effect of Vermicompost and Dolomite on Wet Weight

Vermicompost Dose (tons ha^{-1})	Wet Weight (gr/plant)		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	13.81	17.46	15.63
2.5	13.41	14.74	14.07
5	16.01	17.37	16.69
7.5	19.46	10.77	15.11
Average	15.67	15.08	

Table 15. Effect of Vermicompost and Dolomite on Dry Weight

Vermicompost Dose (tons ha^{-1})	Dry Weight (gr/plant)		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	2.94	2.6	2.77
2.5	2.07	1.92	1.99
5	2.65	2.99	2.82
7.5	3.89	2.09	2.99
Average	2.88	2.4	

Table 16. Effect of Vermicompost and Dolomite on Dry Weight

Vermicompost Dose (tons ha^{-1})	Panicle Weight (ton/ha)		Average
	Dolomite Dose (tons ha^{-1})		
	0	0.404	
0	0.756	0.69	1.446
2.5	0.686	0.81	1.496
5	0.753	0.693	1.446
7.5	0.733	0.726	1.459
Average	2.928	2.919	

combination treatment of vermicompost and dolomite at various doses showed an average panicle weight of 0.81 tons ha^{-1}.

Plant height and the number of leaves influence production yield, with taller plants and more leaves generally resulting in higher yields (Nurdin et al., 2009). Additionally, the application of organic matter can affect sorghum yield, including panicle weight (Kaya, 2014).

4. CONCLUSIONS

Based on the results of the research, it can be concluded that the dolomite dosage of 0.404 ton ha^{-1} had no significant effect on tidal soil NPK content, NPK uptake, growth, and production of sorghum. The dose of vermicompost 5 ton ha^{-1} was the best dosage for tidal soil NPK content, NPK uptake, growth, and production of sorghum. The application of vermicompost 5 ton ha^{-1} and dolomite 0 tons ha^{-1} was the best combination based on soil NPK content, NPK uptake, growth, and production of sorghum.

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