RESPONSE OF AMELIORANT GIVING TO SOYBEAN (*Glycine max* (L.) Merril) ON SALINITY LAND

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ABSTRACT

Amelioran is a soil enhancer in the form of organic and inorganic materials which can directly improve the physical and chemical conditions of the soil so as to increase soil fertility. Salinity is a natural process that is closely related to the process of soil establishment. In the saline field, plant growth shows uneven plant growth due to dissolved salt. Restoration of soybean production in saline soil can be done by giving amelioran. The purpose of the study is to find out how far ameliorants can play a role in helping to increase soybean crop production. The study used randomized block design factorial. The first factor was three kinds of varieties, namely: V_1= Anjasmoro, V_2= Wilis, and V_3= Adamame. The second factor is the addition of Amelioran, namely: A_0 = control (saline soil), A_1 = Compost, A_2 = Dolomite, A_3 = Compost + Dolomite. The results showed that varieties did not show different results, but in the addition of dolomite + compost ameliorant showed more potential results in increasing plant growth and production compared to the provision of compost or dolomite.

Keyword: Amelioran, Salinity, Soybean, Varieties

A. INTRODUCTION

Salinity is a limiting factor that inhibits growth which can decrease outcome potential. Salinity causes depressed plants, structure transformation and plant mechanism (Wibowo, 2016). Plant defend mechanism against salinity varies between species from the most sensitive to most tolerant (Farid and Sjahril, 2006). Effect of high salinity show uneven high growth plants. Salinity make leaf narrower, to reduce evaporation and improve the water balance of plants. This situation causes enlargement of young cells not optimal (Nugraheni et al. 2013).

In plant breeding, salinity can be overcome by selecting salinity resistant genotypes, using a testing strategy and eliminating soybean product reduction to spread salinity area. Another way to overcome salinity is by giving amelioran. Amelioran is a soil enhancer that can be in the form of organic or anorganic materials that can improve soil fertility through improvements in physical and chemical conditions. There are several problems that are caused so that rarely used saline soils for crop cultivation include: (1) Low plant osmotic pressure, (2) High Na + content, (3) Low N and K elements, (4) High pH and (5) Low C-organic saline soils (FAO, 2013). The results of research on manure treatment will reduce electric conductivity (DHL). DHL decreases can increase soil N content so that N uptake also increases. Compost contains high enough phosphorus which affects the level of P concentration in the soil. The higher the P concentration in the soil will also increase the level of P plants (Bhakti, etc. 2017).

Dolomite contains high levels of nutrients (CaO) and (MgO). The benefits of dolomite for plants include: being able to regulate the level of soil acidity, supply the needs of Ca and Mg nutrients in plants, neutralize excess substance saturation that can poison plants such as: Al, Fe, Cu. Another benefit of dolomite helps soil microbiology and chemistry work well so as to make the structure and porosity of the soil good and accelerate the absorption of nutrients in the soil and help form chlorophyll so that growth can be maximum (Wibowo, 2017).Based on the above literature, it is expected that this research will find varieties and ameliorants that can increase production and have the potential to be developed in saline soils. The aim of the study is to find out how far varieties and ameliorants can play a role in helping to increase soybean crop production.

B. MATERIALS AND METHODS

Research model

The experimental design used in the study was factorial randomized block design, 2 factors with 3 replications:

First factor is Soybean Varieties :V1 = Anjasmoro, V2 = Wilis, and V3 = Adamame

Second factor isAmelioran :

A0 = Control (salinity) (12kg),

A1 = Salinity (10kg) + Compost (2kg),

A2 = Salinity (10 kg) + Dolomite (2 kg), and

A3 = Salinity (10 kg) + Compost (1 kg) + Dolomite (1 kg)

Data Analysis Techniques

Data analysis techniques were carried conducted by evaluating the growth and development of soybean plants through observation parameters. Results of the research data are analyzed using Microsoft Excel and MiniTab 16.0 programs.

C. RESULT AND DISCUSSION

Plant height (cm)

Table 1. The average plant height (cm) of soybean plants in the combination of ameliorant and variety treatments

Treat	Plant height (cm)			
	2 Week	4 Week	6 Week	8 Week
V1 A0	16,67	31,44	40,33	45,22 a
V1 A1	17,33	35,56	42,11	64,00 bc
V1 A2	16,67	34,89	45,33	68,33 c
V1 A3	17,00	37,33	46,37	71,56 c
V2 A0	17,33	33,56	42,11	46,67 a
V2 A1	17,33	34,00	41,78	60,00 b
V2 A2	17,67	35,50	41,11	63,22 bc
V2 A3	19,67	35,05	47,44	67,33 c
V3 A0	17,22	30,20	41,67	45,00 a
V3 A1	18,00	36,06	45,33	58,89 b
V3 A2	18,22	35,43	46,00	63,33 b
V3 A3	19,33	37,50	46,67	69,67 c

Note: The average value in the same column followed by the same letter is not significantly different according to the DMRT test level of 5%

Observations of plant height at 2MST, 4 MST and 6 MST did not show plant height that was significantly different between treatments, while at plant height 8MST on treatment without ameliorant (A0), significantly different compost (A1), dolomite (A2) and compost + Dolomite (A3) with the highest plant height shown in ameliorant (A3) is shown in all varieties. The highest plant height of 71.56 is shown by V1A3

Number of Leaf (sheet)

Table 2. The average number of leaf (sheet) of soybean plants in the combination of ameliorant and variety treatments

Treat	Number of leaf (sheet)			
	2 Week	4 Week	6 Week	8 Week
V1 A0	2,44	7,44	13,24 a	27,88 a
V1 A1	2,44	8,44	14,44 a	32,44 a
V1 A2	2,88	8,44	15,88 a	33,88 a
V1 A3	2,88	8,88	19,88 b	42,44 b
V2 A0	2,44	6,84	10,44 a	27,66 a
V2 A1	2,44	7,12	14,88 a	34,88 a
V2 A2	2,44	7,44	14,88 a	34,44 a
V2 A3	2,88	9,58	17,44 ab	48,88 b
V3 A0	2,44	6,14	11,88 a	29,66 a
V3 A1	2,44	8,92	13,34 a	33,44 a
V3 A2	2,44	8,82	16,44 ab	36,88 a
V3 A3	3,88	10,38	22,88 b	49,88 b

Note: The average value in the same column followed by the same letter is not significantly different according to the DMRT test level of 5%

Observations on the number of leaf showed that at 2MST, 4MST did not show significantly different results. While at 6 MST and 8 MST the ameliorant treatment A3 showed significant effects on A0, A1 and A2, this result was shown in all varieties. The highest result was 48.88 in V3A3 treatment.

Number of pods (pods)

Table 3. The average number of pods of soybean plants in the combination of ameliorant and variety treatments

Ameliorant (A)	Varieties (V)			AVG
	V1	V2	V3	
A0	5,22 a	6,88 a	7,88 a	11,25 a
A1	9,44 b	13,44 b	11,44 b	13,77 b
A2	13,88 b	14,44 b	15,44 b	14,58 b
A3	19,24 b	17,00 b	19,44 b	18,56 b
AVG	14,19 b	14,19 b	15,24 b	

Note: The average value in the same column followed by the same letter is not significantly different according to the DMRT test level of 5%

The results of the observation of the number of pods showed that the addition ameliorant on A0 showed a significant effect on A1, A2 and A3 while the difference in varieties did not show a significantly different effect. The highest number of plant pods was 19.44 in V3A3 treatment.

Discussion

The results of observations of plant height, number of leaf, and number of pods in the treatment without ameliorant (A0) were obtained smaller than the treatment using additional ameliorant (A1, A2, and A3). This proves that ameliorant can improves the performance of saline soil which has Soil chemistry so that the addition ameliorant can reduce the harmful effects of toxic organic acids. The LITBANG for Agricultural Research and Development (2011) stated that the provision of ameliorant such as organic fertilizers, mineral soils, manure, dolomite can increase pH and bases soil. The addition of ameliorant ingredients that contain polyvalent cation can reduce the bad effects of toxic organic acids. Ameliorant is also referred to as a soil enhancer which can improve the root environment as a nutrient source, reduce acidity, bind to leached cation due to water flow and increase soil fertility.

In this study the use of dolomite further increased the growth of plant height, number of leaf and number of pods in plants compared to the use of compost. This is because Dolomite contains high levels of nutrients (CaO) and (MgO). In Wibowo's writing (2017), Dolomite is able to regulate soil acidity, supply the needs of Ca and Mg nutrients, neutralize excess substance saturation which poison the soil, such as: Al, Fe, Cu dolomite helps soil microbiology and chemistry work well so as to make structure and porosity the soil becomes good and accelerates the absorption of nutrients in the soil and helps the formation of chlorophyll so that maximum growth. Purba (2015) wrote that ameliorant can improve soil physical properties by improving soil granulation so that aeration is better, chemical properties that reduce the density of H ions, increasing base saturation decreasing the solubility of Fe, Al, and Mn increasing the availability of C, Mg, P and Mo, biology that is able to increase the activity of soil microorganisms.

The results of the research on the use of compost + dolomite ameliorant (A3) were significantly able to increase the growth and production of soybean plants grown in salinity. The use of dolomite and compost simultaneously can improve soil structure, physical and chemical properties. Compost which is the result of fermentation or decomposition of plants and animal waste has complete nutrient content both macri and micro nutrients. While dolomite contains nutrients (CaO) and (MgO) with a high enough level so as to be able to regulate the level of soil acidity as described in Wibowo's research (2017). In the Juarsah study (2016) hollow dolomites were able to improve soil structure, soil air pores and soil holding capacity for water in clay. The efficiency of fertilizer use is optimal, nutrient absorption.Henuhili (2008) stated that compost has beneficial properties, including: improving the structure of clay so that it becomes light, increases the binding capacity of groundwater, improves soil drainage and aeration, helps the weathering process of minerals, provides food availability for soil microorganisms, decreases activity of harmful microorganisms, preventing infections caused by seeds of disturbing plants, are easily available and relatively fast. The results of his research are Bhakti, etc. (2017) writing on the treatment of manure will reduce electrical conductivity (DHL). DHL decreases can increase soil N content so that N uptake also increases. Compost contains high enough phosphorus which affects the level of P concentration in the soil solution. The higher the P concentration in the soil solution will also increase the level of plant P. This has led to the incorporation of these two ameliorants into effective use of saline soils in planting.

D. CONCLUSION

The results of the study revealed that the varieties had not shown a significant effect on the observation of plant height, number of leaf and number of pods. Unlike the case for ameliorant addition, ameliorant addition has a significant effect on the observation parameters. The best ameliorant is shown by the combination of compost and dolomite which is seen in all observations parameters.

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