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The Effect of Various Water Content Levels and The Application of Several Brown Algae (*Sargassum polycystum*) Composts in Increasing The Production of Soybean (*Glycine max* L.) Plant.

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ABSTRACT

The purpose of this research was to study whether the application of brown algae (Sargassum polycystum) compost can increase production and reduce the amount of water needed by soybean (Glycine max L.) plants. This research was conducted from July 2017 to September 2017 at Pasar 1 Tanjung Sari land, Medan Selayang sub-district. The research design used was Factorial Randomized Group Design with two factors. The first factor was watering with various levels of water content, with K1 = 100% field capacity, K2 = 75% field capacity, K3 = 50% field capacity, K4 = 25% field capacity, the second factor was the application of brown algae compost consisting of G0 = 0 gram/plot, G1 = 1,125 kg/plot, G2 = 2,250 kg/plot, G3 = 3,375 kg/plot. The observed parameters were plant height, stem diameter, number of leaves, pod wet weight, canopy wet weight, pod dry weight, canopy dry weight, 1000 seed weight and seed weight. The results showed that the effect of various watering levels of water content and the application of brown algae compost had a significant effect on plant height parameters at 4 Weeks After Planting, brown algae had a significant effect on canopy wet weight per plot and canopy weight per sample. The cause of soybean production not reaching production of 3 tons/ha was the effect of boron.

Keywords: Brown Algae Compost, Water Content, Increasing Soybean Production.

INTRODUCTION

The field surveys conducted before conducting the research found that there were farmers who could produce soybeans reaching a production of 3 tons/ha. The fertilization carried out by Mr. Sartono was Urea 50 kg/ha, SP-36 100 kg/ha, Phonska 100 kg/ha and Dolomite 1000 kg/ha (Sartono 2017, personal communication).

Soybean is the most popular source of vegetable protein for Indonesian people in general. Its main consumption is in the form of tempeh and tofu which is a vital side dish for the people of Indonesia. Indonesia is the world's largest producer of tempeh and is the largest soybean market in Asia. Based on the 2014 SUSENAS data released by BPS, the average tempeh consumption per person per year in Indonesia was 6.95 kg and tofu was 7.07 kg. Ironically, fulfilling the need for soybean which is the main raw material for tempeh and tofu, 67.28% or 1.96 million tons must be imported from outside. This happened because domestic production was unable to meet the demand of domestic producers of tempeh and tofu.

Data obtained from the Central Statistics Agency (BPS) for soybean productivity in Sumatera Utara in 2015 only reached 1.2 tons/ha with a total yield of 6,549,205 tons/ha. Meanwhile, BTPPP (2009) stated that the potential for soybean yields in Indonesia is 2-3 tons/ha. Thus, there needs to be an increase in soybean cultivation technology in order to increase the crop yields by fertilizing and brown algae compost application.

Indonesia which has a long coastline has the potential to spread various types of

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brown algae. One type of brown algae that grows in Indonesia is the Sargassum clan. According to Kadi (2005) in Indonesian waters, it is estimated that there are more than 15 types of Sargassum and identified algae are 12 species. Sargassum algae grow throughout the year, these plants are "perennial" or non-seasonal.

Brown algae (Sargassum polycystum) has a compound called alginate with the ability to hold water, this alginate ability can be used assist soybeans growth on dry land in order to produce well.

MATERIALS AND METHOD

This research was conducted at Pasar I Tanjung Sari, Medan Selayang District, with an altitude of 25 m above sea level started from June 2017 to September 2017.

The materials used in this research were brown algae from Sibolga waters, Anjasmoro variety soybean seeds, Urea, SP-36, KCl, Phonska, Lanet, Decis, Dhytane, plastic and bamboo.

The tools used were agricultural equipment such as hoes, labels, stationery, used banners for experimental land fences, jerry cans, analytical scales, and scales.

The research design used was Factorial Randomized Group Design with two factors. The first factor was watering with various levels of water content, with K1 = 100% field capacity, K2 = 75% field capacity, K3 = 50% field capacity, K4 = 25% field capacity, the second factor was the application of brown algae compost consisting of G0 = 0 gram/plot, G1 = 1,125 kg/plot, G2 = 2,250 kg/plot, G3 = 3,375 kg/plot.

The observational variables of this research were: plant height, stem diameter, number of leaves, pod wet weight, canopy wet weight, pod dry weight, canopy dry weight, 1000 seed weight and seed weight.

RESULTS AND DISCUSSION

Presented in Table 1, at water content level of 100%, 75% and 50% field capacity, the increase in brown algae compost dosage did not significantly affect plant height, at 25% moisture content it was seen that there was a significant difference in brown algae application of 3,375 kg/plot, with the highest plant height was 34.64 cm.

Table 1. The Height of Soybean Plant at 4 Weeks After Planting (MST) with the effect of Moisture Level and application of Brown Algae Compost (cm)

		K_1	K_2	K_3	K_4	Average
3 MST	G_0	29,38ab	29,40ab	26,03b	21,16b	26,49
	G_1	26,67ab	24,05b	29,98ab	24,95b	26,41
	G_2	26,83ab	24,91b	21,77b	24,90b	24,60
	G_3	21,41b	25,26b	24,85b	34,64a	26,54
	Average	26,08	25,91	25,66	26,41	

Description: The number followed by the same notation showed no significant difference according to Duncan's Multiple Range Test at the level of α = 5%.)

Plant Height

The treatment of watering and composting of brown algae significantly affected the plant height parameters at 4 MST. The highest average at 4 MST was found in the treatment of 25% water content with brown algae compost of 3,375 kg and the lowest was in 25% water

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content treatment and brown algae of 0 kg, but not significantly different from the 25% moisture content treatment and brown algae compost of 3,375 kg/plot. Because the application of brown algae compost made the soil able to hold more available water, hence the higher the compost application, the lower the water needs to be required, on the contrary, the lower the application of brown algae compost is, the higher the water requirement. This was in accordance with Basmal (2009) literature, which stated that brown algae (Sargassum polycystum) has a compound called alginate which is able to hold water.

Table 2. Canopy Wet Weight / Plot with The Effect of Water Content Levels and Application of Brown Algae Compost (g).

	K_1	K_2	K_3	K_4	Average
G_0	437,34	488,14	461,05	519,85	476,60ab
G_1	455,07	434,24	400,13	372,61	415,51b
G_2	529,05	476,24	517,57	388,81	477,92ab
G_3	566,94	526,03	587,96	422,11	525,76a
Average	497,10	481,16	491,68	425,84	

Description: The number followed by the same notation showed no significant difference according to Duncan's Multiple Range Test at the level of α = 5%.)

Table 3. Canopy Dry Weight / Sample with the Effect Water Content Levels and Application of Brown Algae Compost (g).

	K_1	K_2	K_3	K_4	Average
G_0	172,24	163,01	143,93	152,68	157,96
G_1	140,99	167,30	138,44	187,18	158,48
G_2	198,94	187,89	155,82	150,05	173,18
G_3	194,12	154,49	216,80	156,28	180,42
Average	176,58	168,17	163,75	161,55	

Description: The number followed by the same notation showed no significant difference according to Duncan's Multiple Range Test at the level of α = 5%.)

Table 4. Seed Dry Weight with the Effect Water Content Levels and Application of Brown Algae compost (g).

	K_1	K_2	K_3	K_4	Average
G_0	53.45	52.29	33.10	33.89	43.18
G_1	53.44	62.12	30.40	46.66	48.16
G_2	67.04	40.17	35.27	50.76	48.31
G_3	85.01	36.85	62.29	49.64	58.45
Average	64.74a	47.86b	40.27b	45.24b	

Description: The number followed by the same notation showed no significant difference according to Duncan's Multiple Range Test at the level of α = 5%.)

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Canopy Wet Weight Per Plot

Based on the results of the average different test, brown algae compost application had significant results on canopy wet weight per soybean plant plot.

Presented in Table 2, the average of the various doses of brown algae compost treatment had a significant effect on the canopy wet weight per soybean plot. Based on the data, brown algae compost with the highest dose of 3.375 kg/plot gave the highest yield of 525.76 grams. This was in accordance with Eryas (2009) literature, which stated that the use of brown algae compost can increase tomato production to 5 kg/plant in Patogonia, Argentina.

Canopy Dry Weight Per Sample

Based on the results of analysis of variance, it was identified that the average of watering treatment of various water content levels had a significant effect on the canopy dry weight per sample.

It can be seen from Table 3 the application of watering with 100% field capacity significantly increased the canopy dry weight per sample. In addition, the highest canopy dry weight per sample was found in the treatment of 100% field capacity with brown algae of 3,375 kg/plot application. In other words, the highest algae application also produced the highest effect on canopy dry weight per sample but the value was not significantly different from other levels of treatment. This was in accordance with Damanik (2010) literature, which stated that water content in the soil is an important factor for plant growth.

CONCLUSION

The application of brown algae compost 3,375 kg/plot had the best results for production parameters in this research and also significantly reduced the water requirements of soybean plants for parameters of plant height at 3 MST but was not proven to reach 3 tons/ha production.

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