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RESEARCH ARTICLE

THE GROWTH PERFORMANCE AND YIELDS OF STEVIA (*Stevia Rebaudiana* BERTONI) RESPONSES TO DIFFERENT TYPES OF FERTILIZER.

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Abstract

A crop that is nourishing using fertilizer usually gives a better growth performance and yield. Different types of fertilizer giving a different impact on the growth performance and yield of a crop. The presence of different types of fertilizer such as organic, inorganic and semi organic fertilizer boost crops in different rate. As we know that the use of fertilizer seems to be an obligation to the farmer, identifying the best types of fertilizer that can bring the best of the crop should be determined. This experiment was conducted to study the growth performance and yield of Stevia (*Stevia rebaudiana* BERTONI) responses to different types of fertilizer. The study was carried out at UiTM Jasin share farm by using a randomized complete block design (RCBD) for every treatment. Data collection or the perimeter for plant height, number of leaf and leaf area were recorded once every seven days while the yield of this plant were recorded at the end of the experiment. Data analysis was carried out by using Minitab and Microsoft Excel. At the end of this experiment, Stevia plants were harvested and the yield is being calculated. The results obtained in this study indicate that there are significant different in the number of leaves, area of leaves and the yields harvested toward the application of different fertilizer. It is concluded that the best fertilizer to be applied to Stevia plant is semi organic fertilizer.

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Introduction:-

Belonging of the Asteraceae (Compositae) family, *Stevia rebaudiana* (Bertoni) also known as herbaceous perennial plant (Brian., 2003). Nowadays, stevia is one of the importance plants as substitute to the sugar that made up by the sugarcane because the stevia's leaves are applied as non nutritive high potency of natural sugar especially in Asia especially Japan, Korea, China and South America. Besides, the increasing cases such as obesity, diabetes and cardiovascular disease are due to the high consumption of sucrose in daily use such as beverages and food. Geuns (2003) studied the diterpene glycosides that produce by *Stevia rebaudiana* Bertoni called as steviol glycosides mainly natural, high potency of low caloric sweeteners where it has been used as sugar substitute.

Stevia rebaudiana leaves are rich in glycosides that contribute to sweet taste with low caloric value and very vital for diabetes as natural substitute for sugar (Kinghorn., 1987). Regarding to the previous studies that has been conducted, the stevia leaf's extract has beneficial effect on human health as a natural source of antioxidant (Xi et

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al.,1998), used avoid the formation of cavities and plaque in teeth, non toxic (Elkins.,1997),cardiotonic (Machado *et al.*,1986) and also beneficial against microbes *Streptococcus mutan*, *Pseudomonas aeruginao*, and *Proteus vulgaris* (Yabu *et al.*,1997).

Materials And Method:-

Location of study:-

The experimental site is situated at UiTM Jasin share farm. The essential material for the study that is the three types of fertilizer, organic fertilizer, chemical fertilizer and semi organic fertilizer which are the variables in this study. The other material included stevia cutting, poly bag and net.

Planting materials:-

The stem cutting process will be made in a slant form from the young apical shoot for MS012 variety. Consequently, the end of cut plant will be dipped in IBA concentration. The dipped stem cuttings will be placed in the micro cutting chamber propagation box which is contained a medium of perlite and light expanded clay aggregates (LECA). The stevia's parent was supplied by Agriculture Department District of Tampin, Negeri Sembilan.

Experimental treatment and design:-

After two weeks of propagation, the cuttings were transferred to the pot which contained medium of coco pit with rice husk and soil. Experimental treatments comprised the different types of fertilizers i.e. T₀ -control, T₁- Organic fertilizer (FAA), T₂- Inorganic fertilizer (18+33+18+TE), T₃- Semi organic fertilizer(12+7+25).The dosage recommended for organic fertilizer(FAA) 2ml fertilizer + 1000ml of water, inorganic fertilizer (18+33+18+TE) 2.5g fertilizer + 1000ml of water, and semi organic fertilizer (12+7+25) 20 ml fertilizer + 1000 ml of water. All types of fertilizers being applied once a week in the liquid form. Treatments of experiment were conducted in RCBD with five replications for each treatment.

Data collection and analysis:-

The data of growth parameter was recorded based on the plant height, number of leaves, leaves area and the yields of stevia. The data of growth parameter was taken once a week for five weeks. Recorded plant height was measured from poly bags top soil surface up to the highest leaf tip by straightening all leaves using ruler. Every seven days interval, the total number of leaves was counted. Leaf area was recorded in seven days interval by using Portable Leaf Area tool. Total yield of plants were recorded by plant fresh weight being subtracted to the amount of dry weight of the plant. Dry weight of plant was recorded after reduction of moisture from the plant by using oven. The analysis was carried out by using Minitab 16 software. All the data were analyzed by using Analysis of Variance (ANOVA), and descriptive analysis. The different between the treatments means data were compared using Turkey Family Error Rate Test.

Result and Discussion:-

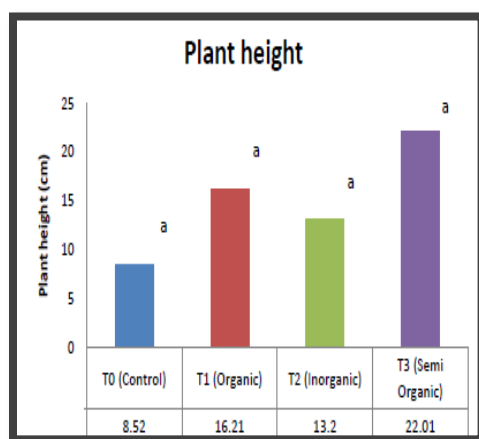


Figure above shows the mean of plants height planted with different application of fertilizer for 5 weeks. From the graph, plant applied with semi organic fertilizer (T₃) show the highest mean of plant height followed by T₁ and T₂. The lowest mean of plant height is the T₀. However, there is no significant different between all the treatments based

on the plant height. By referring to the ANOVA table, it can be concluded that there is no significant different in the plant height of Stevia response to different types of fertilizer. It is because of the P-value in the table (0.237) is lower than the confident interval applied, 0.05.

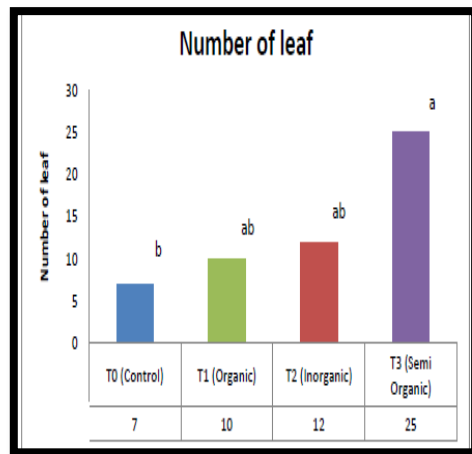


Figure above shows the mean from the number of leaf from different treatment for 5 weeks. Stevia in the T₃ shows the highest average number of leaf. The treatment shows that it is suitable to apply in order to get the highest number of leaf. The plant that is left without applying any fertilizer (T₀) shows the lowest number of leaf to the plant. The higher mean of T₃ in the leaf number was due to the higher presence of humic acid that accelerates plant cell division and promotes growth.

From the analysis using Turkey’s family error rates, the means of T₃ and T₀ indicates there is a significant different as shown by the different letters in the graph. By referring to the ANOVA table, it shows that there significant different in the number of leaf of Stevia applied with different types of fertilizer. This is because the P-value in the table (0.029) is lower than the confident interval used for the test, 0.05.

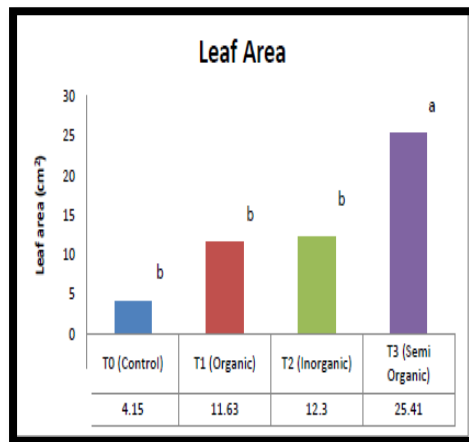
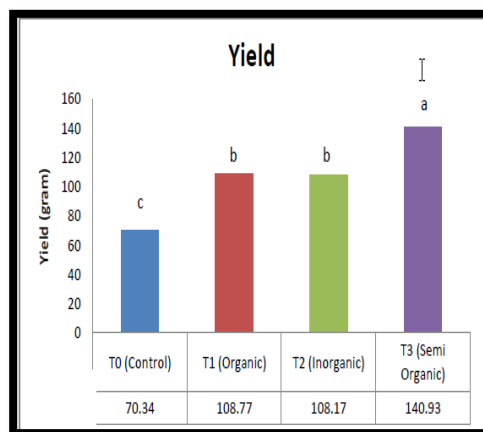


Figure 4.3.2 above shows the mean data of the leaf area from different treatment for 5 weeks. Stevia that is treated with T₃ (semi organic) indicates the highest mean among the treatment applied to the plant. Stevia that is applied with T₀ (control) shows the lowest mean of leaf area. This is due to the nutrient that is absorbed by plant in treatment 3 is faster cause by the presence of humic acid in the fertilizer. From the analysis using Turkey’s family error rates, the mean of T₃ shows letter A while the other treatment mean that are T₀, T₁ and T₂ shows letter B indicates that there is significant different from T₃ toward the other treatment. By referring to the ANOVA table, it can be said that there is significant different in the leaf area of Stevia. It is due to the P-value in the table (0.002) which is lower than the confident interval applied, 0.05.



The above figure shows the mean of the Stevia yield for all the treatment. Stevia that is applied with T₃ (semi organic) fertilizer has the highest mean weight which is more than 140 gram. Stevia that is not applied by any types of fertilizer shows the lowest mean reading that is less than 71 gram. The higher mean of the yield in T₃ indicates that the plant absorb a lots of nutrient from the soil and fertilizer and store it in their plant body. From the Turkey's family error rate, there are several different mean on the treatment applied to the plant. First, the mean of T₃ indicates by letter 'a' show significant different toward the mean of T₀, T₁ and T₂ as the letter indicates them are different from T₃. Then, there is significant different in the mean of T₀ with T₁ and T₂ as the letters shows in the graph is different from each treatment. The ANOVA table above was gained by using Minitab 14. From the table above, it can be concluded that there is significant different between the treatments applied and the yield of the Stevia plant. This is because of the P-value in the ANOVA table (0.000) which is lower than the confident interval use, 0.05.

Conclusion And Recommendation:-

By referring to the result of the study, it can be concluded that Stevia plant (*Stevia Rebaudiana* Bert) shows better growth performance and yields in the application of semi organic fertilizer. This is due to several finding that were obtained during this experiment. Stevia plants that were applied using semi organic fertilizer indicated the best growth in the term of growth performance and yields. This is supported by the significant different of those three parameter tested in the study. Thus, the findings from the study have provided information on the types of the fertilizer that generates the highest yield and plant growth performance toward the farmers. From this research, it is recommended for the farmers to practice the application of semi organic fertilizer to their crops. The used of semi organic significantly increase the yields thus will provide them with more income.

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