Effectiveness of MKM Fertilizer and Bean Sprouts Extract on the Growth and Production of Tomato (Lycopersicum Esculentum Mill.)

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Abstract. The tomato plant is a multipurpose commodity, apart from being used vegetables, tomatoes are also used as raw materials for cosmetics, medicines as well as raw materials for the food processing industry. This study aims (1) to determine the effect of using MKM fertilizer and bean sprouts extract on growth and production of tomato plants (2) know the dosage of MKM fertilizer and bean sprouts extract which are effective in supporting growth and production of the tomato plant. This research was conducted in the land Experiment II, Faculty of Agriculture, Cokroaminoto Palopo University on the month January to March 2020. This study used a randomized design method Groups (RBD) were carried out with 6 treatments with 4 replications. So that there are 24 experimental units. P0 = without treatment, P1 = MKM fertilizer 100 grams / plant and 75 ml bean sprouts extract / plant, P2 = MKM 150 fertilizer gram / plant and 100 ml bean sprouts extract / plant, P3 = MKM 200 fertilizer gram / plant and 125 ml of bean sprouts extract / plant, P4 = MKM 250 fertilizer gram / plant and 150 ml bean sprouts extract / plant, P5 = MKM 300 fertilizer gram / plant and 175 ml of bean sprouts extract / plant.The results of this study indicate that the provision of MKM fertilizer 250 grams / plant and 150 bean sprouts extract ml / plant (P4) can significantly effect the number of leaves, flowering age, and fruit weight. Other parameters such as plant height and number of fruits shows results that have no real effect, but it appears that P4 has an average value of plant height and number of fruit higher than other treatment. This is thought to have occurred due to the influence of the nutrients N, P and K in natural MKM and ZPT fertilizers such as auxins, cytokinins and gibberellins in bean sprouts extract that can meet the needs of plants so shows a good response in plant growth and production tomato..

1. Introduction

Tomato plant (Lycopersicum esculentum Mill.) Is a horticultural commodity originating from Central and South America, from Mexico to Peru. Tomato plants are classified as annuals (annuals) which means they are short-lived plants that produce only once and after that they die. Tomato plants are shrubs or shrubs that spread on the soil surface with a length of up to ± two meters [5].

According to the Central Statistics Agency (2018), the national tomato production for the last 5 years has decreased. Production in 2014 amounted to 59,008 tons, 2015 amounted to 54,544 tons, 2016

amounted to 57,623 tons, 2017 amounted to 55,623 tons and in 2018 tomato production again decreased, namely 53,850 tons.[2]

Tomato plants are a multipurpose commodity, apart from being vegetables, tomatoes are also used as raw material for cosmetics, medicines and raw materials for food processing industries such as sauces, fruit juices, etc. The content contained in tomatoes includes solanine alkaloids (0.007%), folic acid, malic acid, saponins, citric acid, biflavonoids, sugar (fructose, glucose), fat, protein, adenine, trigonelin, choline, tomatin, minerals (Ca , Mg, P, K, Na, Fe, sulfur, chlorine), vitamins (B1, B2, B6, C, E, niacin), histamine, and lycopene. [4]

The people's fondness for tomatoes has increased so that market demand has also increased. However, domestic tomato production has not been able to meet these needs due to decreased tomato production. The decline in tomato production was caused by several factors, one of which was in terms of cultivation, especially in the application of fertilizers. Fertilizer is a material that contains or more nutrients that have an important role in increasing the production and quality of plant cultivation. Most farmers currently use synthetic chemical fertilizers to add nutrients to plants, even though they are expensive, synthetic chemical fertilizers can also have a negative impact on plants and the environment, which can damage the ecosystem.[3]

Damage to the ecosystem can be seen from the high level of damage to the soil and water pollution which results in changes in the physical, biological, and chemical characteristics of the soil. The damage to the ecosystem makes plant and microbial growth disturbed. This can cause growth retardation and can reduce plant productivity [3]. This condition can be overcome by giving organic matter into the soil which is the most important element in building soil fertility.

The application of organic matter into the soil can increase the nutrient content, both macro and micro elements. One of the organic fertilizers that is currently widely used is MKM fertilizer. The use of MKM fertilizer (bokashi) as an organic fertilizer for plants is very much needed because organic matter replaces soil nutrients, improves soil physics and increases the soil's ability to bind nutrients. Therefore, it is hoped that MKM fertilizers will be able to support agricultural businesses and be able to overcome the scarcity and high cost of artificial fertilizers that are currently happening.[3]

Growth regulators that are widely used today are synthetic growth regulators which are relatively expensive and sometimes scarce in availability. To overcome this, it is necessary to think about growth regulators that can obtained easily, cheaply but has the same or more capabilities than synthetic growth regulators in stimulating plant growth which can be extracted from plant bioactive compounds as growth regulators. Extraction of plant biocytic compounds can be carried out on green bean sprouts (bean sprouts). Tauge is a type of vegetable that is commonly consumed by the wider community because it is easy to obtain, economical, and does not produce compounds with toxic effects (poison). Tauge also contains auxin, cytokinin and gibberellin ZPT compounds.[8]

MKM Fertilizer

Bokashi fertilizer is an alternative application of organic farming technology that is environmentally sound and sustainable. Bokashi has a good prospect for making organic fertilizer because it has a high nutrient content. Bokashi fertilizer from the fermentation process or fermentation of organic materials using EM (Effeective Microorganism) technology. The technology for processing organic matter by means of fermentation (fermentation) was first developed in Okinawa, Japan by Professor Dr. Teruo Higa in 1980. This technology is known as EM (Effective Microorganism) technology. The EM used in making bokashi is a mixed culture of various beneficial microorganisms (especially Photosynthetic bacteria, Laciobacillus sp bacteria, yeast, and Actinomycetes). Decomposition activator is one of the leading microbes such as Laciobacillus sp, yeast, and fungi as well as cellulolytic bacillus as decomposers of organic matter. EM can be used as an inoculant to increase soil microbial diversity. The use of EM (Effeective Microorganism) in making bokashi, apart from improving soil health and quality, is also beneficial in improving the growth and quantity and quality of plant production.[6]

Bean Sprouts Extract

Bean sprouts extract is the essence of bean sprouts obtained from the filtering of crushed bean sprouts either by pounding it or blending it. The vitamins found in bean sprouts are vitamin C, thiamin, riboflavin, niacin, pantothenic acid, vitamin B6, folate, choline, β-carotene, vitamin A, vitamin E (α-

tocopherol), and vitamin K. The minerals found in bean sprouts are calcium (Ca), iron (Fe), magnesium (Mg), phosphorus (P), potassium (K), sodium (Na), zinc (Zn), copper (Cu), manganese (Mn), and selenium (Se) . Significant essential amino acids contained in bean sprouts, namely: tryptophan, threonine, phenylalanine, methionine, lysine, leucine, isoleucine, and valine.[1]

The growth hormones most commonly used to promote plant growth are the hormones auxin and gibberellin. Both of these hormones are hormones that can assist in the growth of roots and shoots of plant stems. According to [8], the extract of green bean sprouts (bean sprouts) has a concentration of auxin growth regulating compounds of 1.68 ppm, gibberellin 39.94 ppm, and cytokinins 96.26 ppm. Mung bean sprouts extract is a potential ingredient as an auxin phytohormone in the form of IAA. The optimum concentration of green bean sprouts extract can improve plant root formation well, so that the use of lots of auxins can help in the growth of various types of plants.[7]

2. Method

This experiment used a randomized block design (RBD) with 6 treatments and 4 replications. The treatment is as follows:

P0: Untreated, P1: MHM fertilizer 100 grams / plant and bean sprouts extract 75 ml / plant P2: MHM fertilizer 150 grams / plant and bean sprouts extract 100 ml / plant P3: MKM fertilizer 200 grams / plant and bean sprouts extract 125 ml / plant P4: MKM 250 fertilizer gram / plant and 150 ml bean sprouts extract / plant P5: MHM fertilizer 300 grams / plant and bean sprouts extract 175 ml / plant

The observational data were then analyzed using variance fingerprints (analysis of variance). Furthermore, the data was tested by further test of honest real difference (BNJ) at the 5% level.

The research was conducted at Experimental Field II, Faculty of Agriculture, Cokroaminoto University, Palopo, Jl. Lamaranginang, Batupasi Village, Wara Utara District, Palopo City, South Sulawesi. January to March 2020. The materials used in the study were MKM fertilizer, bean sprouts extract and Servo F1 tomato seeds.

The tools used in the study were hoes, shovels, tape measure, 250 ml used plastic cups, buckets, blenders, filters, bamboo, stationery, rulers, treatment labels, research boards, scales and cameras.

Cultivation of land

Land processing is carried out by clearing the research area from weeds. Furthermore, the land is turned using a hoe so that the soil becomes loose. After that, the beds are made with a height of 30 cm, a length of 60 cm and a width of 50 cm. The distance between the beds is 30 cm.

Seeding

Sowing of seeds is done by preparing a nursery medium from a mixture of cow manure, soil and sand in a ratio of 1: 1: 1. Then the mixture is put into a 250 ml used plastic cup as a nursery. After that, the tomato seeds are placed on the media, each glass containing 1-2 seeds. Sowing lasts for 12-15 days or until the seedlings have 4-6 leaves

Making MKM fertilizer

The materials used in the manufacture of MKM fertilizer are 15 kg of cow manure, 10 kg of husk and two tablespoons of molasses / sugar (10 ml), two tablespoons of EM4 (10 ml) and sufficient water. The method of making it is, first, a solution of EM4, molasses / sugar and water is made with a ratio of 1 ml: 1 ml: 1 liter of water, cow manure and husks are mixed evenly on the dry floor. Then the ingredients are poured with the EM4 solution slowly and gradually while stirring to form a dough. The dough is formed when it is clenched into a fist, then no water will come out of the dough. Likewise, when the fist is released, the dough expands again (about 30-35% water content). The dough is then made into a mound and covered with a tarp. The temperature of the material is maintained between 40-50^{o}C. If the temperature of the ingredients exceeds 50^{o}C, the tarp cover is opened and the dough ingredients are turned over and then the mound is closed again. The fermentation process lasts for 1-2 weeks, after which the MKM fertilizer is ready to be applied.

Making bean sprouts extract

The making of bean sprouts extract begins with preparing the ingredients to be used, namely 2 kg of bean sprouts and 5000 ml of water. As for how to make it, put the bean sprouts in a blender and add 10 tablespoons of water (50 ml), then blend until smooth. After blending, put the bean sprouts into a bucket and add 4950 ml of water, then stir until evenly distributed. Furthermore, the bean sprouts are filtered

and left for one night. Bean sprouts extract is said to be successful and ready to use if it smells fresh like tape.

Observation Parameters :Plant height (cm), Flowering age (days), Fruit weight (gram)

3. Result and Discussion

3.1 Results

1. Plant Height (cm)

Based on the results of the study, the average plant height with the application of MKM fertilizer and bean sprouts extracts on the growth and production of tomato plants is shown in Figure 1.

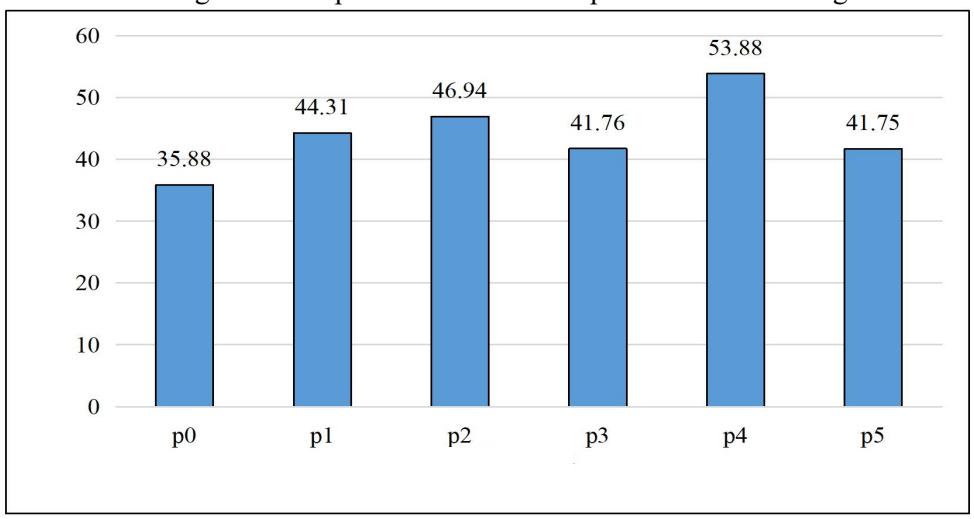

Figure 1. Diagram of average height of tomato plants using MKM fertilizer and bean sprouts extract.

Based on the diagram above, it shows that giving fertilizer and bean sprout extracts at different doses gave results that were not significantly different on the height of tomato plants. The results of the average value show that P4 (MKM fertilizer 250 grams / plant and bean sprouts extract 150 ml / plant) with a value of 53.88 cm is the highest value and is followed by P2 (MKM fertilizer 150 grams / plant and bean sprouts extract 100 ml / plant). plants) of 46.94 cm. The third best treatment was P1 (MKM fertilizer 100 grams / plant and bean sprouts extract 75 ml / plant) with a value of 44.31 cm, while P0 (without treatment) was the lowest average value of all treatments, namely 35.88 cm.The diagram above also shows that there is a treatment that shows a value with an average plant height that is close to the same value, which is shown in P3 and P5.

2. Flowering age (day)

Based on the results of the study, the average flowering age of tomato plants with the application of MKM fertilizer and bean sprouts extract is shown in Figure 2.

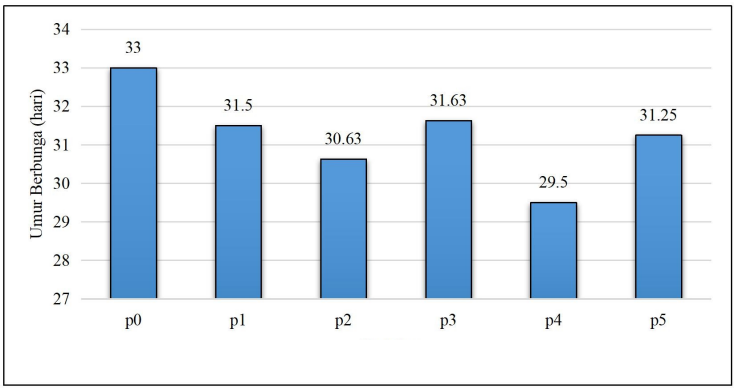

Figure 2. Diagram of average flowering age on tomato plants with the application of MKM fertilizer and bean sprouts extract.

Based on the diagram above, it shows that giving MKM fertilizer and bean sprouts extract at different doses can give significantly different results on the flowering age of tomato plants. The average result shows P0 (without treatment) with an average value of flowering age that is 33 days, which is the average late flowering age of all treatments. Furthermore, P3 (MKM fertilizer 200 grams / plant and bean sprouts extract 125 ml / plant) with an average flowering age of 31.63 days, P5 (MKM fertilizer 300 grams / plant and bean sprouts extract 175 ml / plant) with an average flowering age 31.25 days, P1 (MKM fertilizer 100 grams / plant and bean sprouts extract 75 ml / plant) with an average flowering age of 31.5 days, P2 (MKM fertilizer 150 grams / plant and bean sprouts extract 100 ml / plant) with average -The average flowering age was 30.63 days, the last was P4 (MKM fertilizer 250 grams / plant and bean sprouts extract 150 ml / plant) with an average flowering age of 29.5 days which was the treatment with the fastest flowering age.

Fruit weight

Based on the results of the study, the average fruit weight of tomato plants with the application of MKM fertilizer and bean sprouts extract is shown in Figure 3.

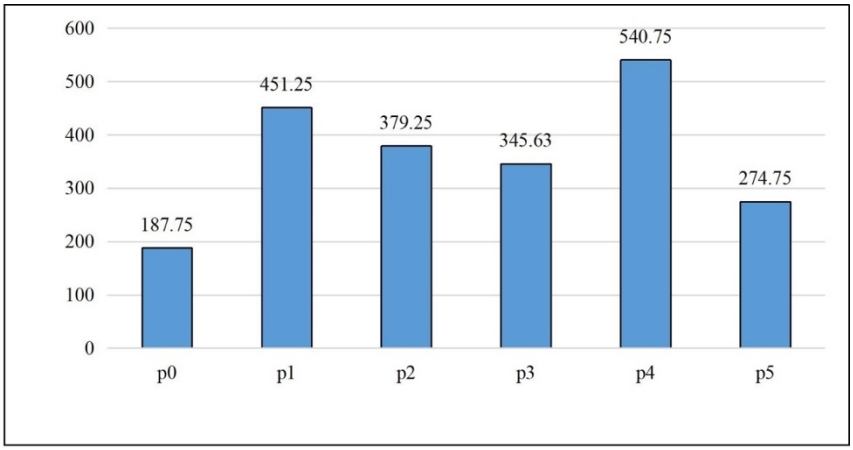

Figure 3. Diagram of average tomato fruit weight using MKM fertilizer and bean sprouts extract.

The diagram above shows that P4 (MKM fertilizer 250 grams / plant and bean sprouts extract 150 ml / plant) has the highest average fruit weight per plant, which is 540.75 grams. The second heaviest was P1 (100 grams of MKM fertilizer / plant and 75 ml of bean sprouts extract / plant) with an average value of 451.25 grams. Furthermore P2 (MKM fertilizer 150 grams / plant and bean sprouts extract 100 ml / plant) with an average weight of 379.25 grams, P3 (MKM fertilizer 200 grams / plant and bean sprouts extract 125 ml / plant) with an average weight of 345, 63, P5 (MKM fertilizer 300 grams / plant and bean sprout extract 175 ml / plant) with an average weight of 274.75 and finally P0 (without treatment) with an average weight of 187.75.

3.2 Discussion

Based on the results of the research that has been carried out and processed through analysis of variance, it was found that the results had a significant effect on the character parameters of the, flowering age, and fruit weight. Meanwhile, the parameters for plant height had no significant effect. P4 treatment (MKM fertilizer 250 grams / plant and extract bean sprouts 150 ml / plant) showed the best results of all the observed parameters, while P0 (without treatment) showed the lowest results of all the parameters of the treatment.

The results showed that the best dose of MKM fertilizer and bean sprouts extract to support the growth and production of tomato plants was aimed at P4 (MKM fertilizer 250 grams / plant and bean sprouts extract 150 ml / plant) with the highest average value of plant height. height namely 53.88 cm. This is because MKM fertilizers contain macro nutrients such as N, P, and K as well as other micro nutrients needed by plants, especially in the vegetative phase.

4. Conclusion

Based on the research results, it was found that the application of MKM fertilizer and bean sprouts extract significantly affected the parameters, flowering age, and fruit weight, but did not significantly affect the plant height parameters. The best dosage of MKM fertilizer and bean sprouts extract was found in the P4 treatment (MKM fertilizer 250 grams / plant and bean sprouts extract 150 ml / plant) with an average plant height value of 53.88 cm, and the fastest flowering age of all treatments, namely 29.5 hst. with an average number of fruits, namely 16 fruits and an average fruit weight of 540.75 grams. This is thought to be due to the presence of N, P and K nutrients contained in the MKM fertilizer as well as the provision of bean sprouts extracts containing natural ZPT such as auxins, gibberellins and cytokines which can support the growth and production of tomato plants.

5. Acknowledgments

Thank you so much to readers who have taken the time to read this research, it is hoped that further research is needed regarding the application of bean sprouts extracts to tomato plants without the addition of MKM fertilizer so that it is better to know the effect of this bean sprout extract.

6. References

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