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Response of garlic varieties growth towards the use of biological fertilizer

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ABSTRACT

This study aimed to identify the response of local and imported garlic varieties' growth to biological fertilizer. The research was conducted in the Majene Regency, West Sulawesi, which began from April to July 2020. The research was arranged in a two-factor factorial Completely Randomized Design with 3 replications. The first factor is the variety of garlic which consists of two varieties, namely Sangga Sembalun and Kating. The second factor is the fertilizer that consists of three types, namely Trichoderma sp., Streptomyces sp., and Trichoderma sp. plus Streptomyces sp. The observations were made at the age of 7, 15, 30, and 45 DAS (Days After Sowing) where the parameters measured were the height of the plant (cm), the number of leaves (blade), the diameter of the bulb (cm) for each treatment. The observation data will be analyzed using the analysis of variance. The analysis of variance for the observation data used the F-test at a 5% significance level. Statistically, the findings of the research show that the treatments given are not significantly affected all parameters observed. The highest mean score on the treatment of biological fertilizers was the Trichoderma sp. plus Streptomyces sp. bacteria on both varieties tested. The results showed that in general, the biological fertilizer Trichoderma sp. plus Streptomycetes sp., gave better results, but it cannot be concluded that the imported Kating variety gave a better response than the local Sangga variety to all parameters, because the morphological or genetic characteristics of Kating and Sangga Sembalun may be also different.

Keywords:
Garlic, Varieties, Organic fertiliser

1. Introduction

Garlic (*Allium sativum* L.) is one of the horticulture commodities that massively consumed by Indonesian people. Due its benefits, the garlic produced cannot meet the increasing demand of it each year. According to BPS [1], Central Java, the center for the garlic production in Indonesia, only produce garlic at about 40% of the total national production, that the government should import garlic to meet the national needs. In addition, there are many approaches to increase the production of garlic, one of them is using the best varieties and the effectiveness of the fertilization at the time of planting [2].

Indonesia has many varieties of garlic that could increase garlic production to meet the needs of the community. One of the varieties of local garlic is Sangga Sembalun. Besides the local variety, Indonesia is also developing imported garlic from China. The famous varieties are Kating and Sin Chung [3].

The use of chemical fertilizers can initially increase crop production, but it has negative effects that cause the occurrence of the accumulated residues of hazardous chemicals in the soil and potentially pollute the environment [4]. One of the

solutions to overcome the continuous use of chemical fertilizers is the use of biological fertilizers. Biological fertilizer is a fertilizer derived from organic materials that are inoculated with microbes that can process organic materials into inorganic materials that benefit the plants [5]. The functional microorganisms used as active ingredients of biological fertilizers are the *Trichoderma sp.* and *Streptomyces sp*. Both microorganisms have a positive effect on plant, i.e., as a biocontrol against pathogenic microbes and produce phytohormones that can improve plant growth [6].

2. Materials and Methods

The research was conducted in the Majene Regency, West Sulawesi, which began from April to July 2020. The research was arranged in a two-factor factorial Completely Randomized Design with 3 replications. The first factor is the variety of garlic (V) that consists of two varieties, namely Sangga Sembalun (V1) and Kating (V2). The second factor is the type of biological fertilizer (P) that consists of three types, namely *Trichoderma sp*. (P1), *Streptomyces sp*. (P2), and *Trichoderma sp.* with *Streptomyces sp*. (P3.) The observations were made at the age of 7, 15, 30, and 45 DAS (Days After Sowing) where the parameters measured were the height of plant (cm), the number of leaves (blade), the diameter of the bulb (cm) for each treatment.

The observation data were analyzed using the analysis of variance. Analysis of variance for the observation data used the F test at a 5% significance level and if the treatment did not show a significant effect, then it would be displayed in the form of a chart in Microsoft Excel.

3. Results and Discussion

The results of the observation data analysis showed that the response of both varieties growth tested was not significantly affected using biological fertilizer. The treatment using *Trichoderma sp*. plus *Streptomycetes sp*. bacteria showed the best growth of the plant height in both varieties during the 50 DAS observation. This happened due to the interaction of *Trichoderma sp*. plus *Streptomycetes sp*., on the garlic plant. As they act as the PGPR (Plant Growth Promoting Rhizobacteria) microbes in the soil, they can produce the plant hormone auxin, gibberellin and cytokinin, which helps to stimulate an increase in plant height [7]. In addition, both microbes are able to inhibit the growth of the causative agent of the white rot disease [8]. The discussion should be more directed at the effect of *Trichoderma sp.* and *Streptomyces sp.,* biofertilizers on the growth parameters of the two varieties of garlic because we cannot compare a treatment for varieties that have different genetics and characteristics (Figure 1).

On the age of 15 DAS, the plants had emerged some of the leaves, except on Kating which only have one new leaf. However, over the observation time, the number of leaves on the Kating was more than the Sangga Sembalun (Figure. 2). The treatment using *Trichoderma* sp. plus *Streptomycetes* sp. bacteria showed the highest growth of the leaves in both varieties during the 50 DAS observation. The effect of the increased growth of the plants by PGPR bacteria can produce one or more mechanisms, for example as a biological controlling through competition, production of antibiotics or siderophore, induction of plant resistance, production of

phytohormones, and increased nutrient availability through the fixation of N and an increase in the solubility of organic and inorganic phosphate [9].

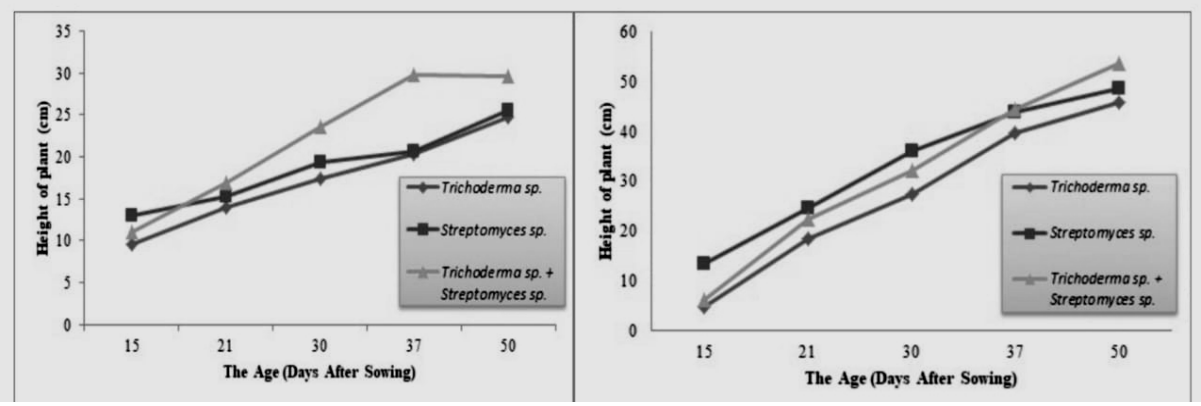

Figure 1. The graph of garlic plant height over 50 DAS (A) the Sangga Sembalun; (B) the Kating

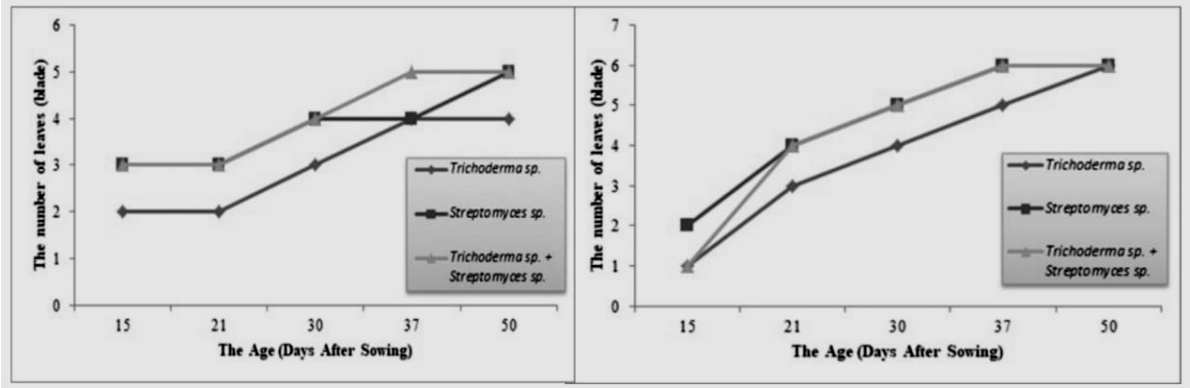

Figure 2. The graph of garlic the number of leaves over 50 DAS (A) the Sangga Sembalun; (B) the Kating

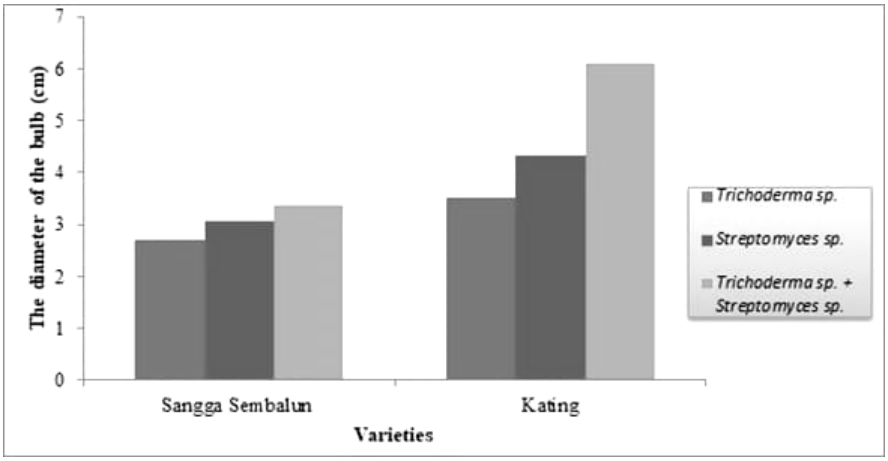

Figure 3. The graph of garlic bulbs diameter (cm)

Figure 3 shows that the treatment of all biological fertilizer did not affect the parameters of the garlic bulb diameter. For both varieties, this is due to the diameter

of bulb formed was similar in every treatment to indicate no significant effect. In addition, the less optimal condition of the environment such as the air temperature and air humidity also affect the growth of garlic. According to Syamsi et al. [10], the response of plants is determined by various factors, such as the genetic trait of the plant, the climate, the land, where such factors are not stand-alone but related to other factors.

4. Conclusion

The results showed that in general, the biological fertilizer *Trichoderma sp.* plus *Streptomycetes sp.,* gave better results, but it cannot be concluded that the imported Kating variety gave a better response than the local Sangga variety to all parameters because it is possible that the morphological or genetic characteristics of Kating and Sangga is also different.

References

1. BPS. Produksi Tanaman Sayuran 2021 [Internet]. Badan Pus. Stat. Indones. 2021 [cited 2022 Oct 17]. Available from: https://www.bps.go.id/indicator/55/61/1/produksi-tanaman-sayuran.html
2. Sudaryono T. Respon tanaman bawang merah terhadap pemupukan boron. Agrika [Internet]. 2017 [cited 2022 Oct 17];11:161–9. Available from: http://publishing-widyagama.ac.id/ejournal-v2/index.php/agrika/article/view/485
3. Hapsari LW, Saptadi D. Respon beberapa varietas bawang putih (Allium sativum L.) dalam pertumbuhan dan potensi pembentukan umbi mikro terhadap pemberian berbagai konsentrasi sukrosa. J Produksi Tanam [Internet]. 2018 [cited 2022 Oct 17];6:2166–74. Available from: http://protan.studentjournal.ub.ac.id/index.php/protan/article/view/893
4. Mardiyanto TC, Pangestuti R. Faktor-faktor yang mempengaruhi respon petani terhadap teknologi budidaya bawang merah ramah lingkungan di Kabupaten Tegal. AGRITEXTS J Agric Ext [Internet]. Universitas Sebelas Maret; 2018 [cited 2022 Oct 17];42:106–18. Available from: https://jurnal.uns.ac.id/agritexts/article/view/43314
5. Syahriyah N, Widyastuti R, Nugroho B. Pengujian efektifitas pupuk hayati majemuk pada tanaman kedelai (Glycine max) [Internet]. IPB; 2014. Available from: http://repository.ipb.ac.id/handle/123456789/68965
6. Sukmadi RB. Aktivitas fitohormon indole-3-acetic acid (IAA) dari beberapa isolat bakteri rizosfer dan endofit. J Sains dan Teknol Indones. 2012;14:221–7.
7. Dhanasekaran D, Jiang Y, editors. Actinobacteria - basics and biotechnological applications. IntechOpen; 2016.
8. Wang J, Shi L, Wang D, Li L, Loake GJ, Yang X, et al. White rot disease protection and growth promotion of garlic (Allium sativum) by endophytic bacteria. Plant Pathol. John Wiley & Sons, Ltd; 2019;68:1543–54.
9. Kafrawi K. Skrining isolat plant growth promoting rhizobacteri (PGPR) dari pertanaman bawang merah (Allium ascalonicum) di Gorontalo. Pros Semin Nas Mikrobiol Kesehat dan Lingkung. Makassar: UIN Alauddin Makassar; 2015. p. 132–9.

10. Syamsi A, Nelvia N, Puspita F. Respon bawang merah (Allium ascalonicum. L) terhadap pemberian trichokompos TKKS terformulasi dan pupuk nitrogen pada lahan gambut. J Phot. 2015;6:5–13.