SSRG International Journal of Agriculture & Environmental Science
ISSN: 2394-2568/ https://doi.org/10.14445/23942568/IJAES-V11I4P102

Volume 11 Issue 4, 13-20, Jul-Aug 2024

Original Article

Response of Shallot (*Allium ascalonicum* L.) Varieties to Plant Waste Organic Fertilizer Doses on Suboptimal Land in Banyuasin Regency, South Sumatra, Indonesia

Erni Hawayanti[1,4], Jabal Tarik Ibrahim[2*], Adi Sutanto[3], Mukhtarudin Muchsiri[5], Nico Syahputra Sebayang[5], Diah Eka Puspita[6], Harum Sahara[7]

[1]*Department of Agriculture Science, Postgraduate University of Muhammadiyah Malang, Indonesia.*
[2]*Department of Agribusiness, Faculty of Agriculture and Animal Science, University of Muhammadiyah Malang, Indonesia.*
[3]*Department of Animal Science, Faculty of Agriculture and Animal Science, University of Muhammadiyah Malang, Indonesia.*
[4]*Department of Agrotechnology, Faculty of Agriculture, University of Muhammadiyah Palembang, Indonesia.*
[5]*Department of Food Technology, Faculty of Agriculture, University of Muhammadiyah Palembang, Indonesia.*
[6]*Department of Agrotechnology, Faculty of Agriculture, Abulyatama University, Aceh, Indonesia.*
[7]*Department of Agribusiness, Postgraduate University of Muhammadiyah Malang.*

Corresponding Author : jabal@umm.ac.id

Received: 18 June 2024 Revised: 22 July 2024 Accepted: 09 August 2024 Published: 30 August 2024

Abstract *- The cultivation of several varieties of shallots (Allium ascalonicum L.) on suboptimal tidal type D land in Banyuasin Regency has not been explored. The low pH and nutrients on the land are the main obstacles. However, it can be overcome by using organic fertilizer from local organic fertilizer resources, especially plant waste (rice straw, banana tubers, water hyacinth and coconut husks), which are widely available in Banyuasin Regency. This research aims to obtain the correct dose of organic plant fertilizer from local resources for certain shallot varieties on suboptimal land. The study used a factorial randomized block design with two treatment factors and 3 replications. The shallots studied were the Bima Brebes (V1), Tajuk (V2) and Sanren (V3) varieties. Meanwhile, the dose of organic fertilizer for plant waste is 0 kg (D0), 7.5 tons/hectare (D1), 15 tons/hectare (D2), and 22.5 tons/hectare (D3). The variables observed were plant height (cm), number of leaves (strands), number of tillers (fruit), and number of tubers per hill (tubers). The research results showed that a dose of organic fertilizer of 7.5 tons/hectare produced the highest plant height, namely 36.64 cm, and the highest number of leaves is 17.48 strands. Meanwhile, the dose of organic fertilizer from plant waste was 22.5 tons/hectare, producing the highest number of tillers, namely 7.35, and the highest number of tubers per hill, namely 9.08. The Bima Brebes variety is the variety with the highest yields for all parameters compared to the Tajuk variety and the Sanren variety.*

Keywords *- Bima, Tajuk, Sanren, Type D tidal land, Shallot growth, Shallot production.*

1. Introduction

Shallots (Allium ascalonicum L.) are one of the horticultural crop commodities that are in great demand among Indonesian people, both for culinary needs and as herbal medicine. This makes shallots have high economic value [1]. However, shallots are also a commodity that contributes to inflation [2]. This is because shallot cultivation is mostly carried out on optimal land to achieve high production. However, in reality, the amount of shallot production is still not able to meet domestic needs. Therefore, the government continues to strive to increase production so that shallot prices become more stable and the amount of imports can be reduced [3]. On the other hand, there is a lot of suboptimal land in Indonesia that has not been explored for cultivating shallots. For example, the South Sumatra region has a tidal swamp area of more than 1.3 million hectares [4] spread over several deltas [5]. So far, the use of tidal land has had physical constraints such as low soil fertility, soil pH and the presence of toxic substances Fe and Al, biological constraints such as pests and disease, and socio-economic constraints, namely farmers' limitations in mastering technology and capital [6][7]. However, this can be overcome by adding nutrients, which can be obtained either from organic fertilizer (manure, compost), inorganic

fertilizer (Urea, SP36, KCl, NPK compounds, microelements), or lime [8]. Utilization of organic fertilizer from plant waste can be done because Banyuasin Regency has potential local organic fertilizer resources, especially from plant waste such as rice straw, banana tubers, water hyacinth, coconut husks and corn husks, which are widely available in the area. Banana humps contain P2O5 439 ppm, K2O 574 ppm, and Ca 700 ppm, which function to stimulate the growth of roots and stems of young plants, as well as harden plant stems [9]. The chemical content of water hyacinth can accelerate root growth [10] to optimize the height of shallot plants [11]. Rice straw compost can increase moisture and maintain sufficient pore space to allow good air circulation, drainage of excess water and dilution of salt concentrations in the soil solution [12]. Coconut fiber organic fertilizer contains the nutrients potassium (K), calcium (Ca), magnesium (Mg), sodium (Na) and phosphorus (P), which are very necessary for the growth and development of cultivated plants [13].

Based on the description above, increasing the productivity of suboptimal land can use organic fertilizer from plant waste and expanding suboptimal land for shallot cultivation can use varieties that are able to adapt well to that land. This research observed the response of certain shallot varieties to doses of organic fertilizer from plant waste in Banyuasin Regency. Therefore, this research aims to (1) get the right dose of organic plant residue fertilizer from local resources for certain shallot varieties and (2) get varieties with the best growth and production that can be cultivated on suboptimal land.

2. Materials and Methods

2.1. Materials and Tools

The materials used in the research included shallot seeds of the Bima Brebes, Sanren and Tajuk varieties, chicken manure, NPK fertilizer in the ratio 16:16:16, dolomite lime, fungicide amistartop 325 SC, insecticide Prevaton 50 SC, chicken manure, rice straw, water hyacinth, banana weevil, and coconut fiber. Meanwhile, the tools used were: a hoe, rake, plant waterer, bucket, measuring tools (meter, scale), hand sprayer, research board (treatment board, group board), an oven, a camera, a knife and a vernier caliper.

2.2. Research Methods

The experimental design used was a factorial-randomized block design with two treatment factors. Each treatment was repeated 3 times. Each experimental unit consisted of plots measuring 130 cm x 120 cm, 120 cm x 120 cm, and 120 cm x 140 cm so that 2,295 plant clusters were obtained with a distance between plots of 0.40 m and a distance between groups of 0.40 m. The shallots studied were the Bima Brebes (V1), Tajuk (V2) and Sanren (V3) varieties. Meanwhile, the dose of organic fertilizer for plant waste is 0 kg (D0), 7.5 tons/hectare (D1), 15 tons/hectare (D2), and 22.5 tons/hectare (D3). The variables observed were plant height (cm), number of leaves (leaves), number of tillers (tillers), and number of tubers per cluster (tubers). Observations of plant height were measured from the base of the stem to the tips of the leaves when the plants were 7 days after planting (DAT) until 10 days before harvest with a measurement interval of once a week.

The number of leaves was calculated based on the clumps of each sample plant at the age of 7 days after planting and 10 days before harvest with a time interval of 10 days. The number of tubers is calculated based on the number per hill and is calculated from each sample plant at harvest.

2.3. Research Implementation

The research implementation includes preparation of planting media, planting, fertilizing, maintenance (watering, weeding, hilling, replanting, pest and disease control), and harvesting.

2.4. Data Analysis

Data obtained from observations of each treatment were analyzed using analysis of variance (ANOVA) at the 0.05 and 0.01 levels to determine the effect of the treatment on the observed variables. If the data has a significant or very significant effect, then proceed with a comparison test of the treatment mean values using Duncan's Multiple Range Test (DMRT) level of 0.05.

3. Results and Discussion

The results of variance analysis of yield parameters of several shallot varieties on the dosage of organic fertilizer from plant waste on suboptimal land are shown in Table 1.

Table 1. The results of variance analysis of yield parameters of several shallot varieties on the dosage of organic fertilizer from plant waste on suboptimal land

Parameters		F-count	F-table	
			0.05	0.01
Plant height	Group	2.05^{ns}	3.44	5.72
	D	1.56^{ns}	3.05	4.82
	V	8.27^{**}	3.44	5.72
	DV	1.73^{ns}	2.55	3.76
Number of leaves	Group	0.04^{ns}	3.44	5.72
	D	0.09^{ns}	3.05	4.82
	V	15.37^{**}	3.44	5.72
	DV	0.93^{ns}	2.55	3.76
Number of saplings	Group	1.20^{ns}	3.44	5.72
	D	0.94^{ns}	3.05	4.82
	V	6.06^{**}	3.44	5.72
	DV	2.62^{*}	2.55	3.76
Number of tubers per hill	Group	2.16^{ns}	3.44	5.72
	D	2.60^{ns}	3.05	4.82
	V	7.28^{**}	3.44	5.72
	DV	2.07^{ns}	2.55	3.76

((Information: * (significant effect with a confidence level of 95%), ** (significant effect with a confidence level of 99%) and ns (not significant)))

3.1. Plant Height

The results of the variance analysis showed that the treatment of the dose of plant waste organic fertilizer and the interaction of several shallot varieties with the dose of plant waste organic fertilizer had no effect on the height of the shallot plants. However, the treatment of several shallot varieties had a very significant effect (P<0.01) on shallot plant height (Table 1). The Bima Brebes variety treatment produced the highest plant height, namely 37.75 cm and was significantly different from other treatments (Table 2). Meanwhile, the Sanren variety treatment produced the lowest plant height, namely 31.32 cm, but this was not significantly different from the Tajuk variety treatment (Table 2). The results showed that each shallot variety in this study gave a different growth response. This is in accordance with the opinion of [14] that different varieties will produce different plant heights. Differences in response between varieties occur due to differences in genetic characteristics and environmental adaptation of the three varieties.

The average of each treatment of several varieties with various measures of plant waste organic fertilizer on shallot yield is shown in Table 2.

Table 2. Average of each treatment of several varieties with various measures of plant waste organic fertilizer on shallot yield

Varieties	Plant Height	Number of Leaves	Number of Saplings	Number of Tubers per Hill
Bima Brebes	37,75 b	19,43 b	8,01 b	9,04 b
Tajuk	34,29 a	18,09 b	6,83 ab	8,46 b
Sanren	31,32 a	14,79 a	6,02 a	6,76 a
Organic Fertilizer from Plant Waste				
0 kg	33,20 a	17,55 a	6,37 a	7,15 a
7,5 tons/ha	36,64 a	17,59 a	6,81 a	8,29 ab
15 tons/ha	33,27 a	17,48 a	7,28 a	7,82 ab
22,5 tons/ha	34,68 a	17,13 a	7,35 a	9,08 b

((Information: Numbers in the same column followed by the same lower case letter are not significantly different according to the DMRT test at the 95% confidence levelt)))

Apart from that, treatment with 7.5 tons/hectare of plant waste organic fertilizer resulted in the highest plant height, namely 36.64 cm (Table 2). Meanwhile, the 0 kg plant waste organic fertilizer treatment produced the lowest plant height, namely 33.20 cm, although both were not significantly different from other treatments (Table 2). These results are reasonable because suboptimal land has a low fertility level, so the growing environment for the three shallot varieties cannot reach their true genetic potential. The nutrient content in organic plant waste fertilizer can increase the productivity of the planting medium by improving the physical, chemical and biological properties of the soil so that plant growth is better [15].

Based on Figure 1, the combination of the Bima Brebes variety treatment and 0 kg plant waste organic fertilizer produced the highest plant height, namely 39.22 cm, compared to other treatments. This shows that the genetic factors of the Bima Brebes variety of shallots dominate so that even if planted on suboptimal land without the use of organic plant waste fertilizer, it can still produce a plant height that matches the description of the Bima Brebes variety, namely between 25 – 44 cm. Meanwhile, the combination treatment of the Sanren variety with 0 kg plant waste organic fertilizer produced the lowest plant height, namely 27.44 cm, compared to other treatments (Figure 1). This shows that the Sanren variety of shallots is more determined by environmental factors.

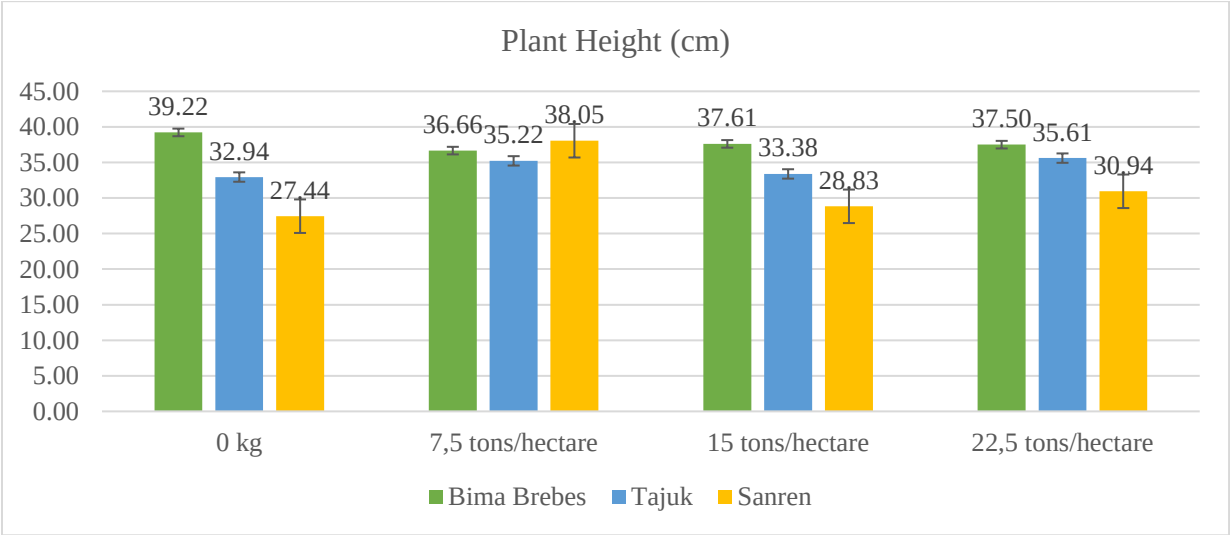

Fig. 1 Average plant height resulting from a combination of shallot varieties and plant waste organic fertilizer

If the Sanren variety of shallots is planted on suboptimal land, it is necessary to add organic plant waste fertilizer so that it can grow well. This is in accordance with the opinion of [16] that the gene potential of a plant will be maximized if environmental factors support it. Providing 7.5 tons/hectare of plant waste organic fertilizer resulted in the highest plant height of the Sanren variety, namely 38.05 cm, compared to other treatment combinations. This is in accordance with the opinion of [17] that cultivating the Sanren variety of shallots on fertile land can produce a plant height of 44.53 cm.

Treating the Bima Brebes variety with 7.5 tons/hectare of plant waste organic fertilizer was the best treatment for increasing the average height of shallot plants if given separately (Table 2). However, treating the Bima Brebes variety with 0 kg plant waste organic fertilizer is the best treatment for increasing shallot plant height when combined with both (Figure 1). This is because using the right varieties and fertilization can increase shallot yields. Apart from that, good adaptation to the environment will have an impact on the production or yield of the plant itself [17].

3.2. Number of Leaves

The results of the variance analysis showed that the treatment of plant waste organic fertilizer doses and the interaction of several varieties of shallots with the plant waste organic fertilizer doses had no effect on the number of shallot leaves. However, the treatment of several shallot varieties had a very significant effect ($P<0.01$) on the number of shallot leaves (Table 1). The Bima Brebes variety treatment produced the highest number of leaves, namely 19.43 leaves, but this was not significantly different from the Tajuk variety treatment (Table 2). Meanwhile, the Sanren variety treatment produced the lowest number of leaves, namely 14.79 leaves and was significantly different from other treatments (Table 2).

Even though in this study, the Sanren variety planted on suboptimal land produced the lowest number of leaves compared to other treatments, this yield was higher than in the study by [17] with a number of leaves of 10.16 leaves even though it was planted on fertile land. This shows that the genetic potential of the Bima Brebes variety and the Tajuk variety is higher than the Sanren variety, even though they are planted on the same land. This is in accordance with the opinion of [18], which states that each variety gives a different response because each variety has different root and leaf growth even though it is planted in the same soil.

Apart from that, the 7.5 ton/hectare plant waste organic fertilizer treatment produced the highest number of leaves, namely 17.48 leaves, compared to other treatments (Table 2). Meanwhile, the plant waste organic fertilizer treatment of 22.5 tons/hectare actually produced the lowest number of leaves, namely 17.13 leaves, although both were not significantly different from other treatments (Table 2). This shows that organic plant waste fertilizer should be given at a rate of 7.5 tons/hectare.

Based on Figure 2, the combination of treatments of the Bima Brebes variety and 0 kg plant waste organic fertilizer produced the highest number of leaves, namely 20.44 leaves. Meanwhile, the combination treatment of the Sanren variety with 0 kg plant waste organic fertilizer produced the lowest number of leaves, namely 13.89 leaves, compared to other treatments. This shows that the combination of the Bima Brebes variety treatment with 0 kg plant waste organic fertilizer is the best treatment for increasing the average number of shallot leaves.

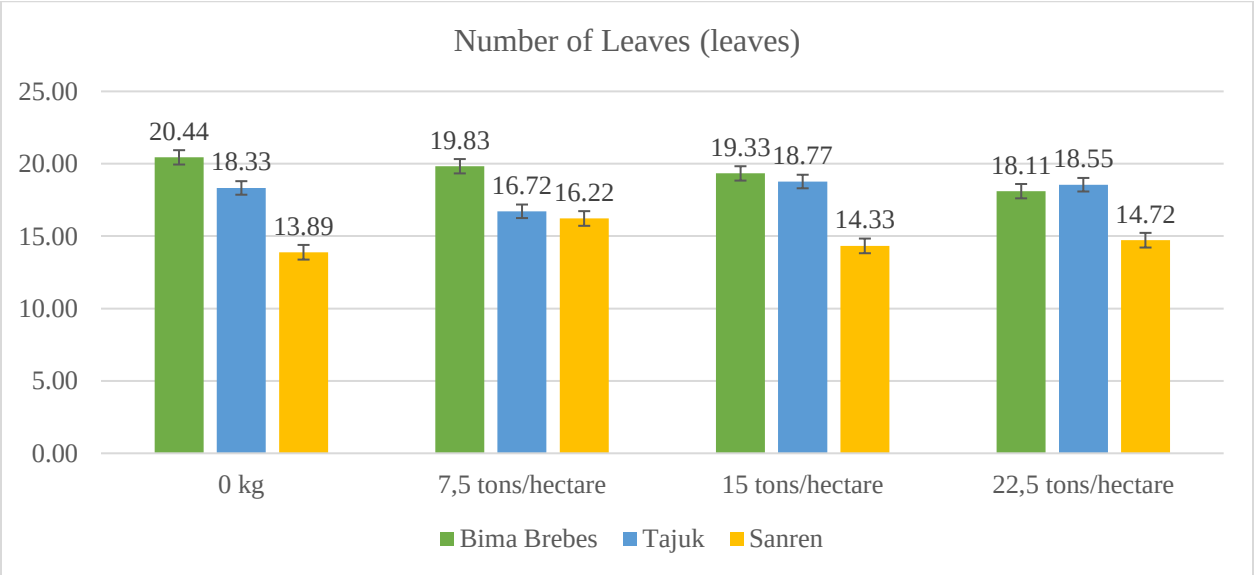

Fig. 2 Average number of leaves resulting from a combination of shallot varieties and plant waste organic fertilizer

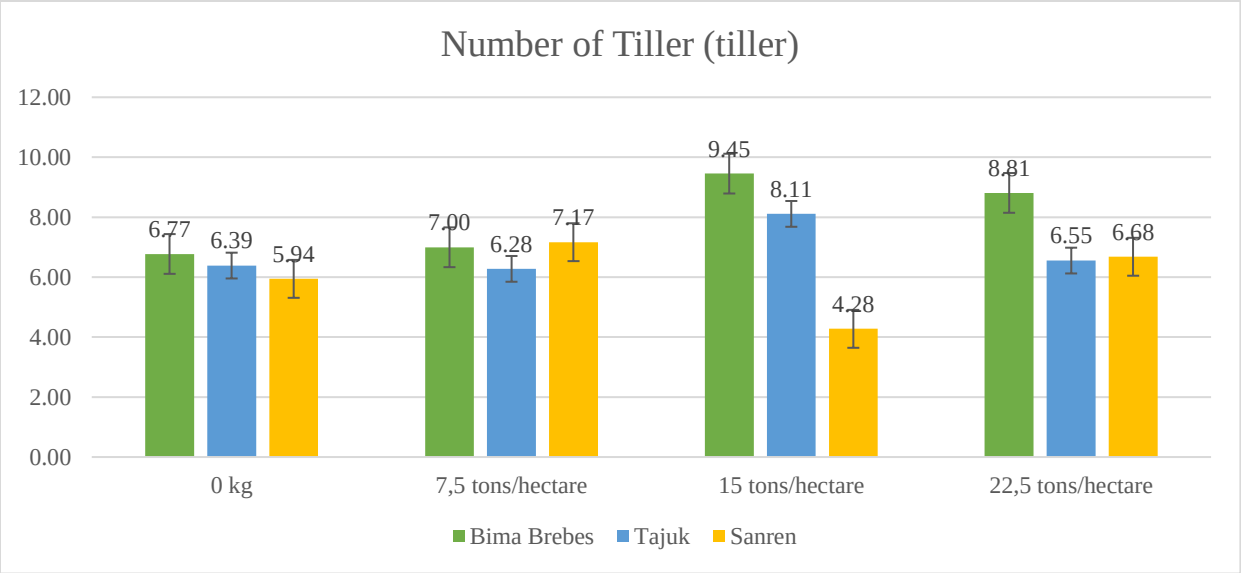

Fig. 3 Average number of tillers resulting from a combination of shallot varieties and plant waste organic fertilizer

3.3. Number of Tillers

The results of the variance analysis showed that the treatment dose of organic fertilizer from plant waste had no effect on the number of shallot tillers. However, the treatment of several shallot varieties had a very significant effect ($P<0.01$) on shallot plant height, and the interaction of several shallot varieties with the dose of plant waste organic fertilizer had a significant effect ($P<0.05$) on the number of shallot tillers (Table 1). The Bima Brebes variety treatment produced the highest number of tillers, namely 8.01 tillers, but this was not significantly different from the Tajuk variety treatment (Table 2). These two results are higher than research by [19] in that the Bima Brebes variety produced a greater number of tillers, namely 7.19 tillers, compared to the Tajuk variety, namely 6.08 tillers. Meanwhile, the Sanren variety treatment produced the lowest number of tillers, namely 6.02 tillers, but this was not significantly different from the Tajuk variety treatment (Table 2).

Apart from that, the treatment of 22.5 tons/hectare of plant waste organic fertilizer produced the highest number of tillers, namely 7.35 tillers (Table 2). Meanwhile, the 0 kg plant waste organic fertilizer treatment produced the least number of tillers, namely 6.37 tillers, although both were not significantly different from other treatments (Table 2).

Based on Figure 3, the combination of treatments of the Bima Brebes variety and 15 tons/hectare of plant waste organic fertilizer produced the highest number of tillers, namely 9.45 tillers, compared to other treatments. Meanwhile, the combination treatment of the Sanren variety with 15 tons/hectare of plant waste organic fertilizer produced the lowest number of tillers, namely 4.28 tillers, compared to other treatments (Figure 3).

Treating the Bima Brebes variety with 22.5 tons/hectare of plant waste organic fertilizer was the best treatment to increase the average number of shallot tillers when given separately (Table 2). However, treatment of the Bima Brebes variety with 15 tons/hectare of plant waste organic fertilizer was the best treatment in increasing the number of shallot tillers, namely 9.45 tillers when combined with both (Figure 3). This shows that plant waste organic fertilizer for shallots of the Bima Brebes variety is optimally given at a rate of 15 tons/hectare. It is suspected that if this dose is increased, business competition will occur between the genetic factors of the Bima Brebes variety of shallots and the planting environment using organic plant waste fertilizer.

The plant waste organic fertilizer in this research consists of several components such as banana tubers, water hyacinth, rice straw and coconut fiber, each of which has its own superior properties. When all these components are mixed, only a smaller amount is needed to optimize the genetic potential of shallot plant varieties. This is in accordance with the opinion of [20] that high doses of fertilizer may not necessarily increase crop yields, especially if carried out in areas that have been used as intensive cultivation land.

3.4. Number of Tubers per Hill

The results of the variance analysis showed that the treatment of the dose of plant waste organic fertilizer and the interaction of several shallot varieties with the dose of plant waste organic fertilizer had no effect on the number of tubers per hill of shallots. However, the treatment of several shallot varieties had a very significant effect ($P<0.01$) on the number of tubers per hill of shallots (Table 1). The Bima Brebes variety treatment produced the highest number of tubers per hill, namely 9.04 tubers, but this was not different from the

Tajuk variety treatment (Table 2). Meanwhile, the Sanren variety treatment produced the lowest number of tubers per hill, namely 6.76 tubers, which was significantly different from the other treatments (Table 2). This is because the genetic factors of the Bima Brebes variety are superior to the Sanren variety. This is supported by [21] that the number of shallot tubers is more influenced by genetic factors and only slightly influenced by the environment.

Even though in this study, the Sanren variety planted on suboptimal land produced a lower number of tubers per hill than other treatments, this yield was much higher than in the study by [17] with a number of tubers of 1.8 tubers even though it was planted on fertile land. Apart from that, it is also higher than [22], where the number of tubers of the Sanren variety using nanotechnology compound fertilizer was 2.07 tubers. This shows that the genetic potential of the Bima Brebes variety and the Tajuk variety is higher than the Sanren variety, even though they are planted on the same land. This is in accordance with the opinion of [14] that each variety has different potential and characteristics due to the plant's ability to distribute photosynthesis to the tubers. The plant height and number of shallots of the Sanren variety are lower than other varieties, which is manifested in the low number of bulbs of the Sanren variety. This shows that plant photosynthesis between different varieties causes different product results.

Apart from that, the 22.5 ton/hectare plant waste organic fertilizer treatment produced the highest number of tubers per hill, namely 9.08 tubers. However, this was not different from the 7.5 ton/hectare and 15 ton/hectare treatments (Table 2). Meanwhile, the 0 kg plant waste organic fertilizer treatment produced the lowest number of tubers per hill, namely 7.15 tubers, but this was not different from the 7.5 ton/hectare and 15 ton/hectare treatments (Table 2).

Based on Fig. 4, the combination of treatment with the Bima Brebes variety and 22.5 tons/hectare of plant waste organic fertilizer produced the highest number of tubers per hill, namely 10.59 tubers. Treating the Bima Brebes variety with 22.5 tons/hectare of plant waste organic fertilizer was the best treatment to increase the average number of bulbs per cluster of shallots when given separately (Table 2) or combined (Figure 4). This shows that the genetic factors of the Bima Brebes variety work together with the planting environment using organic plant waste fertilizer to increase shallot production. This is in accordance with the opinion of [20] that one of the components that influences shallot production is proper fertilization.

Meanwhile, the combination treatment of the Sanren variety with 15 tons/hectare of plant waste organic fertilizer produced the lowest number of tubers per hill, namely 4.72 tubers, compared to other treatments (Figure 4). This is due to the influence of variety on the characteristics of shallot plants. This is in line with the opinion of [23] that plants have different phenotypes and genotypes, where the differences in varieties are quite large, influencing the differences in plant traits. Differences in genetic composition are strands of genetic structure that will be expressed in one or all of the different growth phases. They can also be expressed in various plant traits, which include plant form and function and ultimately produce diversity in plant growth.

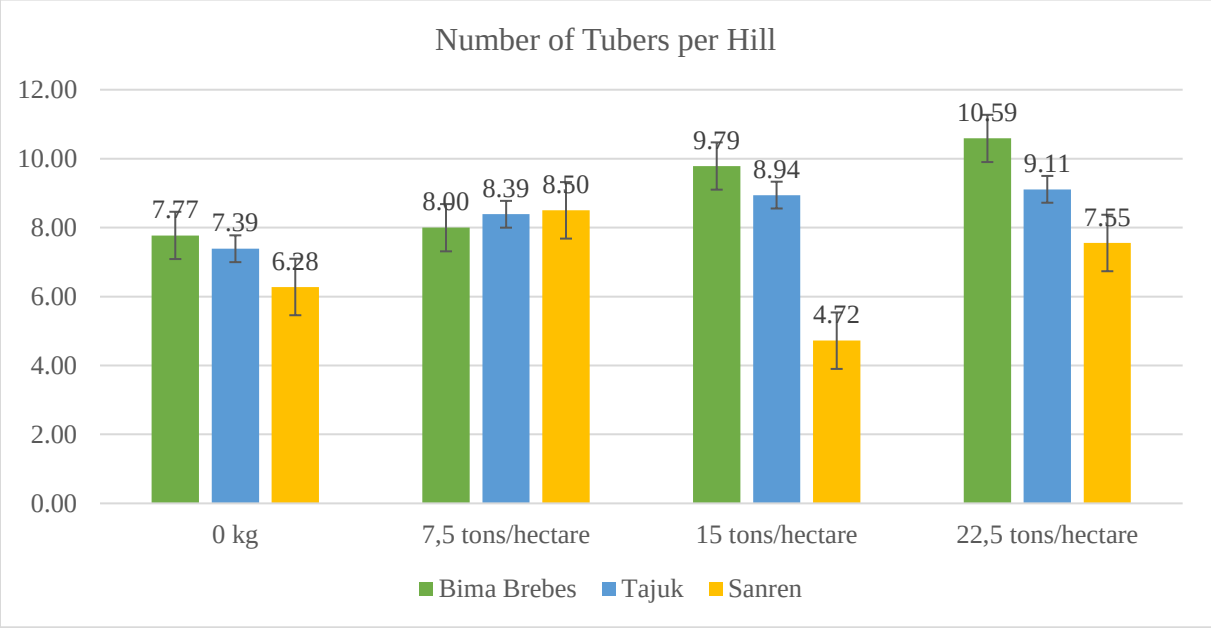

Fig. 4 Average number of tubers per hill resulting from a combination of shallot varieties and plant waste organic fertilizer

4. Conclusion

The treatment of several varieties of shallots had a very significant effect on plant height, number of leaves, number of tillers and number of bulbs per cluster of shallots planted on tidal land type D. Meanwhile, the interaction of several shallot varieties with doses of plant waste organic fertilizer had a significant effect on the number of tillers red onion. An organic fertilizer dose of 7.5 tons/hectare produced the highest plant height, namely 36.64 cm, and the highest number of leaves is 17.48 leaves. Meanwhile, the dose of organic fertilizer from plant waste was 22.5 tons/hectare, producing the highest number of tillers, namely 7.35 tillers, and the highest number of tubers per hill, namely 9.08 tubers. The Bima Brebes variety planted on type D tidal land is the variety with the highest yield for all parameters compared to the Tajuk variety and the Sanren variety. Cultivation of the Bima Brebes variety of shallots on suboptimal land in Banyuasin Regency by applying 15 tons/hectare or 22.5 tons/hectare of plant waste organic fertilizer produces the highest number of tillers and number of bulbs per cluster of shallots compared to other treatments.

Funding Statement

This research was self-funded for the completion of PhD study at the University of Muhammadiyah Malang.

Acknowledgments

Thank you to the supervisor and co-supervisor, as well as the students of the Agrotechnology Department at Muhammadiyah University of Palembang, who were actively involved in the data collection

References

[1] Seno Basuki et al., "The Performance of Production, Price and Marketing System of Shallot in Central Java," *E3S Web of Conferences, 2nd International Conference on Agribusiness and Rural Development (IConARD 2021)*, vol. 316, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[2] Endro Gunawan Saptana et al., "The Competitiveness Analysis of Shallot in Indonesia: A Policy Analysis Matrix," *PLoS ONE*, vol. 16, no. 9, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[3] Olvie Grietjie Tandi, and F. Faisal, "Technology Innovation Support in Development of Local Superior Shallot in North Sulawesi" *Agrotech Journal*, vol. 5, no. 1, pp. 10-21, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[4] Hiroshi Ehara Irmawati, Rujito Agus Suwignyo, and Jun-Ichi Sakagami, "Swamp Rice Cultivation in South Sumatra, Indonesia: An Overview," *Tropical Agriculture Development*, vol. 59, no. 1, pp. 35-39, 2015. [CrossRef] [Google Scholar] [Publisher Link]

[5] H.A. Umar et al., "Mapping Distribution Approach in Various Types of Use Sub-optimal Dry Land in Aceh Besar District," *IOP Conference Series: Earth and Environmental Science*, vol. 715, pp. 1-9, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[6] L.J. van den Eelaart, Problems in Reclaiming and Managing Tidal Lands of Sumatra and Kalimantan, Indonesia, *Proceedings of the Bangkok Symposium on Acid Sulphate Soils*, pp. 272–290, 1981. [Google Scholar] [Publisher Link]

[7] Runsen Zhang et al., "Landscape Ecological Security Response to Land Use Change in the Tidal Flat Reclamation Zone, China," *Environmental Monitoring and Assessment*, vol. 188, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[8] Renato de Mello Prado, *Mineral Nutrition of Tropical Plants*, Springer, pp. 1-339, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[9] Rama R. Sitinjak, Natasya E. Batu Karang, and Bayu Pratomo, "The Effect of Banana Humps and Time Intervals on the Growth of Palm Oil Seedlings (Elaeis Guineensis Jacq.) in the Pre-nursery," *International Journal of Advanced Research*, vol. 6, no. 11, pp. 660-665, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[10] Amin Gultom, "*Response of Growth and Production of Shallots (Alium Ascalonicum L.) to the Provision of Jengkol Skin Compost and Water Hyacinth Liquid Organic Fertilizer*," Thesis, University Faculty of Agriculture Muhammadiyah, North Sumatra, pp. 1-57, 2018. [Google Scholar]

[11] Ervinda Yuliatin, Yanti Puspita Sari, and Medi Hendra, "Effectiveness of Liquid Organic Fertilizer from Water Hyacinth (Eichornia crassipes (Mart), Solm) for Growth and Brightness of the Red Color of Aglaonema 'Lipstick' Leaves," *Biotropika: Journal of Tropical Biology*, vol. 6, no. 1, pp. 660-665, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[12] Esawy Mahmoud et al., "Rice Straw Composting and Its Effect on Soil Properties," *Compost Science & Utilization*, vol. 17, no. 3, pp. 146-150, 2013. [CrossRef] [Google Scholar] [Publisher Link]

[13] Putu Ananta Widhia Dharma, Anak Agung Ngurah Gede Suwastika, and Ni Wayan Sri Sutari, "Study of the Use of Coconut Fiber Waste as a Solution for Local Microorganisms," *Journal of Tropical Agroecotechnology*, vol. 7, no. 2, pp. 200-210, 2018. [Google Scholar]

[14] N. Sumarni, R. Rosliani, and R.S. Basuki, "Growth Response, Bulb Yield and NPK Nutrient Uptake of Red Onion Plants to Various NPK Fertilizer Doses on Alluvial Soil," *Journal of Horticulture*, vol. 22, no. 4, pp. 366-375, 2012. [Google Scholar]

[15] Bachtiar Bachtiar et al., "Nitrogen Requirements of Soybean Plants in Mineral and Mineral Peat Soils with Water Saturated Cultivation," *Jurnal Penelitian Pertanian Tanaman Pangan*, vol. 35, no. 3, 2016. [Google Scholar] [Publisher Link]

[16] Iteu M. Hidayat, S. Putrasameja, and C. Azmin, "Persiapan Pelepasan Varietas Bawang Merah Umbi dan TSS," *Laporan Kegiatan 1804.17.A3*, 2011. [Google Scholar]

[17] Muchtar Saidah, and R. Pangestuti, "Growth and Yield of Two Varieties of Shallot Plants from Seeds in Sigi Regency, Central Sulawesi," *Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia*, vol. 5, no. 2, 2019. [Google Scholar]

[18] Geremew Awas et al., "Effect of Intra Row Spacing on Yield of Three Onion (Allium cepa L.) Varieties at Adami Tulu Agricultural Research Center (Mid Rift Valley of Ethiopia)," *Journal of Horticulture and Forestry*, vol. 2, no. 1, pp. 7-11, 2010. [Google Scholar]

[19] Devi Andriani Luta et al., "The Role of Soil Amendment Application on Soil Chemical Properties in Shallot Plants," *Jurnal Tanah dan Sumberdaya Lahan*, vol. 7, no. 1, pp. 121-125, 2020. [CrossRef] [Google Scholar]

[20] Atin Yulyatin, Meksy Dianawati, and Yati Haryati, "Assessment of the Technology Package for Fertilizing Shallots with Mini Bulb Seeds in Cirebon Regency," *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian*, vol. 22, no. 3, pp. 355–362, 2019. [Google Scholar]

[21] C. Azmi, I.M. Hidayat, and G. Wiguna, G, "Influence of Variety and Bulb Size on Shallot Productivity," *Jurnal Hortikultura*, vol. 21, no. 3, pp. 206–213, 2011. [Google Scholar]

[22] Tubagus Fahmi Adam, A. M., Kartika, and Zahratul Millah, "Response of The Result of True Shallot Seed Variety (Allium ascalonicum L.) on Multiple Fertilizer Concentration Levels with Nano-Technology in Various Varieties," *Jurnal Ilmu Pertanian Tirtayasa*, vol. 3, no. 2, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[23] S. Makmur Sitompul, and Bambang Guritno, *Analysis of Plant Growth*, Gadjah Mada University Press, Yogyakarta, 1995. [Google Scholar] [Publisher Link]