Jurnal Lahan Suboptimal : Journal of Suboptimal Lands
ISSN: 2252-6188 (Print), ISSN: 2302-3015 (Online, www.jlsuboptimal.unsri.ac.id)
Vol. 11, No.2: 197-205 Oktober 2022
DOI: 10.36706/JLSO.11.2.2022.582

The Application of Chicken Manure and NPK Fertilizer on Growth and Yield of Shallot Plant in Tidal Land of Banyuasin Regency

Keragaan Tumbuh dan Hasil Bawang Merah dengan Pemberian Pupuk Kotoran Ayam dan NPK di Lahan Pasang Surut Kabupaten Banyuasin

Susilawati Susilawati[1*)], Irmawati Irmawati[1], Sri Sukarmi[1], Muhammad Ammar[1]

[1]Department of Agronomy, Faculty of Agriculture, Universitas Sriwijaya, Indralaya 30662, South Sumatra, Indonesia
[*)]Corresponding author: susilawati@fp.unsri.ac.id

(Received: 2 February 2022, Accepted: 5 August 2022)

Citation: Susilawati S, Irmawati I, Sukarmi S, Ammar M. 2022. The application of chicken manure and NPK fertilizer on growth and yield of shallot plant in tidal land of Banyuasin Regency. *Jurnal Lahan Suboptimal : Journal of Suboptimal Lands.* 11 (2): 197-205. DOI: 10.36706/JLSO.11.2.2022.582.

ABSTRAK

Penelitian bertujuan untuk mendapatkan teknik budidaya bawang merah varietas Bima Brebes yang tepat melalui penggunaan pupuk kotoran ayam dan pupuk NPK di lahan pasang surut. Lokasi penelitian adalah Lahan Pasang Surut di Desa Sukatani Kecamatan Tanjung Lago Kabupaten Banyuasin Provinsi Sumatera Selatan, terletak pada posisi 1,30°–4,0° Lintang Selatan dan 104° 00'–105° 35' Bujur Timur. Penelitian menggunakan rancangan acak kelompok dengan satu faktor perlakuan dan tiga kelompok. Faktor tersebut adalah dosis pupuk organik kotoran ayam dengan 5 taraf, yaitu P_0 = tanpa kotoran ayam; P_1 = 10 ton pupuk kandang kotoran per hektar; P_2 = 15 ton pupuk kandang kotoran per hektar; P_3 = 20 ton pupuk kandang kotoran per hektar; P_4 = 25 ton pupuk kandang kotoran per hektar. Masing-masing perlakuan dicampur pupuk NPK dengan dosis 200 kg NPK/ha (M). Analisis data dengan analisis ragam menggunakan uji F dan uji lanjut BNT. Peubah yang diamati panjang daun, jumlah daun, berat kering tanaman, luas daun spesifik, berat daun spesifik, rasio tajuk akar, laju tumbuh relatif, laju asimilasi bersih, berat segar umbi, jumlah umbi, diameter umbi, berat kering umbi, dan persentase penyusutan umbi. Hasil penelitian diperoleh bahwa penggunaan pupuk kotoran ayam 10 ton/ha dan 200 kg NPK/ha memperbaiki pertumbuhan bawang merah pada panjang daun, rasio tajuk akar, laju tumbuh relatif, berat segar umbi dan berat kering umbi. Kesimpulan penggunaan pupuk kotoran ayam 10 ton/ha dan 200 kg NPK/ha dapat meningkatkan pertumbuhan dan hasil pada tanaman bawang merah varietas Brebes di lahan pasang surut.

Kata kunci: bawang merah, lahan pasang surut, pupuk kotoran ayam

ABSTRACT

The research objective was to study proper technique for cultivating shallots of Bima Brebes variety through the use of chicken manure and NPK fertilizer on tidal land. The research was located on tidal land in Sukatani Village, Tanjung Lago District, Banyuasin Regency, South Sumatra Province, located at a position of 1.30°–4.0° South Latitude and 104° 00'–105° 35' East Longitude. The study used a randomized block design with one treatment factor and three replicates. The treatment was the dose of organic chicken

manure with 5 levels, namely P_40 = no chicken manure; P_1 = 10 tons of manure per hectare; P_2 = 15 tons of manure per hectare; P_3 = 20 tons of manure per hectare; P_4 = 25 tons of manure manure per hectare. Each treatment was mixed with NPK fertilizer at a dose of 200 kg NPK/ha M). Data analysis was carried out by analysis of variance using F test and least significance difference (LSD) test. The variables observed were leaf length, leaf number, plant dry weight, specific leaf area, specific leaf weight, root-shoot ratio, relative growth rate, net assimilation rate, bulb fresh weight, bulb number, bulb diameter, bulb dry weight, and percentage of bulb shrinkage. The results showed that the use of chicken manure 10 tons/ha and 200 kg NPK/ha repaired the growth of shallots on leaf length, root-shoot ratio, relative growth rate, bulb fresh weight and bulb dry weight. It was then concluded the use of chicken manure 10 tons/ha and 200 kg NPK/ha can increase the growth and yield of the Brebes variety of shallots in tidal land.

Keywords: chicken manure, shallot, tidal land

INTRODUCTION

Based on the average production, shallot production centers in the period of year 2018 to 2019 were located in four provinces: Central Java, East Java, West Nusa Tenggara and West Java. Total production of the four provinces was about 79.36 percent and 79.15 percent of national production in 2018 and 2019, respectively. Central Java made the largest contribution in both years, which were 445 586 tons (29.64%) and 481 890 tons (30.49%) (Indonesian Statistics, 2020). One of the obstacles to meeting shallot domestic demand is due to the centralization of shallot production centers on the island of Java. Government's program to overcome this problem is to achieve shallot self-sufficiency through management and development of production centers that are not only concentrated on Java. Among several shallot varieties known, the "Bima Brebes" (*Allium ascalonicum* L. var "Bima Brebes"), which was produced in 1984, is now widely adopted in Brebes, Indonesia. Brebes is one of the largest shallot production centers in Indonesia (Basuki et al., 2017). In 2019, shallot total production from Sumatra Island only contributed 10.21 percent of national production. Based on Central Statistics Agency of South Sumatra (2018), shallot production in South Sumatra in 2015, 2016 and 2017 was 582.8 tons, 637.6 tons and 1,375.8 tons, respectively (Indonesian Statistics, 2020). One of government's programs in 2019 was to optimize tidal and non-tidal swampland covering an area of 500,000 hectares in six provinces including South Sumatra, South Kalimantan, South Sulawesi, Lampung, Jambi and Central Kalimantan (Husen et al., 2015).

South Sumatra is the second largest province in reclaiming tidal land, of which around 13.52% was reclaimed by local residents and 7.21% by the government. This contribution is about 20.72% of the national potency, which is lower than Riau with 27.27%. Therefore, amelioration and fertilization are considered as important components to solve the probles. Ameliorant should be combined with the use of inorganic fertilizers with recommended doses of N fertilizer ranging from 67.5–135 kg, P_2O_5 from 47 to 70 kg, and K_2O around 50–75 kg/ha. For peatland, recommended lime dose is around 1–2 tons /ha and combined with 45 kg of N fertilizer, 60 kg of P_2O_5 and 50 kg of K_2O per ha. As for potential land, the recommended N fertilizer is 45–90 kg, 22.5–45 kg of P_2O_5, and 50 of K_2O per ha and without liming (Arsyad et al., 2014).

Tanjung Lago District is one of the coastal area of Banyuasin Regency. Its territory consists mostly of swamps with a height almost equal to sea level. Referring to the government's program for the development of shallot production centers outside Java and increasingly limited land in South Sumatra due to changes in land

function, suboptimal land such as tidal swamp in Tanjung Lago District, then can be considered for shallot production area. The research objective was to study proper technique for cultivating shallots of Bima Brebes variety through the use of chicken manure and NPK fertilizer on tidal land of Banyuasin Regency, South Sumatra.

MATERIALS AND METHODS

The research was located in tidal land of Sukatani Village, Tanjung Lago District, Banyuasin Regency, South Sumatra located at a position of 1.30°–4.0° South Latitude and 104° 00'–105° 35' East Longitude. The research was carried out in 2020. The tools and materials used in this study were 1) Stationery, 2) Hoe, 3) Bucket, 4) Camera, 5) Measuring ruler, 6) pH meter, 7) Machete, 8) Analytical balance, 9) Shallot bulbs of Bima Brebes variety from Brebes, Central Java, 10) Dolomite lime, 11) Chicken manure, and 12) NPK fertilizer 16:16:16. Randomized block design was used with one treatment factor and three replicates. The treatment was chicken manure organic fertilizer dose with 5 levels, namely P0 = no chicken manure; P_1 = 10 tons of manure per ha; P_2 = 15 tons of manure per ha; P_3 = 20 tons of manure per ha; P_4 = 25 tons of manure per ha. All treatments were combined with NPK fertilizer at a dose of 200 kg NPK/ha(P). Cultivation was started from land preparation, followed by preparing research plots with the size of 10 m x 1 m x 0.3 m.

The application of chicken manure was carried out following the treatment doses combined with NPK fertilizer 16:16:16 of 200 kg per ha. Both fertilizers were applied one week before planting. Prior to planting, bulbs were first cut 1/3 of the length and then planted with a spacing of 20 cm x 40 cm, resulted in two rows per plot. Plant maintenance included watering, controlling weeds, pests and diseases. Observation was conducted weekly for the parameters of leaf length and leaf number. Plant samples were also taken to obtain data on leaf fresh weight, leaf dry weight, root fresh weight, root dry weight and leaf area. Growth analysis then was calculated based on data collected including plant dry weight, specific leaf area, specific leaf weight, root shoot ratio, relative growth rate and net assimilation rate.

Yield data were collected after harvest including fresh bulb weight, bulb number, bulb diameter, air-dried bulb weight, and percentage of bulb shrinkage. Data analysis was carried out using the analysis of variance with F test and followed by Least Significance Difference (LSD) test.

RESULTS

Growth Parameters

The use of various doses of organic chicken manure mixed with inorganic NPK fertilizer could affect shallot growth in tidal land. Growth response of shallots to the treatment on parameters of leaf length, leaf number and plant dry weight are showed in Table 1. Based on Table 1, the effect of treatment on leaf length and leaf number was statistically not significant. In contrast, the treatment had a significant effect on the parameter of plant dry weight at the 2nd and 3rd week. The longest leaf length was obtained from the application of 10 ton/ha chicken manure and 200 kg NPK per ha (MP_1), except on the first week where the highest value were from MP_1 dan MP_4 with 17.83 cm. While for the parameter of leaf number, the highest number was obtained from different treatment in every week. The highest leaf number on the first week was obtained from MP_1 (9.33), second week was from MP_0 (14.00), third week from MP_3 (25.67), and fourth and fifth week both from MP_0 with 28.00 and 23.00. Plant dry weight also showed similar trend to leaf number where the highest weight in every week was resulted from a different treatment. The highest dry weight in the first and fifth week was obtained in MP_0 treatment, while in the second and fourth week was obtained in MP_1, and in the third week was obtained in MP_2 treatment.

Table 1. The effect of fertilizer treatments on leaf length, leaf number, and plant dry weight

Treatment	Observation				
	Week-1	Week-2	Week-3	Week-4	Week-5
			Leaf length (cm)		
MP_0	16.17	26.00	32.00	33.67	32.67
MP_1	17.83	27.67	33.33	35.17	34.17
MP_2	17.50	25.00	32.33	35.00	34.83
MP_3	14.83	21.67	31.00	32.17	32.50
MP_4	17.83	24.50	29.67	31.83	32.67
Annova	ns	ns	ns	ns	ns
			Leaf number		
MP_0	7.67	14.00	19.67	28.00	23.00
MP_1	9.33	13.00	18.33	20.33	17.00
MP_2	7.67	13.33	23.67	25.33	21.33
MP_3	6.67	10.00	25.67	23.33	19.67
MP_4	7.00	11.00	15.33	18.33	17.67
Annova	ns	ns	ns	ns	ns
			Plant dry weight (g)		
MP_0	0.12	0.36 b	1.34 b	1.92	1.09
MP_1	0.10	0.56 a	1.93 a	2.10	1.02
MP_2	0.08	0.42 a	2.22 a	1.65	0.94
MP_3	0.08	0.26 b	1.35 b	1.52	1.00
MP_4	0.10	0.43 a	1.62 b	1.65	0.72
Annova	ns	**	**	ns	ns
LSD0.05	-	0.15	0.49	-	-

Note: The numbers followed by the same letter in the same column are not significantly different in LSD test at 5% level.

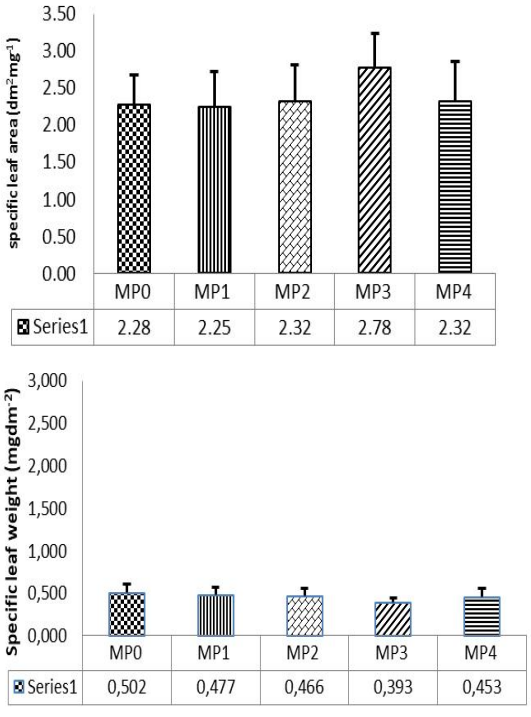

Figure 1. Specific leaf area and specific leaf weight (MP_0 = 0 ton/ha chicken manure and 200 kg/ha NPK; MP_1 = 10 tons/ha chicken manure and 200 kg/ha NPK; MP_2 = 15 tons/ha chicken manure and 200 kg/ha NPK; MP3 = 20 tons/ha chicken manure and 200 kg/ha NPK; MP4 = 25 tons/ha chicken manure and 200 kg/ha NPK)

Figure 1 showed specific leaf area and specific leaf weight. Specific leaf area is the ratio of leaf area and leaf weight of plants, which describes the efficiency of leaves in forming the dry weight. The highest value of specific leaf area was obtained in the treatment of 20 tons organic fertilizer per ha (MP_3) at 2.78 dm^2/mg and the lowest was in the treatment of 10 tons organic fertilizer per ha (MP_1) at 2.25 dm^2/mg. While for specific leaf weight, the highest value was obtained in the treatment of 0 tons organic fertilizer per ha (MP_0) with 0.50 mg dm^{-2} and the lowest was from treatment of 20 tons organic fertilizer per ha (MP_3) with 0 .39 mg dm^{-2}. The improvement on soil structure due to the application of organic fertilizer allows water availability in optimal conditions. The balance of shoot and root growth under normal conditions could be evaluated by calculating shoot-root ratio. Results showed that the highest shoot-root ratio was obtained in the treatment of 10 tons organic fertilizer per ha mixed with 200 kg NPK per ha (MP_1) at 8.52 and the lowest was in the treatment of 20 tons organic fertilizer per ha mixed with

200 kg NPK per ha (MP_3) at 6.78 (Figure 2).

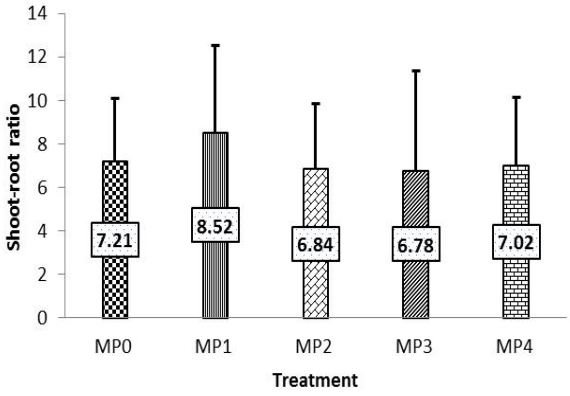

Figure 2. Shoot-root ratio (MP_0 = 0 ton/ha chicken manure and 200 kg/ha NPK; MP_1 = 10 tons/ha chicken manure and 200 kg/ha NPK; MP_2 = 15 tons/ha chicken manure and 200 kg/ha NPK; MP3 = 20 tons/ha chicken manure and 200 kg/ha NPK; MP4 = 25 tons/ha chicken manure and 200 kg/ha NPK)

Results showed that relative growth rate (RGR) increased until the second week (M_2-M_1) in all treatments. The increase occurred in the treatment of 10 tons organic fertilizer per ha (MP_1) and decreased with the increasing doses to 20 tons organic fertilizer per ha (MP_3) and increased again following the dose increase to 25 tons organic fertilizer per ha (MP_4). The decrease in RGR was found in the fourth week (M_4-M_3). However, it lessened due to the addition of fertilizer up to MP_3. The trend of net assimilation rate (NAR) in second week (M_2-M_1) was similar to RGR in all treatments, but an increase occurred in the treatment of 15 tons organic fertilizer per ha (MP_2) and decreased to a dose of 20 tons (MP_3) and then increased again at a dose of 25 tons organic fertilizer per hectare (MP_4) (Figure 3).

Yield Parameters

Several yield components were observed including bulb number, bulb diameter, fresh bulb weight and air-dried bulb weight. Results showed that the application of a mixture of organic and inorganic fertilizers was able to stimulate the formation of a higher number of bulb. It was obtained that the average bulb number in MP treatment was 5.54 bulbs, where the highest number was from MP_1 treatment with 5.80±1.0 bulbs and the lowest was from MP_3 treatment with 5.17 ± 2.1 bulbs. Planting media that has good aeration and drainage would greatly affect the formation and development of bulbs. Shallot bulb size was generally determined from the diameter. In this study, the highest bulb diameter was resulted from MP_1 treatment with an average of 2.42 cm, while in overall treatments was on an average of 2.25 cm (Figure 4).

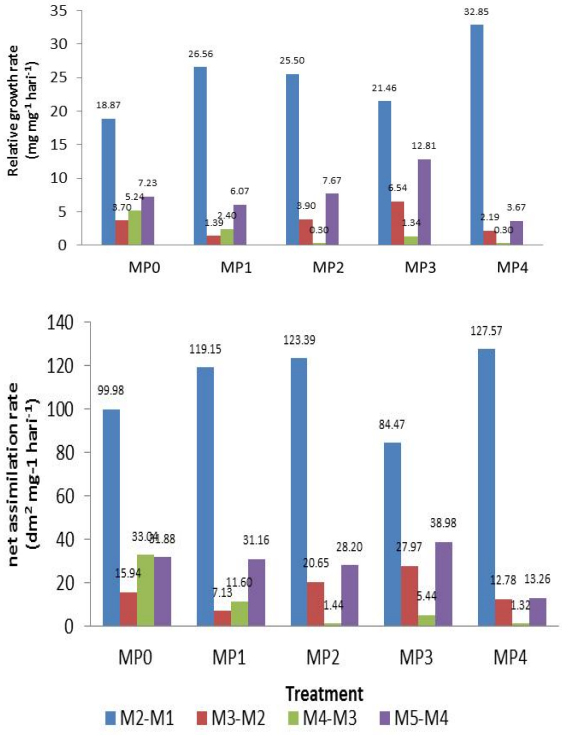

Figure 3. Relative growth rate and net assimilation rate (MP_0 = 0 ton/ha chicken manure and 200 kg/ha NPK; MP_1 = 10 tons/ha chicken manure and 200 kg/ha NPK; MP_2 = 15 tons/ha chicken manure and 200 kg/ha NPK; MP3 = 20 tons/ha chicken manure and 200 kg/ha NPK; MP4 = 25 tons/ha chicken manure and 200 kg/ha NPK)

In line with the highest number and diameter of bulbs, the highest fresh bulb weight and air-dried bulb weight were also resulted from MP_1 treatment. The highest weight was 33.73 g of fresh bulb weight and 30.17 g of air-dried bulb weight, both from MP_1 treatment. Percentage of bulb shrinkage ranged from 9.98 to 17.85 percent. The highest shrinkage was

obtained in MP_4 treatment with 17.85 percent and the lowest was in MP_1 treatment with 9.98 percent (Figure 5).

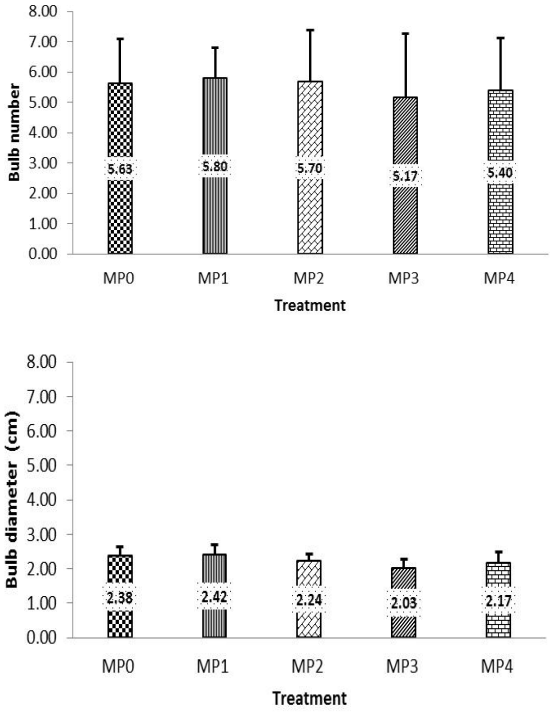

Figure 4. Bulb number and bulb diameter (MP_0 = 0 ton/ha chicken manure and 200 kg/ha NPK; MP_1 = 10 tons/ha chicken manure and 200 kg/ha NPK; MP_2 = 15 tons/ha chicken manure and 200 kg/ha NPK; MP3 = 20 tons/ha chicken manure and 200 kg/ha NPK; MP4 = 25 tons/ha chicken manure and 200 kg/ha NPK)

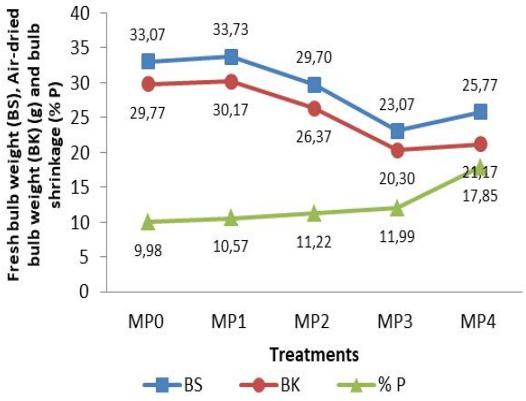

Figure 5. Fresh bulb weight, air-dried bulb weight and percentage of bulb shrinkage (MP_0 = 0 ton/ha chicken manure and 200 kg/ha NPK; MP_1 = 10 tons/ha chicken manure and 200 kg/ha NPK; MP_2 = 15 tons/ha chicken manure and 200 kg/ha NPK; MP3 = 20 tons/ha chicken manure and 200 kg/ha NPK; MP4 = 25 tons/ha chicken manure and 200 kg/ha NPK)

DISCUSSION

Tidal land is one of the suboptimal lands with high soil acidity and low nutrient availability. High acidity or low pH has caused the land to become infertile. The use of ameliorant and/or fertilization can be applied for plant cultivation on tidal land. The results of the study showed that the highest value for leaf length was obtained in the treatment of 10 tons/ha of chicken manure added with 200 kg of NPK per ha (MP_1). While for leaf number and plant dry weight, the results fluctuated every week. Research by Dani et al. (2019) reported that the independent effect of chicken manure had a significant effect on the average plant height at 14 days and 35 days of planting, tuber diameter, average tuber wet weight per hill, and the average tuber dry weight per hillThe addition of chicken manure greatly affected the composition of growing media, as also reported in a study of shallot plant growth by Susilawati et al. (2018a).

The increase on growth can be evaluated through growth analysis, including the parameters of leaf area and specific leaf weight which can describe growth efficiency. The highest specific leaf area was obtained in the treatment of 20 tons organic fertilizer per ha mixed with 200 kg NPK per ha (MP_3) with 2.78 dm^2/mg and the lowest was in the treatment of 10 tons organic fertilizer per ha mixed with 200 kg NPK per ha (MP_1) with 2.25 dm^2/mg. On the other hand, the highest specific leaf weight was obtained in the treatment of 0 tons organic fertilizer mixed with 200 kg NPK per ha (MP_0) with 0.50 mg dm^{-2} and the lowest was in the treatment of 20 tons organic fertilizer per ha added with 200 kg NPK per ha (MP_3) with 0.39 mg dm^{-2}. These two parameters reflected the portions of plant shoot. The balance between shoot and root growth under normal conditions can be determined by calculating the shoot-root ratio. Results showed that the highest shoot-root ratio was in the treatment of 10 tons organic fertilizer per ha (MP_1) with 8.52 and the lowest was in the treatment of

20 tons organic fertilizer per ha (MP_3) with the ratio of 6.78. This was in line with the highest specific leaf area in MP_3 indicating a low shoot weight divided by the root portion so that a low shoot-root ratio was obtained. A report by Alkharpotly (2018) on *Capsicum annum* L. showed that the combination of 20 tons organic chicken manure per ha combined with inorganic fertilizer was the optimal combination treatment resulting in the best average value of vegetative growth characters. The results of another study showed that the application of various organic fertilizers without a combination of inorganic fertilizers did not give a positive response to the growth of shallots (Suwandi et al., 2015; Arifin & Mujoko, 2019).

The rate of plant growth due to fertilizer application which can stimulate the photosynthesis process to form higher photosynthate can be determined by analyzing the growth rate and net assimilation rate (NAR). The high increase in relative growth rate (RGR) was obtained in the third week observation then started to decrease due to the period of bulb formation started from the fourth week. According to Sumarni et al. (2012), unoptimized growth could be resulted from the differences in fertilizer doses for each variety.The increase in RGR occurred in the treatment of 10 tons organic fertilizer per ha (MP_1) and then decreased with the increasing dose to 20 tons organic fertilizer per ha (MP_3) and increased again at 25 tons organic fertilizer per ha (MP_4). The decrease in RGR was found in the fourth week (M_4-M_3), but it lessened with the addition of fertilizer to MP_3. While decrease in NAR was found in the second week (M_2-M_1) in all treatments, but then an increase occurred in the treatment of 15 tons organic fertilizer per ha (MP_2), decreased to a dose of 20 tons (MP_2) and then increased again at a dose of 25 tons organic fertilizer per ha (MP_3).

The highest bulb number per plant was 5.80 bulbs in MP_1 treatment (Figure 4). However, bulb number obtained still did not meet the description of Bima Brebes shallot variety. Based on variety description, Bima Brebes shallot variety has a potency to produce 7 to 12 bulbs per plant (per clump). The results obtained were also not similar with research results by Ali et al. (2019) where it stated that the use of organic and inorganic fertilizers could increase the number of shallot bulbs compared to control. In contrast to bulb number, bulb diameter from all treatments showed a good result and has met the SNI (Indonesian National Standard) standard (Figure 4). Bulb diameter ranged from 2.03 to 2.42 cm resulted from MP_3 and MP_1 treatment, respectively. This diameter has met the standard of SNI quality I, which is 1.7 cm. The results of several studies showed that the application of organic and inorganic fertilizers could increase bulb diameter (Dapaah et al., 2014; Dou et al., 2014; Faladun et al., 2015; Gebretsadik & Dechassa, 2018; Gateri et al., 2018).

The highest fresh bulb weight and air-dried bulb weight were obtained in the same treatment, which was MP_1 with 33.73 g and 30.17 g, respectively (Figure 5). The high yield obtained from the combination of organic and inorganic fertilizer as it would stimulate a relatively fast growth compared to the treatment of a mixture from both organic fertilizers. Improvement on physical properties of growing media due to the application of organic fertilizers will support root respiration which in turn would spurs an increase on shoot growth. The use of various organic or inorganic fertilizers has also been widely used to obtain better growth and yields on Bima Brebes shallot variety (Santosa et al., 2015; Irianto et al., 2017; Astuti et al., 2018; Susilawati et al., 2018b). The highest bulb shrinkage percentage was 17.85 percent in MP_4 and the lowest was 9.98 percent in MP_0. The shrinkage however still can be be tolerated since it's still lower than in the description of Bima Brebes shallot variety with 21.5 percent. Several related fields can be involved, including the fields of plant

ecophysiology, plant physiology and soil fertility.

CONCLUSSION

Based on the results, it was concluded that the use of chicken manure (10 tons/ha chicken manure + 200 kg/ha NPK) could increase the growth and yield of Bima Brebes shallot variety on tidal land.

ACKNOWLEDGEMENTS

Our gratitude to the Rector of Universitas Sriwijaya for the support on research funds through the Head of Research and Community Service Center (LPPM) with Competitive Research Scheme in the year of 2020.

REFERENCES

Arifin M, Mujoko T. 2019. Application of biological organic fertilizers towards P dosage reduction in shallot cultivation. *In: Proceeding 4th International Seminar of Research Month*. NST Proceedings. p 290–296. DOI: 10.11594/nstp.2019.0441.

Ali A, Danje ME, Essilfie, Asiedu EK. 2019. Growth and yield response of two onion (*Allium cepa* L.) varieties to organic and inorganic fertilizers in the Forest- Savannah Transitional Zone of Ghana. *Asian Journal of Agricultural and Horticultural Research.* 4 (4): 1–14. DOI: 10.9734/ajahr/2019/v4i430028.

Alkharpotly AA. 2018. Growth and yield responses of sweet pepper (*Capsicum annum* L.) to organic and NPK mineral fertilization under plastic houses conditions at arid regions. *J. Plant Production.* 9 (3): 299–305. DOI:10.21608/jpp.2018.35501.

Arsyad DM, Saidi BB, Enrizal. 2014. Agricultural innovation development in tidal swampland in supporting food sovereignty. *Pengembangan Inovasi Pertanian*. 7 (4): 169–176. DOI: 10.5219/1287.

Astuti K, Susilawati, Sefrila M. 2018. Growth characteristics of shallot on various planting media composition. *J.Hort Indonesia.* 9 (3): 167–173. DOI: 10.29244/jhi.9.3. 167-173.

Basuki RS, Kharirіyatun N, Sembiring A, Arsanti IW. 2017. Adoption study of "Bima Brebes" shallot from IVEGRI in Brebes District. *Journal of Horticulture.* 27 (2): 261–268. DOI: 10.21082/jhort.v27n2.2017.p261-268.

Indonesian Statistic 2020. Central Statistic Agency. 2020. Sub directorate of Publication and Statistic Compilation, Central Statistical Agency. Jakarta.

Dani U, Budiarti ANS, Wijaya AA. 2021. Application of Chicken manure Dosage and Plant Growth Promoting Rhizobacetria on the Growth and Yield of Shallot Plants (*Allium ascalonicum* L.). IOP Conf. Series: Earth and Environmental Science 748 (2021) 012044. DOI: 10.1088/1755-1315/748/1/012044.

Dapaah HK, Koranteng JGA, Darkwah K, Borketey-La EB. 2014. Influence of poultry manure and NPK fertilization on growth, yield and storability of onion (*Allium cepa* L.) grown under rain-fed conditions. *American Journal of Experimental Agriculture*. 4 (8): 866–878. DOI: 10.9734/AJEA/2014/7526.

Dou L, Komatsuzaki M, Nakagawa M. 2014. Effects of biochar, mokusakueki and bokashi application on soil nutrients, yields and qualities of sweet potato. *J. Agriculture Science and Soil Science*. 2: 318–327.

Faladun E, Ehigiator J, Egharevba R. 2015.Growth and yield of onion as influenced by organic and inorganic fertilizer in Edo rainforest of Nigeria. *Agro-Science*. 12 (3):15. DOI: 10.4314/as.v12i3.3.

Gateri MW, Nyankanga R, Ambuko J, Muriuki AW. 2018. Growth, Yield and Quality of Onion (*Allium cepa* L.) as Influenced by Nitrogen and Time of Topdressing. *International Journal of*

Plant & Soil Science. 23 (3): 1–13. DOI: 10.9734/IJPSS/2018/42135.

Gebretsadik K, Dechassa N. 2018. Response of Onion (*Allium cepa* L.) to nitrogen fertilizer rates and spacing under rain fed condition at Tahtay Koraro, Ethiopia. Scientific REPOrTS | *(2018) 8:9495* | DOI:10.1038/s41598-018-27762-x 8: 8 pages

Husen E, Agus F, Nursyamsi D. 2015. Indonesian Agricultural Natural Resources: Coverage Area, Distribution, and Availability Potency. IAARD PRESS. Agricultural Research and Development Agency.

Irianto, Yakup, Harun MU, Susilawati. 2017. Growth and yield characteristics of three shallot varieties affected by phosphate fertilizer dosages on ultisol. *Russian Journal of Agricultural and Socio Economic Sciences*. 5 (65): 245–254. DOI 10.18551/rjoas.

Santosa M, Suryanto A, Maghfoer MD. 2015. Application of biourine on growth and yield of shallot fertilized with inorganic and organic fertilizer in Batu, East Java. *AGRIVITA.* 37 (3): 290–296. DOI: 10.17503/Agrivita-2015-37-3-p290-295.

Sumarni N, Rosliani R, Basuki RS. 2012. Growth response, yield and NPK nutrient absorption of shallot on several doses of NPK fertilizer in alluvial soil. *J.Hort*. 22 (4): 366–375. DOI: 10.21082/jhort.v22n4.2012.p366-375.

Susilawati, Ammar M, Mu'arif. 2018a. The composition od growing media on growth and yield of shallot (*Allium cepa* L.). *In: Proceeding of National Seminar on Suboptimal Land. October 18-19, 2018*, Palembang. p.93–102.

Susilawati, Ammar M, Kurnianingsih A, Irmawati, Adhistia Y, Yuniar F. 2018b. The Correlation Between Growth Characters and Yield of Shallot (*Allium ascalonicum* L.) due to the Application of Nitrogen, Phosphate and Potassium Fertilizers. *Russian Journal Of Agricultural and Socio Economic Sciences*. 9 (81): 502–509. DOI: 10.18551/rjoas.2018-09-62

Suwandi, Sopha GA, Yufdy MP. 2015. The effectiveness of organic fertilizer, npk, and biofertilizer managements on growth and yields of shallots. *Jurnal Hortikultura*. 25: 208–221. DOI: 10.21082/jhort.v25n3.2015.p208-221.