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APPLICATION OF PLANT BIOMASS COMPOST APPLICATION AND THE USE OF SEVERAL TYPES OF mulch ON THE GROWTH AND PRODUCTION OF RED ONION *(Allium ascalonicum* L.*)*

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ABSTRAK

Bawang merah merupakan komoditi pertanian yang selalu di butuhkan, terutama sebagai bumbu masakan. Tanpa bawang merah, serasa ada yang kurang lengkap rasa masakan. Untuk meningkatkan produksi bawang merah perlu dilakukan modifikasi dalam budidaya nya. Penelitian ini bertujuan untuk menentukan jenis mulsa dan dosis pupuk organik limbah tanaman yang berpengaruh terbaik terhadap pertumbuhan dan produksi bawang merah (*Allium ascalonicum* L). Penelitian dilaksanakan pada bulan April sampai Juli 2021 dilahan petani Jalan Sukarela Lr.Batujajar RT.18 KM 7 Kecamatan Sukarame Palembang.Penelitian ini menggunakan metode exsperimen dengan Rancangan Petak Terbagi (*Split Plot Design*) terdiri dari 12 kombinasi perlakuan yang di ulang 3 kali sehingga diperoleh sebanyak 36 petakan. Faktor I = Jenis Mulsa (M) terdiri dari 3 taraf :M1 = Mulsa Anorganik Plastik Hitam Perak, M2=Mulsa Organik Eceng Gondok, M3= Mulsa Organik Kulit Jengkol. Faktor II= Dosis Pupuk Organik limbah Tanaman (L) terdiri dari 4 taraf : L0 = Pupuk Kimia Sesuai Dosis Anjuran, L1 = 5 ton/ha (1kg/petak), L2= 10ton/ha (2kg/petak) L3= 15ton/ha (3kg/petak).Peubah yang diamati tinggi tanaman(cm),jumlah umbi per rumpun, berat umbi per petak (g). Perlakuan kombinasi antara jenis mulsa organik kulit jengkol dengan dosis pupuk organik limbah tanaman 15ton/ha (3kg/petak) memberikan pengaruh tertinggi terhadap pertumbuhan dan produksi tanaman bawang merah sebesar 850,00 g/petak atau setara dengan 8,50 ton/ha.

Kata kunci: Bawang Merah, Jenis Mulsa, Dosis Pupuk Organik Limbah Tanaman

ABSTRACT

Shallots are agricultural commodities that are always ordered, especially as a cooking spice. Without shallots, it feels as if there is something incomplete in the taste of the dish. To increase the production of shallots it is necessary to modify the cultivation. This study aims to determine the type of mulch and the dose of organic fertilizer from plant waste that has the best effect on the growth and production of shallot (Allium ascalonicum L). The research was carried out from April to July 2021 on the farmer's land, Jalan Sukarela Lr. Batujajar RT.18 KM 7 Sukarame Subdistrict, Palembang. This study used the Experimental Method with a Divided Plot Design consisting of 12 treatment combinations which were repeated 3 times to obtain 36 plots. Factor I = Mulch Type (M) consisting of 3 levels: M1 = Black Silver Plastic Organic Mulch, M2 = Water Hyacinth Organic Mulch, M3 = Jengkol Bark Organic Mulch. Factor II = Plant-waste Organic Fertilizer Dosage (L) consisting of 4 levels: L0 = Chemical Fertilizer According to Recommended Dosage, L1 = 5 tons/ha (1kg/plot), L2 = 10 tons/ha (2kg/plot) L3 = 15tons /ha (3kg/plot). The variables observed were plant height (cm), number of tubers per clump (tubers), tuber weight per plot (grams). The combination treatment of jengkol skin organic mulch with a dose of organic fertilizer from plant waste of 15 tons/ha (3kg/plot) gave the highest effect on the growth and production of shallots at 850.00 grams/plot or equivalent to 8.50 tons/ha.

Keywords: Shallots, Types of Mulch, Dosage of Organic Fertilizer Plant Waste

INTRODUCTION

The onion (*Allium ascalonicum* L.) is thought to have originated in Central Asia, especially around Palestine and India. Shallots are widely consumed by the community as a mixture of cooking spices after chili. The main shallot producing centers in Indonesia include North Sumatra, West Sumatra, West Java, Central Java, the Special Region of Yogyakarta, East Java, Bali, NTB, and South Sulawesi, which account for 95.8% of the total production of shallots in Indonesia. For production centers in the province of South Sumatra are Ogan Komering Ulu, Lahat, and Palembang, so they have the potential as a foreign exchange earner [1].

Based on data from BPS, the production of shallots in South Sumatra Province in 2018 was 1,443 tons and in 2019 it was 1,390 tons. To overcome

the decline in shallot production, it is necessary to improve cultivation techniques and optimize soil function. How to optimize soil function, namely by using mulch which has the function of preventing water loss from the soil so that water loss can be reduced by maintaining temperature and humidity [2].

In addition, the function of mulch creates suitable conditions for plants, so that plants can grow and develop properly. This is supported by Ansar on shallot plants that the application of silver black plastic mulch can increase the fresh weight of tubers per hectare by 24.7% compared to no mulch [3].

To increase the production of shallots, it is also necessary to implement effective and efficient cultivation techniques, by verifying balanced fertilization. Inorganic fertilizers if used in the long term can harden the soil and reduce the stability of soil aggregates [4]. Therefore, it is necessary to add organic fertilizer.

According to Tarigan, soils in Palembang are ultisol soils, namely soils that are poor in nutrients, have a pH ranging from 4.5 to 5.6, low total N, low organic C and high Al-dd. It is necessary to add compost, because it comes from the final result of the decomposition of animal and plant remains so that it can improve the soil physically, chemically, and biologically [5].

Composting can be made from a variety of organic materials derived from agricultural and non-agricultural waste, such as banana weevil, rice bran, peanut shells, bagasse. In addition, organic waste collected from markets and household waste can be processed into compost with the help of decomposing microorganisms so that it can be used optimally for agricultural land [6]. According to Chasanah the application of agricultural waste compost at a dose of 5 tons/ha can increase the growth of corn plants [7].

A mixture of coconut coir/cocopeat, water hyacinth and banana hump can be processed into compost. According to Rahma stated that coconut coir has significant effect on plant height because it contains nutrients in the form of K (67.20 me/100g); N (0.44%); P (119mgKg-1);Ca (7.73me/100g); Mg (11.03me/100g) [8]. Strengthened by

Dharma, coconut fiber contains beneficial bacteria *Klebsiella* sp, *Psudomonas* sp, *Citrobacter* sp, *B. circularis*, *B. megaterium* and *B. fimus* [9].

Water hyacinth plants have good properties, including absorbing heavy metals, sulfide compounds [10]. In addition, water hyacinth contains more than 11.5% protein and contains cellulose which is higher than non-cellulose such as lignin, ash, fat, and other substances. Water hyacinth compost also contains N, P, K which are needed by plants.

According to Suhastyo, the banana hump contains C/N 22, Fe 0.09 ppm, and Mg 800 ppm. These chemical elements are very influential on the vegetative growth of plants, especially the formation of leaves [11].

RESEARCH METHOD

The study was conducted from April to July 2021 in Sukarame Palembang District. This study used a Split Plot Design consisting of 12 treatment combinations which were repeated 3 times. The treatment in question is as follows: Main plot: Type of mulch, (M). M1 = Black Silver Plastic Inorganic Mulch, M2 = Water Hyacinth Organic Mulch, M3 = Jengkol Bark Organic Mulch. Sub plots: Organic fertilizer from plant waste, L0 = Chemical Fertilizer according to the recommended dosage, L1 = 5 tons/ha, L2 = 10 tons/ha L3=15ton/ha. The variables observed were plant height (cm), number of tubers per clump, tuber weight per plot (g).

The tools used in this study were hoe, tape measure, raffia rope, nameplate, gembor, knife, basket, tarpaulin, scales. While the materials used were shallot seeds of canopy varieties, coconut fiber, water hyacinth, banana weevil, em4, chicken manure, silver black plastic mulch, pesticides, compound NPK fertilizers, TSP, Urea, KCL, ZPT. Diversity analysis test is carried out by comparing the F-count with the F-table at the 5% and 1% test levels. If the F-count is greater than the F-table at the 1% test level, it is stated that the treatment has a very significant

effect (**), but if the F-count is smaller than the F-table at the 1% test level and is greater than the F-table at the 5% test level, the treatment is declared to have a significant effect (*), whereas if the F-count is smaller than the F-table at the 5% test level, it is stated that the treatment has no significant effect (tn).

RESULTS AND DISCUSSION

Based on the results of the analysis showed that the type of mulch treatment had a significant to very significant effect on the tuber weight variable per plot but had no significant effect on other variables. The dose treatment of plant waste organic fertilizer had no significant effect on the number of tubers per clump but had a very significant effect on other variables. While the interaction treatment had no significant effect on the number of tubers per clump but had a significant to very significant effect on other variables.

Table 1 shows that the type of mulch treatment and the dose of organic fertilizer from plant waste had a very significant effect on plant height and tuber weight per plot but had no significant effect on the number of tubers per clump.

Table 1. Effect of Mulch Type Treatment and Dosage of Plant Waste Organic Fertilizer on Plant Height, Number of Tubers Per Clump and Tuber Weight Per Plot.

Treatment	Plant height (cm)	Number of Bulbs per Clump	Bulb Weight per Plot (g)
M_1L_0	33,33 a	8,87	506,67 a
M_1L_1	38,40 b	7,60	526,67 ab
M_1L_2	36,33 ab	9,07	583,33 abc
M_1L_3	36,13 ab	9,67	586,67 abc
M_2L_0	34,00 a	7,60	456,67 a
M_2L_1	33,40 a	9,87	646,67 abcd
M_2L_2	38,47 b	8,80	593,33 abcd
M_2L_3	38,80 b	9,27	713,33 abcd
M_3L_0	33,53 a	10,53	650,00 abcd
M_3L_1	34,53 a	9,73	780,00 bcd
M_3L_2	38,40 b	9,90	823,33 cd
M_3L_3	39,13 b	9,93	850,00 d
Uji F	**	tn	**

Description: The numbers followed by the same letter in the column the same means that they are not significantly different at the 95% confidence level.

The mulch and organic fertilizer treatments had a very significant effect on plant height, significantly on tuber weight per plot but not on the number of tubers per clump. The M_2L_3 treatment plant height was significantly different from the M_1L_0, M_2L_0, M_2L_1, M_3L_0, M_3L_1 treatments. However, it was not significantly different from other treatments and resulted in the highest plant height of 39.13 cm. In the number of tubers per clump there was no significant difference between the interaction treatments, the highest number of tubers per clump was found in the M_3L_0 treatment, which was 10.53 bulbs, while the lowest number of tubers per clump was found in the M_1L_1 treatment, which was 7.6 bulbs. In tuber weight per plot, M_3L_3 treatment was significantly different from M_1L_0, M_1L_1, M_1L_2, M_1L_3 and M_2L_0 treatments, but not significantly different from other treatments and resulted in the highest tuber weight per plot, which was 850g.

DISCUSSION

Based on the results of the analysis of soil fertility on the research land, it shows that the pH content of H_2O is 5.65 (slightly acidic), cation exchange capacity is 8.66 cmol + kg (lower), C-Organic 1.10 (lower), N-total 0, 14% (classified low), P Bray II 297.86 ppm (classified very high), Ca-dd3.79 cmol+ kg (classified low), Mg-dd 0.49 cmol+kg (classified low) K-dd 0, 19 cmol+ kg (classified as low), Na 0.06 cmol+ kg (very low), soil texture 73.85% (sand), 20.82% (dust), 8.33% (clay) classified as sandy loam [12].This means that the soil in this study has very low soil fertility, indicated by a slightly acidic pH and low to very low nutrient content, while onion plants require nitrogen (N), phosphorus (P) and potassium (K) in sufficient quantities. large quantities, namely urea 500kg/ha, TPS 200kg/ha, and KCl 200kg/ha [13] Therefore, it is necessary to apply organic fertilizers that can improve soil properties and structure, one of which is organic fertilizer from waste. cocopeat, water hyacinth and banana weevil that have been composted. According to Sayara, compost is a type of fertilizer that comes from the final result of the decomposition of animal and plant

remains that function as a supplier of soil nutrients so that it can be used to improve soil physically, chemically, and biologically [14].

In addition to organic fertilization, another effort that can be applied to increase plant productivity is to modify the water balance, temperature and soil moisture using mulch. According Sopha, the application of different types of mulch to plants has different effects on regulating temperature, humidity, soil water content, suppressing weeds and nuisance organisms. Besides mulch especially Plastic mulch can tightly cover the soil surface, so there is less chance of water loss through downward or lateral seepage and less through holes where plants grow [15].

Based on the results of the study, it showed that the type of organic mulch of jengkol skin was the best treatment for the growth and production of shallot plants, as evidenced by each variable observed, it produced the highest plant height (36.32 cm), the highest number of bulbs per clump (10.00 bulbs).), and the heaviest tuber weight per plot (775.83 grams). This is inseparable from its function as a mulch that can maintain soil moisture, maintain soil aggregates from rainwater, minimize soil surface erosion, prevent water evaporation, and protect soil from sun exposure as well as suppress weed growth. This is in line with Gusnidar, from the results of this study, it was found that jengkol bark mulch could suppress weed growth without disturbing plant growth [16].

Jengkol skin contains essential oils, saponins, alkaloids, terpenoids, steroids, tannins, glycosides, proteins, carbohydrates, calcium (Ca), phosphorus (P), and vitamins which can be natural pesticides so as to reduce the number of pests [17]. The active ingredients in jengkol skin are able to reduce levels of heavy metals such as lead (Pb), which if absorbed in excess by plants can result in decreased plant growth and production because it causes disturbances in the photosynthesis process and is also harmful to human health.

While the treatment of black silver plastic inorganic mulch showed the lowest yield and production of shallot plants. This was evidenced by the dead variables, yielding plant

height (36.05 cm), number of tubers per clump (8.8 bulbs) and tuber weight per plot (550.83 grams). This could be due to the surface of the silver black plastic inorganic mulch which non-porous so that the soil moisture is very high plus the influence of the weather at the time of the study which was dominantly rainy in April caused diseases such as *Fusarium oxysporum* which resulted in tuber rot and reduced production yields. In line with the statement of Sinha, stated that silver black plastic mulch causes the soil to become moist and dark so it is possible that the soil temperature can be lowered [18]. Decreasing soil temperature and humid conditions can cause disease and plant growth to be less than optimal. Coupled with the statement of Lukash, which states that the onion plant is not resistant to waterlogged places. The amount of water in the rainy season can cause diseases caused by fungi [19].

The water hyacinth organic mulch treatment showed better growth and production results than the black silver plastic inorganic mulch treatment, but not better than the jengkol bark organic mulch treatment. This can be seen from the observed variables, such as plant height (36.25 cm), number of tubers per clump (8.89 bulbs) and tuber weight per plot (602.50 grams). This is because water hyacinth mulch is easy to shrink and dry so that the soil surface is not completely covered and its role as mulch is less than optimal.

The results of statistical tests showed that the dose of organic fertilizer from plant waste had no significant effect on the number of tubers per clump but had a very significant effect on other variables. This is in line with the research results of Rahma that the application of organic fertilizer has no effect on the number of tillers of shallot plants. It seems that the number of tillers is determined more by genetic factors than by fertilization [20]. Based on the results of the laboratory analysis test, it shows that the organic fertilizer collected from plant waste contains N 3733 ppm, P 4990 ppm, and K 5360 ppm [12]. From research results showed that the treatment of organic fertilizer from plant waste at a dose of 15ton/ha (3kg/plot) gave the best effect on the growth and production of

shallots, this could be seen from the highest yield of plant height (38.02 cm), the highest number of tubers per clump. (9.58 bulbs) and the heaviest bulb weight per plot (716.67 grams). This could be because the dose has been able to meet the nutrient needs of the plant so that it can increase the growth and production of shallot plants. This is in line with Kurniadi that the presence of nutrients absorbed by plants is one of the causes that can affect plant growth [21]. The increase in plant height was due to the need for N nutrients which were met from the application of organic fertilizers from plant waste, where N was directly involved in the formation of amino acids, proteins, nucleic acids, enzymes, nucleoproteins, and alkaloids, which are needed for the plant growth process [22]. Furthermore, the high weight of tubers per plot is also due to the need for K which is fulfilled according to which states that potassium plays a role in increasing plant vegetative growth such as the formation, enlargement, and elongation of tubers and has an effect on increasing the weight of shallots [23]. Meanwhile, phosphorus is one of the essential nutrients needed by plants for optimum growth and yields [24]. Phosphorus is a component of enzymes, proteins, ATP, RNA, DNA, and fitins that have important functions in the processes of photosynthesis, the use of sugar and starch, and energy transfer which ultimately increases plant growth and yield.

Meanwhile, the chemical fertilizer treatment according to the recommendation (L0) showed the lowest average yield and production of shallots. This is evidenced by the observed variables, such as plant height (33.62 cm), tuber weight per plot (537.78 grams). This is due to the condition of the research soil which has a low level of fertility and nutrient content, so that if it is not added with organic fertilization, the absorption of nutrients to plants cannot run optimally. Suggested Prommer that the use of organic fertilizers combined with inorganic fertilizers is a land management strategy that can increase soil productivity, crop yields and reduce the dose of inorganic fertilizer use [25]. Then according to Bayu suggested that the response of plants to the application of inorganic fertilizers

is strongly influenced by the content of organic matter in the soil [26].

CONCLUSION

Application of organic mulch type jengkol skin gave the best effect on the growth and production of shallots. The dose of organic fertilizer plant waste 15ton/ha (3kg/plot) gave the best effect on the growth and production of shallots. Tabulated administration of a combination of types of organic mulch Jengkol peel with a dose of organic fertilizer from plant waste of 15 tons/ha (3kg/plot) gave the highest effect on the growth and production of shallots at 850.00 grams/plot or equivalent to 8.50 tons/ha.

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