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STUDY OF THE COMPOSITION OF PLANTING MEDIA AND ZA FERTILIZER ON THE GROWTH AND PRODUCTION OF SAMOSIR SHALLOTS USING PVC PIPES

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Abstract: The research was joined by Suka Raya Village, Rampah Dua Village, Pancur Batu and Deli Serdang Districts. Research launches in July 2021 and ends in November 2021. Research objective is used for ingredient resource volume as well as the development of ZA, thereby increasing Samosir's productivity and productivity. The experimental design used in this study was a factorial randomized block design with 2 factors: the first factor, namely, the composition of the planting medium with 3 treatment levels: 100% topsoil, 75% top soil: 25% cocopeat, 50 top soil soil. %: cocopeat 50%. The second factor is ZA fertilizer with 3 treatment levels: 0 g/planting hole, 1g/planting hole, and 2 g/planting hole. Parameters observed were plant length (cm), number of leaves (strands), number of tubers, tuber diameter (mm), tuber fresh weight per plant (g), tuber dry weight per plant (g), quercetin analysis (ppm). The outcomes showed that the treatment of ZA manure with a portion of 2 g/establishing opening on plant length boundaries brought about the best plant length, tuber diameter, fresh weight and dry weight of Samosir shallots, while a dose of 1 g/planting hole could increase the number of tubers and quercetin compared to the dose of 1 g/planting hole. other. The composition of the growing media, namely top soil and cocopeat, showed an increase in the growth and quality of Samosir shallots on the number of leaves and quercetin parameters. The communication between the treatment of the sythesis of the developing media and the utilization of ZA manure didn't expand the development and nature of Samosir shallots on totally noticed factors.

Keywords: *Shallots, cocopeat, ZA fertilizer*

INTRODUCTION

Shallots are vegetable plants that have many benefits and are quite popular among the public. Onions provide nutritional value and can be consumed because they can improve the taste of other foods [1]. The need for shallots in North Sumatra reaches 4,057 tons / month or 48,684 tons/year while shallot production in North Sumatra Province is 18,072 tons / year. The low production of shallots in North Sumatra makes the government have to import shallots to meet domestic needs[2].

Samosir Regency is one of the largest contributors to shallot crops in North Sumatra. This region is predominantly agricultural, dependent on rainfall for successful farming. Shallots are a cornerstone of Samosir's agriculture, with a local Samosir variety known for its vibrant color, lower moisture content, and spicier flavor, commanding a premium price in the market (Antara Sumut, 2012). The unique flavor and vivid color of Samosir onions are attributed to the abundant sulfur content in the Lake Toba region. Here, plants absorb sulfur in the form of SO42-, which plays a crucial role in their metabolic processes, influencing various factors that determine the nutritional quality of vegetable crops.[3].

The decline in Samosir Onion production every year is due to the reduction in production area in the Samosir area and planting patterns and fertilization that have not been carried out intensively while consumer demand is still very high. The problem of food shortage is responded by urban people specifically by carrying out agricultural cultivation in urban areas. The urgency of urban agriculture becomes heightened when the economic crisis makes food security a big question. Food security, especially for the urban poor, is likely to be an important issue in the future. Urban agriculture serves as a valuable tool for optimizing land and natural resource utilization within city environments, achieved through the application of suitable technologies. (Fauzi, et al. 2016). One of the appropriate technologies that can be used to overcome the narrowness of land in urban areas is to use PVC (paralon) media.

[1] M Bekele, "Effects of Different Levels of Potassium Fertilization on Yield, Quality and Storage Life of Onion (Allium Cepa L.) at Jimma, Southwestern Ethiopia," *J Food Sci Nutr. 2018; 1 (2): 32-9. J Food Sci Nutr 2018 Volume 1 Issue* 2 (2018).

[2] Badan Pusat Statistik, *Badan Pusat Statistik Provinsi Sumatera Utara 2020* (Badan Pusat Statistik, 2020).

[3] Jeffry Tiardo Sihite, Aditia Sovia Pramudita, and Saptono Kusdanu Waskito, "ANALISIS PEMILIHAN VENDOR PLASTIK DENGAN MENGGUNAKAN METODE VISE KRITERIJUMSKA OPTIMIZACIJA I KOMPOMISN RESENJE (VIKOR) PADA PT AGRONESIA SARIPETOJO BANDUNG," *JATI (Jurnal Mahasiswa Teknik Informatika)* 7, no. 1 (2023): 333–41.

Shallot cultivation on PVC (Paralon) media is a solution to overcome land narrowing. Placement of planting media for onion cultivation using PVC pipes (paralon) which can be used as an alternative place for planting media[4].

The advantages of using agricultural systems using PVC pipes (paralon): (1) land use efficiency because there are more planted than conventional systems, (2) savings in the use of fertilizers and pesticides, (3) the possibility of grass and weeds growing is smaller, (4) can be moved easily because plants are placed in certain containers, (5) facilitate monitoring / maintenance of plants, and (6) the presence of plastic roofs provide advantages (a) prevent damage due to rain, (b) save on watering costs because plastic roofs reduce evaporation while the drawbacks are (1) prone to fungal attacks, due to high air humidity due to high plant populations of roofs plastic, (2) the initial investment is quite high, (3) the watering system must be continuous, and some additional equipment is needed, such as a ladder as a watering aid[5]. Therefore, a good planting medium is needed to be used in the cultivation of shallots on PVC pipes (paralon) to support the growth and development of shallots on narrow land. One of the ingredients that can be added to get good media criteria is by adding organic materials[6]. According to [7] cocopeat planting media has a high water storage capacity compared to soil media and cocopeat and soil type media so it is suitable for use in critical land rehabilitation activities in dry areas. Cocopeat also contains important nutrients such as, phosphorus (P), potassium (K), magnesium (Mg), sodium (N), and calcium (Ca).

The cultivation of Samosir shallots cultivated outside their habitat also requires fertilizers that provide nutrients as in their place of origin because fertilization is one of the determining factors in efforts to increase plant yields. Fertilizers containing S elements are needed to meet the nutrients for growth, production, and special quality

[4] dan Sukadi Wartapa, A. S. Sugihartiningsih, S. Astuti, "Pengaruh Jenis Pupuk Dan Tanaman Antagonis Terhadap Hasil Cabai Rawit (Capsicum Frutencens) Budidaya Vertikultur," 2010.

[5] dan Marheny Pujiati, Primiani. N., "Budidaya Bawang Merah Pada Lahan Sempit. Program Studi Pendidikan Biologi," 2017.

[6] E. Syawal, Y., Susilawati., dan Ghinola., "Pengaruh Komposisi Media Tanam Terhadap Pertumbuhan Dan Hasil Tanaman Bawang Merah (Allium Cepa L. Var Bimo)" (Majalah Ilmiah Sriwijaya, 2019).

[7] Hasrian Rudi Setiawan and Widya Masitah, "Meningkatkan Motivasi Dan Hasil Belajar Mahasiswa Melalui Model Pembelajaran Kooperatif Group Investigation Pada Mata Kuliah Psikologi Pendidikan Di Program Studi Pendidikan Agama Islam Fai Umsu 2016-2017," *Intiqad: Jurnal Agama Dan Pendidikan Islam* 9, no. 1 (2017): 47–67.

of aroma from Samosir onions. Thus, the expected impact of fertilization not only increases the yield of broad unity but is also efficient in fertilizer use[8].

One fertilizer that can be used to increase sulfur nutrient needs in Samosir onion cultivation is ZA fertilizer. ZA fertilizer can give shallots a stronger aroma that correlates with the availability of sulfur in the soil. ZA fertilizer is one of the Single inorganic fertilizers with a content of Nitrogen (N) 21% and sulfate (S) 23% (Lide, 2016). Shallots also need S nutrients to increase plant metabolism related to the nutritional quality of vegetable crops. ZA fertilizer has several properties and advantages such as hygroscopic, easily soluble in water, used as a basic fertilizer and follow-up, safe to use for all types of crops, increasing production and crop quality, and improving the taste and color of the harvest[9].

Based on the description above, the author wants to conduct a research entitled "Study of the Composition of Planting Media and ZA Fertilizer on the Growth and Production of Samosir Shallots.

REGIONAL GEOLOGY

Plant Botany

Shallots, scientifically known as *Allium ascalonicum* L., are a popular horticultural crop often used as a key ingredient in various culinary spice blends. These annual plants are characterized by their grass-like appearance, short stems, and tendency to grow in clusters.[10].

The morphology of shallots consists of parts of roots, leaves, flowers, fruits and seeds. Shallot plants have a superficial and unbranched root system, so fertilizing needs to be done gradually. The shallot plant features a distinct stem structure, commonly referred to as a disc-shaped base, which is thin and short, serving as the point for both root attachment and bud growth. Atop this disc, a pseudo-stem consisting of leaf sheaths emerges, with some of these pseudo-stems transforming into

[8] Bangun Amanda Putra, "Analisis Aspek Perlindungan Konsumen Dalam Jual Beli Kambing Dengan Sistem Oper Nota (Studi Kasus Di Kelurahan Hadimulyo Timur, Kecamatan Metro Pusat, Kota Metro)" (IAIN Metro, 2020).

[9] Samuel L Tisdale, Werner L Nelson, and James D Beaton, *Soil Fertility and Fertilizers.* (Collier Macmillan Publishers, 1985).

[10] Hapsoh dan Y. Hasanah., "Budidaya Tanaman Obat Dan Rempah," 2011.

layered tubers as they reach into the soil, exhibiting changes in both their form and function[11].

Flower stalks emerge from the plant's growing point, extending between 30 to 90 cm in length. At the tip of these stalks, there are typically 50 to 100 florets arranged in a circular fashion, resembling an umbrella shape. Each floret comprises 5 to 6 white petals, 6 green or yellowish stamens, a solitary pistil, and produces a practically three-sided natural product[12]. The base of the tuber forms a disc that is an imperfect tree stem (rudimentary). From the bottom of the disc grow fibrous roots. At the top of the disc there are buds that can become new plants. These shoots are called lateral shoots, which will form new discs and can then form re-layered tubers[13].

Growing Terms

Shallots can grow and develop well in lowlands and highlands (0-900 m asl), dry climate with temperatures of 250 – 320 C, and get sunlight for more than 12 hours, with rainfall 300 – 2500 mm/year. Shallot plants can grow optimally in dry climates, and require maximum sunlight (at least 70% irradiation), air temperature 25-32 °C, and relative moistness 50-70%[14].

Shallot plants need high air humidity at the beginning of growth, and dry soil and high temperatures will be required in the ripening period of onion bulbs. The best planting time for onion plants is at the end of the rainy season and the beginning of the dry season or can be planted throughout the year as long as drainage is well maintained[15]. Shallot plants do not like flooded places, but this plant needs a lot of water, especially in the period of tuber formation[16].

[11] Saptorini Saptorini, Supandji Supandji, and Taufik Taufik, "Pengujian Pemberian Pupuk Za Terhadap Pertumbuhan Dan Produksi Tanaman Bawang Merah Varietas Bauji," *Jurnal Agrinika: Jurnal Agroteknologi Dan Agribisnis* 3, no. 2 (2019): 134–48.

[12] Fl Sudiran Tintin Istiakroh, "PENGARUH KOMUNIKASI TERHADAP PELAYANAN PRIMA KEPADA MASYARAKAT DI KANTOR LURAH BUKUAN," *ADMINISTRASI PUBLIK* 1, no. 2 (2018): 61–65.

[13] Nani Sumarni, Rini Rosliani, and Rofik Sinung Basuki, "Respons Pertumbuhan, Hasil Umbi, Dan Serapan Hara NPK Tanaman Bawang Merah Terhadap Berbagai Dosis Pemupukan NPK Pada Tanah Alluvial," 2012.

[14] N. dan A.Hidayat Sumarni, *Budi Daya Bawang Merah* (Bandung: Balai Penelitian Tanaman Sayuran, 2015).

[15] Sumarni, Rosliani, and Basuki, "Respons Pertumbuhan, Hasil Umbi, Dan Serapan Hara NPK Tanaman Bawang Merah Terhadap Berbagai Dosis Pemupukan NPK Pada Tanah Alluvial."

[16] Saptorini, Supandji, and Taufik, "Pengujian Pemberian Pupuk Za Terhadap Pertumbuhan Dan Produksi Tanaman Bawang Merah Varietas Bauji."

Red onion (Allium ascalonicum L.) Samosir

Shallot plants are widely planted in Simanindo and Sianjur Mula-Mula Districts with a planting area of 10-15 ha. In addition to these two sub-districts, shallots are also planted in Sitio-tio, Onan Runggu, Harian, Nainggolan, Palipi, and Pangururan sub-districts with planting areas between 1-8 ha. Data from the Agriculture, Fisheries, and Livestock Office of Samosir Regency until April 2013 from a harvest area of 55 ha produced 345 tons of shallots. Thus, the productivity of shallots that can be achieved is still low, which is an average of 6.27 t / ha compared to the national average of around 9.7 t / ha[17]. Samosir's local shallots are known for their distinctive attributes, including a vibrant red color, minimal water content, and a notably spicier flavor. These qualities contribute to the higher market value and selling price of this unique variety of shallots[18].

Cocopeat Planting Media

Cocopeat or coconut powder is a by-product of the process of consuming coconut husk fiber. Cocopeat has a high content of lignin and cellulose. The ingredients contained in cocopeat cause cocopeat to be resistant to bacteria and fungi. Cocopeat has a pH of 5.2-6.8 and does not decompose easily. Cocopeat is good for use as a mixture of soil in pots, seeding media, and hydroponic media (Sari, 2013). Cocopeat is a hydroponic planting medium whose use is usually mixed first with other materials such as burnt husks with a ratio of 50: 50 whose purpose is none other than to increase aeration in the growing media[19].

ZA Fertilizer

Fertilizer is one of the most important means to increase agricultural production. Its use increased rapidly after the launch of an intensification program that began in 1969. The current rice fertilization recommendations are general to all regions of Indonesia without considering soil nutrient status and the ability of plants to absorb nutrients[20]. ZA fertilizer (Ammonium Sulfate) is a fertilizer containing 20-21% N and 24% S. ZA fertilizer has acidic properties, so it is recommended that the application be

[17] Badan Pusat Statistik, "Luas Panen, Produksi Dan Produktivitas Bawang Merah," 2013, http://www.bps.go.id.

[18] Ni Luh Indrawati, S Farm, and S Si Razimin, *Bawang Dayak: Si Umbi Ajaib Penakluk Aneka Penyakit* (AgroMedia, 2013).

[19] L. Hadiawati, *Dosis Dan Manfaat Pupuk ZA Untuk Tanaman Bawang Merah* (BPTP NTB. Kementerian Pertanian, 2020).

[20] dan Antonius K. Sofyan, A., Nurjaya, "Status Hara Tanah Sawah Untuk Rekomendasi Pemupukan," 2014.

carried out on land with an alkaline or high pH [21] According to the application of ZA fertilizer is a very important fertilizer for plants because it contains S elements which function to increase the number of saplings in plants. According to that nitrogen is one of the macro elements needed in sufficient quantities for growth. Nitrogen assumes a part in invigorating plant development, particularly stems, branches, and leaves. Lack of nitrogen will cause yellow leaf color, dry leaves, thin and stunted plants, and small tubers produced.

RESEARCH METHODS

The research was carried out in Suka Raya Village, specifically in the Rampah Dua Hamlet of the Pancur Batu Deli Serdang District, spanning from July 2021 to November 2021. This study utilized factorial gathering randomized plan (RAK) with 2 elements, specifically:
Factor I. Composition of Planting Media (M) with 3 levels, namely:
M0 : *Top soil* 100%
M1 : *Top soil* 75% : *Cocopeat* 25%
M2 : *Top soil* 50% : *Cocopeat* 50%
Factor II. ZA (Z) fertilizer with 3 levels, namely:
Z0 : 0 g/ planting hole
Z1: 1 g/ planting hole
Z2: 2 g/ planting hole
So 9 combinations of treatments were obtained as follows:

M0Z0	M0Z1	M0Z2
M1Z0	M1Z1	M1Z2
M2Z0	M2Z1	M2Z2

Number of repetitions : 3 Deuteronomy

Plant Spacing: 10 cm x 15cm
Total Number of Plants: 810 Plant
Number of Samples: 135 Plant
distance between paralogs: 15 cm Random Design linear model Factorial Group :

$$\mathbf{Yijk = \mu + \rho i + \alpha j + \beta k + (\alpha\beta)jk + \varepsilon ijk}$$

[21] Ulysses S Jones, *Fertilizers and Soil Fertility.* (Reston Publishing Co., Inc., 1982).

Yijk: The results of observations for the i-level planting media factor, the j-level ZA fertilizer factor on the repeat to-k
μ: General average
ρi: Effect of an i-th block of treatment factors
αj: The influence of planting media at the j-th level
βk: Influence of ZA fertilizer on the k-th grade
(αβ) jk: Interaction between planting media at the i-th level and ZA fertilizer at the j level
Ɛijk: Experimental error for j-level planting media factor and effect of k-level ZA fertilizer on i-th repetition

RESEARCH RESULT

The results of observations on the parameters of Samosir shallot plants with the composition of planting media and ZA fertilizer and their fingerprints can be seen in appendices 4-13. Based on the fingerprint data, it can be seen that the use of ZA compost truly affects the length of plants matured 2-5 MST (weeks subsequent to planting), while the organization of the establishing medium and the cooperation of the two medicines affect plant length. The length of Samosir onion plants with the composition of planting media with ZA fertilizer at 2-6 MST can be seen in Table 1:

Table 1. The length of Samosir Shallot Plant with the treatment of Planting Media Composition with ZA Fertilizer 2-6 MST

Age	Composition of Growing Media	ZA Fertilizer			Average
		0 g/hole plant	1 g/ hole plant	2 g/ hole plant	
MST		----------cm----------			
2	Topsoil 100%	11,53	12,12	11,74	11,80
	Topsoil 75%: Cocopeat 25%	11,61	12,20	14,24	12,68
	Topsoil 50%:Cocopeat	12,51	10,55	12,67	11,91
	Average	11,88b	11,62b	12,88a	12,13
3	Topsoil 100%	13,53	14,12	14,24	13,96
	Topsoil 75%: Cocopeat 25%	13,73	14,33	16,17	14,74
	Topsoil 50%:Cocopeat	14,51	12,55	14,67	13,91
	Average	13,92b	13,67b	15,03a	14,21
	Topsoil 100%	13,81	14,29	14,40	14,17

4	Topsoil 75%: Cocopeat 25%	14,11	14,50	16,47	15,03
	Topsoil 50%:Cocopeat	15,18	14,19	15,79	15,05
	Average	14,37b	14,33b	15,55a	14,75
5	Topsoil 100%	19,16	20,92	22,19	20,76
	Topsoil 75%:Cocopeat 25%	22,04	19,70	22,59	21,44
	Topsoil 50%:Cocopeat	21,57	20,63	22,26	21,49
	Average	20,92b	20,42b	22,34a	21,23
6	Topsoil 100%	23,66	25,42	26,69	25,26
	Topsoil 75%:Cocopeat 25%	26,54	24,20	27,09	25,94
	Topsoil 50%:Cocopeat	26,07	25,13	26,76	25,99
	Average	25,42b	24,92b	26,84a	25,73

Description: Numbers followed by different letters on the same line show markedly different according to Duncan's Multiple Spacing Test at the level α = 5%.

Table 1. It can be seen that the treatment of ZA fertilizer has a noticeable influence on the length of Samosir onion plants. At the age of 2 MST – 6 MST, the highest average plant length was in the application of ZA fertilizer with a dose of 2 g / planting hole, which was significantly different from the application of ZA fertilizer doses of 0 g / planting hole and 1 g / planting hole, while the lowest average plant length was in treatment without ZA fertilizer (control).

Number of leaves

The after effects of perceptions on the boundaries of the quantity of Samosir shallots with the piece of establishing media and ZA compost and their fingerprints should be visible in Supplement 14-23. In view of the finger impression information, it tends to be seen that the treatment of the piece of the establishing media truly affects the quantity of leaves matured 2-5 MST (weeks subsequent to planting), while the utilization of ZA manure and the collaboration of the two medicines affect the quantity of leaves. The number of Samosir shallots with the composition of planting media with ZA fertilizer at 2-6 MST can be seen in Table 2.

As depicted in Table 2, it is evident that the choice of planting media composition has a discernible impact on the Samosir shallot population. Specifically, between the 2nd and 6th week after planting (MST), the highest average plant length is observed in the planting media composition of Top soil 50%: Cocopeat 50%, which significantly

differs from the compositions of Top soil 75%: Cocopeat 25% and Top soil 100%. In contrast, the treatment employing Top soil 100% as the planting media exhibits the lowest average number of Samosir shallots.

Table 2. Number of Samosir Shallots with Planting Media Composition Treatment with ZA 2-6 MST Fertilizer

Age	Composition of Growing Media	ZA Fertilizer			Average
		0 g/ hole plant	1 g/ hole plant	2 g/ hole plant	
MST		-----Sheet-----			
2	Topsoil 100%	2,13	2,13	2,40	2,22b
	Topsoil 75%: Cocopeat 25%	2,20	2,33	2,13	2,22b
	Topsoil 50%:Cocopeat 50%	2,47	2,40	2,67	2,51a
	Average	2,27	2,29	2,40	2,32
3	Topsoil 100%	3,00	2,93	3,13	3,02b
	Topsoil 75%: Cocopeat25%	3,00	3,33	3,40	3,24b
	Topsoil 50%:Cocopeat 50%	3,40	3,60	3,87	3,62a
	Average	3,13	3,29	3,47	3,30
4	Topsoil 100%	4,53	4,73	4,53	4,60b
	Topsoil 75%: Cocopeat25%	4,80	4,67	4,60	4,69b
	Topsoil 50%:Cocopeat 50%	4,60	5,00	5,00	4,87a
	Average	4,64	4,80	4,71	4,72
5	Topsoil 100%	6,53	6,80	6,73	6,69c
	Topsoil 75%:Cocopeat 25%	6,87	6,93	7,07	6,96b
	Topsoil 50%:Cocopea 50%t	6,93	7,27	7,27	7,16a
	Average	6,78	7,00	7,02	6,93
6	Topsoil 100%	9,53	9,80	9,73	9,69c
	Topsoil 75%:Cocopeat 25%	9,87	9,93	10,07	9,96b

Topsoil 50%	50%:Cocopeat	9,93	10,27	10,27	10,16a
Average		9,78	10,00	10,02	9,93

Description: Numbers followed by different letters in the same column show real differences according to Duncan's Multiple Distance Test at the level of α = 5%. The relationship between the treatment of planting media composition and the number of Samosir shallots is seen in Figure 2.

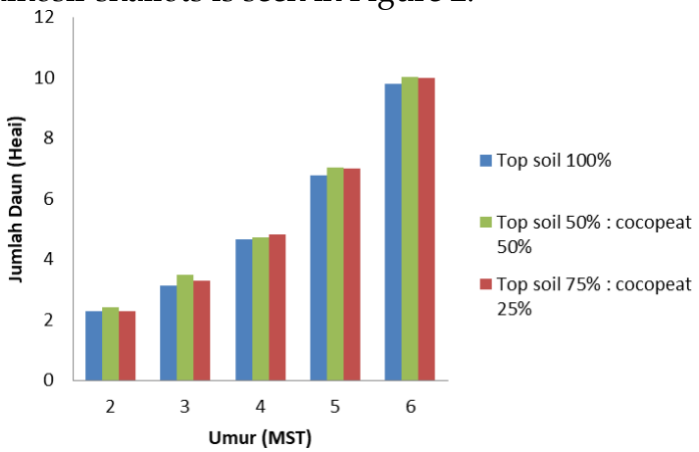

Figure 1. The Relationship between the Treatment of Planting Media Composition and ZA Fertilizer Dose on the Number of Samosir Shallots

Number of Tubers Planted

The results of observations on the parameters of the number of Samosir onion planting bulbs with the composition of planting media and ZA fertilizer and their various fingerprints can be seen in Appendix 24-25. According to the fingerprint data, it is evident that the application of ZA fertilizer significantly impacts the number of tubers per plantation. In contrast, the treatment involving the composition of the planting media and the combined effect of both treatments do not yield a significant influence on the number of planting tubers. The number of Samosir onion planting bulbs with the composition of planting media with ZA fertilizer can be seen in Table 3.

Table 3. Number of Samosir Shallot Planting Bulbs with Treatment of Planting Media Composition with ZA Fertilizer

Composition of Growing Media	ZA Fertilizer			Average
	0 g/hole plant	1 g/hole plant	2 g/hole plant	

	tubers			
Topsoil 100%	6,87	7,33	5,07	6,42
Topsoil 75%: Cocopeat 25%	8,00	8,07	5,67	7,24
Topsoil 50%:Cocopeat 50%	6,00	7,93	6,47	6,80
Rataan	6,96b	7,78a	5,73c	6,82

Description: Numbers followed by different letters in the same column show markedly different according to Duncan's Multiple Spacing Test at the level α = 5%.

Table 3. can be seen that the treatment of ZA fertilizer application has a noticeable influence on the number of bulbs planted in shallots samosir. In the application of ZA fertilizer with a dose of 1 g / planting hole, the highest average number of planting tubers is 7.78 tubers which is significantly different from the ZA fertilizer treatment with a dose of 2 g / planting hole which is 5.73 tubers and 0 g / planting hole which is 6.96 tubers and the lowest average of ZA fertilizer treatment is found at a dose of 2 g / planting hole. The relationship between ZA fertilizer treatment and the number of samosir onion planting bulbs is seen in Figure 3.

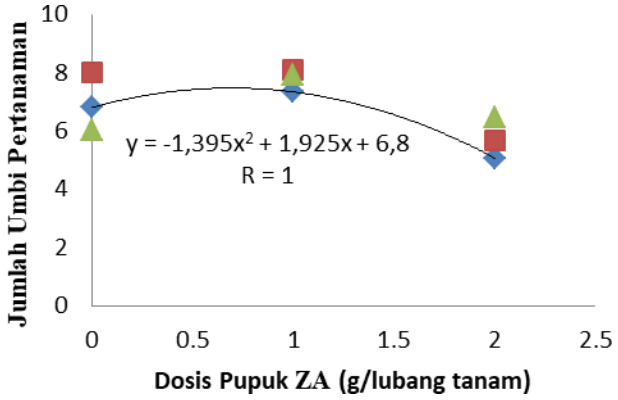

Figure 2. Response Curve of Planting Media Composition and ZA Fertilizer Dose to the Number of Samosir Shallot Planting Bulbs.

Tuber Diameter

The results of observations on the diameter parameters of Samosir onion planting bulbs with the composition of planting media and ZA fertilizer and their fingerprints can be seen in Appendix 26-27. The fingerprint data reveals a significant impact of the ZA fertilizer application treatment on tuber diameter. Conversely, the

treatment involving the composition of the planting medium and the combined effect of both treatments do not demonstrate any substantial influence on tuber diameter. You can find the specific tuber diameters associated with the planting medium composition and ZA fertilizer in Table 4.

Table 4. Diameter of Samosir Shallot Bulbs with Treatment of Planting Media Composition with ZA Fertilizer

Composition of Growing Media	ZA Fertilizer			Average
	0 g/hole plant	1 g/hole plant	2 g/hole plant	
	mm			
Topsoil 100%	13,81	14,73	15,41	14,65
Topsoil 75%: Cocopeat 25%	14,07	15,19	16,03	15,10
Topsoil 50%:Cocopeat 50%	13,65	14,99	15,85	14,83
Average	13,84c	14,97b	15,77a	14,86

Description: Numbers followed by different letters in the same column show markedly different according to Duncan's Multiple Spacing Test at the level α = 5%.

Table 4. can be seen in the treatment of ZA fertilizer application has a noticeable influence on the diameter of samosir onion bulbs. In the application of ZA fertilizer with a dose of 2 g / planting hole, it has the highest average tuber diameter of 15.77 mm which is significantly different from the ZA fertilizer treatment with a dose of 1 g / planting hole and 0 g / planting hole, while the lowest average of the ZA fertilizer treatment is at a dose of 0 g / planting hole, which is 13.84 mm.

The relationship between the treatment of ZA fertilizer and the diameter of the Samosir shallot bulbs can be seen in Figure 4.

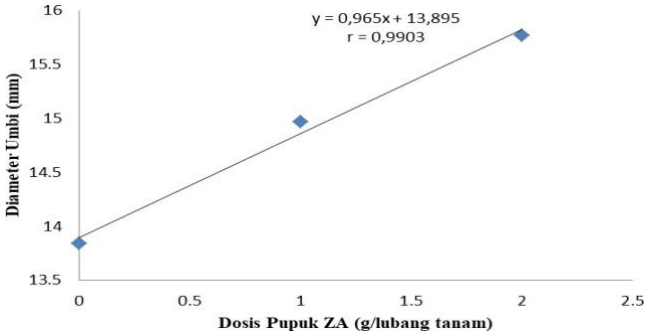

Figure 3. Response Curve of Planting Media Composition and ZA Fertilizer Dose to Samosir Shallot Bulb Diameter

Weight of fresh tubers per plant

The results of observations on the weight parameters of fresh bulbs per Samosir onion plants with the composition of planting media and ZA fertilizer and their fingerprints can be seen in Appendix 28-29. According to the fingerprint data, it is evident that the application of ZA fertilizer significantly impacts the fresh tuber weight per plant, while the treatment involving the composition of the planting medium and the combined effect of both treatments do not demonstrate any substantial influence on the fresh tuber weight per plantation. Specific data on the weight of fresh bulbs per Samosir onion plant, considering the planting medium composition and ZA fertilizer, can be found in Table 5.

Table 5. Weight of Fresh Bulbs Planted Samosir Shallots with Treatment of Planting Media Composition with ZA Fertilizer

Composition of Growing Media	ZA Fertilizer			Average
	0 g/ hole plant	1 g/ hole plant	2 g/ hole plant	
	gram			
Topsoil 100%	10,67	11,53	12,19	11,46
Topsoil 75%: Cocopeat 25%	10,91	12,01	12,85	11,92
Topsoil 50%:Cocopeat50%	10,47	11,81	12,65	11,64
Average	10,68c	11,78b	12,56a	11,68

Description: Numbers followed by different letters in the same column show markedly different according to Duncan's Multiple Spacing Test at the level α = 5%.

Table 5. can be seen in the treatment of ZA fertilizer application has a noticeable influence on the weight of fresh bulbs per Samosir onion plantation. In the application of ZA fertilizer with a dose of 2 g / planting hole, the highest average fresh weight per plant is 12.56 grams, which is significantly different from the ZA fertilizer treatment with a dose of 1 g / planting hole and 0 g / planting hole, while the lowest average of ZA fertilizer treatment is found at a dose of 0 g / planting hole, which is 10.68 grams. The relationship between ZA fertilizer treatment and the fresh weight of Samosir shallot plants is shown in Figure 5.

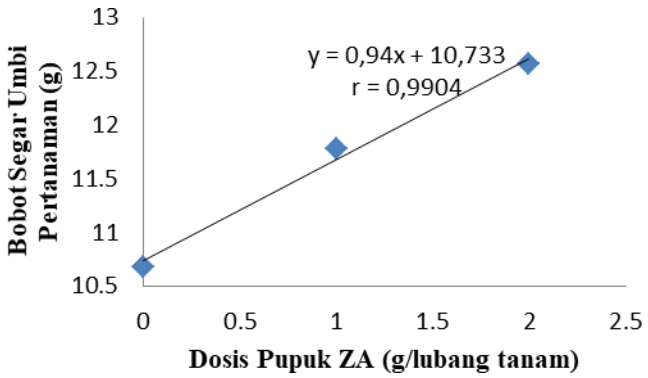

Figure 5. Response Curve of Planting Media Composition and ZA Fertilizer Dose to Fresh Bulb Weight of Samosir Shallot Plant

Dry Tuber Weight Per Plant

The results of observations on the weight parameters of dry bulbs per Samosir onion plants with the composition of planting media and ZA fertilizer and their fingerprints can be seen in Appendix 30-31. The analysis of fingerprint data reveals a significant influence of the ZA fertilizer application treatment on the dry tuber weight per plantation. However, neither the treatment involving the composition of the planting medium nor the combined impact of both treatments demonstrate any noticeable effect on the dry tuber weight per plantation. Detailed information about the weight of dry bulbs per Samosir onion plant, considering the planting medium composition and ZA fertilizer, can be found in Table 6.

Table 6. Weight of Dry Bulbs Planting Samosir Shallots with Treatment of Planting Media Composition with ZA Fertilizer

Composition of Growing Media	ZA Fertilizer			Average
	0 g/hole plant	1 g/hole plant	2 g/hole plant	
		gram		
Topsoil 100%	8,89	9,65	10,03	9,52c
Topsoil 75%: Cocopeat 25%	9,23	10,06	10,36	9,88b
Topsoil 50%:Cocopeat 50%	8,77	10,06	10,93	9,92a
Average	8,96c	9,92b	10,44a	9,77

Description: Numbers followed by different letters in the same column show markedly different according to Duncan's Multiple Spacing Test at the level α = 5%.

In Table 6. it can be seen that the treatment of ZA fertilizer has a significant influence on the weight of dry bulbs of Samosir onion plants. In the application of ZA fertilizer with a dose of 2 g / planting hole, the highest average dry weight per plant is 10.44 grams, which is significantly different from the ZA fertilizer treatment with a dose of 1 g / planting hole and 0 g / planting hole, while the lowest average of ZA fertilizer treatment is found at a dose of 0 g / planting hole, which is 8.96 grams. The manipulation of the planting medium composition exerts a notable impact on the dry bulb weight of Samosir shallot plants. Notably, the use of a planting medium composed of topsoil 50% and cocopeat 50% results in the highest average dry weight per plant, which stands at 9.92 grams. This outcome is significantly distinct from the treatments utilizing topsoil 100% and topsoil 75% with cocopeat 25%. Conversely, the lowest average dry weight is associated with the planting medium consisting solely of topsoil (100%), measuring 9.52 grams.The relationship between ZA fertilizer treatment and the dry weight of Samosir shallot plants is shown in Figure 6.

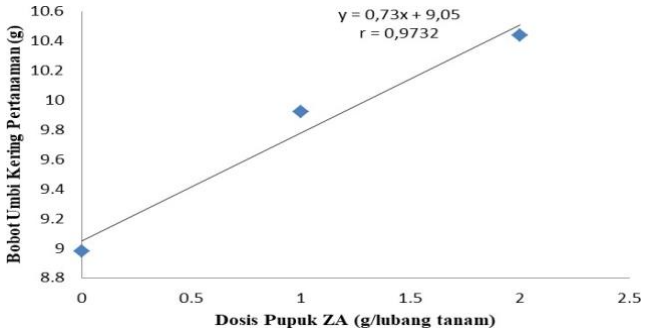

Figure 6. Response Curve of Planting Media Composition and ZA Fertilizer Dose to Dry Bulb Weight of Samosir Shallot Plant

The relationship between the treatment of the composition treatment of the planting media with the dry weight of Samosir shallot plants is seen in Figure 7.

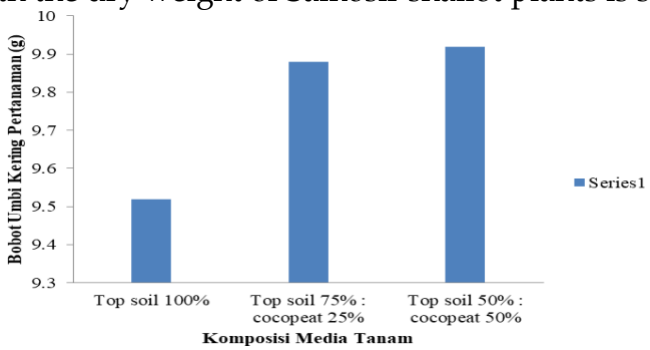

Figure 7. Histogram of Treatment of Planting Media Composition and ZA Fertilizer Dose on Dry Bulb Weight of Samosir Shallot Planting

Quercetin Analysis

The results of observations on the parameters of quercetin analysis of Samosir shallots with the composition of planting media and ZA fertilizer and their fingerprints can be seen in appendices 32-34. Based on the fingerprint data, it can be seen that the treatment of ZA fertilizer has a real effect on quercetin, as well as the treatment of planting media has a real effect on the quercetin of shallots, while the interaction of the two treatments has no real effect on the quercetin of shallots. Analysis of quercetin of Samosir shallots by applying the composition of planting media with ZA fertilizer can be seen in Table 7.

Table 7. Quercetin Analysis of Samosir Shallots with Treatment of Planting Media Composition with ZA Fertilizer

Composition of Growing Media	ZA Fertilizer			Average
	0 g/hole plant	1 g/hole plant	2 g/hole plant	
		ppm		
Topsoil 100%	7,48	10,85	6,54	8,29c
Topsoil 75%: Cocopeat 25%	11,14	10,41	7,75	9,77b
Topsoil 50%:Cocopeat 50%	10,28	13,90	10,50	11,56a
Average	9,63b	11,72a	8,26c	9,87

Description: Numbers followed by different letters in the same column show markedly different according to Duncan's Multiple Spacing Test at the level α = 5%.

Table 7. can be seen in the treatment of ZA fertilizer application has a noticeable effect on the quercetin of Samosir shallots. The application of ZA fertilizer with a dose of 1 g / planting hole has the highest quercetin average value of 11.72 ppm which is significantly different from the treatment of 0 g / planting hole and 2 g / planting hole while the lowest quercetin average in the treatment of 2 g / planting hole with a value of 8.26 ppm. The treatment of the composition of the growing medium has a significant influence on the quercetin of Samosir shallots. In the provision of the composition of planting media with a composition of topsoil 50%: cocopeat 50% has the highest average quercetin which is 11.56 ppm which is significantly different from the treatment of the composition of planting media top soil 100% and topsoil 75%: cocopeat 25% while the lowest average composition of *planting* media top *soil 100%* is 8.29 ppm. The relationship between ZA fertilizer treatment and Samosir shallot quercetin is shown in Figure 8.

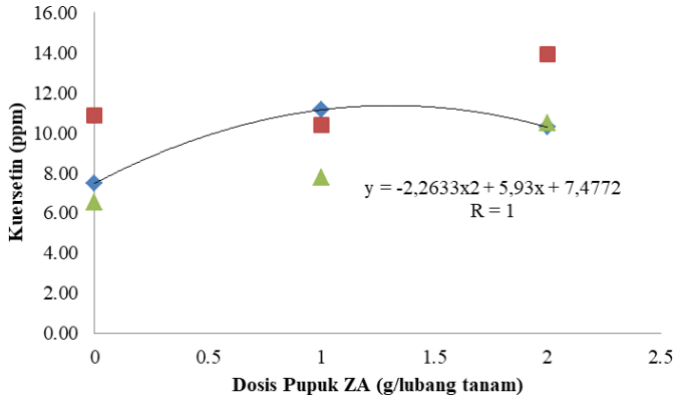

Figure 8. Response Curve of Planting Media Composition and ZA Fertilizer Dose to Samosir Shallot Quercetin Analysis.

The relationship between the treatment of planting media composition treatment with quercetin analysis of Samosir shallots is shown in Figure 9.

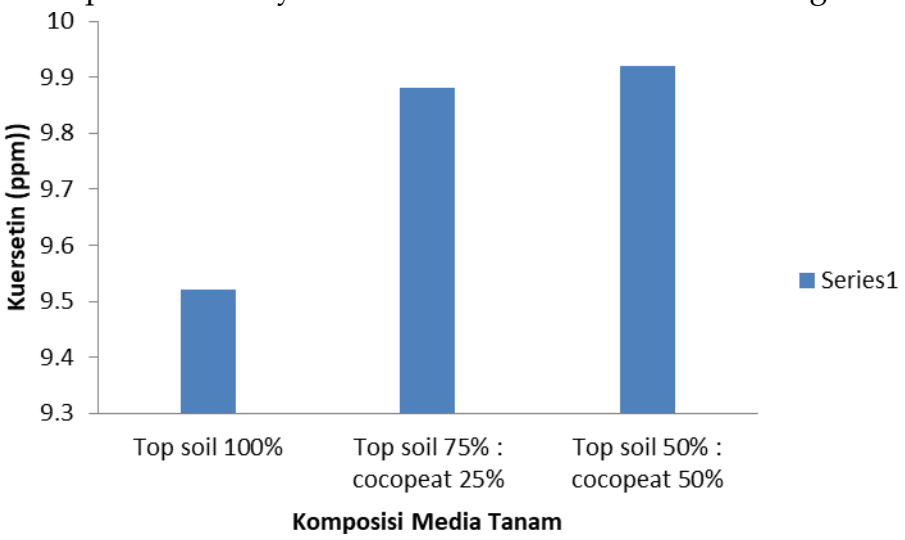

Figure 9. Histogram of Planting Media Composition and ZA Fertilizer Dose Against Samosir Shallot Quercetin

Quality of Shallots According to SNI Quality 01-3159-1992

Based on the results of research on the quality of Samosir shallots can be seen in Table 8. the following.

Table 8. Quality of Samosir Shallots with Treatment of Planting Media Composition with ZA Fertilizer according to SNI Quality

Characteristics of Research Results		Condition	
		Head I	Head II
Similarity of properties	Uniform	Uniform	Uniform

varieties			
Chiefs	Quite Old	Old	Quite Old
Violence	Loud enough	Hard	Loud enough
Diameter (cm) minimal	1,3-1,6	1,7	1,3
Drought	Dry Store	Dry Store	Dry Store
Damage (%)	8-10%	5	8
Rotten (%)	3-4	1	2
Dirt (%) (maximum weight/weig ht)	None	None	None
Up to air (%)	75-80	80-85	75-80

From the results of the study, the quality of shallots according to SNI standard 01-3159-1992 Samosir shallots are included in quality II which has the characteristics of uniform varietal similarity, quite hard, diameter bulbs 1.3-1.6 cm and moisture content 75-80%.

DISCUSSION

The Effect of Several Planting Media Compositions to Increase Shallot Production and Quality

The combination of topsoil and cocopeat as the growing medium composition notably impacts both the growth and quality of Samosir shallots, particularly in terms of the number of leaves.The results of the initial soil *and cocopeat* analysis used for planting media contained elements of C-organic 11.30%, N-total 0.75%, and P2O5 0.21% and organic matter 19.48%, and topsoil used contained C-organic 6.62%, N-total 1.02%, P-available 8.71, CEC 12.39 me / 100 g and organic matter 11.42% while in the study of Saptorini, *et al*. (2019) the use of ZA fertilizer with a dose of ZA/ha 200 kg with nitrogen element content in ZA fertilizer is 21% so that the N-total onion element requirement is around 42 kg N/ha.

The N-total content of the *composition of topsoil* and early cocopeat *planting media has a total content of* 1.77% total N so there is a deficit of N elements of 19.23% to support the growth and production of onion plants on some parameters only the number of leaves has a real effect. This aligns with the findings of Zainal and Yulius (2015), who asserted that coconut coir is a rich source of essential plant nutrients, including Potassium (K), along with other elements such as Calcium (Ca), Magnesium (Mg), Sodium (Na), and Phosphorus (P). As a result, coconut husk compost is commonly employed as a planting medium.

The Effect of Various Doses of ZA Fertilizer to Increase Shallot Production and Quality

Based on the results of research and fingerprints obtained in the treatment of ZA fertilizer application has a real effect on plant length, the number of tubers per plant, the diameter of the tubers, the fresh weight of the planting tubers, the dry weight of the planting tubers. The treatment of ZA fertilizer with a dose of 2 g / planting hole on the plant length parameter resulted in the best average plant length compared to other doses of ZA fertilizer. This is because the content of ZA fertilizer is nutrients N (21%) and S (24%) where these nutrients play a role in plant growth. N nutrients play a role in helping plant vegetative growth and the formation of chlorophyll and S plays a role in plant metabolism. This *is in accordance with Suwandi et al*., (2015), who said in accordance with the function of nitrogen nutrients for onion plants is to accelerate vegetative growth so that plants become large quickly, have wide leaves, and green, nitrogen nutrients are also useful for improving protein quality. The application of ZA fertilizer with a dose of 2 g / planting hole can meet the nutrient needs so that Samosir shallots can photosynthesize perfectly so that the photosynthetic results will be translocated optimally as well as the S nutrient which functions for plant growth, compiling protein and forming chlorophyll which will affect the final yield. As per Fatmawati et al. (2018), when chlorophyll is synthesized and favorable environmental conditions are present, photosynthesis proceeds efficiently, leading to the production of optimal photosynthates. These photosynthates are subsequently transported to the plant parts requiring them and are stored in the form of tubers. (Deng *et al*. 2019).

Another advantage of planting media such *as cocopeat as a growing medium is that* cocopeat contains essential nutrients, namely organic C-elements 11.30%, N-total 0.75% P2O5 0.21%, and organic matter 19.48%. Thus the *top soil* used contains C-organic 6.62%, N-total 1.02%, P-available 8.71, CEC 12.39 me / 100 g, and organic matter 11.42%. However, the levels of nutrients owned by *top soil*: *cocopeat* cannot meet the nutrients needed to increase the growth production and quality of Samosir shallots. The addition of ZA fertilizer is one solution for the adequacy of nutrients, especially N in increasing the growth, production, and quality of shallots, especially the aroma of shallots. Halifah, *et al* (2014) stated that the application of ZA fertilizer to onion plants affects the formation of bulbs and the aroma of bulbs. ZA fertilizer application will give a stronger onion aroma. The sharpness of the onion aroma correlates with the availability of S in the soil (Sumarni dan Hidayat, 2015).

Treatment Interaction of Several Planting Media Compositions and ZA Fertilizer Doses in Increasing Shallot Production and Quality

The combination of the use of planting media composition and ZA fertilizer has no real effect on all observation parameters, this is because the composition of *topsoil* and *cocopeat* planting media only gives about 1.77% N in total so ZA fertilizer is added to meet nutrients in the growth and production of onion plants. However, the

composition of planting media and ZA fertilizer was not enough. The use of plant containers in PVC pipes causes water in the media to be retained due to the use of planting media (*topsoil* and *cocopeat) where* cocopeat has the ability to absorb water 6 times its volume (Simatupang, 2018). As a result, the use of *topsoil* + *cocopeat* planting media will cause water retention in the pipe so that excess water in the planting media will inhibit root respiration so that the absorption of ZA fertilizer is less optimal simultaneously.

CONCLUSION

The planting medium composition of topsoil 50% and cocopeat 50% promotes enhanced growth and improved quality of Samosir shallots, as reflected in the number of leaves and quercetin content. Furthermore, the application of ZA fertilizer at a 2 g per planting hole dosage proves to be the most effective for various parameters of Samosir shallot plants, including plant length, tuber diameter, fresh weight, and dry weight. Conversely, a ZA compost treatment of 1 g for each establishing opening upgrades both the number of Samosir shallot bulbs and the quercetin content compared to other dosages. The combined effect of altering the planting medium composition and applying ZA fertilizer did not lead to improvements in the growth and quality of shallots across all observed parameters.

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