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Influence of Liquid Organic Fertilizer and Cow Manure Application on Growth and Yield of Shallot (Allium ascalonicum L.)

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Abstract

Shallots (Allium ascalonicum L.) is a horticultural plant which is widely used as a kitchen spice and as an ingredient in traditional medicine. This research aims to determine the effect of liquid organic fertilizer doses and cow manure doses on the growth and yield of shallots. The research used a Complete Randomized Block Design (RAKL) with two factors, namely the dose of liquid organic fertilizer (0 ml, 10 ml, 20 ml per plant) and the dose of cow manure (0, 5, 10, 15 tons/ha), with three replications so that there were 12 treatment combinations. The results of the research showed that applying liquid organic fertilizer had an effect on plant height and fresh stover weight, but had no effect on dry stover weight. Liquid organic fertilizer also affects the number of tubers and tuber weight per plant, but has no effect on tuber diameter. Cow manure affects plant height, number of leaves, weight of fresh stover, as well as crop yields such as number of tubers, tuber weight and tuber diameter. The combination of liquid organic fertilizer and cow manure had an effect on the number of leaves and weight of fresh stover, but had no effect on plant height, dry stover weight and tuber yield. The best combination was obtained in the treatment of 20 ml liquid organic fertilizer and 15 tons/ha of cow manure (G2S3).

Keywords: *shallots, liquid organic fertilizer, cow manure, growth, crop yields*

Introduction

Shallots (Allium ascalonicum L.) are horticultural plants that are often used by people as a complementary ingredient in cooking. In addition to being a kitchen spice, shallots are also sold in the form of extracts, powders, essential oils, fried onions and used as a medicine to lower cholesterol, blood sugar, and prevent blood clots, low blood pressure and improve blood circulation. Opportunities to develop shallot cultivation still exist in the domestic and international markets because shallots are horticultural plants that are in great demand by the public (Deedad et al., 2017).

The price and yield of shallots vary greatly, making them one of the main spices. The imbalance in the supply of crops in season and off-season is caused by pests, especially in crops planted off-season. In addition, consumer demand remains, and the shelf life of shallots is short, only 3 to 4 months. Therefore, if there is market demand, shallots must be maintained throughout the year in addition to the bulbs (Sukmasari et al., 2023).

The demand for Indonesian shallots for domestic consumption and seeds has increased by 5% annually over the past ten years. This increase is in line with the increasing population growth. Indonesian shallot production increased from 2015 to

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2020 to 893,124 tons, 964,195 tons, 1,010,773 tons, 1,233,984 tons, and 1,229,184 tons, respectively (BPS, 2020). However, in 2020, national production fell by 0.39% compared to the previous year. The area planted with shallots in Indonesia from 2011 to 2015 was as follows: 93,667 ha, 99,519 ha, 98,937 ha, 120,704 ha, and 122,126 ha (Sukmasari et al., 2023).

Both in the lowlands and highlands, shallots can be planted at an altitude of 1,000 MDPL, but the best conditions are between 0 and 400 MDPL. Shallots can grow well at temperatures between 13 and 24 degrees Celsius and are resistant to frost. The ideal air humidity for planting shallots is 50-70%, and the minimum plant temperature is 22 degrees Celsius (Sukmasari et al., 2023).

Shallots can only grow in fertile, sandy or clay soil, which is rich in organic matter, and has good drainage. Loose and fertile soil will encourage bulb growth and produce a larger harvest. The appropriate acidity for planting shallots is pH 5.6 to 6.5. Shallot roots will not grow well in dry soil, so the base of the shallots must always be kept moist. According to Yamaguchi (1983) in Zulkarnain (2013), a water supply of around 380 to 760 mm is needed throughout the shallot growing season from planting to harvest (Sukmasari et al., 2023).

To obtain optimal shallot yields, planting distance is an important planting technique. One of the best ways to optimize shallot population is to change the planting distance. Planting plants with a certain density is intended to provide enough space for each plant to grow well. By providing a planting distance that suits the needs, there will be enough space for each plant to grow well. In addition, this distance will affect the density of the plant population, the efficiency of light use, and competition between plants in the use of water and nutrients. Ultimately, this will affect the harvest. Therefore, to achieve the best productivity of chives, selecting and arranging the right planting distance is one of the important components in the cultivation process (Fjjriyah, 2017).

Many different methods have been used to improve crop yields and quality, including the use of compound fertilizers that may include a mixture of macronutrients, a combination of macro and micronutrients, macronutrients, micronutrients and hormones. The use of this type of fertilizer has been widely practiced, including direct application to plant leaves (Irfan, 2013).

Chemical pesticides are often used as a common solution to combat stem rot disease, but this method is not recommended because it can harm the environment and biological ecosystems. Because it is environmentally friendly and does not have negative impacts on humans, biodiversity, or the environment, the use of natural materials is a priority today. Considered as the best method to treat plant diseases is the use of virus extracts. Virus or pathogen-associated proteins (PR) are special proteins found in plants and function to maintain plant survival by protecting them from bacteria and viruses that cause dangerous diseases. PR proteins are able to activate genes that protect plants from stem rot (Ifadah et al., 2021).

When planting shallots, farmers usually face major problems due to pest attacks. According to data from the General Department of Plant Protection of the Ministry of Agriculture, Fusarium oxysforum disease is one of the main pathogenic fungi that causes stem rot disease in shallots in Indonesia. The attack of this disease has grown to 618 ha (Hasanah et al., 2016).

Due to the difficult-to-control plant disease attacks, increasing domestic shallot production faces many challenges. Fusarium wilt, caused by the pathogenic fungus

Fusarium oxysporum f.sp. cepa, is one of the major diseases that often attacks shallots. This disease attack can cause significant damage and a decrease in yield of up to 50%, even loss of yield (Indrawan et al., 2023).

According to data from the Central Statistics Agency (BPS), Indonesia's shallot production increased by 10.42% in 2019 to 2 million tons, up from 1.82 million tons in 2020, showing an annual increase from 1.47 million tons in 2017. According to Sukmasari & Wijaya (2022), an average increase of 8% per year continues to occur. The nitrogen (N), phosphorus (P), and potassium (K) values that are important for plants are contained in fertilizers made from cow dung. In addition, it also helps improve the physical condition of the soil, which includes aggregate density, soil pore volume, and soil water holding capacity (Sakti &Sugito, 2018).

Method

The research was carried out from August to October 2023 on agricultural land located in Bangsalan Village, Teras District, Boyolali Regency, Central Java Province, Indonesia.

The materials used in this study included shallot plants of the Bali Karet variety, agricultural land, cow manure, urea, SP-36, NPK, ZA fertilizer, 200 grams of shallot plants infected with stem rot, Biofast, and a fungicide (Acrobat 50 TW). The tools used consisted of buckets, sprayers, measuring tapes, rulers, digital scales, raffia ropes, stationery, sickles, hoes, mulch, labels, scissors, measuring cups, aerators, blenders, and plot name boards.

This study used a factorial method based on a Completely Randomized Block Design (CRBD) with three replications. The research included two treatment factors: the dose of Liquid Organic Fertilizer (G) and the dose of Cow Manure (S). The Liquid Organic Fertilizer consisted of three levels: G0 (0 ml/plant), G1 (10 ml/plant), and G2 (20 ml/plant). The Cow Manure consisted of four levels: S0 (0 or control), S1 (5 tons/ha or 150 g/plant), S2 (10 tons/ha or 300 g/plant), and S3 (15 tons/ha or 450 g/plant).

The implementation of the research began with land preparation, where the soil was plowed and hoed to a depth of 20 cm, mapped into a 50 m by 100 m area, and cleared of weeds. A total of 36 plots were prepared and grouped into three blocks. The soil type used was Regosol, classified under the Entisol suborder. Fertilization was carried out according to the treatment plan. The cow manure was applied one week before planting, while the base fertilizers (NPK 300 kg/ha, SP-36 180 kg/ha, and ZA 100 kg/ha) were applied two weeks before planting.

For seed preparation, shallot bulbs that were 80 days old, medium-sized (around 17 grams), healthy, fresh, firm, and bright-colored were selected. The bulbs were cleaned of dry outer skin, the tips were trimmed to stimulate shoot emergence and side bulb development, and then soaked in fungicide solution for two hours before planting.

Planting was done at a spacing of 15 cm by 20 cm using a screw-like motion to ensure the bulb tips were level with the soil surface. The plots were then irrigated using watering cans. Irrigation was provided every 2–3 days, depending on soil conditions. Weed control was performed manually throughout the growth period. Observations were made weekly, from the beginning of planting until harvest. Harvesting took place at 60 days after planting, when approximately 60% of the stems had soft necks, plants had lodged, and leaves began turning yellow.

The observed parameters included both growth and yield components. Growth components consisted of plant height, number of leaves, fresh stalk weight per plant, and

dry stalk weight per plant. Plant height was measured from the stem base to the tip of the tallest leaf, and leaf numbers were counted weekly. Fresh stalk weight was recorded after harvest, while dry stalk weight was measured after drying.

Yield components included the number of bulbs per plant, bulb weight per plant, dry bulb weight for consumption, and bulb diameter. Bulb numbers were counted per sample plant. Bulb weights were recorded individually after harvest, while the dry consumption weight was measured after four days of air drying. Bulb diameter was measured at the midsection using a caliper.

The data obtained were analyzed using analysis of variance (ANOVA) at a 5% significance level. If significant differences were found, the results were further analyzed using Duncan's Multiple Range Test (DMRT) to determine the differences between treatments.

Result And Discussion

Onion Plant Growth (*Allium ascalonicum* L)

To determine the effect of the treatment of liquid organic fertilizer and cow manure on the growth and yield of shallots (Allium ascalonicum L.), ANOVA (Analysis Of Variance) or analysis of variance was carried out. Meanwhile, to determine the effect of the level of treatment of liquid organic fertilizer and cow manure on the growth and yield of shallots (Allium ascalonicum L.), a further DMRT (Duncan's Multiple Range Test) test was carried out at the 5% level to differentiate the results presented in Table 1

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Table 1. Average Results of DMRT Test of the Effect of Liquid Organic Fertilizer and Cow Manure on the Growth of Red Onion Plants (*Allium ascalonicum* L)

Treatment	Growth Parameters			
	Plant Height (cm)	Number of Leaves (strand)	Fresh Storge Per Plant (g)	Dry Storage Per Plant (g)
Liquid Organic Fertilizer (G)				
G0	31,10c	35,12a	60,98a	43,35
G1	28,11a	37,74b	71,08a	52,17
G2	31,00b	38,48c	80,59b	55,42
Cow Manure (S)				
S0	27,99a	36,20a	61,36a	47,89
S1	29,53a	35,04a	82,56c	46,49
S2	28,72a	37,22a	62,76a	49,71
S3	34,03b	39,99b	76,87b	57,16
Combination of G and S Treatment (GS)				
G0S0	27,40	33,67a	55,00a	40,67
G0S1	27,83	38,20a	62,80a	51,07
G0S2	28,73	36,73a	66,27a	51,93
G0S3	31,13	35,87a	70,47a	43,73
G1S0	28,67	34,07a	84,00b	52,20
G1S1	28,80	35,20a	93,20c	43,53
G1S2	30,07	36,47a	55,23a	45,00
G1S3	27,46	38,13a	77,47a	41,73
G2S0	28,63	37,07a	55,57a	62,40
G2S1	35,80	34,47a	63,20a	44,00
G2S2	28,47	40,57b	60,07a	63,67
G2S3	37,83	44,93c	107,33d	63,80

Information: Treatments followed by the same letter in the same column show no significant difference in results.

Based on table 1, the treatment of liquid organic fertilizer (G) has an effect on the parameters of plant height growth and fresh stalks per plant, has an effect on the parameter of the number of leaves, and has no effect on the parameter of dry stalks per plant. In the parameter of plant height, the G0 treatment reached 31.10 cm, had an effect on the G1 treatment reaching 28.11 cm and G2 reaching 31.00 cm. The parameter of fresh stalks per plant, the G2 treatment reached 80.59 g, had an effect on the G0 treatment reaching 60.98 g and G1 reaching 71.08 g. While the parameter of the number of leaves, the G2 treatment reached 38.48 strands, had an effect on the G0 treatment reaching 35.12 strands and G1 reaching 37.74 strands. Liquid organic fertilizer contains auxin compounds. Auxin plays an important role in plant growth, including increasing stem diameter, root growth, and cell division. When absorbed, auxin activates energy reserves, accelerates cell division and elongation, so that the stem enlarges. (Paelongan *et al.*, 2023). Onion extract also increases the metabolism of plant cells and tissues. The concentration and stage of plant development affect the effectiveness of plant growth regulators (PGRs). (Pradita *et al.*, 2022). The increased concentration of onion extract contributes to the number of new leaves thanks to allicin and vitamin B1 (Pangestu *et al.*, 2023). In addition, in shallots there is also a compound called allin which when its

structure is damaged due to crushing can change into a thiosulfinate compound such as allicin. In addition to the auxin compound, the extract of shallot plants that show symptoms of stem rot also contains allicin compounds. Allicin can react with thiamin (Vitamin B) to form another organo sulfate, namely allithiamine, which functions to facilitate metabolism in plant tissue. (Nishimura *et al.*, 2000). Along with the smooth metabolic process, the photosynthesis process also runs smoothly so that the results of photosynthesis can also be translocated to all plant tissues optimally.

The treatment of cow manure (S) has an effect on the parameters of plant height growth, also affects the parameters of the number of leaves and fresh stalks per plant, and does not affect the parameters of dry stalks per plant. In the parameters of plant height, the S3 treatment reached 34.03 cm, influenced by the S0 treatment reaching 27.99 cm, S1 reaching 29.53 cm and S2 28.72 cm. The parameter of the number of leaves, the S3 treatment reached 39.99 strands, influenced by the S0 treatment reaching 36.20 strands, S1 reaching 35.04 strands and 37.22 strands. While the parameters of fresh stalks per plant, the S3 treatment reached 76.87 g, influenced by the S0 treatment reaching 61.36 g, S1 reaching 82.56 g and S2 62.76 g. Cow manure, which is rich in water and mucus, has a slow decomposition process so it does not produce heat (Alfit *et al.*, 2020). The content of this fertilizer includes 0.20% P2O5, 0.40% nitrogen, and 0.10% K2O. The nutrients P, N, and K are important for the formation of red onion leaves, help convert carbohydrates into protein, increase the number and size of leaves (Khadijah *et al.*, 2021). Using cow manure in the right dosage can increase the growth of red onion bulbs (Marlina *et al.*, 2020).

Red Onion Crop Results (*Allium ascalonicum* L)

Table 2. Average Results of DMRT Test of the Effect of Liquid Organic Fertilizer and Cow Manure on Shallot Plant Yield (*Allium ascalonicum* L)

Treatment	Result Parameters				
	Number of tubers per plant (fruit)	Tuber Weight Per Plant (g)	Dry Bulb Weight Consumption Per Plant (g)	Tuber Diameter Per Plant (mm) B	Tuber Diameter Per Plant (mm) K
Liquid Organic Fertilizer (G)					
G0	5,47a	51,43a	40,27a	3,00	1,83
G1	6,28b	59,82b	48,90b	3,14	1,96
G2	6,73c	66,93c	55,62c	3,87	2,39
Cow Manure (S)					
S0	5,40a	56,60a	45,16a	2,46a	1,72a
S1	5,73a	53,94a	50,40b	3,50b	2,02a
S2	5,91a	53,38a	39,44a	3,59c	1,89a
S3	7,60b	73,64b	58,04c	3,78d	2,60b
Combination of G and S Treatment (GS)					
G0S0	4,60	40,60	25,80	2,15	1,51
G0S1	6,53	57,60	53,47	2,57	1,84
G0S2	5,07	71,60	56,20	2,65	1,80
G0S3	4,87	46,27	56,27	3,47	2,12
G1S0	6,40	59,33	47,07	3,54	1,87
G1S1	5,93	56,23	47,87	3,50	2,07
G1S2	6,40	58,00	36,93	3,15	1,77
G1S3	4,93	47,33	29,13	2,99	1,90
G2S0	6,40	54,80	52,27	4,64	2,01
G2S1	6,00	60,87	42,07	3,20	1,91
G2S2	7,27	75,00	65,93	3,46	2,23
G2S3	9,53	85,07	66,13	4,67	3,68

Keterangan: Treatments followed by the same letter in the same column show no significant difference in results

Based on table 2, the treatment of liquid organic fertilizer (G) affects the parameters of the number of tubers per plant, tuber weight per plant, dry tuber consumption weight per plant, and does not affect the parameter of tuber diameter per plant. In the parameter of the number of tubers per plant, the G0 treatment reached 5.47 fruits, influenced by the G1 treatment reaching 6.28 fruits and G2 reaching 6.73 fruits. The parameter of tuber weight per plant, the G0 treatment reached 51.43 g, influenced by the G1 treatment reaching 59.82 g and G2 reaching 66.93 g. The parameter of dry tuber consumption weight per plant, the G0 treatment reached 40.27 g, influenced by the G1 treatment reaching 48.90 g and G2 reaching 55.62 g. The gibberellin hormone functions synergistically with auxin, activating cell division and stimulating the formation of roots, shoots, leaves, and plant stems (Amukti & Ramli, 2022). Auxin from onion extract affects tuber weight by stimulating cell elongation through cell wall flexion due to osmosis, which increases sweet tuber weight (Aulia *et al.*, 2022).

Potassium maintains water content and cell turgor, increasing resistance to pests and drought (Febryanto *et al.*, 2023). The cooperation of auxin and gibberellin also promotes the development of vascular tissue and cell division (Suyat *et al.*, 2021).

The treatment of cow manure (S) was significantly different on the parameters of the number of tubers per plant, tuber weight per plant, dry tuber consumption weight per plant, tuber diameter per plant. In the parameter of the number of tubers per plant, the S0 treatment reached 5.40 fruits and had an effect on the S1 treatment reaching 5.73 fruits, S2 reaching 5.91 fruits and S3 reaching 7.60 fruits. The parameter of tuber weight per plant, the S0 treatment reached 56.60 g and had an effect on the S1 treatment reaching 53.94 g, S2 reaching 53.38 g and S3 reaching 73.64 g. The parameter of dry tuber consumption weight per plant, the S0 treatment reached 45.16 g and had an effect on the S1 treatment reaching 50.40 g, S2 reaching 39.44 g and S3 reaching 58.04 g. Parameters of bulb diameter per plant (B), treatment S0 reached 2.46 mm, influenced by treatment S1 reaching 3.50 mm, S2 reaching 3.59 mm and S3 reaching 3.78 mm. Parameters of bulb diameter per plant (K), treatment S0 reached 1.72 mm, significantly different from treatment S1 reaching 2.02 mm, S2 reaching 1.89 mm and S3 reaching 2.60 mm. Manure has a significant effect on the diameter and number of shallot bulbs. The availability of the right nutrients increases the ability of plants to store photosynthates, thereby increasing the diameter of the bulbs (Mariana & Nabila, 2024). Cow manure increases crop yields by improving soil structure and adding nutrients, which are essential for plant growth (Kusuawardani *et al.*, 2024). Cow manure contains macronutrients (nitrogen, phosphorus, potassium) and micronutrients (calcium, magnesium, copper, and small amounts of manganese, copper, boron) which provide nutrients for plant growth and development, which ultimately increases crop production (Meriati, 2018). This fertilizer also improves tuber quality by improving the physical, chemical and biological properties of the soil, as well as increasing the population of microorganisms (Sakti & Sugito, 2018).

The Effect of Liquid Organic Fertilizer and Cow Manure on the Yield of Shallot (Allium ascalonicum L.)

Table 3. Summary of Analysis of Variance (ANOVA)

No	Observation Parameter	Liquid Organic Fertilizer	Cow Manure	Interaction (G×S)	Highest Value	Lowest Value
1	Plant Height (cm)	**	**	ns	37.83 (G2S3)	27.40 (G0S0)
2	Number of Leaves (leaves)	*	*	*	44.93 (G2S3)	33.67 (G0S0)
3	Fresh Biomass per Plant (g)	**	*	*	107.33 (G2S3)	55.00 (G0S0)
4	Dry Biomass per Plant (g)	ns	ns	ns	63.80 (G2S3)	40.67 (G0S0)
5	Number of Bulbs per Plant (bulbs)	*	*	ns	9.53 (G2S3)	4.60 (G0S0)
6	Fresh Bulb Weight per Plant (g)	*	*	ns	85.07 (G2S3)	40.60 (G0S0)
7	Dry Bulb Weight for Consumption	*	*	ns	66.13 (G2S3)	25.80 (G0S0)

	per Plant (g)					
8	Bulb Diameter per Plant (mm) B	ns	*	ns	4.67 (G2S3)	2.15 (G0S0)
9	Bulb Diameter per Plant (mm) K	ns	*	ns	3.68 (G2S3)	1.51 (G0S0)

Information:
ns : no real effect
* : have a real impact
** : very real influence

The combination of GxS treatment (liquid organic fertilizer and cow manure) affected the growth parameters of the number of leaves, fresh stalks per plant and did not affect the parameters of plant height, dry stalks per plant. In the parameter of the number of leaves, the highest number of leaves was in the G2S3 treatment, which was 44.93 strands and the lowest number of leaves was in the G0S0 treatment, which was 33.67 strands. The parameter of fresh stalks per plant, the highest fresh stalks per plant was in the G2S3 treatment, which was 107.33 g and the lowest fresh stalks per plant was in the G0S0 treatment, which was 55.00 g. The combination of GxS treatment (liquid organic fertilizer and cow manure) did not differ significantly on the growth parameters of the number of tubers per plant, tuber weight per plant, dry tuber weight consumption per plant, tuber diameter per plant.

Red onion extract contains the most active growth regulators and auxins for various plants and plays an important role in stimulating optimal growth. In addition, the gibberellin hormone works synergistically with auxin, stimulating gibberellin activity so that cell division occurs. The phytohormone content in red onion extract, such as auxin and gibberellin, can accelerate plant growth by affecting plant height, cell division, and root development (Amukti & Ramli, 2022). Vegetative and generative growth of plants requires adequate availability of nutrients, so that soil fertility is an important factor in agriculture. Plants that receive sufficient nutrient supply can produce optimally, while those that are deficient cannot function optimally. In general, plants have two types of nutrients, namely macro and micro, which must be given in a balanced manner because each has an important role in plant growth. One example of an effective fertilizer in increasing soil fertility is cow manure. Cow manure contains many nutrients such as nitrogen, phosphorus, and potassium which are essential for plant growth. In addition, organic materials such as cow manure also play a role in improving soil structure, contributing nutrients, and increasing the efficiency of fertilization and nutrient absorption for plant production (Sofiani *et al.*, 2022).

Conclusion

Treatment of liquid organic fertilizer (G) on the growth parameters of red onion plants (Allium ascalonicum L.) effect on plant height, fresh stalks per plant, no effect on dry stalks per plant. Liquid organic fertilizer treatment (G) on shallot (Allium ascalonicum L.) plant yield parameters effect on number of bulbs per plant, bulb weight per plant, dry bulb consumption weight per plant, no effect on bulb diameter per plant. Cow manure treatment (S) on shallot (Allium ascalonicum L.) plant growth parameters effect on plant height, also effect on number of leaves, fresh stalks per plant and no effect on dry stalks per plant. Cow manure treatment (S) on shallot (Allium ascalonicum L.) plant yield parameters effect on number of bulbs per plant, bulb weight per plant,

dry bulb consumption weight per plant, bulb diameter per plant. Combination of G and S treatments on shallot (Allium ascalonicum L.) plant growth parameters effect on number of leaves, fresh stalks and no effect on plant height and dry stalks per plant. The combination of G and S treatments on the parameters of shallot (Allium ascalonicum L.) plant yield did not affect the number of bulbs per plant, bulb weight per plant, dry bulb consumption weight per plant and bulb diameter per plant (B and K). The best combination of growth parameters and yield parameters was in the G2S3 treatment.

References

Alfit., Samosir, O. M., Nainggolan, T., & Sirait, B. A. 2020. Respon Pertumbuhan Dan Produksi Tanaman Bawang Merah (Alium Ascalonicum L.) Varietas Bangkok Terhadap Aplikasi Pupuk Kandang Sapi Dan Pupuk Nitrogen. Jurnal Agrotekda, 2(2), 13-24.

Amukti, W. R. & Ramli. 2022. Aplikasi Ekstrak Bawang Merah Untuk Meningkatkan Pertumbuhan Dan Hasil Bawang Merah (Allium Cepal. Var. Aggregatum.) Varietas Lembah Palu. J. Agrotekbis, 10(4), 375-382.

Aulia, S. N., Wibowo, S. F., & Hidayat, A. R. 2024. Pembuatan Sistem Tampung Air Atau Irigasi Tetes Sederhana Dan Membuat Pestidsida Alami Untuk Mengendalikan Hama Pada Perkebunan Jeruk. Prosiding Patriot Mengabdi, 3(01), 24-26.

Deedad, A., Samudin, S., & Ansar, M. 2017. Pertumbuhan Tanaman Bawang Merah Varietas Lembah Palu Yang Diberikan Berbagai Konsentrasi Atonik. Agroland: Jurnal Ilmu-Ilmu Pertanian, 24(1), 10-17.

Fajjriyah, N. 2017. Kiat Sukses Budidaya Bawang Merah. Yogyakarta : Bio Genesis.

Febryanto, D. D., Despita, R., & Wahyudi, T. 2023. Pengaruh Aplikasi Biourine Dan Plant Growth Promoting Rhizobacteria (PGPR) Pada Tanaman Bawang Merah. In Seminar Nasional Politeknik Pembangunan Pertanian Malang, 243-243.

Hasanah, U., Ernawati, N. M. L., & Sudantha, I. M. 2016. Uji Campuran Trichoderma Spp. Dengan Ekstrak Fungisida (Kunyit Dan Daun Sirih) Terhadap Jamur Fusarium Oxysporum F. Sp. Capsici Penyebab Penyakit Layu Pada Tanaman Cabai. Ekosains, 8(03).

Ifadah, N. F., Syarof, Z. N., Al Jauhary, M. R., & Musyaffa, H. J. (2021). Dasar-dasar Manajemen Kesuburan Tanah. Malang: Universitas Brawijaya Press.

Indrawan, T., Sudantha, I. M., & Astiko, W. 2023. Pengaruh Dosis Biofungisida Legundi (Vitex Trifolia) Fermentasi Trichoderma Terhadap Insiden Penyakit Layu Fusarium Pada Beberapa Varietas Bawang Merah (Allium Ascalonicum L.). Jurnal Ilmiah Mahasiswa Agrokomplek, 2(1), 26-36.

Irfan, M. 2013. Respon Bawang Merah (Allium Ascalonicum L) Terhadap Zat Pengatur Tumbuh Dan Unsur Hara. Jurnal Agroteknologi, 3(2), 35-40.

Khadijah, K., Rizali, A., & Sari, N. (2021). Pertumbuhan Dan Produksi Bawang Merah (Allium Ascalonicum L.) Yang Diaplikasikan Pupuk Kandang Dan Bokashi Kiambang. Jurnal Pertanian, 12(2), 77-88.

Kusumawardani, W., Suhada, I., Oklima, A. M., & Parisi, L. M. M. 2024. Efektifitas Aplikasi Pupuk Organik Cair Batuan Vulkanik Dan Pupuk Kandang Sapi Terhadap Peningkatan Hasil Tanaman Bawang Merah (Allium ascalonicum L). Jurnal Agroteknologi, 4(1), 15-21.

Mariana., & Nabila, R. 2024. Pengaruh Pupuk Kandang Sapi Dan Pupuk Kcl Terhadap Pertumbuhan Dan Hasil Tanaman Bawang Merah (Allium ascalonicum L). Lentera: Jurnal Ilmiah Sains, Teknologi, Ekonomi, Sosial, dan Budaya, 8(3), 50-56.

Marlina, N., Aminah, R. I. S., & Puspa, R. D. (2021). Peningkatan Produktivitas Bawang Merah (Allium ascalonicum L.) Dengan Pemberian Kompos Kotoran Sapi dan Jenis Mulsa. Klorofil: Jurnal Penelitian Ilmu-Ilmu Pertanian, 15(1), 23-29.

Meriati. 2018. Aplikasi Beberapa Dosis Pupuk Kandang Sapi Dalam Peningkatan Hasil Tanaman Bawang Merah (Allium Ascalonicum L). Jurnal Menara Ilmu, 12(5): 94-101.

Paelongan, A. H., & Malau, K. M. 2023. Pengaruh Ekstrak Bawang Merah (Allium Cepa L.) Sebagai Zat Pengatur Tumbuh Pada Benih Kakao (Theobroma Cacao L.). Jurnal Agro Industri Perkebunan, 185-196.

Pangestu, D. M. K. 2023. Pengaruh Pemberian Ekstrak Bawang Merah (Alium Cepa) Sebagai Zpt Alami Untuk Meningkatkan Pertumbuhan Anggrek Bulan (Phalaenopsis Hibrida) Pasca Aklimatisasi. Biofarm: Jurnal Ilmiah Pertanian, 19(1), 131-135.

Pradita, A. I., Kasifah, K., Firmansyah, A. P., & Pudji, N. P. 2022. Pertumbuhan tanaman jahe merah (Zingiber officinale var. Rubrum) pada berbagai konsentrasi ekstrak bawang merah (Allium cepa L.). Agrotekmas Jurnal Indonesia: Jurnal Ilmu Peranian, 3(1), 74-85.

Sakti, I. T., & Sugito, Y. 2019. Pengaruh Dosis Pupuk Kandang Sapi Dan Jarak Tanam Terhadap Pertumbuhan Dan Hasil Tanaman Bawang Merah (Allium Ascalonicum L.). Plantropica: Journal Of Agricultural Science, 3(2), 124-132.

Sofiani, Z., Santoso, E., & Surachman, S. 2022. Respon Pertumbuhan Dan Hasil Tanaman Bawang Merah Terhadap Pemberian Pupuk Kotoran Sapi Dan Kalium Pada Tanah Gambut. Jurnal Sains Pertanian Equator, 11(4), 158-165.

Statistik, Badan Pusat. 2020."Statistik Hortikultura". Jakarta: Badan Pusat Statistik.

Sukmasari, M. D., & Wijaya, A. A. 2022. Pemberian Berbagai Jenis Pupuk Kandang Terhadap Pertumbuhan Dan Hasil Dua Kultivar Bawang Merah (Allium Ascolanicum L.). Agrivet: Jurnal Ilmu-Ilmu Pertanian Dan Peternakan (Journal Of Agricultural Sciences And Veteriner), 10(1), 42-48.

Sukmasari, M. D., Yulianti, I., & Harti, A. O. R. 2023. Pengaruh Jarak Tanam Dan Penggunaan Pupuk Hayati Terhadap Pertumbuhan Dan Hasil Tanaman Bawang Merah (Allium Ascalonicum L.) Varietas Bali Karet. Agrivet: Jurnal Ilmu-Ilmu Pertanian Dan Peternakan (Journal Of Agricultural Sciences And Veteriner), 11(1), 29-36.

Suyat., Nurhayati, D. R., & Bahri, S. 2021. Pengaruh Ekstrak Tanaman Terhadap Pertumbuhan Dan Hasil Bebeberapa Varietas Bawang Merah (Allium Ascalonicum L.). Innofarm: Jurnal Inovasi Pertanian, 23 (2): 165-171.

Zulkarnain, Z. 2013. Budidaya Sayuran Tropis. Jakarta: PT Bumi Aksara 50.