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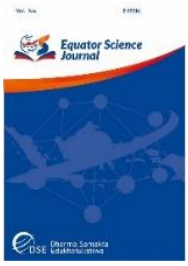

The Influence of GDM Liquid Organic Pupils On The Onion Growth of Palu Valley (*Allium wageki* Araki.) and Its Use As Learning Resources

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ABSTRACT
GDM liquid organic fertiliser is an organic-based fertiliser or nutrient that contains complete nutrients according to plant needs. This study aims to describe information on the effect of GDM liquid organic fertiliser on shallot plants of Palu Valley variety and determine the best dose in its use. This research is an experimental study using a completely randomised design (CRD), consisting of 5 treatments with 4 replications. The treatments consisted of P0 = Control (without fertiliser), P1 = 2 ml/polybag, P2 = 4 ml/polybag, P3 = 6 ml/polybag, P4 = 8 ml/polybag. Data analysis used ANOVA test and continued with BNT test. The results showed that the treatment of GDM liquid organic fertiliser had a significant effect on the growth of shallot plants of Palu Valley varieties, and the best dose for plant growth was P3= 6 ml/polybag. The results of this study were then utilised as a learning resource in the form of a practical guidebook. Based on the validation test and trial on students, the results of the research can be utilised declared feasible as a learning resource with an average percentage of assessment results of 89.34%.

INTRODUCTION

Horticultural plants are very much needed by the community in fulfilling their daily needs. One part of the horticultural plant group that has a role in fulfilling people's nutritional intake such as vitamins, minerals, and fibre is vegetables (Suparno et al., 2022). Shallots are a major vegetable commodity that has many benefits and shallots are also categorised in the non-substitutable spice group which has a

function as a seasoning for cooking flavours and is also used as a traditional medicine. (Luta et al., 2020). In addition, shallots are also a commodity with high economic value (Rohmah et al., 2023). Although in everyday life, shallots are only used as a complement or as a seasoning for food, shallots have nutritional content that can complement the main nutrients contained in the main food (Aryanta, 2019). Shallots are members of the *Liliceae* family and the Allium genus, which are often cultivated by the community (Nova et al., 2020).

The cultivation of shallot plants carried out by the community, especially in Indonesia, has actually been going on for a long time. This is supported by good agroecosystem conditions in Indonesia because the cultivation of shallot plants is very much determined by agroecosystem conditions in order to provide maximum results (Liana et al., 2024). One of the shallot varieties is Palu Valley shallot (*Allium wageki* Araki.). Palu Valley shallot is a shallot that is only found in the Central Sulawesi region and is not found in other regions. Ansar et al., (2019) explained that the red onion variety of Palu Valley is an industrial raw material that is processed into fried onions and has now become a superior product in Palu City, Central Sulawesi and is also used as a typical souvenir from Palu City. The Palu Valley shallot variety is unique in that the texture of the bulb is dense so that it can be processed into fried shallots which have an unchanged aroma and produce crispy and savoury fried shallots (Marulu et al., 2022).

Fertilisation is one of the main factors in crop cultivation, including shallots. The fertilisation process has a very important role and determines the quality and quantity of the crop (Akbar et al., 2022). Fertilisation is done with the aim of fulfilling nutrient needs and improving soil conditions so as to increase the productivity of shallot plants (Ekawati et al., 2023; Supriyatman et al., 2024).

Organic fertilisers can be a good option in their use on crops. The use of organic fertilisers can have positive implications on plants such as good nutritional development. Organic fertilisers tend to have a balanced nutrient content and are able to ensure plants get the right intake of various essential nutrients and are able to maintain agricultural sustainability. Organic fertilisers are derived from natural and renewable sources and therefore support sustainable and environmentally friendly agriculture.

Organic fertiliser is a fertiliser that is formed from a process that utilises the activity of microorganisms to convert organic matter into simpler substances. In addition, organic fertilisers have a role in ensuring soil fertility and can reduce the use of inorganic fertilisers (Warintan et al., 2021). Organic fertilisers, apart from being available in solid form such as compost, are also available in liquid form. Liquid organic fertiliser or commonly abbreviated as LOF is an organic fertiliser that is made or packaged in liquid form. Liquid organic fertiliser is an artificial fertiliser that is currently widely circulated in the market, usually made from several organic wastes that are mixed and have the ability to improve important soil properties, namely physical, chemical and biological soil (Cahyawati et al., 2022). The use of organic fertiliser is claimed to be more practical and more flexible in its use such as being able to be sprayed on the leaves so that it can be used by plants directly through the leaves (Yunanda et al., 2023). Warintan et al., (2021) explained that the use and application of liquid organic fertiliser has been widely used among farmers and plant lovers. The underlying reasons for using liquid organic fertiliser include the fact that it is easy to apply and much more efficient than solid organic fertiliser.

Nowadays, the production of liquid organic fertiliser is no longer limited to conventional methods. The existence of liquid organic fertiliser is now easily found in various places, for example in supermarkets, agricultural stores, and even available in online stores through e-commerce platforms. This will certainly make it easier for farmers or the public to meet the need for liquid organic fertiliser. One of the liquid organic fertilisers that is currently widely circulated is "GDM". GDM is a fertiliser produced by PT Graha Alam Sempurna (GAS). This fertiliser has many advantages in its use such as being able to improve biological and chemical elements in the soil and also reduce the need for the use of chemical fertilisers, being able to prevent various diseases caused by the activity of pathogens and fungi, containing organic ingredients such as bacteria, animal oil, organic waste, seaweed, and algae (Meutia et al., 2021). Some of the important contents contained in GDM liquid organic fertiliser are macro and micro nutrients that have a very large contribution to growth.

The results of this study are part of important information related to the use of GDM liquid organic fertiliser in shallot plants and as a practical guide used in the process of growing shallots. A practical guide is a document or set of instructions designed to provide clear and detailed steps or

information on how to perform a particular task or activity effectively. This practical guidebook will be a needed learning resource and is expected to be used not only in the community but also in the world of education to achieve educational goals. Pratama et al., (2024) explains that education can be said to be successful when it has achieved the goals that have been set. The purpose of a practical guide is to provide easy-to-follow guidance to readers so that they can carry out the process or task correctly, avoid mistakes, and achieve the desired results. The practical guide will provide concrete and easy-to-follow instructions for farmers or individuals who want to make good use of GDM liquid organic fertiliser. The guide will outline the steps of implementation, and the correct dosage. In addition, it can be a source of learning, especially for farmers and the community in using GDM Referring to the explanation of the problems above, the researchers conducted research on POC GDM and its effect on shallot growth (Allium wageki Araki.) and designed the research results into learning resources. The title of this research is "The Influence of GDM Liquid Organic Pupils On The Onion Growth of Palu Valley (*Allium wageki* Araki.) and Its Use As Learning Resources".

METHOD

Based on the problems that occur, research is carried out related to the effect of GDM liquid organic fertiliser on the growth of shallot plants of Palu Valley varieties to see the effect and determine the best dose suitable for shallot plants of Palu Valley varieties.

This research is an experimental research using a quantitative approach. The research design used a complete randomised design (CRD) consisting of 5 treatments and 4 repetitions. Each treatment was repeated 4 times so that 20 experimental units were obtained. Each treatment was repeated 4 times, resulting in 20 experimental units. The five treatments are P0 = Control (without fertiliser), P1 = 2 ml/polybag, P2 = 4 ml/polybag, P3 = 6 ml/polybag, P4 = 8 ml/polybag. The parameters measured were plant height, number of leaves, and number of tillers. Measurement of each parameter was conducted at 11 DAP, 18 DAP, 25 DAP, 32 DAP, 39 DAP, and 46 DAP. Particularly for the number of tillers parameter, it was calculated from 18 DAP, 32 DAP, and 46 DAP. Data were analysed using ANOVA to see the effect of each treatment and continued with the Least Significant Different (LSD) test. If the significance value shows <0.05 in ANOVA and the value of $F_{count} > F_{table}$, then it is declared a real effect and continued to the Least Significant Different test to determine the best treatment or dose. The results of the research were then made into a practical guide as a learning resource which was then validated by experts. The feasibility of learning resources is based on the criteria for the percentage of validation put forward by (Hera et al., 2014) where 0-20% is not feasible, 21-40% is less feasible, 41-60% is quite feasible, 61-80% is feasible, and 81-100% is very feasible.

RESULTS AND DISCUSSIONS

The results showed that the application of GDM liquid organic fertiliser had a real or significant effect on all observed parameters. This is evidenced by the significant difference between the Palu Valley variety shallot plants that are not given GDM liquid organic fertiliser compared to those given GDM liquid organic fertiliser and the ANOVA test results which show the significance value in all observed parameters <0.05 and the $F_{count} > F_{table}$ value. P3 dose of 6 ml/polybag is the best dose as evidenced by the results of the Least Significant Different test conducted. The average measurement results on each parameter are presented in Figure 1.

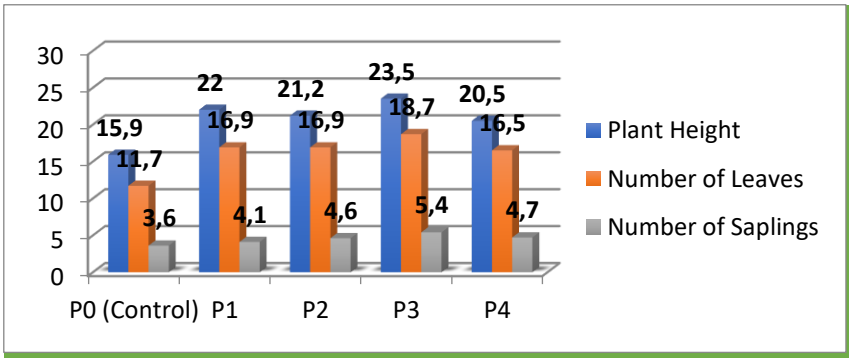

Fig 1. Average Data of Measurement Results in Each Treatment

Table 1. Hypothesis Test Results Using ANOVA

Observed Parameters	df	F_{count}	F_{table}	α	Sig
Plant Height	19	10,369			0,000
Number of Leaving	19	9,580	3,06	0,05	0,000
Number of Saplings	19	5,420			0,007

Table 2. Least Significant Different Test Results

Observed Parameters	Treatment	Average
Plant Height	P0	$15,9^{a}$
	P4	$20,5^{b}$
	P2	$21,2^{bc}$
	P1	$22,0^{bc}$
	P3	$23,5^{c}$
Number of Leaving	P0	$11,67^{a}$
	P4	$16,54^{b}$
	P1	$16,88^{bc}$
	P2	$16,92^{bc}$
	P3	$18,67^{c}$
Number of Saplings	P0	$3,58^{a}$
	P1	$4,08^{ab}$
	P2	$4,58^{bc}$
	P4	$4,66^{bc}$
	P3	$5,41^{c}$

The best treatment based on the results of the least significant difference test

Table 3. Validator Feasibility Percentage Score

Validators	Percentage (%)
Content Expert	100%
Design Expert	91,66%
Media Expert	73,84%
Students	91,88%
Average	89,34%
Conclution	Very Feasible

Based on the results obtained, it shows that the application of GDM liquid organic fertiliser has a real or significant effect on the height of shallot plants of Palu Valley varieties. This is based on the results of the ANOVA test conducted and shows the value of F_{count} (10.369) > F_{table} (3.06) or sig value < α (0.05) which is 0.000 so that it can be said to have a real or significant effect because it rejects H0

and accepts H1. This is in accordance with research conducted by (Rambe et al., 2020) which states that the application of GDM liquid organic fertiliser has a significant effect on the height of shallot plants (Allium ascalonicum). This is due to the content of nutrients in GDM liquid organic fertiliser which has the ability to trigger the process of plant growth in the aspect of plant height. The application of GDM liquid organic fertiliser supplies and meets the needs of nutrients needed by shallot plants of Palu Valley varieties, especially the need for macro nutrients such as Nitrogen (N), Phosphorus (P) and Kalium/Potassium (K). These three elements are macro-nutrients that are needed by horticultural crops such as shallot varieties of Palu Valley that are absorbed by plants from the soil. The need for these macro-nutrients is needed in sufficient quantities and when the shallot plants of the Palu Valley variety lack these macro-nutrients, it will make the growth of plant height inhibited.

The macronutrient nitrogen (N) plays an important role in plant height growth. (Utami et al., 2023) explained that the nutrient nitrogen (N) is able to stimulate overall plant growth in terms of plant height, especially in stems, leaves, and branches. Nitrogen is an important nutrient and is needed in large quantities, especially in the vegetative growth phase of plants (Irawan et al., 2021).

Environmental conditions affect the height of shallot plants of the Palu Valley variety. Shallot plants require ideal environmental conditions to grow. Yulina et al.,(2021) xplained that the growing environment and genetic interactions greatly affect the growth of plants and a good environment and good plant genetics will be able to produce good plant growth. In addition, the environment can also affect the physiological status of plants, which means that the environment has an influence on the development of the physical form of the plant (Aditiya, 2021).

P3 treatment (6 ml) has a more effective effect on the height of shallot plants of hammer valley varieties compared to other treatments such as P0 (control), P1 (2 ml), P2 (4 ml), and P4 (8 ml). The reason is because the P3 treatment shows the highest average result of all treatments which is 23.5 cm, the highest compared to the average value of the treatment P0 (15.9 cm), P1 (22.0 cm), P2 (21.2 cm), and P4 (20.5 cm). The P0 (control) is the treatment that gets the lowest result because the P0 treatment shows the average result of all treatments which is 15.9 cm.

Furthermore, in the parameter of the number of leaves, the observation results obtained show that the application of GDM liquid organic fertiliser has a real or significant effect on the number of leaves of shallot varieties of Palu Valley. This is based on the results of the ANOVA test conducted and shows the value of F_{count} (9.580) > F_{table} (3.06) or sig value < α (0.05) which is 0.000 so that it can be said to have a real or significant effect because it rejects H0 and accepts H1. This is in accordance with research conducted by (Rambe et al., 2020) which states that the provision of GDM liquid organic fertiliser has a significant effect on shallot growth (Allium ascalonicum).

The cause of the effect of GDM liquid organic fertiliser on the number of shallot leaves of the Palu Valley variety is the presence of nutrients or nutrients needed in GDM liquid organic fertiliser so as to stimulate plant growth, in this case the number of leaves. The nutrient Nitrogen (N) plays an important role in increasing the number of leaves. (Hidayati et al., 2021) stated that Nitrogen (N) can increase plant growth in the aspect of the number of leaves.

This statement is supported by (Rahmah et al., 2021) which states that the nutrient Nitrogen (N) is able to increase the number of leaves on plants so that plants that get enough Nitrogen (N) will be able to produce many leaves. Nitrogen nutrients have a role as a constituent of chlorophyll, where chlorophyll is needed in the photosynthesis process. The more chlorophyll, the more photosynthetic activity will increase which results in the development of leaf meristematic tissue which has an impact on increasing the number of leaves.

In addition, the content of Potassium (K) nutrients contained in GDM liquid organic fertiliser also plays a role in the increase in the number of leaves. (Ramadhani et al., 2020) explained that the nutrient Potassium (K) gives a very significant effect on the increase in the number of leaves on shallots. Treatment P3 (6 ml) has a more effective effect on the number of leaves compared to P0 (Control), P1 (2 ml), P2 (4 ml), and P4 (8 ml). The reason is because the P3 treatment shows the highest average result of all treatments which is 18.67, the highest compared to the average value of the treatment P0 (11.67), P1 (16.88), P2 (16.92), and P4 (16.54). The P0 (control) treatment is the treatment that gets the lowest result because the P0 treatment shows the average result of all treatments which is 11.67.

The parameter of the number of tillers shows that the application of GDM liquid organic fertiliser has a real or significant effect on the number of shallot tillers of Palu Valley varieties. This is based on

the results of the ANOVA test conducted and shows the value of $F_{Count}(5.420) > F_{table}(3.06)$ or sig value < α (0.05) which is 0.007 so that it can be said to have a real or significant effect because it rejects H0 and accepts H1.

The presence of nitrogen (N) and phosphorus (P) nutrients affects the growth in the number of shallot tillers. The content of nitrogen (N) and phosphorus (P) in GDM liquid organic fertiliser plays an important role in the growth of the number of shallot tillers of the Palu Valley variety. Shallot plants can grow and produce normally if given fertilisers that contain sufficient and balanced amounts of nitrogen and phosphorus. (Mustikawati et al., 2020) also stated that the absence of phosphorus or phosphorus deseciency will cause plant growth to be very slow, weak, and grow in a stunted form.

Treatment P3 (6 ml) has a more effective effect on the increase in the number of tillers compared to P0 (Control), P1 (2 ml), P2 (4 ml), and P4 (8 ml). The reason is because the P3 treatment shows the highest average result of all treatments which is 5.41, the highest compared to the average value of the treatment P0 (3.58), P1 (4.08), P2 (4.58), and P4 (4.66). The P0 (control) treatment is the treatment that gets the lowest result because the P0 treatment shows the average result of all treatments which is 3.58.

To determine the best dose of all treatments, the least significant difference test was conducted as a further test. The results showed that the P3 treatment with a dose of 6 ml was the best dose because the BNT test results showed that P3 was the best dose for all observed parameters by looking at the differences with other treatments and the level of effectiveness against other treatments. Therefore, giving a dose of 6 ml of GDM liquid organic fertiliser per polybag is the best dose for the growth of shallot plants of Palu Valley variety.

CONCLUTION AND SUGGESTION

Based on the results of the study, it can be concluded that the application of GDM liquid organic fertiliser affects the growth of shallot plants of Palu Valley varieties. The best dose of GDM liquid organic fertiliser for the growth of shallot plants of Palu Valley varieties is P3 = 6 ml of GDM liquid organic fertiliser/polybag. The results of the study are very feasible to use and can be utilised as a learning resource in the form of a practical guidebook with a feasibility percentage of 89.34%.

REFERENCE

Aditiya, D. R. (2021). Herbisida : risiko terhadap lingkungan dan efek menguntungkan. *Sainteknol : Jurnal Sains dan Teknologi*, *19*(1), 6–10. https://journal.unnes.ac.id/nju/index.php/sainteknol/article/view/28371

Akbar, M., Quraysh, Q., & Borman, R. I. (2022). Otomatisasi pemupukan sayuran pada bidang hortikultura berbasis mikrokontroler arduino. *Jurnal Teknik dan Sistem Komputer*, *2*(2), 15–28. https://doi.org/10.33365/jtikom.v2i2.109

Ansar, M., Bahrudin, & Dwi, P. (2019). Pertumbuhan dan hasil tanaman bawang merah "varietas lembah palu" dengan pola tanam berbeda di antara tanaman cabai. *Jurnal Pembangunan Daerah*, *1*(1), 7–11. http://jurnalbppid.sultengprov.go.id/index.php/bomba

Aryanta, I. W. R. (2019). Bawang Merah dan Manfaatnya Bagi Kesehatan. *E-Jurnal Widya Kesehatan*, *1*(1), 1–7.

Cahyawati, A. N., Kusuma, L. T. W. N., Widiyawati, S., Lustyana, A. T., Putro, W. W., Setyanto, N. W., Maghdiyyah, Z. A., Kirana, A. Z., Fitri, A. M., Maulida, A. S., Aufi, Y. N., Alia, C. P. T., & Budiarko, A. P. (2022). Pemanfaatan sampah organik menjadi pupuk organik cair dengan pendekatan effective microorganisms yang berbasis sustainable manufacturing. *TEKAD : Teknik Mengabdi*, *1*(1), 23–30. https://doi.org/10.21776/ub.tekad.2022.01.1.4

Ekawati, D., Ardi, A., & Rindi, F. (2023). Respon pertumbuhan dan produksi tanaman bawang merah (*Allium ascalonicum*, L) terhadap pemberian poc limbah tahu dan npk majemuk. *Jurnal Ilmiah Fakultas Pertanian*, *4*(2), 17–24.

Hera, R., Khairil, & Hasanuddin. (2014). Pengembangan handout pembelajaran embriologi berbasis

kontekstual pada perkuliahan perkembangan hewan untuk meningkatkan konsep mahasiswa di universitas muhammadiyah aceh. *Jurnal EduBio Tropika*, *2*(2), 187–250. https://jurnal.usk.ac.id/JET/article/view/5263

Hidayati, S., Nurlina, N., & Purwanti, S. (2021). Uji pertumbuhan dan hasil tanaman sawi dengan pemberian macam pupuk organik dan pupuk nitrogen. *Jurnal Pertanian Cemara*, *18*(2), 81–89. https://doi.org/10.24929/fp.v18i2.1638

Irawan, S., Tampubolon, K., Elazhari, & Julian. (2021). Pelatihan pembuatan pupuk cair organik dari air kelapa dan molase, nasi basi, kotoran kambing serta activator jenis produk EM4. *Jurnal PKM Journal Liaison Academia and Society (J-LAS)*, *1*(3), 1–18. http://j-las.lemkomindo.org/index.php/J-LAS/issue/view/J-LAS/showToc

Liana, D., Panjaitan, F. J., Taopan, R. A., Astuti, T., Purba, D. P., Knaofmone, E., Ariefin, M. N., Adi, D. D., Choirunnisa, J. P., Mulu, M., Jelatu, S., & Rofita, D. (2024). Penerapan Teknologi budidaya bawang merah bima brebes sesuai kondisi agroekosistem untuk meningkatkan pengetahuan kelompok tani "bantang cama". *PengabdianMu: Jurnal Ilmiah Pengabdian Kepada Masyarakat*, *9*(5), 912–920. https://doi.org/10.33084/pengabdianmu.v9i5.6534

Luta, D. A., Mahareni Br Sitepu, S., & Syahfitri Harahap, A. (2020). Pemanfaatan Kompos dalam pembudidayaan bawang merah pada pekarangan rumah di desa tomuan holbung kecamatan bandar pasir mandoge. *Jurnal Prodikmas Hasil Pengabdian Kepada Masyarakat*. https://doi.org/10.30596/jp.v5i1.5746

Marulu, P. L., Junaidi, J., & Fadjryani, F. (2022). Penerapan peta kendali T^2 hotelling algoritma fast minimum covariance determinant pada pengendalian kualitas bawang merah varietas lembah palu. *Jambura Journal of Probability and Statistics*, *3*(2), 97–109. https://doi.org/10.34312/jjps.v3i2.15522

Meutia, R. I., Nurahmi, E., & Jumini, J. (2021). Pengaruh komposisi media tanam dan konsentrasi pupuk organik cair gdm terhadap pertumbuhan bibit kakao (*Theobroma cacao* L.). *Jurnal Ilmiah Mahasiswa Pertanian*, *6*(4), 72–80. https://doi.org/10.17969/jimfp.v6i4.18711

Mustikawati, R., Tadjudin, & Afandi. (2020). Effect of phosphorus and sulfur fertilizers on growth and tield shallots (*Allium ascalonicum* L.) bima variety. *Agroswagati Jurnal Agronomi*, *8*(2), 58–66. https://doi.org/10.33603/agroswagati.v8i2.4945

Nova, N., Zakiah, Z., & Mukarlina, M. (2020). Pertumbuhan bawang merah (*Allium Cepa* Var. Bauji) pada tanah gambut dengan penambahan tricho-kompos kotoran bebek. *Jurnal Protobiont*, *9*(2), 109–116.

Pratama, Y. A., Jamhari, M., & Agni, R. (2024). Application of the group investigation (gi) type cooperative learning model to increase students ' interest in learning in class x- j of sma negeri 1 torue. *Equator Science Journal (ESJ)*, *2*(1), 31–38. https://doi.org/10.61142/esj.v2i1.123

Rahmah, S., Mardin, S., & Purwanto. (2021). Aplikasi pupuk daun yang di perkaya dengan silika untuk meningkatkan pertumbuhan dan hasil tanaman kacang hijau (*Vigna radiata* L.). *Jurnal Pertanian Peradaban*, *01*(02), 17–27.

Ramadhani, N. F., Hayati, M., & Hayati, R. (2020). respon pertumbuhan dan hasil bawang merah akibat dosis pupuk kalium dan konsentrasi poc limbah tahu. *Jurnal Ilmiah Mahasiswa Pertanian*, *4*(1), 184–192. https://doi.org/10.17969/jimfp.v4i1.10292

Rambe, B. S., Ningsih, S. S., & Gunawan, H. (2020). Pengaruh pemberian pupuk npk mutiara dan pupuk organik cair gdm terhadap pertumbuhan dan produksi tanaman bawang merah. *Bernas*, *15*(2), 64–73. http://www.jurnal.una.ac.id/index.php/jb/article/view/773

Rohmah, N. H., Alif, T., & Wahidah, F. F. (2023). Efektivitas tanaman seledri (*Apium Graveolens* L.) sebagai tanaman repelensi populasi dan serangan spodoptera litura f. pada budidaya bawang merah (*Allium ascalonicum* L.) Di Desa Pesanggrahan. *Jurnal Matematika Dan Sains*, *3*(1), 13–22. https://doi.org/10.55273/jms.v3i1.183

Suparno, S., Ruben Tinting S, & Ellen Christ Tambunan. (2022). Pembinaan pemanfaatan pekarangan untuk komoditi hortikultura di desa goha kecamatan batu mandi kabupaten balangan. *J-ABDI: Jurnal Pengabdian Kepada Masyarakat*, *2*(5), 4887–4892. https://doi.org/10.53625/jabdi.v2i5.3569

Supriyatman, S., Kade, A., Darmadi, I. W., Miftah, M., Supriyadi, S., & Ismail, I. (2024). Competence of Junior high Schools' Science Teachers in Implementing Laboratory Teaching: A Case Study

on Palu, Centre Celebes. *Jurnal Penelitian Pendidikan IPA*, *10*(6), 3114–3122. https://doi.org/10.29303/jppipa.v10i6.7510

Utami, Y., Suyitman, S., Rastosari, A., Edwin, T., & Suharto, E. L. S. (2023). Kombinasi media tanam berbeda terhadap pertumbuhan *Indigofera zollingeriana*. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*, *25*(2), 240. https://doi.org/10.25077/jpi.25.2.240-245.2023

Warintan, S. E., Purwaningsih, Tethool, A., & Noviyanti. (2021). Pupuk organik cair berbahan dasar limbah ternak untuk tanaman sayuran. *Dinamisia : Jurnal Pengabdian Kepada Masyarakat*, *5*(6), 1465–1471. https://doi.org/10.31849/dinamisia.v5i6.5534

Yulina, N., Ezward, C., & Haitami, A. (2021). Karakter tinggi tanaman, umur panen, jumlah anakan dan bobot panen pada 14 genotipe padi lokal. *Jurnal Agrosains Dan Teknologi*, *6*(1), 15–24. jurnal.umj.ac.id/index.php/ftan/index

Yunanda, F., Nyoman, S. I., & Putu, S. I. (2023). Pengaruh pemberian berbagai pupuk organik terhadap sifat fisik tanah, kimia tanah, dan produksi kacang tanah (*Arachis hypogaea* L.) di kecamatan kediri. *Jurnal Ilmiah Mahasiswa Agrokomplek*, *1*(3), 294–303. https://doi.org/10.29303/jima.v1i3.2148