

DAFTAR PUSTAKA

- Adhani, R., Husaini. 2017. *Logam Berat Sekitar Manusia*. Lambung Mangkurat University Press. ISBN: 978-602-6483-47-8
- Aprilia, W. P. 2021. Analisis Logam Berat Dalam Sedimen Berdasarkan Geoaccumulation Index (Ige) Di Sungai Winongo, DI Yogyakarta.
- Alaboudi, A., K., Ahmed, B., Brodie, G. 2018. Phytoremediation of Pb and Cd contaminated soils by using sunflower (*Helianthus annuus*) plant. *Annals of Agricultural Sciences*. Volume 63, Issue 1. Pages 123-127.
- Antoniadis, V., Shaheen, M. S., Stark, J. H., Wennrich, R., Levizou, E., Merbach, I., Rinklebe, J. 2021. Phytoremediation potential of twelve wild plant species for toxic elements in a contaminated soil. *Environment International* 146. 106233.
- Bhat., S., A, Omar, B., Syed, A., U., H., Tawheed, A., Asif, R, Mudasir, A, Juliana, H., P., A., P, Farooq, S. 2022. Phytoremediation of heavy metals in soil and water: An eco-friendly, sustainable and multidisciplinary approach. *Chemosphere*. Volume 303, Part 1,
- Burlec, A. F., Pecio, Ł., Mircea, C., Cioancă, O., Corciovă, A., Nicolescu, A., & Hăncianu, M. 2019. Chemical profile and antioxidant activity of Zinnia elegans Jacq. fractions. *Molecules*, 24(16), 2934.
- Chauhan, P., Mathur, J. 2020. Phytoremediation efficiency of *Helianthus annuus* L. for reclamationof heavy metals-contaminated industrial soil. *Environmental Science and Pollution Research*. 27:29954–29966.
- DalCorso, G., Fasani, E., Manara, A., Visioli, G., & Furini, A. 2019. Heavy Metal Pollutions: State of the Art and Innovation in Phytoremediation. *International Journal of Molecular Sciences*, 20(14), 3412. MDPI AG. Retrieved from <http://dx.doi.org/10.3390/ijms20143412>
- Ehsan, N., Nawaz, R., Ahmad, S., Arshad, M., Umair, M., & Sarmad, M. 2016. Remediation of Heavy Metal-Contaminated Soil by Ornamental Plant Zinnia (Zinnia elegans L.). *Asian Journal of Chemistry*, 28(6).
- 
- ar, M., & Bintara, A. 2021. Analisis Risiko Kesehatan Lingkungan bal (Pb) pada Pa'limbang-limbang di Jl. Urip Sumoharjo Kota rnal Sanitasi dan Lingkungan, 2(1), 128-138.
- íquez, R., Gari, V., Abraira, S, P., Bautista, F, L. 2022. Coupling tion of Pb-contaminated soil and biomass energy production: A Life Cycle Assessment. *Science of the Total Environment* 840.

- Gamage, S. S. W., Masakorala, K., Brown, M. T., & Gamage, S. M. K. W. 2021. Comparative phytoremediation potentials of Impatiens balsamina L. and Crotalaria retusa L. for soil contaminated with used lubricating oil. *Environmental Advances*, 5, 100095.
- Glišić, Radmila & Simic, Zoran & Grbovic, Filip & Rajacic, Vera & Brankovic, Snezana. 2021. Phytoaccumulation of metals in three plants species of the Asteraceae family sampled along a highway. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*. 49. 12180. 10.15835/nbha49212180.
- Guerra Sierra BE, Muñoz Guerrero J, Sokolski S. 2021. Phytoremediation of Heavy Metals in Tropical Soils an Overview. *Sustainability*. 13(5):2574. <https://doi.org/10.3390/su13052574>
- Hatika, G. R. 2022. Kandungan Logam Berat dalam Tanah pada Daerah Sekitar Penambangan Emas di Sungai Kuantan. *Jurnal Sainsmat*. Vol. XI, No. 1. Halaman 95-103
- Hamzah, Amir. Priyadarshini, R. 2019. *Remediasi Tanah Tercemar Logam Berat* (R. M. Putri, ed.). Malang: UNITRI Press.
- Hernahadini, N., Muhamram, L. H., & Istiqomah, N. A. 2020. Uji Kemampuan Daya Serap Hanjuang (Cordyline fruticosa) Sebagai Agen Fitoremediasi Logam Pb Pada Media Tanah. *Jurnal Biotehnologi & Biosains Indonesia (JBBI)*, 7(1), 114–120. <https://doi.org/10.29122/jbbi.v7i1.3859>
- Hidayati, N. 2013. Mekanisme fisiologis tumbuhan hiperakumulator logam berat. *Jurnal Teknik Lingkungan*, 14(2), 75-82.
- Irhamni, I., Pandia, S., Purba, E., & Hasan, W. 2017. Kajian akumulator beberapa tumbuhan air dalam menyerap logam berat secara fitoremediasi. *Jurnal Serambi Engineering*, 1(2).
- Jiang, Youngbin. Li, Zhangbao. yan, Xinpei. Qing, Zhixiong. Huang, R. 2019. Field scale remediation of Cd and Pb contaminated paddy soil using three mulberry (*Morus alba* L.) cultivars. *Ecological Engineering*, Volume 129, Pages 38-44.
- Juhriah, Islamiah, D., Umar, R., M. 2023. Phytoremediation Ability Of Ornamental Plants Celosia argentea L. and Mirabilis jalappa L. in Plumbum (Pb) Contaminated Soil. *ture*. Vol. 24, No. 1.
- 
- Ali. Kiyani, Amna. Mirza, Cyrus Raza. But, Tayyab Ashfaq. Barros, 2021. Ornamental plants for the phytoremediation of heavy metals: vledge and future perspectives. *Environmental Research*, 195,
- Optimized using trial version**
www.balesio.com
- an, M., Tariq, S., Jabeen, S., Jamal, A., Alomrani, S. O., & Riaz, A. 2024. Microbe assisted phytoremediation of heavy metal contaminated soil using African marigold (*Tagetes erecta* L.). *Plant Stress*, 11, 100369.

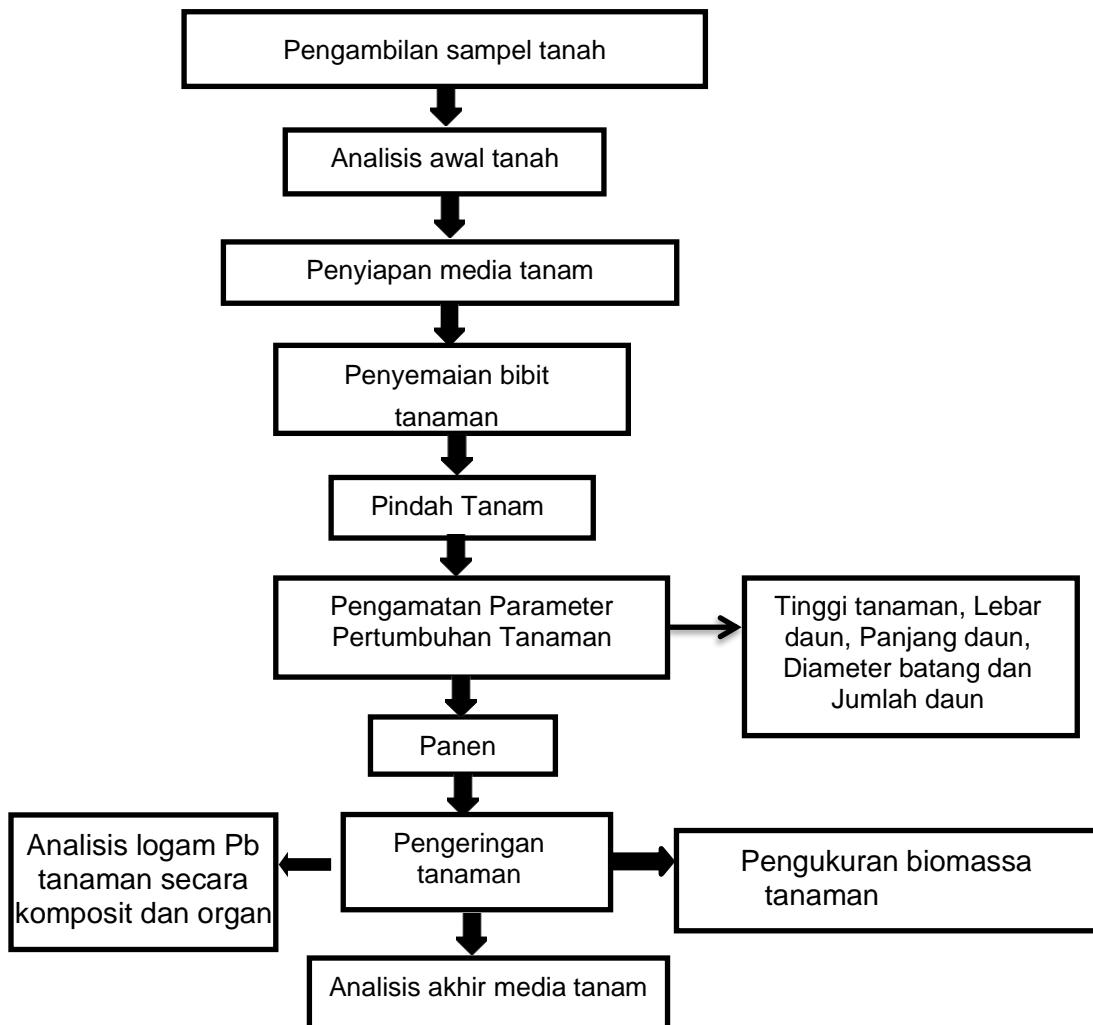
- Kurniawan, S. B., Ramli, N. N., Said, N. S. M., Alias, J., Imron, M. F., Abdullah, S. R. S., Hasan, H. A. 2022. Practical limitations of bioaugmentation in treating heavy metal contaminated soil and role of plant growth promoting bacteria in phytoremediation as a promising alternative approach. *Heliyon*, 8(4), e08995.
- Lestari, W., Martina, A., & Wardani, I. 2023. Germination Capacity of *Helianthus annuus* Less Seeds on Soil Media Contaminated by Waste. *Jurnal Biologi Tropis*, 23(2), 154-163.
- Madanan, M. T., Shah, I. K., Varghese, G. K., & Kaushal, R. K. 2021. Application of Aztec Marigold (*Tagetes erecta L.*) for phytoremediation of heavy metal polluted lateritic soil. *Environmental Chemistry and Ecotoxicology*, 3, 17-22.
- Mahardika, G., Rinanti, A., & Fachrul, M. F. 2018. Phytoremediation of heavy metal copper (Cu²⁺) by sunflower (*Helianthus annuus L.*). In IOP conference series: *earth and environmental science*. Vol. 106, No. 1, p. 012120. IOP Publishing.
- Mawaddah, N., Musyrapah, R., Mulyani, N. S., & Supriyatna, A. 2024. Inventarisasi Tanaman Dan Potensinya Sebagai Agen Fitoremediasi di Kawasan Masjid Raya Al Jabbar Bandung. *Jurnal Teknologi Pangan dan Ilmu Pertanian*, 2(2), 73-80.
- Munazir, M., Qureshi, R., Munir, M., & Mukhtar, H. 2022. Role of Phytoremediation as a Promising Technology to Combat Environmental Pollution. In *Phytoremediation for Environmental Sustainability* (pp. 423-466). Singapore: Springer Nature Singapore.
- Muslimah, M. muslimah. 2017. Dampak Pencemaran Tanah Dan Langkah Pencegahan. *Jurnal Penelitian Agrisamudra*, 2(1), 11–20. <https://doi.org/10.33059/jpas.v2i1.224>
- Nedjimi, B. (2021). Phytoremediation: a sustainable environmental technology for heavy metals decontamination. *SN Applied Sciences*, 3.
- Njoku, K. L., & Nwani, S. O. 2022. Phytoremediation of heavy metals contaminated soil samples obtained from mechanic workshop and dumpsite using Amaranthus spinosus. *Scientific African*, 17, e01278. <https://doi.org/10.1016/j.sciaf.2022.e01278>
-
- Optimized using
trial version
www.balesio.com
- Alamah, Andi. 2017. Identifikasi Spesies Famili Asteraceae Di indonesia Depok. *Jurnal Pro-Life*. Vol. 4. No. 1.
- Ajuruk, L. 2023. Pemanfaatan Biochar dan Konsorsium Bakteri pada tanah Tercemar Logam Berat dan Pengaruhnya terhadap Hasil Sayur (Brassica Juncea L.). Agrotekma: *Jurnal Agroteknologi dan Ilmu*, 1, 46-55.
- Rahmawati, Ida., Sulistiyowati, Indah, Tutut. 2021. Identifikasi Jenis Tumbuhan dari Famili Asteraceae Di Kawasan Wisata Irenggolo Kediri. *Jurnal Stigma*. Vol. 14.

No.1.

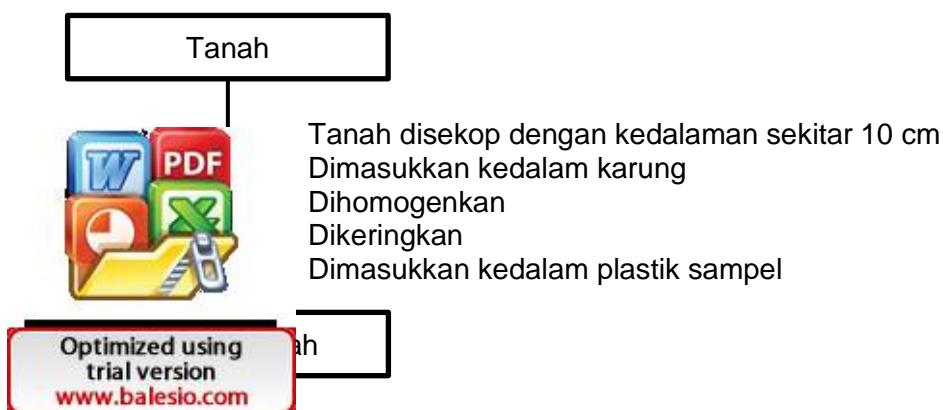
- Ratnawati, R., & Fatmasari, R. D. 2018. Fitoremediasi tanah tercemar logam timbal (Pb) menggunakan tanaman lidah mertua (*Sansevieria trifasciata*) dan jengger ayam (*Celosia plumosa*). Al-Ard: Jurnal Teknik Lingkungan, 3(2), 62-69.
- Rosariastuti, R., Taruno, D., Hartati, S., & Atmojo, S. W. 2018. Effect of bioremediation in soil of paddyfield contaminated by chromium (Cr) on soil fertility and chromium uptake by plant in karanganyar, central java. Bulgarian Journal of Agricultural Science, 24(6), 1027–1033.
- Sari, N. E. P., Nurlela, N., & Wardoyo, S. E. 2019. Fitoremediasi Tanah Tercemar Logam Berat Cd Dengan Menggunakan Tanaman Hanjuang (*Cordyline fruticosa*). *Jurnal Sains Natural*, 9(2), 57. <https://doi.org/10.31938/jsn.v9i2.230>
- Sukono, G. A. B., Hikmawan, F. R., Evitasari, D. S., & Satriawan, D. 2020. Mekanisme fitoremediasi. *Jurnal Pengendalian Pencemaran Lingkungan (JPPL)*, 2(02), 40-46.
- Yang, Y., Liao, J., Chen, Y., Tian, Y., Chen, Q., Gao, S., Luo, Z., Yu, X., Lei, T., Jiang, M. 2022. Efficiency of heterogeneous chelating agents on the phytoremediation potential and growth of *Sasa argenteostriata* (Regel) E.G. Camus on Pb-contaminated soil. *Ecotoxicology and Environmental Safety* 238. 113603.
- Zulfikar, Khairunnisa, dan Yasir. 2019. Pengaruh Ekstrak Daun Bunga Tahi Ayam (*Tagetes erecta*) Terhadap Kematian Larva *Aedes aegypti*. SEL. *Jurnal Penelitian Kesehatan*. 6(2): 66- 73.



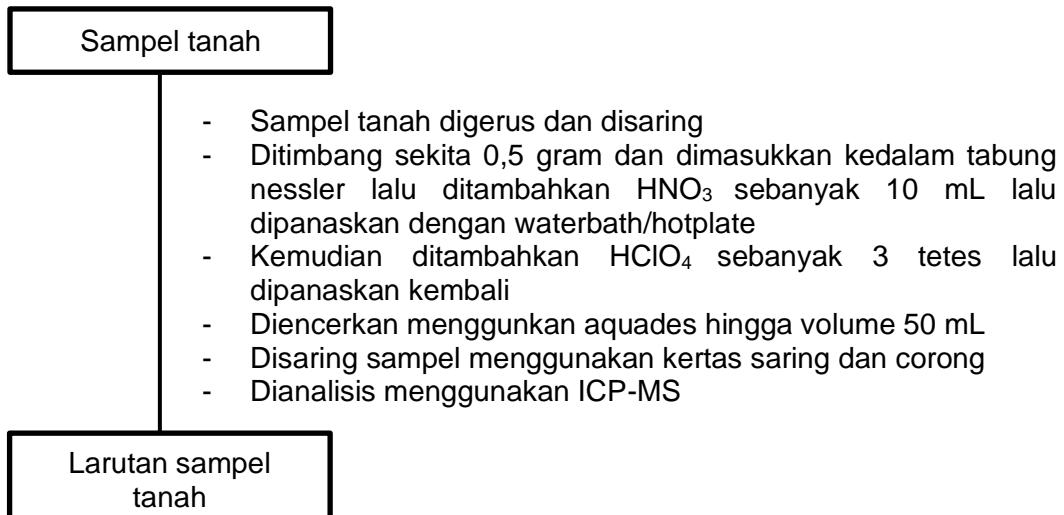
Lampiran 1. Skema Kerja Penelitian



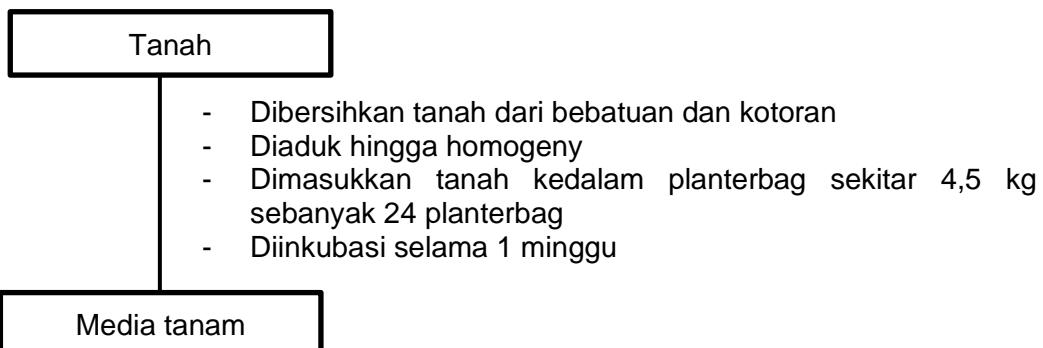
Lampiran 2. Skema kerja pengambilan tanah



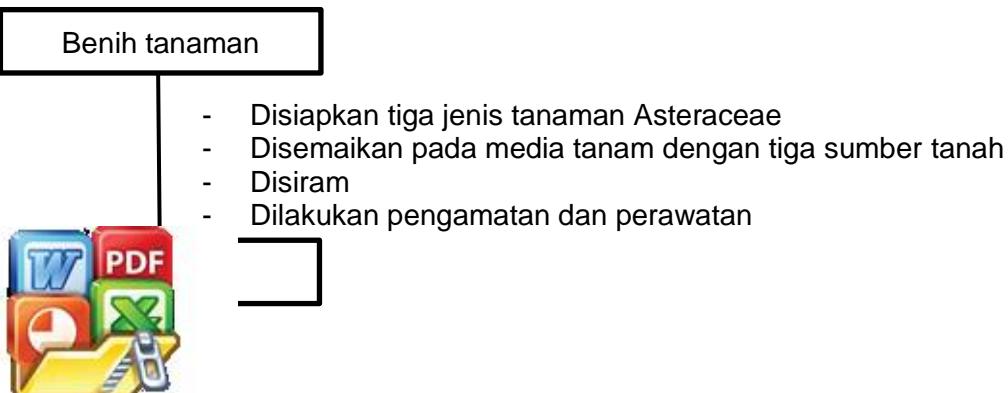
Lampiran 3. Skema kerja preparasi sampel tanah (analisis awal)



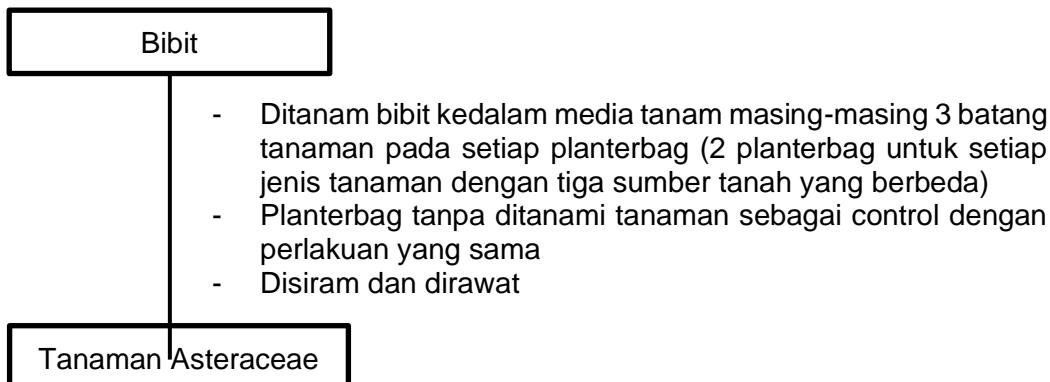
Lampiran 4. Skema kerja persiapan media tanam



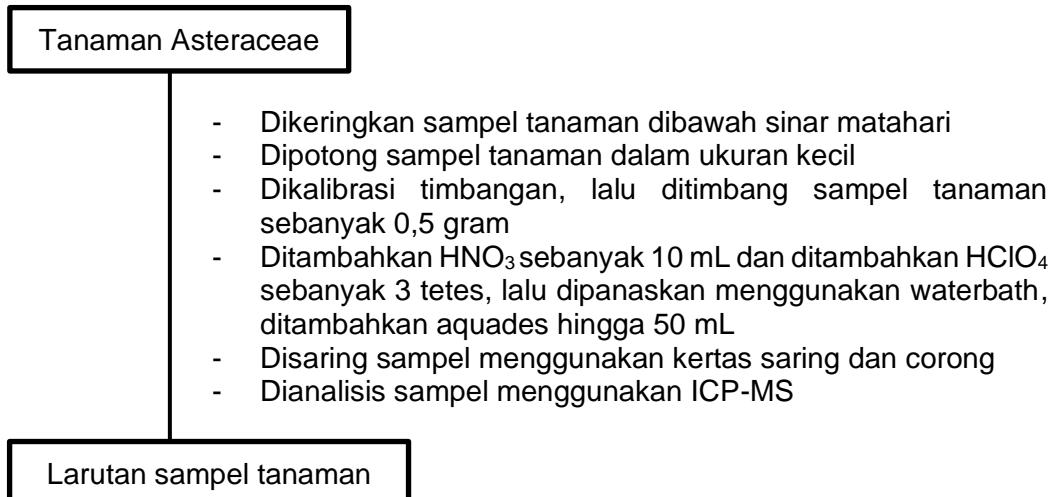
Lampiran 5. Skema kerja penyemaian benih tanaman



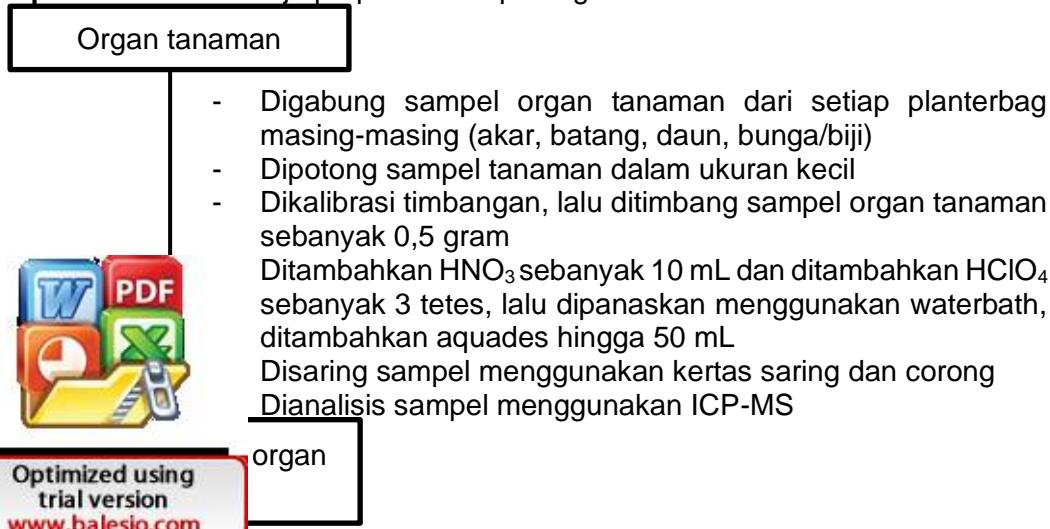
Lampiran 6. Skema kerja penanaman bibit tanaman



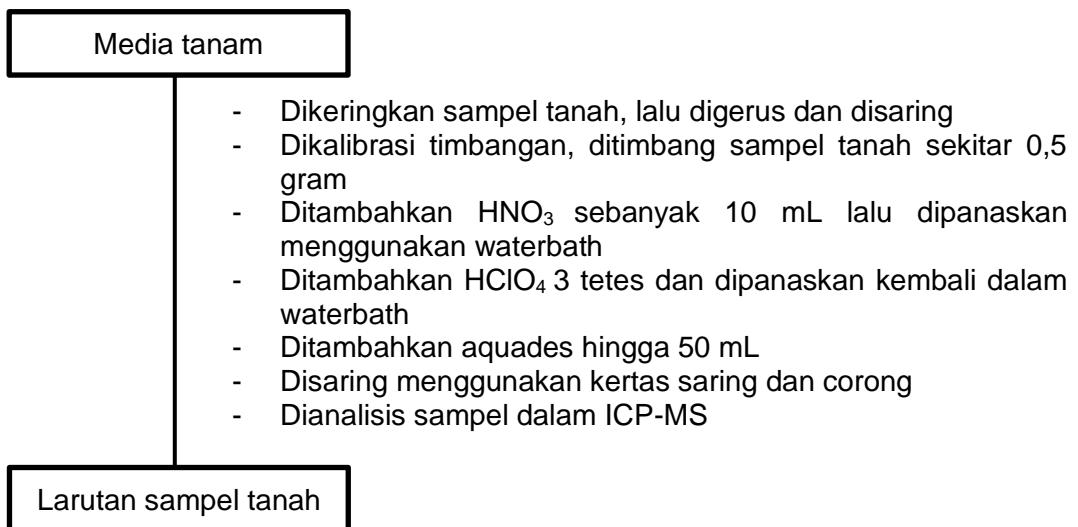
Lampiran 7. Skema kerja preparasi sampel tanaman secara komposit



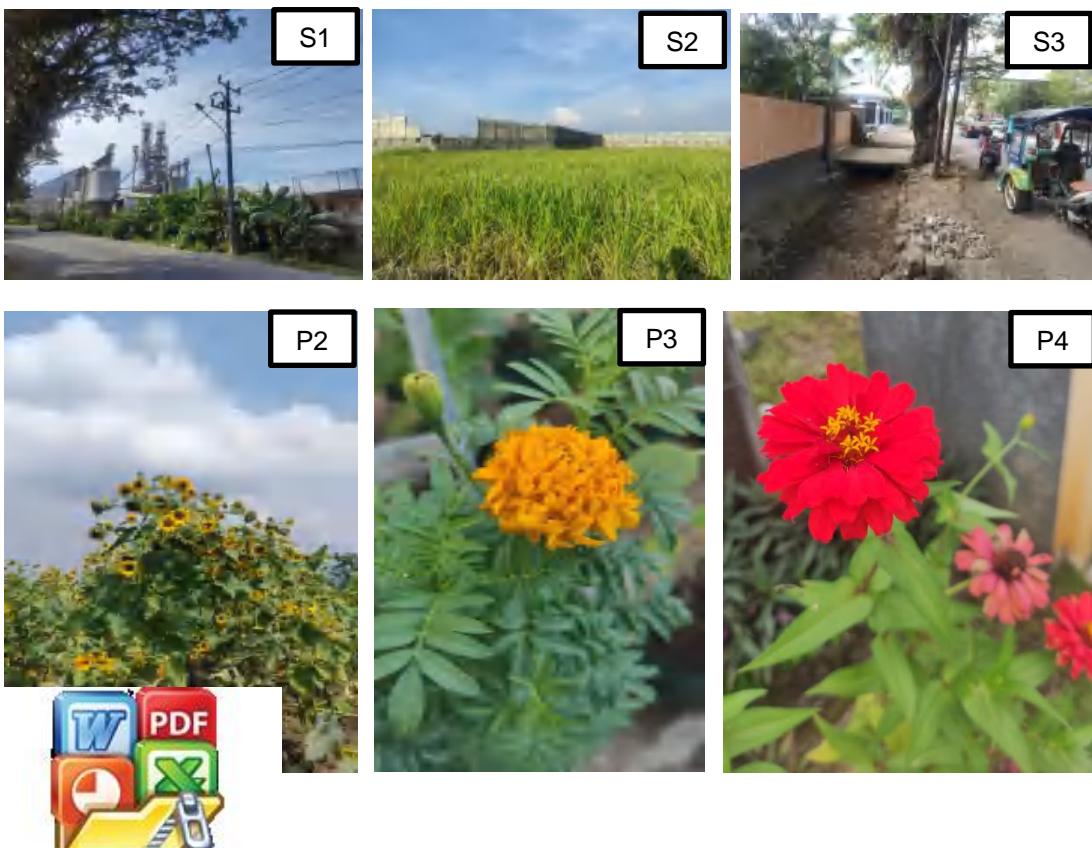
Lampiran 8. Skema kerja preparasi sampel organ tanaman



Lampiran 9. Skema kerja preparasi sampel media tanam (analisis akhir)



Lampiran 10. Foto pengambilan sampel tanah dan tanaman



Lampiran 11. Foto penyemaian bibit tanamanBibit bunga *Zinnia elegans* JacqBibit bunga *Tagetes erecta* L.Bibit bunga *Helianthus annuus* L.**Lampiran 12.** Foto sampel tanah dan tanaman setelah perlakuan

Lampiran 13. Foto pemindahan bibit tanaman kedalam planterbag



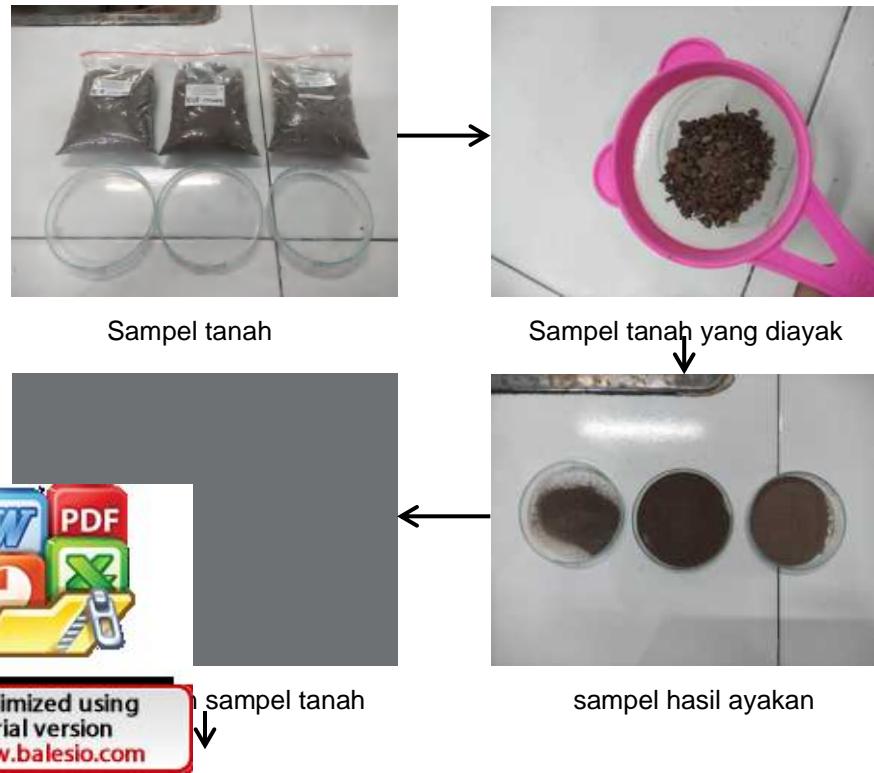
Lampiran 14. Pengamatan parameter pertumbuhan tanaman

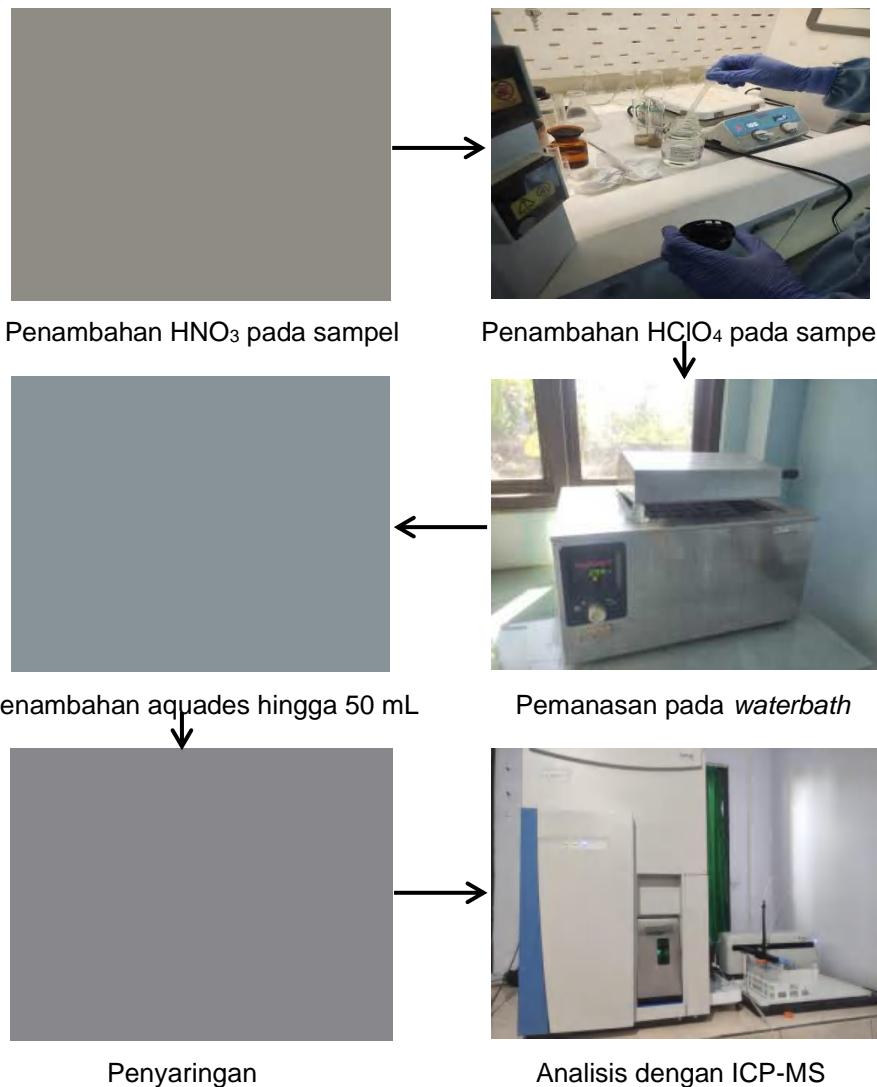


Lampiran 15. Foto pertumbuhan tanaman



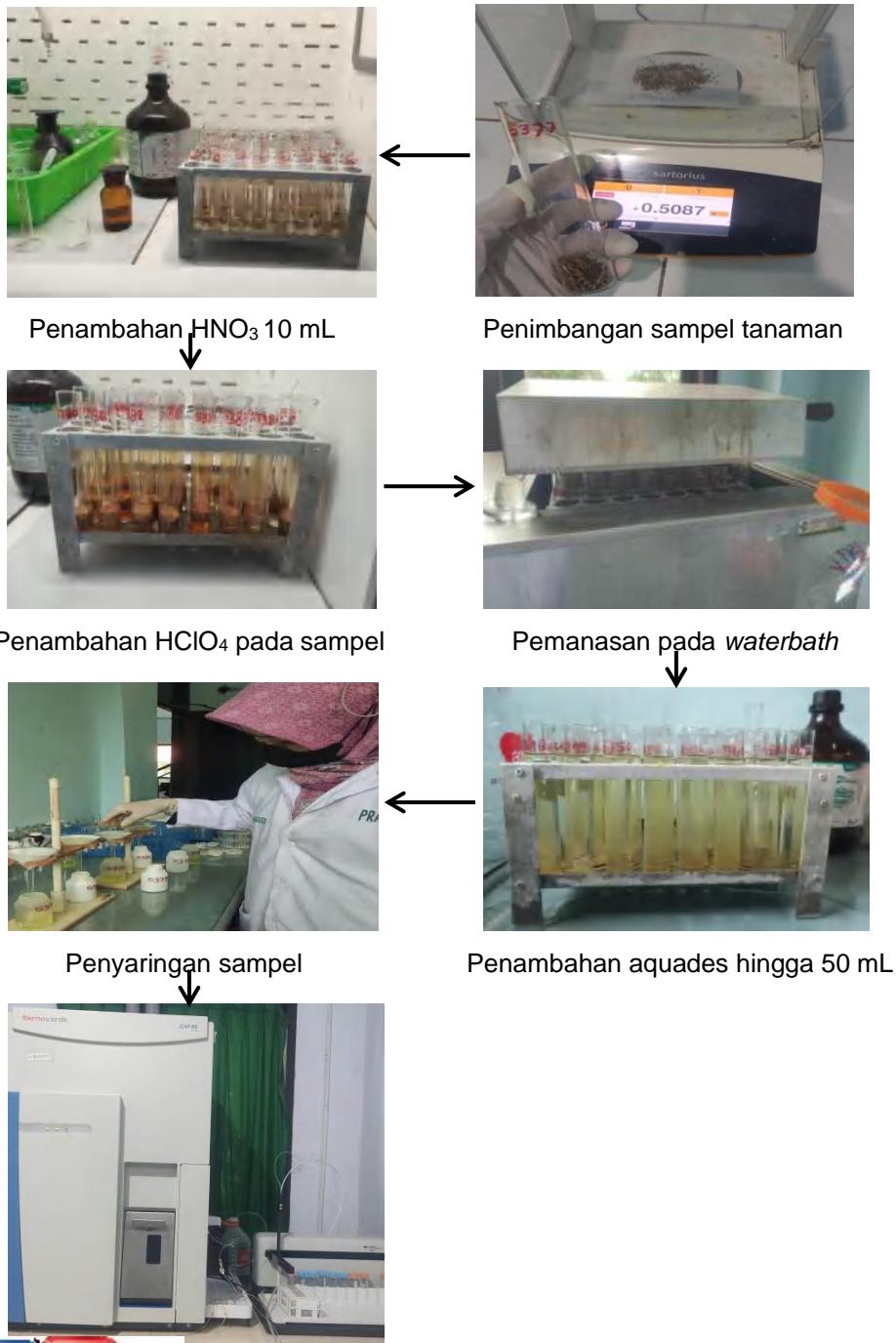
Lampiran 16. Foto proses analisis sampel tanah





Lampiran 17. Foto proses analisis sampel tanaman





Lampiran 18. Analisis ANOVA data pertumbuhan tanaman

1. Tinggi Tanaman (cm)

1.1. Minggu 1

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 1

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	174.032 ^a	1	1115.821	31.865	<.001
Intercept	441.098	1	441.098	888.407	<.001
SumberTanah	4.506	2	2.253	4.538	.034 (*)
JenisTanaman	162.176	3	54.059	108.879	<.001 (**)
SumberTanah * JenisTanaman	7.349	6	1.225	2.467	.086 (TN)
Error	5.958		12.497		
Total	621.088		24		
Corrected Total	179.990		23		

1.2. Minggu 2

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 2

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	416.541 ^a	1	1137.867	364.095	<.001
Intercept	913.777	1	913.777	8785.965	<.001
SumberTanah	31.809	2	15.904	152.920	<.001 (**)
JenisTanaman	351.295	3	117.098	1125.902	<.001 (**)
SumberTanah * JenisTanaman	33.437	6	5.573	53.582	<.001 (**)
Error	1.248		12.104		
Total	1331.566		24		
Corrected Total	417.789		23		

a. R Squared = ,997 (Adjusted R Squared = ,994)

1.3. Minggu 3

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	597.624 ^a	1	1154.329	92.002	<.001
Intercept	1368.966	1	1368.966	2318.219	<.001
SumberTanah	43.828	2	21.914	37.109	<.001 (**)
JenisTanaman	500.944	3	166.981	282.768	<.001 (**)
SumberTanah * JenisTanaman	52.852	6	8.809	14.917	<.001 (**)
Error	7.086		12.591		
Total	1973.677		24		
Corrected Total	604.710		23		

a. R Squared = .988 (Adjusted R Squared = .978)



Variance Effects

Tinggi Tanaman Minggu 4

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
	741.552 ^a	1	1167.414	101.505	<.001
Optimized using trial version www.balesio.com	1646.230	1	1646.230	2478.717	<.001
	60.840	2	30.420	45.804	<.001 (**)
	608.663	3	202.888	305.487	<.001 (**)
SumberTanah * JenisTanaman	72.049	6	12.008	18.080	<.001 (**)
Error	7.970		12.664		

Total	2395.752	24
Corrected Total	749.522	23

a. R Squared = .989 (Adjusted R Squared = .980)

1.5. Minggu 5

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 5

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1078.753 ^a	1	1198.068	92.291	<,001
Intercept	2356.994	1	2356.994	2218.139	<,001
SumberTanah	83.376	2	41.688	39.232	<,001 (**)
JenisTanaman	878.100	3	292.700	275.457	<,001 (**)
SumberTanah * JenisTanaman	117.277	6	19.546	18.395	<,001 (**)
Error	12.751		121.063		
Total	3448.499	24			
Corrected Total	1091.505	23			

a. R Squared = .988 (Adjusted R Squared = .978)

1.6. Minggu 6

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 6

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1462.544 ^a	11	132.959	91.756	<,001
Intercept	3474.264	1	3474.264	2397.629	<,001
SumberTanah	90.809	2	45.404	31.334	<,001 (**)
JenisTanaman	1266.563	3	422.188	291.356	<,001 (**)
SumberTanah * JenisTanaman	105.173	6	17.529	12.097	<,001 (**)
Error	17.388	12	1.449		
Total	4954.197	24			
Corrected Total	1479.933	23			

1.7. Minggu 7

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 7

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2872.457 ^a	11	11261.132	65.428	<,001
Intercept	6618.089	1	6618.089	1658.205	<,001
SumberTanah	126.667	2	63.334	15.869	<,001 (**)
JenisTanaman	2502.987	3	834.329	209.047	<,001 (**)
SumberTanah * JenisTanaman	242.803	6	40.467	10.139	<,001 (**)
Error	47.893		123.991		
Total	9538.439	24			
Corrected Total	2920.350	23			

a. R Squared = .984 (Adjusted R Squared = .969)



Variance jects Effects

Tinggi Tanaman Minggu 8

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
	3740.232 ^a	1	11340.021	82.117	<,001
	9049.332	1	9049.332	2185.466	<,001
Optimized using trial version www.balesio.com	118.877	2	59.439	14.355	<,001 (**)
	3373.969	3	1124.656	271.611	<,001 (**)
SumberTanah * JenisTanaman	247.386	6	41.231	9.958	<,001 (**)
Error	49.688		124.141		
Total	12839.252	24			

Corrected Total	3789.921	23
-----------------	----------	----

1.9. Minggu 9

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 9

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4860.142 ^a	1	11441.831	26.680	<.001
Intercept	13339.678	1	13339.678	805.509	<.001
SumberTanah	22.889	2	11.445	.691	.520 (TN)
JenisTanaman	4732.474	3	1577.491	95.256	<.001 (**)
SumberTanah * JenisTanaman	104.778	6	17.463	1.054	.439 (TN)
Error	198.727			1216.561	
Total	18398.546			24	
Corrected Total	5058.868			23	

1.10. Minggu 10

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 10

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6802.817 ^a	1	11618.438	28.412	<.001
Intercept	18232.594	1	18232.594	837.640	<.001
SumberTanah	53.965	2	26.982	1.240	.324 (TN)
JenisTanaman	6549.755	3	2183.252	100.303	<.001 (**)
SumberTanah * JenisTanaman	199.098	6	33.183	1.524	.251 (TN)
Error	261.200			1221.767	
Total	25296.611			24	
Corrected Total	7064.017			23	

1.11. Minggu 11

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 11

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	9154.198 ^a	1	11832.200	36.338	<.001
Intercept	25412.438	1	25412.438	1109.639	<.001
SumberTanah	29.547	2	14.774	.645	.542 (TN)
JenisTanaman	8908.687	3	2969.562	129.666	<.001 (**)
SumberTanah * JenisTanaman	215.964	6	35.994	1.572	.238 (TN)
Error	274.818			1222.902	
Total	34841.455			24	
Corrected Total	9429.017			23	

1.12. Minggu 12

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 12

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
	13697.572 ^a	1	111245.234	36.433	<.001
	39717.511	1	39717.511	1162.064	<.001
	23.807	2	11.904	.348	.713 (TN)
	13438.060	3	4479.353	131.058	<.001 (**)
	anaman235.704	6	39.284	1.149	.393 (TN)
	410.141			1234.178	
	53825.225			24	
	14107.713			23	



1.13. Minggu 13

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 13

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	15912.935 ^a	1	111446.630	7.218	<.001
Intercept	41958.008	1	41958.008	209.348	<.001
SumberTanah	111.940	2	55.970	.279	.761 (TN)
JenisTanaman	14454.596	3	4818.199	24.040	<.001 (**)
SumberTanah * JenisTanaman	1346.400	6	224.400	1.120	.407 (TN)
Error	2405.073			12200.423	
Total	60276.016			24	
Corrected Total	18318.008			23	

1.14. Minggu 14

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: Tinggi Tanaman Minggu 14

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	17402.794 ^a	1	111582.072	4.832	.006
Intercept	40520.493	1	40520.493	123.754	<.001
SumberTanah	394.901	2	197.451	.603	.563 (TN)
JenisTanaman	15157.810	3	5052.603	15.431	<.001 (**)
SumberTanah * JenisTanaman	1850.082	6	308.347	.942	.501 (TN)
Error	3929.141			12327.428	
Total	61852.427			24	
Corrected Total	21331.935			23	



Lampiran 19. Analisis data Uji lanjut BNT**Tabel 7.** Uji lanjut BNT interaksi antara sumber tanah dan jenis tanaman pada tinggi tanaman

Perlakuan	Minggu Ke-										
	2	3	4	5							
Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a
S3P3	5.38	b	S3P3	5.60	b	S3P3	6.03	b	S3P3	7.75	b
S3P4	6.47	c	S3P4	7.60	bc	S3P4	8.08	bc	S3P4	9.50	bc
S1P3	6.63	c	S1P3	8.75	c	S1P3	9.33	c	S1P2	10.58	bc
S1P2	6.68	c	S1P2	8.82	c	S1P2	9.42	c	S1P3	11.83	c
S3P2	6.97	cd	S3P2	9.97	c	S3P2	10.83	cd	S2P2	12.17	cd
S2P2	7.95	de	S2P2	10.03	c	S2P2	11.13	cd	S3P2	12.33	cd
S2P3	8.92	d	S2P3	10.90	c	S2P3	12.10	d	S2P3	15.00	d
S1P4	11.83	e	S1P4	13.58	d	S1P4	15.20	e	S1P4	19.50	e
S2P4	13.20	f	S2P4	15.38	d	S2P4	17.25	e	S2P4	20.25	e
Minggu Ke-											
6	7	8									
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol			
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a			
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a			
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a			
S3P3	9.93	b	S3P3	14.50	b	S3P3	17.43	b			
	12.83	bc	S1P2	16.62	bc	S1P2	19.38	bc			
	13.37	bc	S3P4	18.42	bc	S3P4	23.28	bc			
	14.83	c	S1P3	19.92	bc	S2P2	23.60	bc			
	14.92	c	S2P2	20.25	bc	S1P3	24.35	c			
	15.50	c	S3P2	21.08	c	S3P2	25.25	c			
	17.33	c	S2P3	23.25	c	S2P3	26.42	c			
	22.33	d	S2P4	32.45	d	S1P4	35.77	d			
	23.33	d	S1P4	32.78	d	S2P4	37.53	d			



Tabel 8. Uji lanjut BNT interaksi antara sumber tanah dan jenis tanaman pada lebar daun

Minggu Ke-											
2			3			4			5		
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a
S3P3	0.35	b	S3P4	1.05	b	S3P4	1.07	b	S3P4	1.32	b
S1P3	0.43	b	S3P2	1.08	b	S3P2	1.23	b	S3P2	1.38	b
S2P3	0.67	b	S1P2	1.25	b	S1P2	1.43	b	S1P2	1.70	bc
S3P4	1.17	c	S3P3	1.37	b	S3P3	1.62	b	S3P3	2.42	c
S3P2	1.23	c	S2P2	1.50	b	S2P2	1.73	b	S2P2	2.55	c
S1P2	1.27	cd	S1P3	2.52	c	S1P3	2.95	c	S1P3	3.23	cd
S2P2	1.62	d	S1P4	2.80	c	S1P4	3.13	c	S1P4	3.92	d
S1P4	2.23	e	S2P4	3.25	cd	S2P4	3.53	cd	S2P4	4.05	de
S2P4	2.68	f	S2P3	3.77	d	S2P3	4.23	d	S2P3	5.00	e

Minggu Ke-											
6			7			8			9		
Perlakuan	Rata-rata	Perlakuan	Rata-rata	Perlakuan	Rata-rata	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S1P1	0.00	S1P1	0.00	S1P1	0.00	S1P1	0.00	a	S1P1	0.00	a
S2P1	0.00	S2P1	0.00	S2P1	0.00	S2P1	0.00	a	S2P1	0.00	a
S3P1	0.00	S3P1	0.00	S3P1	0.00	S3P1	0.00	a	S3P1	0.00	a
S3P2	2.45	S3P2	2.45	S3P2	2.45	S1P2	3.88	b	S1P4	3.95	b
S1P2	2.60	S1P2	2.60	S1P2	2.60	S3P2	4.18	b	S2P4	4.35	bc
S2P4	2.75	S3P4	2.75	S3P4	2.75	S3P4	4.42	bc	S1P2	4.52	bc
	3.23	S3P3	3.23	S3P3	3.23	S2P2	5.12	c	S3P2	5.48	c
	3.58	S2P2	3.58	S2P2	3.58	S1P4	5.13	c	S2P3	5.72	c
	4.28	S1P3	4.28	S1P3	4.28	S3P3	5.58	c	S2P2	5.83	c
	4.70	S1P4	4.70	S1P4	4.70	S2P4	6.18	d	S3P4	6.17	c
	4.95	S2P4	4.95	S2P4	4.95	S1P3	7.05	e	S1P3	6.55	c
	5.83	S2P3	5.83	S2P3	5.83	S2P3	7.13	e	S3P3	6.60	c



Table 9. Uji lanjut BNT interaksi antara sumber tanah dan jenis tanaman pada panjang daun

Minggu Ke-											
Perlakuan	2			3			4			5	
	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a
S3P3	0.75	b	S3P3	2.17	b	S3P4	2.28	b	S3P2	2.58	b
S1P3	1.48	bc	S3P4	2.18	b	S3P3	2.33	b	S3P4	2.82	b
S2P3	1.85	bc	S3P2	2.28	b	S3P2	2.50	b	S1P2	2.83	b
S3P2	2.12	c	S1P2	2.40	b	S1P2	2.63	bc	S3P3	3.50	bc
S1P2	2.23	c	S2P2	3.45	bc	S2P2	3.62	bc	S2P2	4.30	c
S3P4	2.32	c	S1P3	4.02	c	S1P3	4.17	c	S1P3	5.50	cd
S2P2	2.62	c	S2P4	5.47	cd	S2P4	5.83	d	S2P4	6.50	d
S1P4	5.52	d	S1P4	6.02	d	S1P4	6.42	d	S1P4	7.17	d
S2P4	5.73	d	S2P3	6.07	d	S2P3	6.57	d	S2P3	7.25	d
Minggu Ke-											
Perlakuan	6			7			9				
	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan		
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a	S1P1		
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a	S2P1		
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a	S3P1		
S3P2	3.73	b	S1P2	4.50	b	S2P4	7.60	b	S2P4		
S1P2	3.90	b	S3P2	5.83	b	S1P4	7.72	b	S1P4		
S2P4	3.98	b	S2P2	6.68	c	S3P2	8.15	bc	S3P2		
	4.68	bc	S3P4	7.50	cd	S1P2	8.27	bc	S1P2		
	5.53	c	S3P3	7.83	cd	S2P2	8.61	bc	S2P2		
	6.40	cd	S1P4	8.50	d	S2P3	9.75	c	S2P3		
	7.52	d	S2P4	9.03	de	S1P3	11.00	cd	S1P3		
	8.25	d	S2P3	9.83	de	S3P4	11.37	cd	S3P4		
	8.30	d	S1P3	10.08	e	S3P3	11.67	d	S3P3		



Tabel 10. Uji lanjut BNT interaksi antara sumber tanah dan jenis tanaman pada diameter batang

Minggu Ke-											
Perlakuan	1			2			3			4	
	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a
S3P4	0.87	b	S3P4	0.90	b	S3P4	0.95	b	S3P4	1.18	b
S3P3	0.95	bc	S3P3	1.13	bc	S3P3	1.45	bc	S3P3	1.72	c
S1P3	1.05	bc	S1P3	1.25	bc	S1P3	1.62	c	S1P3	1.92	cd
S3P2	1.20	c	S1P2	1.50	c	S1P2	1.88	cd	S1P2	2.22	d
S1P2	1.22	c	S3P2	1.53	cd	S3P2	1.95	cd	S3P2	2.25	d
S2P3	1.27	cd	S2P3	1.58	cd	S2P3	2.05	cd	S2P3	2.37	de
S1P4	1.53	d	S1P4	1.78	cd	S1P4	2.18	d	S1P4	2.53	de
S2P2	1.55	d	S2P2	1.87	cd	S2P4	2.42	d	S2P4	2.75	e
S2P4	1.65	d	S2P4	1.95	d	S2P2	2.42	d	S2P2	2.80	e
Minggu Ke-											
Perlakuan	5			7			8				
	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan		
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a			
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a			
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a			
S3P4	1.40	b	S3P4	2.63	b	S3P4	2.87	b			
S3P3	2.07	c	S3P3	3.18	bc	S3P3	3.45	bc			
S1P3	2.22	cd	S1P3	3.45	c	S2P2	3.63	c			
	2.50	cd	S2P2	3.47	cd	S1P3	3.68	c			
	2.53	cd	S1P2	3.68	cd	S1P2	3.87	c			
	2.67	d	S2P4	3.70	cd	S2P4	3.90	c			
	2.88	d	S3P2	3.75	cd	S3P2	3.95	c			
	3.05	d	S1P4	3.97	cd	S1P4	4.17	c			
	3.15	d	S2P3	4.08	d	S2P3	4.27	c			



Tabel 11. Uji lanjut BNT interaksi antara sumber tanah dan jenis tanaman pada jumlah daun

Minggu Ke-											
3			4			5			7		
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a	S1P1	0.00	a
S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a	S2P1	0.00	a
S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a	S3P1	0.00	a
S3P2	5.67	b	S3P4	6.67	b	S3P2	8.00	b	S3P4	13.00	b
S3P4	6.00	b	S3P2	7.17	b	S3P4	8.00	b	S3P2	13.67	b
S1P2	6.67	b	S1P2	8.33	bc	S1P2	9.67	b	S2P2	14.83	b
S2P2	6.67	b	S2P2	9.67	c	S2P2	12.67	c	S1P2	15.33	b
S3P3	9.00	c	S3P3	10.33	c	S3P3	12.67	c	S3P3	18.67	bc
S1P3	9.33	c	S1P3	13.00	d	S1P3	16.67	d	S1P3	21.67	c
S2P4	10.00	c	S1P4	13.33	d	S1P4	17.00	d	S2P3	25.33	cd
S1P4	10.33	c	S2P4	14.00	d	S2P4	17.00	d	S1P4	27.67	cd
S2P3	10.33	c	S2P3	15.00	d	S2P3	20.33	e	S2P4	30.33	d
Minggu Ke-											
8											
Perlakuan	Rata-rata	Simbol									
S1P1	0.00	a									
S2P1	0.00	a									
S3P1	0.00	a									
S3P2	15.67	b									
S3P4	16.00	b									
S2P2	17.17	bc									
	18.17	bc									
	21.33	c									
	24.67	cd									
	27.83	d									
	30.17	de									
	32.67	e									



Tabel 12. Uji lanjut BNT dari jenis tanaman pada tinggi tanaman

Perlakuan	Minggu Ke-						Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	
	1	9	10	11														
P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a	
P3	4.60	b	P2	28.34	b	P2	32.80	b	P3	39.49	b	P3	39.49	b	P2	40.33	b	
P2	5.71	bc	P3	28.90	b	P3	33.47	b	P2	40.33	b	P4	50.34	c	P4	50.34	c	
P4	6.84	c	P4	37.06	c	P4	43.98	c	P4	50.34	c							
Minggu Ke-																		
12						13						14						
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol							
P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a							
P3	50.39	b	P2	49.94	b	P2	42.31	b	P3	56.47	b							
P2	53.83	b	P3	54.94	b	P3	56.47	b	P4	65.58	b							
P4	58.50	b	P4	62.36	b	P4	65.58	b										

Tabel 13. Uji lanjut BNT dari jenis tanaman pada lebar daun

Perlakuan	Minggu Ke-						Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	
	0	1	10	11														
P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a	
P3	0.56	b	P3	0.87	b	P4	4.66	b	P4	5.21	b							
P2	0.99	c	P2	1.08	bc	P2	5.69	c	P2	6.70	c							
P4	0.99	c	P4	1.28	c	P3	6.64	d	P3	7.66	c							
Minggu Ke-																		
12						13						14						
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol							
	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a							
	4.91	b	P4	5.04	b	P2	8.03	b										
	7.46	c	P2	6.37	b	P4	10.04	b										
	7.88	c	P3	7.87	b	P3	13.11	b										



Tabel 14. Uji lanjut BNT dari jenis tanaman pada panjang daun

Minggu Ke-											
1			8			10			11		
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a
P2	1.79	b	P2	6.36	b	P2	8.84	b	P2	9.71	b
P3	1.19	b	P4	9.10	c	P4	9.12	b	P4	9.82	b
P4	2.72	c	P3	9.98	c	P3	11.44	c	P3	12.09	c

Minggu Ke-											
12			13			14					
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
P1	0.00	a	P1	0.00	a	P1	0.00	a			
P4	9.40	b	P4	9.53	b	P2	8.26	b			
P2	11.50	c	P2	10.04	b	P4	10.29	b			
P3	12.49	c	P3	12.63	b	P3	13.33	b			

Tabel 15. Uji lanjut BNT dari jenis tanaman pada diameter batang

Minggu Ke-											
6			9			10			11		
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a
P3	2.93	b	P3	4.11	b	P3	4.77	b	P4	5.19	b
P4	3.05	b	P4	4.37	b	P4	4.87	b	P3	5.39	b
	3.31	b	P2	4.97	c	P2	5.17	b	P2	6.30	b

Minggu Ke-											
12			13			14					
Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	
0.00	a	P1	0.00	a	P1	0.00	a				
5.52	b	P4	5.72	b	P2	4.64	b				
5.79	b	P3	5.92	b	P4	5.77	b				
7.42	b	P2	6.18	b	P3	6.43	b				



Table 16. Uji lanjut BNT dari jenis tanaman pada jumlah daun

Perlakuan	Minggu Ke-										
	2	6	9	10							
Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	
P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a
P2	4.00	b	P2	12.11	b	P2	18.47	b	P2	20.69	b
P3	5.89	c	P4	17.72	c	P3	34.50	c	P3	38.83	c
P4	6.11	c	P3	19.33	c	P4	39.83	c	P4	44.22	c

Perlakuan	Minggu Ke-										
	11	12	13	14							
Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol	
P1	0.00	a	P1	0.00	a	P1	0.00	a	P1	0.00	a
P2	24.36	b	P2	27.97	b	P2	19.28	b	P2	15.69	b
P3	42.11	c	P3	45.61	c	P3	53.61	c	P3	55.83	c
P4	48.44	c	P4	54.33	c	P4	56.22	c	P4	58.50	c

Table 17. Uji lanjut BNT dari sumber tanah pada tinggi tanaman

Perlakuan	Minggu Ke-	
	1	Simbol
S3	3.72	a
S1	4.37	ab
S2	4.78	b



Uji lanjut BNT dari sumber tanah pada lebar daun

Rata-rata	Minggu Ke-	
	12	Simbol
4.45	a	
5.30	b	
5.42	b	

Table 19. Uji lanjut BNT dari sumber tanah pada panjang daun

Minggu Ke-					
	8		10		
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S3	5.82	a	S2	6.89	a
S1	6.30	ab	S1	7.18	ab
S2	6.96	b	S3	7.98	b

Table 20. Uji lanjut BNT dari sumber tanah pada diameter batang

Minggu Ke-					
	0		6		12
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S3	0.68	a	S3	2.03	a
S1	0.76	b	S1	2.28	a
S2	0.87	b	S2	2.65	b

Table 21. Uji lanjut BNT dari sumber tanah pada jumlah daun

Minggu Ke-					
	6		9		10
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S3	9.75	a	S3	18.63	a
S1	12.54	b	S1	22.92	ab
S2	14.58	b	S2	28.06	b

Minggu Ke-					
	12		13		
Perlakuan	Rata-rata	Simbol	Perlakuan	Rata-rata	Simbol
S3	25.75	a	S3	23.75	a
S1	30.81	a	S1	34.46	b
S2	39.38	b	S2	38.63	b



Lampiran 20. Perhitungan hasil pembacaan ICP-MS sampel tanah

$$\Sigma \text{Kadar logam Pb} = \frac{\frac{\Sigma \text{Hasil ICPMS} - \Sigma \text{blanko } (\mu\text{g/ml})}{1000}}{\text{Gram sampel}} \times \text{Volume sampel (ml)}$$

$$\Sigma \text{Kadar logam Pb} = \frac{\frac{\Sigma 99,506 - \Sigma 0,493 }{1000}}{0,5076 \text{ g}} \times 50 \text{ (ml)}$$

$$\Sigma \text{Kadar logam Pb} = \frac{4,95065 \text{ } \mu\text{g}}{0,5076 \text{ g}}$$

$$\Sigma \text{Kadar logam Pb} = 9,753 \text{ } \mu\text{g/g}$$

Lampiran 21. Perhitungan hasil pembacaan ICP-MS sampel organ tanaman

$$\Sigma \text{Kadar logam Pb} = \frac{\frac{\Sigma \text{Hasil ICPMS} - \Sigma \text{blanko } (\mu\text{g/ml})}{1000}}{\text{Gram sampel}} \times \text{Volume sampel (ml)}$$

$$\Sigma \text{Kadar logam Pb} = \frac{\frac{\Sigma 63,591 - \Sigma 0,084 }{1000}}{0,5160 \text{ g}} \times 50 \text{ (ml)}$$

$$\Sigma \text{Kadar logam Pb} = \frac{3,17535 \text{ } \mu\text{g}}{0,5160 \text{ g}}$$

$$\Sigma \text{Kadar logam Pb} = 6,153 \text{ } \mu\text{g/g}$$

Lampiran 22. Perhitungan efisiensi penyisihan Pb

$$\text{Efisiensi penyisihan (\%)} = \frac{\text{Kadar Serapan Logam Tanaman } (\mu\text{g/g})}{\text{Kadar Logam Tanah Awal } (\mu\text{g/g})} \times 100\%$$

$$\text{Efisiensi penyisihan (\%)} = \frac{15,471 \text{ } (\mu\text{g/g})}{21,333 \text{ } (\mu\text{g/g})} \times 100\%$$

$$\text{Efisiensi penyisihan (\%)} = 73\%$$

Lampiran 23. Perhitungan efisiensi akumulasi Pb pada tanaman



$$\text{Pb (\%)} = \frac{\text{Kadar Akumulasi Logam dalam Tanaman } (\mu\text{g/g})}{\text{Kadar Logam dalam Media Tanam Awal } (\mu\text{g/g})} \times 100\%$$

$$\text{Pb (\%)} = \frac{1,213 \text{ } (\mu\text{g/g})}{21,333 \text{ } (\mu\text{g/g})} \times 100\%$$

Optimized using
trial version
www.balesio.com

$$\text{Efisiensi akumulasi Pb (\%)} = 6\%$$

Lampiran 24. Perhitungan biomassa tanaman

$$\text{Biomassa (\%)} = \frac{\text{Berat kering(g)}}{\text{Berat basah (g)}} \times 100\%$$

$$\text{Biomassa (\%)} = \frac{7,67 \text{ (g)}}{32,67 \text{ (g)}} \times 100\%$$

$$\text{Biomassa (\%)} = 23\%$$



Optimized using
trial version
www.balesio.com

Daftar Riwayat Hidup

A. Data Pribadi

- | | |
|----------------------|-------------------------------------|
| 1. Nama | : Rifa'atul Mahmudah |
| 2. Tempat, Tgl Lahir | : Sinjai, 17 November 1997 |
| 3. Alamat | : Jl. Abd. Muthalib Dg Narang, Gowa |
| 4. Kewarganegaraan | : Warga Negara Indonesia |

B. Riwayat Pendidikan

1. Tamat SD pada 2009 di SD Inpres 6/75 Buareng
2. Tamat SMP pada 2012 di SMP Negeri 3 Sinjai
3. Tamat SMA pada 2015 di SMA Negeri 1 Sinjai
4. Sarjana (S1) tahun 2020 di Universitas Negeri Makassar

