LAMPIRAN

Lampiran 01. Surat-surat Penelitian

1.1 Surat Permohonan Izin Penelitian

KEMENTERIAN PENDIDIKAN TINGGI, SAINS, DAN TEKNOLOGI
UNIVERSITAS PENDIDIKAN GANESHA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
JURUSAN BIOLOGI DAN PERIKANAN KELAUTAN
Alamat : Jalan Udayana No.11 Singaraja-Bali Tlp. (0362) 25335, Kode Pos 81116

Singaraja, 06 Januari 2026

No : 08/ UN48.9.7/PT.01.04/2026
Lampiran : -
Perihal : Rekomendasi Penelitian

Kepada
Yth. Kepala UPTD Balai Benih Induk Tanaman Pangan, Hortikultura, dan Perkebunan Provinsi Bali)
di
Tempat

Dengan hormat, dalam rangka pelaksanaan penelitian mahasiswa Prodi S1 Biologi Jurusan Biologi dan Perikanan Kelautan FMIPA Universitas Pendidikan Ganesha, maka kami mohon bantuan untuk sekiranya mahasiswa kami dapat melaksanakan penelitian. Adapun data lengkap mahasiswa sebagai berikut :

Nama	: Kadek Ayu Natalia Dewi
Alamat	: Br. Busana Sibanggede, Kec. Abiansemal, kab. Badung, Bali
NIM	: 2213091010
Judul Penelitian	: Pengaruh Variasi Jenis dan Dosis Biochar Terhadap Pertumbuhan Tanaman Pokcoy (*Brassica* rapa*)*
Data Yang Diambil	: Parameter pertumbuhan vegetative pakcoy yaitu tinggi tnaman, jumlah daun, dan berat segar pakcoy
Waktu Penelitian	: Bulan 19 Januari – 31 Maret 2026
Jumlah Penelitian	: 1 orang

Demikian surat ini disampaikan, atas perkenan dan kerjasamanya diucapkan terima kasih.

Ketua Jurusan Biologi dan Perikanan Kelautan

Dr. Gede Ari Yudasmara, S.Si., M.Si
NIP. 197904142002121002

Balai Sertifikasi Elektronik

Catatan :
- UU ITE No. 11 Tahun 2008 Pasal 5 ayat 1"Informasi Elektronik dan/atau Dokumen Elektornik dan/atau hasil cetaknya merupakan alat bukti hukum yang sah"
- Dokumen ini tertanda ditandatangani secara elektronik menggunakan sertifikat elektronik yang diterbitkan BsrE
- Surat ini dapat dibuktikan keasliannya dengan menggunakan *qr code* yang telah tersedia

1.2 Surat Permohonan Rekomendasi Penelitian

PEMERINTAH PROVINSI BALI

DINAS PENANAMAN MODAL DAN PELAYANAN TERPADU SATU PINTU

JALAN RAYA PUPUTAN NITI MANDALA (80235), TELEPON (0361)243804
WEBSITE: www.dpmptsp.baliprov.go.id, Email: dpmptsp@baliprov.go.id

Nomor : B.30.070/09/IZIN-E/DPMPTSP

Lampiran : -

Hal : Rekomendasi Penelitian

Bali, 12 Januari 2026

Kepada
Yth.Kepala Dinas Pertanian dan Ketahanan Pangan Provinsi Bali
Cq. Kepala UPTD Balai Benih Induk Tanaman Pangan, Hortikultura, dan Perkebunan Provinsi Bali
di -
Tempat

I. Dasar
1. Peraturan Menteri Dalam Negeri Republik Indonesia Nomor 7 Tahun 2014 Tentang Perubahan atas Peraturan Menteri Dalam Negeri RI Nomor 64 tahun 2011 Tentang Pedoman Penerbitan Rekomendasi Penelitian (Berita Negara Republik Indonesia Tahun 2014 Nomor 114).
2. Peraturan Gubernur Bali Nomor 46 Tahun 2022 Tentang Penyelenggaraan Perizinan dan Pelayanan Terpadu Satu Pintu (Berita Daerah Provinsi Bali Tahun 2022 Nomor 47).
3. Surat Permohonan dari Universitas Pendidikan Ganesha Nomor 08/ UN48.9.7/PT.01.04/2026, tanggal 06 Januari 2026, Perihal Permohonan Izin Penelitian.

II. Bersama ini memberikan Rekomendasi Penelitian Kepada :

Nama	: KADEK AYU NATALIA DEWI
Pekerjaan	: Mahasiswa
Alamat	: BR. BUSANA DESA SIBANGGEDE, KEC. ABIANSEMAL, KAB. BADUNG, BALI
Judul / Materi	: Pengaruh Variasi Jenis dan Dosis Biochar Terhadap Pertumbuhan Tanaman Pakcoy (Brassica rapa)
Lokasi Penelitian	: UPTD Balai Benih Induk Tanaman Pangan, Hortikultura, dan Perkebunan (Dinas Pertanian dan Ketahanan Pangan Provinsi Bali)
Jumlah Peserta	: 1 Orang
Lama Penelitian	: 3 Bulan (19 Januari 2026 - 31 Maret 2026)

III. Dalam melakukan kegiatan agar yang bersangkutan mematuhi ketentuan sebagai berikut :
a. Sebelum melakukan kegiatan agar melaporkan kedatangannya kepada Bupati/Walikota setempat atau pejabat yang berwenang.
b. Tidak dibenarkan melakukan kegiatan yang tidak ada kaitannya dengan bidang / judul Penelitian. Apabila melanggar ketentuan maka segala kegiatannya diberhentikan.
c. Mentaati segala ketentuan perundang- undangan yang berlaku serta menghormati adat istiadat dan budaya setempat.
d. Apabila masa berlaku Rekomendasi Penelitian ini telah berakhir, sedangkan pelaksanaan kegiatan belum selesai, agar pemohon mendaftar ulang permohonan penelitian secara online ke Dinas Penanaman Modal danPelayanan Terpadu Satu Pintu Provinsi Bali.
e. Peneliti wajib mengirim Laporan Hasil Penelitian Kepada Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu Provinsi Bali melalui dpmptsp@baliprov.go.id

IZIN INI DIKENAKAN TARIF RP 0,-

Ditandatangani secara elektronik oleh:
KEPALA DINAS
Dr. I Ketut Sukra Negara, S.Sos.,M.Si
Pembina Utama Madya (IV/d)
NIP. 19681129 198903 1 007

Tembusan kepada Yth
1. Gubernur Bali Sebagai Laporan
2. Arsip

Balai Besar Sertifikasi Elektronik

Dokumen ini telah ditandatangani secara elektronik menggunakan sertifikat elektronik yang diterbitkan oleh BSrE

Lampiran 02. Data Mentah Pengukuran Parameter Pertumbuhan Pakcoy

Tabel 2.1 Data Pengukuran Tinggi Tanaman Pakcoy Selama 30 Hari

Perlakuan	Ulangan	Hasil Tinggi Tanaman (cm)				
		0 HST	7 HST	14 HST	21 HST	30 HST
J1D1	1	6,3	9,7	12,5	15,8	18,8
	2	7,3	10,1	13,6	16,5	19,6
	3	6,6	11,6	13,5	16,4	19,5
	4	6,9	10,4	14,7	17,1	19,9
J1D2	1	6,9	10,5	14,6	17,9	20,7
	2	7,4	11,8	15,1	18,6	21,8
	3	6,7	10,8	13,9	18,5	21,4
	4	6,8	11,2	13,7	17,2	20,5
J1D3	1	7,6	12,7	16,9	21,5	26,2
	2	6,9	12,5	19,8	24,7	29,4
	3	6,2	10,9	17,6	23,3	28,3
	4	7,1	13,3	20,4	25,5	29,8
J1D4	1	7,5	10,7	17,5	21,8	25,9
	2	6,7	11,2	16,4	20,6	24,7
	3	6,5	12,9	17,1	20,9	24,9
	4	6,8	12,4	18,7	21,7	25,3
J2D1	1	6,7	10,3	12,7	16,5	19,3
	2	6,5	9,2	11,7	14,8	17,6
	3	6,6	9,9	11,9	15,5	18,7
	4	7,3	11,5	13,5	16,0	18,9
J2D2	1	7,5	10,6	13,7	17,9	21,4
	2	6,4	10,5	12,8	16,8	20,9
	3	6,9	9,9	11,9	17,2	20,6
	4	7,1	11,2	12,9	17,4	21,5
J2D3	1	6,8	12,4	17,7	21,3	24,7
	2	7,4	11,5	16,7	20,4	23,4
	3	6,5	10,2	17,6	20,7	24,5
	4	7,0	9,9	15,3	19,8	23,2
J2D4	1	6,2	13,5	18,5	22,2	26,6
	2	7,5	12,1	17,4	21,9	25,7
	3	7,1	10,2	16,8	20,6	25,4
	4	6,8	11,6	18,8	23,2	26,2

Tabel 2.2 Data Pengukuran Jumlah Daun Tanaman Pakcoy Selama 30 Hari

Perlakuan	Ulangan	Hasil Jumlah Daun Tanaman (helai)				
		0 HST	7 HST	14 HST	21 HST	30 HST
J1D1	1	3	4	6	9	10
	2	3	5	7	11	12
	3	5	6	8	10	11
	4	4	5	8	11	12
J1D2	1	5	7	10	12	14
	2	4	5	9	11	13
	3	3	5	8	13	15
	4	4	6	9	12	14
J1D3	1	4	6	11	15	18
	2	5	8	11	15	17
	3	3	6	9	13	16
	4	4	7	10	14	17
J1D4	1	5	8	11	14	16
	2	4	7	9	12	14
	3	3	5	9	11	14
	4	3	6	10	13	15
J2D1	1	4	5	8	11	12
	2	3	4	7	10	11
	3	5	6	9	10	11
	4	4	7	9	12	13
J2D2	1	3	5	9	13	15
	2	3	6	8	12	14
	3	5	7	10	14	16
	4	4	7	9	13	15
J2D3	1	5	8	10	14	17
	2	4	7	11	13	16
	3	3	5	9	13	15
	4	4	7	11	15	17
J2D4	1	4	8	12	15	18
	2	5	9	13	16	19
	3	3	6	11	14	16
	4	4	8	13	16	18

Tabel 2.3 Data Pengukuran Berat Segar Tanaman Pakcoy Selama 30 Hari

Perlakuan	Ulangan	Hasil Berat Segar Tanaman (gram)
J1D1	1	22
	2	27
	3	25
	4	19
J1D2	1	37
	2	40
	3	39
	4	35
J1D3	1	92
	2	95
	3	92
	4	91
J1D4	1	63
	2	63
	3	68
	4	65
J2D1	1	24
	2	23
	3	20
	4	20
J2D2	1	46
	2	44
	3	45
	4	48
J2D3	1	75
	2	74
	3	79
	4	77
J2D4	1	104
	2	103
	3	107
	4	110

Lampiran 03. Hasil Analisis SPSS *Two-Way ANOVA*

3.1 Hasil Analisis Parameter Tinggi Tanaman Pakcoy

3.1.1 Hasil Uji Deskriptif

Descriptives

	Perlakuan		Statistic	Std. Error
Tinggi_0HST	TK 0 gram	Mean	6.775	.2136
		Std. Deviation	.4272	
	TK 75 gram	Mean	6.950	.1555
		Std. Deviation	.3109	
	TK 100 gram	Mean	6.950	.2901
		Std. Deviation	.5802	
	TK 125 gram	Mean	6.875	.2175
		Std. Deviation	.4349	
	SP 0 gram	Mean	6.775	.1797
		Std. Deviation	.3594	
	SP 75 gram	Mean	6.975	.2287
		Std. Deviation	.4573	
	SP 100 Gram	Mean	6.925	.1887
		Std. Deviation	.3775	
	SP 125 gram	Mean	6.900	.2739
		Std. Deviation	.5477	

Descriptives

	Perlakuan		Statistic	Std. Error
Tinggi_7HST	TK 0 gram	Mean	10.450	.4093
		Std. Deviation	.8185	
	TK 75 gram	Mean	11.075	.2810
		Std. Deviation	.5620	
	TK 100 gram	Mean	12.350	.5123
		Std. Deviation	1.0247	
	TK 125 gram	Mean	11.800	.5115
		Std. Deviation	1.0231	
	SP 0 gram	Mean	10.225	.4820
		Std. Deviation	.9639	
	SP 75 gram	Mean	10.550	.2661
		Std. Deviation	.5323	
	SP 100 Gram	Mean	11.000	.5817
		Std. Deviation	1.1633	
	SP 125 gram	Mean	11.850	.6813
		Std. Deviation	1.3626	

Descriptives

	Perlakuan		Statistic	Std. Error
Tinggi_14HST	TK 0 gram	Mean	13.575	.4498
		Std. Deviation	.8995	
	TK 75 gram	Mean	14.325	.3224
		Std. Deviation	.6449	
	TK 100 gram	Mean	18.675	.8440
		Std. Deviation	1.6879	
	TK 125 gram	Mean	17.425	.4820
		Std. Deviation	.9639	
	SP 0 gram	Mean	12.450	.4113
		Std. Deviation	.8226	
	SP 75 gram	Mean	12.825	.3683
		Std. Deviation	.7365	
	SP 100 Gram	Mean	16.825	.5558
		Std. Deviation	1.1117	
	SP 125 gram	Mean	17.875	.4679
		Std. Deviation	.9359	

Descriptives

	Perlakuan		Statistic	Std. Error
Tinggi_21HST	TK 0 gram	Mean	16.450	.2661
		Std. Deviation	.5323	
	TK 75 gram	Mean	18.050	.3227
		Std. Deviation	.6455	
	TK 100 gram	Mean	23.750	.8770
		Std. Deviation	1.7540	
	TK 125 gram	Mean	21.250	.2958
		Std. Deviation	.5916	
	SP 0 gram	Mean	15.700	.3629
		Std. Deviation	.7257	
	SP 75 gram	Mean	17.325	.2287
		Std. Deviation	.4573	
	SP 100 Gram	Mean	20.550	.3122
		Std. Deviation	.6245	
	SP 125 gram	Mean	21.975	.5360
		Std. Deviation	1.0720	

Descriptives

	Perlakuan		Statistic	Std. Error
Tinggi_30HST	TK 0 gram	Mean	19.450	.2327
		Std. Deviation	.4655	
	TK 75 gram	Mean	21.100	.3028
		Std. Deviation	.6055	
	TK 100 gram	Mean	28.425	.8066
		Std. Deviation	1.6132	
	TK 125 gram	Mean	25.200	.2646
		Std. Deviation	.5292	
	SP 0 gram	Mean	18.625	.3637
		Std. Deviation	.7274	
	SP 75 gram	Mean	21.100	.2121
		Std. Deviation	.4243	
	SP 100 Gram	Mean	23.950	.3797
		Std. Deviation	.7594	
	SP 125 gram	Mean	25.975	.2658
		Std. Deviation	.5315	

3.1.2 Hasil Uji Normalitas

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Tinggi_0HST	TK 0 gram	.993	4	.970
	TK 75 gram	.854	4	.240
	TK 100 gram	.981	4	.908
	TK 125 gram	.873	4	.310
	SP 0 gram	.828	4	.163
	SP 75 gram	.993	4	.971
	SP 100 Gram	.994	4	.976
	SP 125 gram	.989	4	.951

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Tinggi_7HST	TK 0 gram	.914	4	.506
	TK 75 gram	.973	4	.858
	TK 100 gram	.899	4	.426
	TK 125 gram	.933	4	.612
	SP 0 gram	.973	4	.863
	SP 75 gram	.974	4	.869
	SP 100 Gram	.922	4	.546
	SP 125 gram	.992	4	.970

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Tinggi_14HST	TK 0 gram	.963	4	.795
	TK 75 gram	.933	4	.610
	TK 100 gram	.899	4	.424
	TK 125 gram	.973	4	.863
	SP 0 gram	.925	4	.564
	SP 75 gram	.966	4	.815
	SP 100 Gram	.873	4	.310
	SP 125 gram	.923	4	.555

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Tinggi_21HST	TK 0 gram	.974	4	.869
	TK 75 gram	.902	4	.442
	TK 100 gram	.963	4	.800
	TK 125 gram	.874	4	.312
	SP 0 gram	.991	4	.964
	SP 75 gram	.993	4	.971
	SP 100 Gram	.998	4	.995
	SP 125 gram	.979	4	.894

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Tinggi_30HST	TK 0 gram	.918	4	.528
	TK 75 gram	.927	4	.578
	TK 100 gram	.904	4	.453
	TK 125 gram	.946	4	.689
	SP 0 gram	.910	4	.480
	SP 75 gram	.912	4	.492
	SP 100 Gram	.852	4	.232
	SP 125 gram	.973	4	.857

3.1.3 Hasil Uji Homogenitas

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Tinggi_0HST	Based on Mean	.254	7	24	.966
	Based on Median	.281	7	24	.955
	Based on Median and with adjusted df	.281	7	21.112	.954
	Based on trimmed mean	.264	7	24	.962
Tinggi_7HST	Based on Mean	.833	7	24	.570
	Based on Median	.712	7	24	.662
	Based on Median and with adjusted df	.712	7	16.077	.663
	Based on trimmed mean	.818	7	24	.581
Tinggi_14HST	Based on Mean	1.768	7	24	.141
	Based on Median	1.568	7	24	.193
	Based on Median and with adjusted df	1.568	7	17.555	.210
	Based on trimmed mean	1.765	7	24	.141
Tinggi_21HST	Based on Mean	2.138	7	24	.078
	Based on Median	1.982	7	24	.100
	Based on Median and with adjusted df	1.982	7	11.499	.146
	Based on trimmed mean	2.136	7	24	.078
Tinggi_30HST	Based on Mean	2.050	7	24	.090
	Based on Median	1.590	7	24	.186
	Based on Median and with adjusted df	1.590	7	6.760	.281
	Based on trimmed mean	2.025	7	24	.094

3.1.4 Hasil Uji Hipotesis (*Two-Way ANOVA*)

Tests of Between-Subjects Effects

Dependent Variable: Tinggi_0HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.170[a]	7	.024	.122	.996
Intercept	1519.383	1	1519.383	7664.779	.000
Jenis_Biochar	.000	1	.000	.002	.969
Dosis_Biochar	.166	3	.055	.279	.840
Jenis_Biochar * Dosis_Biochar	.003	3	.001	.006	.999
Error	4.757	24	.198		
Total	1524.310	32			
Corrected Total	4.927	31			

a. R Squared = ,034 (Adjusted R Squared = -,247)

Tests of Between-Subjects Effects

Dependent Variable: Tinggi_7HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16.340[a]	7	2.334	2.488	.045
Intercept	3987.245	1	3987.245	4250.228	.000
Jenis_Biochar	2.101	1	2.101	2.240	.148
Dosis_Biochar	12.037	3	4.012	4.277	.015
Jenis_Biochar * Dosis_Biochar	2.201	3	.734	.782	.516
Error	22.515	24	.938		
Total	4026.100	32			
Corrected Total	38.855	31			

a. R Squared = ,421 (Adjusted R Squared = ,252)

Tests of Between-Subjects Effects

Dependent Variable: Tinggi_14HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	170.907[a]	7	24.415	23.436	.000
Intercept	7684.900	1	7684.900	7376.767	.000
Jenis_Biochar	8.100	1	8.100	7.776	.010
Dosis_Biochar	156.626	3	52.209	50.115	.000
Jenis_Biochar * Dosis_Biochar	6.181	3	2.060	1.978	.144
Error	25.002	24	1.042		
Total	7880.810	32			
Corrected Total	195.910	31			

a. R Squared = ,872 (Adjusted R Squared = ,835)

Tests of Between-Subjects Effects

Dependent Variable: Tinggi_21HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	235.264[a]	7	33.609	42.000	.000
Intercept	12020.251	1	12020.251	15021.402	.000
Jenis_Biochar	7.801	1	7.801	9.749	.005
Dosis_Biochar	211.556	3	70.519	88.125	.000
Jenis_Biochar * Dosis_Biochar	15.906	3	5.302	6.626	.002
Error	19.205	24	.800		
Total	12274.720	32			
Corrected Total	254.469	31			

a. R Squared = ,925 (Adjusted R Squared = ,903)

Tests of Between-Subjects Effects

Dependent Variable: Tinggi_30HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	331.932[a]	7	47.419	75.355	.000
Intercept	16895.815	1	16895.815	26849.831	.000
Jenis_Biochar	10.238	1	10.238	16.269	.000
Dosis_Biochar	289.318	3	96.439	153.256	.000
Jenis_Biochar * Dosis_Biochar	32.376	3	10.792	17.150	.000
Error	15.103	24	.629		
Total	17242.850	32			
Corrected Total	347.035	31			

a. R Squared = ,956 (Adjusted R Squared = ,944)

3.1.5 Hasil Uji Lanjut DMRT (*Duncan Multiple Range Test)*

3.1.5.1 Hasil Uji Lanjut DMRT Faktor Tunggal (Dosis)

Tinggi_7HST

	Dosis_Biochar	N	Subset 1	Subset 2
Duncan[a,b]	0 gram	8	10.337	
	75 gram	8	10.813	10.813
	100 gram	8		11.675
	125 gram	8		11.825
	Sig.		.336	.058

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = ,938.

a. Uses Harmonic Mean Sample Size = 8,000.

b. Alpha = 0,05.

Tinggi_14HST

	Dosis_Biochar	N	Subset 1	Subset 2
Duncan[a,b]	0 gram	8	13.013	
	75 gram	8	13.575	
	125 gram	8		17.650
	100 gram	8		17.750
	Sig.		.281	.846

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 1,042.

a. Uses Harmonic Mean Sample Size = 8,000.

b. Alpha = 0,05.

Tinggi_21HST

	Dosis_Biochar	N	Subset 1	Subset 2	Subset 3
Duncan[a,b]	0 gram	8	16.075		
	75 gram	8		17.687	
	125 gram	8			21.613
	100 gram	8			22.150
	Sig.		1.000	1.000	.241

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = ,800.

a. Uses Harmonic Mean Sample Size = 8,000.

b. Alpha = 0,05.

Tinggi_30HST

	Dosis_Biochar	N	Subset 1	Subset 2	Subset 3
Duncan[a,b]	0 gram	8	19.038		
	75 gram	8		21.100	
	125 gram	8			25.588
	100 gram	8			26.187
	Sig.		1.000	1.000	.143

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = ,629.

a. Uses Harmonic Mean Sample Size = 8,000.

b. Alpha = 0,05.

3.1.5.2 Hasil Uji Lanjut DMRT Interaksi J*D

Tinggi_21HST

			Subset for alpha = 0.05					
	Perlakuan	N	1	2	3	4	5	6
Duncan[a]	SP 0 gram	4	15.700					
	TK 0 gram	4	16.450	16.450				
	SP 75 gram	4		17.325	17.325			
	TK 75 gram	4			18.050			
	SP 100 Gram	4				20.550		
	TK 125 gram	4				21.250	21.250	
	SP 125 gram	4					21.975	
	TK 100 gram	4						23.750
	Sig.		.247	.179	.263	.279	.263	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 4,000.

Tinggi_30HST

			Subset for alpha = 0.05				
	Perlakuan	N	1	2	3	4	5
Duncan[a]	SP 0 gram	4	18.625				
	TK 0 gram	4	19.450				
	TK 75 gram	4		21.100			
	SP 75 gram	4		21.100			
	SP 100 Gram	4			23.950		
	TK 125 gram	4				25.200	
	SP 125 gram	4				25.975	
	TK 100 gram	4					28.425
	Sig.		.154	1.000	1.000	.180	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 4,000.

3.2 Hasil Analisis Parameter Jumlah Daun Tanaman Pakcoy

3.2.1 Hasil Uji Deskriptif

Descriptives

	Perlakuan		Statistic	Std. Error
Daun_0HST	TK 0gram	Mean	3.75	.479
		Std. Deviation	.957	
	TK 75 gram	Mean	4.00	.408
		Std. Deviation	.816	
	TK 100 gram	Mean	4.00	.408
		Std. Deviation	.816	
	TK 125 gram	Mean	3.75	.479
		Std. Deviation	.957	
	SP 0 gram	Mean	4.00	.408
		Std. Deviation	.816	
	SP 75 gram	Mean	3.75	.479
		Std. Deviation	.957	
	SP 100 gram	Mean	4.00	.408
		Std. Deviation	.816	
	SP 125 gram	Mean	4.00	.408
		Std. Deviation	.816	

Descriptives

	Perlakuan		Statistic	Std. Error
Daun_7HST	TK 0gram	Mean	5.00	.408
		Std. Deviation	.816	
	TK 75 gram	Mean	5.75	.479
		Std. Deviation	.957	
	TK 100 gram	Mean	6.75	.479
		Std. Deviation	.957	
	TK 125 gram	Mean	6.50	.645
		Std. Deviation	1.291	
	SP 0 gram	Mean	5.50	.645
		Std. Deviation	1.291	
	SP 75 gram	Mean	6.25	.479
		Std. Deviation	.957	
	SP 100 gram	Mean	6.75	.629
		Std. Deviation	1.258	
	SP 125 gram	Mean	7.75	.629
		Std. Deviation	1.258	

Descriptives

	Perlakuan		Statistic	Std. Error
Daun_14HST	TK 0gram	Mean	7.25	.479
		Std. Deviation	.957	
	TK 75 gram	Mean	9.00	.408
		Std. Deviation	.816	
	TK 100 gram	Mean	10.25	.479
		Std. Deviation	.957	
	TK 125 gram	Mean	9.75	.479
		Std. Deviation	.957	
	SP 0 gram	Mean	8.25	.479
		Std. Deviation	.957	
	SP 75 gram	Mean	9.00	.408
		Std. Deviation	.816	
	SP 100 gram	Mean	10.25	.479
		Std. Deviation	.957	
	SP 125 gram	Mean	12.25	.479
		Std. Deviation	.957	

Descriptives

	Perlakuan		Statistic	Std. Error
Daun_21HST	TK 0gram	Mean	10.25	.479
		Std. Deviation	.957	
	TK 75 gram	Mean	12.00	.408
		Std. Deviation	.816	
	TK 100 gram	Mean	14.25	.479
		Std. Deviation	.957	
	TK 125 gram	Mean	12.50	.645
		Std. Deviation	1.291	
	SP 0 gram	Mean	10.75	.479
		Std. Deviation	.957	
	SP 75 gram	Mean	13.00	.408
		Std. Deviation	.816	
	SP 100 gram	Mean	13.75	.479
		Std. Deviation	.957	
	SP 125 gram	Mean	15.25	.479
		Std. Deviation	.957	

Descriptives

	Perlakuan		Statistic	Std. Error
Daun_30HST	TK 0gram	Mean	11.25	.479
		Std. Deviation	.957	
	TK 75 gram	Mean	14.00	.408
		Std. Deviation	.816	
	TK 100 gram	Mean	17.00	.408
		Std. Deviation	.816	
	TK 125 gram	Mean	14.75	.479
		Std. Deviation	.957	
	SP 0 gram	Mean	11.75	.479
		Std. Deviation	.957	
	SP 75 gram	Mean	15.00	.408
		Std. Deviation	.816	
	SP 100 gram	Mean	16.25	.479
		Std. Deviation	.957	
	SP 125 gram	Mean	17.75	.629
		Std. Deviation	1.258	

3.2.2 Hasil Uji Normalitas

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Daun_0HST	TK 0gram	.863	4	.272
	TK 75 gram	.945	4	.683
	TK 100 gram	.945	4	.683
	TK 125 gram	.863	4	.272
	SP 0 gram	.945	4	.683
	SP 75 gram	.863	4	.272
	SP 100 gram	.945	4	.683
	SP 125 gram	.945	4	.683

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Daun_7HST	TK 0gram	.945	4	.683
	TK 75 gram	.863	4	.272
	TK 100 gram	.863	4	.272
	TK 125 gram	.993	4	.972
	SP 0 gram	.993	4	.972
	SP 75 gram	.863	4	.272
	SP 100 gram	.895	4	.406
	SP 125 gram	.895	4	.406

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Daun_14HST	TK 0gram	.863	4	.272
	TK 75 gram	.945	4	.683
	TK 100 gram	.863	4	.272
	TK 125 gram	.863	4	.272
	SP 0 gram	.863	4	.272
	SP 75 gram	.945	4	.683
	SP 100 gram	.863	4	.272
	SP 125 gram	.863	4	.272

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Daun_21HST	TK 0gram	.863	4	.272
	TK 75 gram	.945	4	.683
	TK 100 gram	.863	4	.272
	TK 125 gram	.993	4	.972
	SP 0 gram	.863	4	.272
	SP 75 gram	.945	4	.683
	SP 100 gram	.863	4	.272
	SP 125 gram	.863	4	.272

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Daun_30HST	TK 0gram	.863	4	.272
	TK 75 gram	.945	4	.683
	TK 100 gram	.945	4	.683
	TK 125 gram	.863	4	.272
	SP 0 gram	.863	4	.272
	SP 75 gram	.945	4	.683
	SP 100 gram	.863	4	.272
	SP 125 gram	.895	4	.406

3.2.3 Hasil Uji Homogenitas

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Daun_0HST	Based on Mean	.247	7	24	.968
	Based on Median	.222	7	24	.976
	Based on Median and with adjusted df	.222	7	23.579	.976
	Based on trimmed mean	.247	7	24	.968
Daun_7HST	Based on Mean	.327	7	24	.934
	Based on Median	.229	7	24	.974
	Based on Median and with adjusted df	.229	7	17.498	.973
	Based on trimmed mean	.313	7	24	.941
Daun_14HST	Based on Mean	.257	7	24	.965
	Based on Median	.198	7	24	.983
	Based on Median and with adjusted df	.198	7	23.581	.983
	Based on trimmed mean	.256	7	24	.965
Daun_21HST	Based on Mean	.448	7	24	.862
	Based on Median	.365	7	24	.914
	Based on Median and with adjusted df	.365	7	23.516	.913
	Based on trimmed mean	.447	7	24	.863
Daun_30HST	Based on Mean	.316	7	24	.939
	Based on Median	.184	7	24	.986
	Based on Median and with adjusted df	.184	7	17.927	.985
	Based on trimmed mean	.300	7	24	.947

3.2.4 Hasil Uji Hipotesis (*Two-Way ANOVA*)

Tests of Between-Subjects Effects

Dependent Variable: Daun_0HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.469[a]	7	.067	.088	.999
Intercept	488.281	1	488.281	642.123	.000
Jenis_biochar	.031	1	.031	.041	.841
Dosis_biochar	.094	3	.031	.041	.989
Jenis_biochar * Dosis_biochar	.344	3	.115	.151	.928
Error	18.250	24	.760		
Total	507.000	32			
Corrected Total	18.719	31			

a. R Squared = ,025 (Adjusted R Squared = -,259)

Tests of Between-Subjects Effects

Dependent Variable: Daun_7HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	20.719[a]	7	2.960	2.388	.053
Intercept	1262.531	1	1262.531	1018.513	.000
Jenis_biochar	2.531	1	2.531	2.042	.166
Dosis_biochar	16.594	3	5.531	4.462	.013
Jenis_biochar * Dosis_biochar	1.594	3	.531	.429	.734
Error	29.750	24	1.240		
Total	1313.000	32			
Corrected Total	50.469	31			

a. R Squared = ,411 (Adjusted R Squared = ,239)

Tests of Between-Subjects Effects

Dependent Variable: Daun_14HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	63.500[a]	7	9.071	10.620	.000
Intercept	2888.000	1	2888.000	3381.073	.000
Jenis_biochar	6.125	1	6.125	7.171	.013
Dosis_biochar	49.000	3	16.333	19.122	.000
Jenis_biochar * Dosis_biochar	8.375	3	2.792	3.268	.039
Error	20.500	24	.854		
Total	2972.000	32			
Corrected Total	84.000	31			

a. R Squared = ,756 (Adjusted R Squared = ,685)

Tests of Between-Subjects Effects

Dependent Variable: Daun_21HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	81.719[a]	7	11.674	12.316	.000
Intercept	5176.531	1	5176.531	5460.956	.000
Jenis_biochar	7.031	1	7.031	7.418	.012
Dosis_biochar	63.594	3	21.198	22.363	.000
Jenis_biochar * Dosis_biochar	11.094	3	3.698	3.901	.021
Error	22.750	24	.948		
Total	5281.000	32			
Corrected Total	104.469	31			

a. R Squared = ,782 (Adjusted R Squared = ,719)

Tests of Between-Subjects Effects

Dependent Variable: Daun_30HST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	152.719[a]	7	21.817	24.074	.000
Intercept	6932.531	1	6932.531	7649.690	.000
Jenis_biochar	7.031	1	7.031	7.759	.010
Dosis_biochar	131.094	3	43.698	48.218	.000
Jenis_biochar * Dosis_biochar	14.594	3	4.865	5.368	.006
Error	21.750	24	.906		
Total	7107.000	32			
Corrected Total	174.469	31			

a. R Squared = ,875 (Adjusted R Squared = ,839)

3.2.5 Hasil Uji Lanjut DMRT (*Duncan Multiple Range Test)*

3.2.5.1 Hasil Uji Lanjut DMRT Faktor Tunggal (Dosis)

Daun_7HST

Duncan[a,b]

Dosis_biochar	N	Subset 1	Subset 2
0 gram	8	5.25	
75 gram	8	6.00	6.00
100 gram	8		6.75
125 gram	8		7.12
Sig.		.190	.067

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 1.240.

a. Uses Harmonic Mean Sample Size = 8.000.

b. Alpha = 0,05.

Daun_14HST

Duncan[a,b]

Dosis_biochar	N	Subset 1	Subset 2	Subset 3
0 gram	8	7.75		
75 gram	8		9.00	
100 gram	8			10.25
125 gram	8			11.00
Sig.		1.000	1.000	.118

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = .854.

a. Uses Harmonic Mean Sample Size = 8.000.

b. Alpha = 0,05.

Daun_21HST

Duncan[a,b]

Dosis_biochar	N	Subset 1	Subset 2	Subset 3
0 gram	8	10.50		
75 gram	8		12.50	
125 gram	8			13.88
100 gram	8			14.00
Sig.		1.000	1.000	.800

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = .948.

a. Uses Harmonic Mean Sample Size = 8.000.

b. Alpha = 0,05.

Daun_30HST

Duncan[a,b]

Dosis_biochar	N	Subset 1	Subset 2	Subset 3
0 gram	8	11.50		
75 gram	8		14.50	
125 gram	8			16.25
100 gram	8			16.63
Sig.		1.000	1.000	.439

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = .906.

a. Uses Harmonic Mean Sample Size = 8.000.

b. Alpha = 0,05.

3.2.5.2 Hasil Uji Lanjut DMRT Interaksi J*D

Daun_14HST

	Perlakuan	N	Subset for alpha = 0.05			
			1	2	3	4
Duncan[a]	TK 0gram	4	7.25			
	SP 0 gram	4	8.25	8.25		
	TK 75 gram	4		9.00	9.00	
	SP 75 gram	4		9.00	9.00	
	TK 125 gram	4			9.75	
	TK 100 gram	4			10.25	
	SP 100 gram	4			10.25	
	SP 125 gram	4				12.25
	Sig.		.139	.289	.098	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 4,000.

Daun_21HST

	Perlakuan	N	Subset for alpha = 0.05					
			1	2	3	4	5	6
Duncan[a]	TK 0gram	4	10.25					
	SP 0 gram	4	10.75	10.75				
	TK 75 gram	4		12.00	12.00			
	TK 125 gram	4			12.50	12.50		
	SP 75 gram	4			13.00	13.00	13.00	
	SP 100 gram	4				13.75	13.75	
	TK 100 gram	4					14.25	14.25
	SP 125 gram	4						15.25
	Sig.		.475	.082	.182	.098	.098	.159

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 4,000.

Daun_30HST

	Perlakuan	N	Subset for alpha = 0.05				
			1	2	3	4	5
Duncan[a]	TK 0gram	4	11.25				
	SP 0 gram	4	11.75				
	TK 75 gram	4		14.00			
	TK 125 gram	4		14.75			
	SP 75 gram	4		15.00	15.00		
	SP 100 gram	4			16.25	16.25	
	TK 100 gram	4				17.00	17.00
	SP 125 gram	4					17.75
	Sig.		.465	.173	.076	.276	.276

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 4,000.

3.3 Hasil Analisis Parameter Berat Segar Tanaman Pakcoy

3.3.1 Hasil Uji Deskriptif

Descriptives

	Perlakuan		Statistic	Std. Error
Berat_segar	TK 0gram	Mean	23.25	1.750
		Std. Deviation	3.500	
	TK 75 gram	Mean	37.75	1.109
		Std. Deviation	2.217	
	TK 100 gram	Mean	92.50	.866
		Std. Deviation	1.732	
	TK 125 gram	Mean	64.75	1.181
		Std. Deviation	2.363	
	SP 0 gram	Mean	21.75	1.031
		Std. Deviation	2.062	
	SP 75 gram	Mean	45.75	.854
		Std. Deviation	1.708	
	SP 100 gram	Mean	76.25	1.109
		Std. Deviation	2.217	
	SP 125 gram	Mean	106.00	1.581
		Std. Deviation	3.162	

3.3.2 Hasil Uji Normalitas

Tests of Normality

		Shapiro-Wilk		
	Perlakuan	Statistic	df	Sig.
Berat_segar	TK 0gram	.979	4	.894
	TK 75 gram	.963	4	.798
	TK 100 gram	.840	4	.195
	TK 125 gram	.848	4	.220
	SP 0 gram	.827	4	.161
	SP 75 gram	.971	4	.850
	SP 100 gram	.963	4	.798
	SP 125 gram	.940	4	.653

3.3.3 Hasil Uji Homogenitas

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Berat_segar	Based on Mean	1.021	7	24	.442
	Based on Median	.932	7	24	.501
	Based on Median and with adjusted df	.932	7	19.159	.505
	Based on trimmed mean	1.025	7	24	.439

3.3.4 Hasil Uji Hipotesis (*Two-Way ANOVA*)

Tests of Between-Subjects Effects

Dependent Variable: Berat_segar

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	27810.500[a]	7	3972.929	664.462	.000
Intercept	109512.000	1	109512.000	18315.596	.000
Jenis_biochar	496.125	1	496.125	82.976	.000
Dosis_biochar	23746.750	3	7915.583	1323.861	.000
Jenis_biochar * Dosis_biochar	3567.625	3	1189.208	198.892	.000
Error	143.500	24	5.979		
Total	137466.000	32			
Corrected Total	27954.000	31			

a. R Squared = ,995 (Adjusted R Squared = ,993)

3.3.5 Hasil Uji Lanjut DMRT (*Duncan Multiple Range Test)*

3.3.5.1 Hasil Uji Lanjut DMRT Faktor Tunggal (Dosis)

Berat_segar

	Dosis_biochar	N	Subset 1	2	3
Duncan[a,b]	0 gram	8	22.50		
	75 gram	8		41.75	
	100 gram	8			84.38
	125 gram	8			85.37
	Sig.		1.000	1.000	.421

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 5,979.

a. Uses Harmonic Mean Sample Size = 8,000.

b. Alpha = 0,05.

3.3.5.2 Hasil Uji Lanjut DMRT Interaksi J*D

Berat_segar

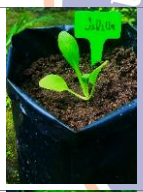
	Perlakuan	N	Subset for alpha = 0.05 1	2	3	4	5	6	7
Duncan[a]	SP 0 gram	4	21.75						
	TK 0gram	4	23.25						
	TK 75 gram	4		37.75					
	SP 75 gram	4			45.75				
	TK 125 gram	4				64.75			
	SP 100 gram	4					76.25		
	TK 100 gram	4						92.50	
	SP 125 gram	4							106.00
	Sig.		.394	1.000	1.000	1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 4,000.

Lampiran 04. Dokumentasi Penelitian

Tabel 4.1 Dokumentasi Pengamatan Pertumbuhan Pakcoy Selama 30 Hari

Perlakuan	0 HST	7 HST	14 HST	21 HST	30 HST
J1D1					
J1D2					
J1D3					
J1D4					
J2D1					
J2D2					
J2D3					
J2D4					

4.2 Pembuatan Biochar oleh Produsen

Gambar 1. Proses Pirolisis Biomassa
(Sumber: Produsen Jaya Taniku)

Gambar 2. Pendinginan Biochar
(Sumber: Produsen Jaya Taniku)

4.3 Persiapan Media Tanam

Gambar 1. Penggemburan tanah

Gambar 2. Pengisian tanah ke polibag

Gambar 3. Penimbangan volume tanah

Gambar 4. Pengayakan biochar

Gambar 5. Penambahan biochar

Gambar 6. Pencampuran media tanam

Gambar 8. Inkubasi media tanam

Gambar 7. Penyusunan polibag sesuai denah RAL

4.4 Penanaman

Gambar 1. Pelubangan media tanam

Gambar 2. Pemilihan sampel bibit pakcoy

Gambar 4. Penyiraman setelah pindah tanam

Gambar 3. Penanaman bibit pakcoy

Gambar 5. Pengukuran tinggi bibit

4.3 Pemeliharaan

Gambar 1. Pemasangan *insect net*

Gambar 3. Penyemprotan pestisida nabati

Gambar 2. Penyiraman

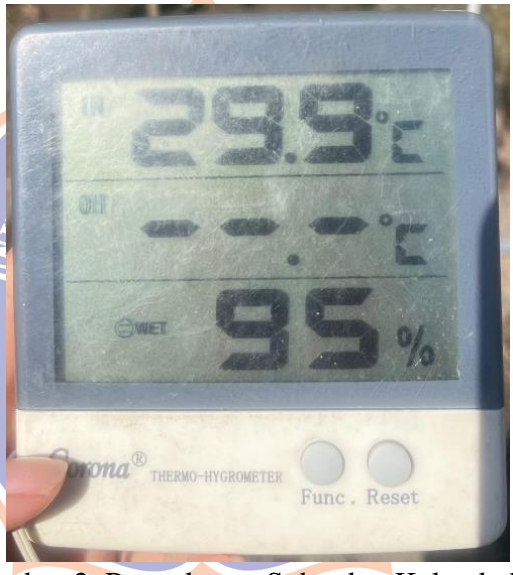
4.4 Pemanenan

Gambar 1. Pemanenan tanaman pakcoy

Gambar 2. Penimbangan berat segar pakcoy

4.5 Pengukuran Faktor Lingkungan

Gambar 1. Pengukuran pH Media Tanam



Gambar 2. Pengukuran Suhu dan Kelembaban

RIWAYAT HIDUP

Kadek Ayu Natalia Dewi lahir di Kapal, Mengwi, pada tanggal 27 Desember 2003. Penulis merupakan anak dari pasangan I Ketut Sandi dan Ni Wayan Murniati. Penulis beralamat di Banjar Busana, Desa Sibanggede, Kecamatan Abiansemal, Kabupaten Badung, Provinsi Bali. Penulis memulai pendidikan formal di SD Negeri 1 Sibanggede dan lulus pada tahun 2016. Penulis melanjutkan pendidikan di SMP Negeri 3 Abiansemal dan lulus pada tahun 2019. Pendidikan menengah atas ditempuh di SMA Negeri 1 Kuta Utara dan berhasil diselesaikan pada tahun 2022. Pada tahun 2022, penulis melanjutkan pendidikan ke jenjang Strata Satu (S1) pada Program Studi Biologi, Jurusan Biologi dan Perikanan Kelautan, Universitas Pendidikan Ganesha. Selama menempuh pendidikan di perguruan tinggi, penulis aktif dalam berbagai kegiatan organisasi. Penulis tergabung dalam Himpunan Mahasiswa Jurusan (HMJ) Biologi dan Perikanan Kelautan serta dipercaya menjadi ketua panitia dan bendahara dalam beberapa kegiatan, di antaranya Seminar *Soft Skill* dan Kepemimpinan, *Biomerish Modern Dance Competition*, dan *Biomerish in Action*. Pada tahun 2024, penulis terpilih sebagai salah satu dari lima mahasiswa yang mewakili Universitas Pendidikan Ganesha dalam kegiatan KKN Kebangsaan XII yang diselenggarakan di Provinsi Maluku dan diikuti oleh mahasiswa dari berbagai perguruan tinggi di seluruh Indonesia. Pada tahun 2026, penulis menyelesaikan skripsi yang berjudul "Analisis Variasi Jenis dan Dosis Biochar terhadap Pertumbuhan Tanaman Pakcoy (*Brassica rapa*)" sebagai salah satu syarat untuk memperoleh gelar Sarjana Sains pada Program Studi Biologi, Jurusan Biologi dan Perikanan Kelautan, Universitas Pendidikan Ganesha.