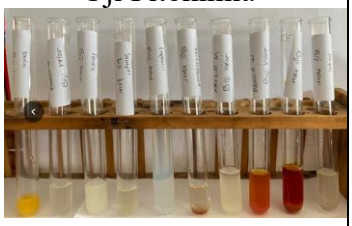
LAMPIRAN

Lampiran 1. Dokumentasi penelitian

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Lampiran 2. Data Hasil analisis *Atomic Absorption Spectrophotometer* (AAS)

Tabel 1. Kurva Kalibrasi

Konsentrasi (ppm)	Absorbansi	Panjang Gelombang
0	0,0002	217
2	0,0208	217
4	0,0357	217
8	0,0690	217
18	0,1231	217
32	0,2377	217

Tabel 2. Kadar Pengukuran Kadar Logam Timbal (Pb)

N0	Nama Sampel	Kadar Logam Pb (mg/L) Pre-Test	Kadar Logam Pb (mg/L) Post-Test
1	K- (1)	0,0522	0,0154
2	K- (2)	0,0493	0,0152
3	K- (3)	0,0515	0,0161
4	K- (4)	0,0515	0,0152
5	K+ (1)	0,4635	0,4363
6	K+ (2)	0,4544	0,4363
7	K+ (3)	0,4771	0,4352
8	K+ (4)	0,4467	0,4363
9	K_NaCMC (1)	0,4421	0,4285
10	K_NaCMC (2)	0,4461	0,4280
11	K_NaCMC (3)	0,4477	0,4290
12	K_NaCMC (4)	0,4473	0,4270
13	Dosis 1000 (1)	0,4515	0,3637
14	Dosis 1000 (2)	0,4517	0,3420
15	Dosis 1000 (3)	0,4550	0,3492
16	Dosis 1000 (4)	0,4510	0,3565
17	Dosis 1250 (1)	0,4478	0,2838
18	Dosis 1250 (2)	0,4523	0,2766
19	Dosis 1250 (3)	0,4557	0,2911
20	Dosis 1250 (4)	0,4497	0,2766
21	Dosis 1500 (1)	0,4523	0,1481
22	Dosis 1500 (2)	0,4525	0,1700
23	Dosis 1500 (3)	0,4553	0,1920
24	Dosis 1500 (4)	0,4513	0,1628

Lampiran 3. Hasil Uji fitokimia

UNIVERSITAS NEGERI SURABAYA
FAKULTAS MATEMATIKA
DAN ILMU PENGETAHUAN ALAM
LABORATORIUM KIMIA

Kampus Unesa 1
Jl. Ketintang, Surabaya 60231
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http://kimia.unesa.ac.id

Kode : Zagita Indah Camelia (Teknologi Laboratorium Medis - Umsida)

Analisis : Alkaloid,Flavonoid, Saponin,Steroid, Triterpenoid,Fenolik dan Tanin.

Sampel : Ekstrak Etanol 96% Biji Kelor *(Moringa oleifera.)*

Metode : Fitokimia

Tanggal : 22 Mei 2026

Uji Fitokimia	Pereaksi	Hasil (Terbentuknya)	Kesimpulan (+) / (-)
	Mayer	Endapan putih	+
Alkaloid	Wagner	Endapan coklat	+
	Dragendorf	Endapan jingga	+
Flavonoid	Mg + HCl $_{pekat}$ + etanol	Warna merah	+
Saponin	-	Adanya busa stabil	+
Steroid	Libermann-Burchard	Ungu ke biru/hijau	+
Triterpenoid	Kloroform+$H_2SO_{4\ Pekat}$	Merah kecoklatan	+
Fenolik	NaCl 10% + Gelatin 1%	Endapan Putih	+
Tanin	$FeCl_3$ 1%	Coklat kehijauan	+

Surabaya, 22 Mei 2026

Laboran

Idah Dianah Wati,S.Pd

Lampiran 4. Hasil Uji Data Statistik SPSS Versi 25 (pre-test dan post-test)

a. Uji normalitas Shapiro-Wilk

Tests of Normality

	Kelompok	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Hasil	K-	.316	8	.018	.695	8	.002
	K+	.278	8	.070	.835	8	.066
	K_NaCMC	.296	8	.037	.780	8	.017
	D 1000	.317	8	.017	.747	8	.007
	D 1250	.314	8	.019	.708	8	.003
	D 1500	.322	8	.015	.716	8	.003

a. Lilliefors Significance Correction

b. Uji homogenitas Levene test

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Hasil	Based on Mean	481.412	5	42	.000
	Based on Median	257.316	5	42	.000
	Based on Median and with adjusted df	257.316	5	18.188	.000
	Based on trimmed mean	467.587	5	42	.000

c. Uji lanjutan Wilcoxon

Kelompok = K-

Wilcoxon Signed Ranks Test

Ranks[a]

		N	Mean Rank	Sum of Ranks
Post Test - Pre Test	Negative Ranks	4[b]	2.50	10.00
	Positive Ranks	0[c]	.00	.00
	Ties	0[d]		
	Total	4		

a. Kelompok = K-
b. Post Test < Pre Test
c. Post Test > Pre Test
d. Post Test = Pre Test

Test Statistics[a,b]

	Post Test - Pre Test
Z	-1.826[c]
Asymp. Sig. (2-tailed)	.068

a. Kelompok = K-
b. Wilcoxon Signed Ranks Test
c. Based on positive ranks.

Kelompok = K+

Wilcoxon Signed Ranks Test

Ranks[a]

		N	Mean Rank	Sum of Ranks
Post Test - Pre Test	Negative Ranks	4[b]	2.50	10.00
	Positive Ranks	0[c]	.00	.00
	Ties	0[d]		
	Total	4		

a. Kelompok = K+
b. Post Test < Pre Test
c. Post Test > Pre Test
d. Post Test = Pre Test

Test Statistics[a,b]

	Post Test - Pre Test
Z	-1.826[c]
Asymp. Sig. (2-tailed)	.068

a. Kelompok = K+
b. Wilcoxon Signed Ranks Test
c. Based on positive ranks.

Kelompok = K_NaCMC

Wilcoxon Signed Ranks Test

Ranks[a]

		N	Mean Rank	Sum of Ranks
Post Test - Pre Test	Negative Ranks	4[b]	2.50	10.00
	Positive Ranks	0[c]	.00	.00
	Ties	0[d]		
	Total	4		

a. Kelompok = K_NaCMC
b. Post Test < Pre Test
c. Post Test > Pre Test
d. Post Test = Pre Test

Test Statistics[a,b]

	Post Test - Pre Test
Z	-1.826[c]
Asymp. Sig. (2-tailed)	.068

a. Kelompok = K_NaCMC
b. Wilcoxon Signed Ranks Test
c. Based on positive ranks.

Kelompok = D 1000

Wilcoxon Signed Ranks Test

Ranks[a]

		N	Mean Rank	Sum of Ranks
Post Test - Pre Test	Negative Ranks	4[b]	2.50	10.00
	Positive Ranks	0[c]	.00	.00
	Ties	0[d]		
	Total	4		

a. Kelompok = D 1000
b. Post Test < Pre Test
c. Post Test > Pre Test
d. Post Test = Pre Test

Test Statistics[a,b]

	Post Test - Pre Test
Z	-1.826[c]
Asymp. Sig. (2-tailed)	.068

a. Kelompok = D 1000
b. Wilcoxon Signed Ranks Test
c. Based on positive ranks.

Kelompok = D 1250

Wilcoxon Signed Ranks Test

Ranks[a]

		N	Mean Rank	Sum of Ranks
Post Test - Pre Test	Negative Ranks	4[b]	2.50	10.00
	Positive Ranks	0[c]	.00	.00
	Ties	0[d]		
	Total	4		

a. Kelompok = D 1250
b. Post Test < Pre Test
c. Post Test > Pre Test
d. Post Test = Pre Test

Test Statistics[a,b]

	Post Test - Pre Test
Z	-1.826[c]
Asymp. Sig. (2-tailed)	.068

a. Kelompok = D 1250
b. Wilcoxon Signed Ranks Test
c. Based on positive ranks.

Kelompok = D 1500

Wilcoxon Signed Ranks Test

Ranks[a]

		N	Mean Rank	Sum of Ranks
Post Test - Pre Test	Negative Ranks	4[b]	2.50	10.00
	Positive Ranks	0[c]	.00	.00
	Ties	0[d]		
	Total	4		

a. Kelompok = D 1500
b. Post Test < Pre Test
c. Post Test > Pre Test
d. Post Test = Pre Test

Test Statistics[a,b]

	Post Test - Pre Test
Z	-1.826[c]
Asymp. Sig. (2-tailed)	.068

a. Kelompok = D 1500
b. Wilcoxon Signed Ranks Test
c. Based on positive ranks.

d. Data Pre Test dan Post Test Mean ± SD

Descriptives

	Kelompok		Statistic	Std. Error
Pre Test	K-	Mean	.051125	.0006303
		95% Confidence Interval for Mean — Lower Bound	.049119	
		95% Confidence Interval for Mean — Upper Bound	.053131	
		5% Trimmed Mean	.051167	
		Median	.051500	
		Variance	.000	
		Std. Deviation	.0012606	

	Minimum		.0493	
	Maximum		.0522	
	Range		.0029	
	Interquartile Range		.0022	
	Skewness		-1.574	1.014
	Kurtosis		2.957	2.619
K+	Mean		.460425	.0065332
	95% Confidence Interval for Mean	Lower Bound	.439634	
		Upper Bound	.481216	
	5% Trimmed Mean		.460261	
	Median		.458950	
	Variance		.000	
	Std. Deviation		.0130663	
	Minimum		.4467	
	Maximum		.4771	
	Range		.0304	
	Interquartile Range		.0251	
	Skewness		.556	1.014
	Kurtosis		-.440	2.619
K_NaCMC	Mean		.445800	.0012793
	95% Confidence Interval for Mean	Lower Bound	.441729	
		Upper Bound	.449871	
	5% Trimmed Mean		.445900	
	Median		.446700	
	Variance		.000	
	Std. Deviation		.0025586	
	Minimum		.4421	
	Maximum		.4477	
	Range		.0056	
	Interquartile Range		.0045	
	Skewness		-1.608	1.014
	Kurtosis		2.484	2.619
D 1000	Mean		.452300	.0009120
	95% Confidence Interval for Mean	Lower Bound	.449398	
		Upper Bound	.455202	
	5% Trimmed Mean		.452222	
	Median		.451600	
	Variance		.000	
	Std. Deviation		.0018239	
	Minimum		.4510	
	Maximum		.4550	

		Range		.0040	
		Interquartile Range		.0030	
		Skewness		1.841	1.014
		Kurtosis		3.530	2.619
	D 1250	Mean		.451375	.0017114
		95% Confidence Interval for Mean	Lower Bound	.445928	
			Upper Bound	.456822	
		5% Trimmed Mean		.451333	
		Median		.451000	
		Variance		.000	
		Std. Deviation		.0034228	
		Minimum		.4478	
		Maximum		.4557	
		Range		.0079	
		Interquartile Range		.0066	
		Skewness		.520	1.014
		Kurtosis		-.827	2.619
	D 1500	Mean		.452850	.0008578
		95% Confidence Interval for Mean	Lower Bound	.450120	
			Upper Bound	.455580	
		5% Trimmed Mean		.452800	
		Median		.452400	
		Variance		.000	
		Std. Deviation		.0017156	
		Minimum		.4513	
		Maximum		.4553	
		Range		.0040	
		Interquartile Range		.0030	
		Skewness		1.422	1.014
		Kurtosis		2.625	2.619
Post Test	K-	Mean		.015475	.0002136
		95% Confidence Interval for Mean	Lower Bound	.014795	
			Upper Bound	.016155	
		5% Trimmed Mean		.015456	
		Median		.015300	
		Variance		.000	
		Std. Deviation		.0004272	
		Minimum		.0152	
		Maximum		.0161	
		Range		.0009	

	Interquartile Range		.0007	
	Skewness		1.728	1.014
	Kurtosis		2.919	2.619
K+	Mean		.436025	.0002750
	95% Confidence Interval for Mean	Lower Bound	.435150	
		Upper Bound	.436900	
	5% Trimmed Mean		.436056	
	Median		.436300	
	Variance		.000	
	Std. Deviation		.0005500	
	Minimum		.4352	
	Maximum		.4363	
	Range		.0011	
	Interquartile Range		.0008	
	Skewness		-2.000	1.014
	Kurtosis		4.000	2.619
K_NaCMC	Mean		.428125	.0004270
	95% Confidence Interval for Mean	Lower Bound	.426766	
		Upper Bound	.429484	
	5% Trimmed Mean		.428139	
	Median		.428250	
	Variance		.000	
	Std. Deviation		.0008539	
	Minimum		.4270	
	Maximum		.4290	
	Range		.0020	
	Interquartile Range		.0016	
	Skewness		-.753	1.014
	Kurtosis		.343	2.619
D 1000	Mean		.352850	.0046734
	95% Confidence Interval for Mean	Lower Bound	.337977	
		Upper Bound	.367723	
	5% Trimmed Mean		.352850	
	Median		.352850	
	Variance		.000	
	Std. Deviation		.0093468	
	Minimum		.3420	
	Maximum		.3637	
	Range		.0217	
	Interquartile Range		.0181	

	Skewness		.000	1.014
	Kurtosis		-1.240	2.619
D 1250	Mean		.282025	.0034685
	95% Confidence Interval for Mean	Lower Bound	.270987	
		Upper Bound	.293063	
	5% Trimmed Mean		.281822	
	Median		.280200	
	Variance		.000	
	Std. Deviation		.0069370	
	Minimum		.2766	
	Maximum		.2911	
	Range		.0145	
	Interquartile Range		.0127	
	Skewness		.866	1.014
	Kurtosis		-1.230	2.619
D 1500	Mean		.168225	.0091417
	95% Confidence Interval for Mean	Lower Bound	.139132	
		Upper Bound	.197318	
	5% Trimmed Mean		.168022	
	Median		.166400	
	Variance		.000	
	Std. Deviation		.0182834	
	Minimum		.1481	
	Maximum		.1920	
	Range		.0439	
	Interquartile Range		.0347	
	Skewness		.560	1.014
	Kurtosis		.950	2.619

Lampiran 5. Determinasi Tanaman

PEMERINTAH PROVINSI JAWA TIMUR
DINAS KESEHATAN
UPT LABORATORIUM HERBAL MATERIA MEDICA BATU
Jalan Lahor Nomor 87, Pesanggrahan, Kota Batu, Jawa Timur 65313
Telepon 0341 593396, Laman materiamedica.jatimprov.go.id,
Pos el materiamedicabatu@jatimprov.go.id

Batu, 28 April 2026

Nomor : 000.9.3/1592/102.20/2026
Sifat : Terbuka
Hal : Surat Keterangan Determinasi Tanaman Kelor

Memenuhi permohonan saudara :

Nama : Zagita Indah Camelia
NIM/NIP/NIK : 221335300037
Fakultas : Ilmu Kesehatan (FIKES), Universitas Muhammadiyah Sidoarjo

1. Perihal *determinasi tanaman kelor*
   Suku : *Moringaceae*
   Marga : *Moringa*
   Jenis : *Moringa oleifera* Lamk.
   Nama Daerah : Kelor, merunggai (Indonesia, Jawa, Sunda, Bali, Lampung); kerol (Buru); marangghi (Madura); moltong (Flores); kelo (Gorontalo); keloro (Bugis); kawano (Sumba); ongge (Bima); hau fo (Timor).
   Kunci Determinasi : 1b-2b-3b-4b-6b-7b-9b-10b-11b-12b-13b-14a-15b-197b-208b-209b-210b-211b-214a:*Moringaceae*-1:*M.oleifera*.
2. Morfologi : Habitus: Pohon, tinggi dapat mencapai 8 m. Batang: Berkayu, bulat, bercabang, berbintik hitam, putih kotor. Daun: Majemuk, panjang 20-60 cm, anak daun bulat telur, tepi rata, ujung berlekuk, menyirip ganjil, hijau. Bunga: Majemuk, bentuk malai, letak di ketiak daun, panjang 10-30 cm, daun kelopak hijau, benang sari dan putik kecil, mahkota putih, putih. Buah: Polong, panjang 20-45 cm, berisi 15-25 biji, coklat kehitaman. Biji: Bulat, bersayap tiga, hitam. Akar: Tunggang, putih kotor.
3. Bagian yang digunakan : Biji.
4. Penggunaan : Penelitian.
5. *Daftar Pustaka*
   - The International Plant Names Index and World Checklist of Vascular Plants 2026. Published on the Internet at http://www.ipni.org and https://powo.science.kew.org/
   - Van Steenis, CGGJ. 2008. *FLORA: untuk Sekolah di Indonesia*. Pradnya Paramita, Jakarta.

Demikian surat keterangan determinasi ini kami buat untuk dipergunakan sebagaimana mestinya.

a.n. Kepala UPT Laboratorium Herbal Materia Medica Batu
Kepala Seksi Pengembangan Tanaman Obat dan Obat Tradisional

SABRINA A. MARTHA, SKM., M.Sc.
Penata
NIP 198804272014032003

Lampiran 6. Sertifikat Uji Etik / *Ethical Clearence*



UNIVERSITAS AIRLANGGA FACULTY OF DENTAL MEDICINE
HEALTH RESEARCH ETHICAL CLEARANCE COMMISSION

ETHICAL CLEARANCE CERTIFICATE
Number: 0467/HRECC.FODM/V/2026

Universitas Airlangga Faculty of Dental Medicine Health Research Ethical Clearance Commission has studied the proposed research design carefully, Declared to be ethically appropriate in accordance to 7 (seven) WHO 2011, and therefore, shall herewith certify that the research entitled:

"Effectiveness of Moringa Seed Extract (*Moringa oleifera*) on Reducing Lead (Pb) Heavy Metal Levels in Wistar Rats (*Rattus Norvegicus*) In Vivo"

Principal Researcher : ZAGITA INDAH CAMELIA

Unit/Institution/Place of Research :
- Pharmacology Laboratory and Experimental Animal Laboratory, Medical Laboratory Technology Study Program, Faculty of Health Sciences, Muhammadiyah University of Sidoarjo
- Chemistry Laboratory, Chemistry Study Program, Faculty of Mathematics and Natural Sciences, State University of Surabaya
- Public Health Laboratory Center (BBLABKESMAS), UPT Materia Medica Herbal Laboratory, Batu, East Java Provincial Department of Health

CERTIFIED TO BE ETHICALLY CLEARED

Surabaya, May 4, 2026
Chairman,

Prof. Dr. ERNIE MADURATNA S., drg., M.Kes., Sp.Perio(K)
Official No. 196602121992032001