

LAMPIRAN

Lampiran 1. Komposisi Siwak Berdasarkan Penelitian Sebelumnya

No	Unsur/Senyawa	Konsentrasi (%)	Pelarut	Proses Ekstraksi	Referensi
1	Benzyl nitrile	33,69	Hexenylacetate	<i>Solid-phase Microextraction (SPME)</i>	Farang et al, 2017
	Benzyl isothiocyanate (BITC)	25,61			
	Benzaldehyde	12,26			
	Nonanal	6,18			
	n-Octyl acetate	3,81			
	E-Cinnamaldehyde	3,18			
	α -Terpineol acetate	2,21			
	Naphthalene	2,05			
	E- β -Farnesene	1,90			
	Oxalic acid, butyl propyl ester	1,61			
	β -Bisabolene	1,59			
	2,2,4-Trimethyl-2,5-dihydrofuran	1,40			
	Zingiberene	1,08			
	3-Indolecarbonitrile	0,73			
	Dodecane	0,69			
	α -Terpineol	0,63			
	Isopropyl myristate	0,40			
Unknown nitrile	0,39				
Benzyl isocyanate	0,24				
Benzoic acid	0,23				
Butyl maleate	0,11				
2	Benzenecarboxylic acid	24,50	Metanol	<i>Soxhlet Extraction</i>	Al-Sohaibani dan Murugan, 2012
	Benzene isothiocyanate	18,10			
	Benzaldehyde	13,20			
	Benzylidenebenzylamine	12,10			
	N- benzylacetamide	10,90			
	Benzyl isocyanate	7,20			
	Benzyl nitrile	2,00			
	Benzyl chloride	1,60			
	2-(3'-phenylpropyl)-5-ethylpyridine	0,80			
	3a`-hydroxy-3-methyl-6-phenyl-4-piperidone	0,80			

No	Unsur/Senyawa	Konsentrasi (%)	Pelarut	Proses Ekstraksi	Referensi
	Benzaldehyde, 3-methoxy	0,50			
	benzamide, N-(4-methylphenyl)	0,45			
	Acetophenone benzyloxime	0,43			
	2-coumaranone	0,40			
	Benzaldehyde, 4-(phenylmethoxy)	0,30			
	(Z,Z)-a`-farnesene	0,30			
	Pyrrole-2-carboxylic acid, 4-hydrazonomethyl-3,5-dimethyl-, ethyl ester	0,30			
	1-[-]-4-hydroxy-1-methylproline	0,10			
	Benzaldehyde, 4-methoxy	0,10			
	Decanoic acid, methyl ester	0,10			
	Ethanone,2-hydroxy-1-phenyl	0,09			
	Docosanoic acid, ethyl ester	0,08			
	Benzeneacetic acid	0,07			
	Benzyl (6Z,9Z,12Z)-6,9,12-octadecatrienoate	0,02			
	3-benzyloxy-1-nitro-butan-2-Ol	0,01			
	1,3-cyclohexanedicarbohydrazide	0,01			
3	Benzyl isothiocyanate	52,50			
	Benzyl nitrile	38,30			
	Carvacrol	3,30			
	Benzaldehyde	2,50			
	Aniline	0,70			
	Naphtalene	0,60			
	1,8-cineole	0,30			
	Benzyl isocyanate	0,30	Air	Distilasi	Noumi et al, 2011
	Methyl chavicol	0,30			
	Trans-anethol	0,20			
	Diphenyl ether	0,20			
	Sabinene	0,10			
	Linalool	0,10			
	Myrcenol	0,10			
	Benzyl ester	0,10			
4	1,8-Cineole	45,90			
	α -Caryophyllene	13,37	Air	Distilasi	Alali et al, 2004
	Caryophyllene oxide	6,34			

No	Unsur/Senyawa	Konsentrasi (%)	Pelarut	Proses Ekstraksi	Referensi
	β -Pinene	6,30			
	Unidentified traces	5,00			
	α -Terpineol	4,58			
	Terpinolene	2,85			
	β -Thujone	1,84			
	Terpi-4-ol	1,65			
	<i>p</i> -Cymene	1,32			
	Linalyl acetate	1,28			
	Linalool	1,15			
	Champor	1,03			
	β -Caryophyllene	0,72			
	Aromadendrene	0,63			
	α -Pinene	0,50			
	<i>cis</i> -Pinochampone	0,50			
5	Cl ⁻	4,64-6,84	Air	Ekstraksi satu tingkat	Darout et al, 2000
	SO ₄ ²⁻	19,85-20,1			
	SCN ⁻	0,28-0,38			
	NO ₃ ⁻	0,05			
6	Cl	71 mg/g	Air	Ekstraksi satu tingkat	Abhary and Al-Hazmi 2016
	Na	7,262 ± 0,002 mg/g	Siwak halus	-	
	Mg	1,569 ± 0,001 mg/g			
	Al	0,051 ± 0,001 mg/g			
	K	12,198 ± 0,002 mg/g			
	Ca	4,126 ± 0,001 mg/g			

Lampiran 2. Total E.Coli Setelah Penambahan Variasi Volume Ekstrak Siwak

No	Waktu Kontak (menit)	Volume Ekstrak (ml)	Jumlah Koloni Sampel 10 ⁻¹			Rata-rata	CFU/ml	Jumlah Koloni Sampel 10 ⁻²			Rata-rata	CFU/ml
			1	2	3			1	2	3		
1	1	0						95	114	129	121,5	121.500
		1						67	96	63	65	65.000
		5						262	139	120	129,5	129.500
		10						30	47	42	44,5	44.500
		15						18	48	53	50,5	50.500
2	5	0	27	27	13	27	2.700	16	3	7	5	5.000
		1	37	47	52	49,5	4.950	3	4	13	3,5	3.500
		5	173	77	63	70	7.000	13	10	4	11,5	11.500
		10	91	104	87	89	8.900	10	22	9	9,5	9.500
		15	3	1	1	1	100	0	0	1	0	1
3	10	0	20	132	61	40,5	4.050	12	32	67	22	22.000
		1	59	66	81	62,5	6.250	44	30	40	42	42.000
		5	15	72	18	16,5	1.650	12	3	8	10	10.000
		10	18	13	10	11,5	1.150	1	0	0	0	1
		15	78	13	12	12,5	1.250	1	3	4	3,5	3.500
4	15	0	59	72	34	65,5	6.550	17	8	20	18,5	18.500
		1	97	84	54	90,5	9.050	3	24	15	19,5	19.500
		5	2	1	1	1	100	2	1	0	1,5	1.500
		10	22	34	47	28	2.800	28	39	16	33,5	33.500
		15	41	47	39	40	4.000	6	5	1	5,5	5.500
5	30	0	32	34	46	33	3.300	2	36	3	2,5	2.500
		1	20	23	10	21,5	2.150	1	2	4	1,5	1.500
		5	7	7	10	7	700	1	1	1	1	1.000
		10	13	59	15	14	1.400	40	60	6	50	50.000
		15	12	4	7	5,5	550	0	2	2	2	2.000
6	60	0	4	10	11	10,5	1.050	1	0	1	1	1.000
		1	3	9	7	8	800	1	0	0	0,5	500
		5	20	47	5	12,5	1.250	2	1	20	1,5	1.500
		10	147	181	184	182,5	18.250	2	5	1	3,5	3.500
		15	15	10	4	12,5	1.250	12	50	28	20	20.000

Contoh perhitungan:

$$\begin{aligned} \text{Total E.Coli (CFU/ml)} &= \frac{\text{Jumlah Koloni}}{\{\text{Pengenceran Sampel} \times \text{Volume Sampel (mL)}\}} \\ &= \frac{121,5 \text{ koloni}}{(10^{-2} \times 0,1 \text{ ml})} = 121.500 \text{ CFU/ml} \end{aligned}$$

Lampiran 3. Total E.Coli Setelah Penambahan Variasi Massa Residu Siwak

No	Waktu Kontak (menit)	Massa Residu (mg)	Jumlah Koloni Sampel 10 ⁻¹			Rata-rata	CFU/ml	Jumlah Koloni Sampel 10 ⁻²			Rata-rata	CFU/ml
			1	2	3			1	2	3		
1	1	0	256	243	166	249,5	24.950	57	51	85	54	54.000
		1	121	162	134	127,5	12.750	26	81	51	38,5	38.500
		5	146	126	111	118,5	11.850	45	68	39	42	42.000
		10	106	119	153	112,5	11.250	37	45	44	44,5	44.500
		15	68	55	111	61,5	6.150	38	19	53	45,5	45.500
2	5	0	262	268	315	265	26.500	156	116	70	136	136.000
		1	172	139	153	146	14.600	78	56	25	67	67.000
		5	142	90	82	86	8.600	50	34	35	34,5	34.500
		10	76	134	101	88,5	8.850	43	36	35	35,5	35.500
		15	74	83	109	78,5	7.850	28	28	24	28	28.000
3	10	0	180	235	193	186,5	18.650	205	107	170	187,5	187.500
		1	158	128	129	128,5	12.850	91	60	63	61,5	61.500
		5	93	133	77	85	8.500	55	74	54	54,5	54.500
		10	106	131	90	98	9.800	40	47	48	47,5	47.500
		15	69	77	45	73	7.300	35	20	22	21	21.000
4	15	0	218	208	178	213	21.300	92	103	140	97,5	97.500
		1	148	131	116	123,5	12.350	63	57	8	60	60.000
		5	135	72	124	129,5	12.950	62	45	44	44,5	44.500
		10	133	135	82	134	13.400	112	72	50	61	61.000
		15	99	121	134	127,5	12.750	95	35	44	39,5	39.500
5	30	0	236	320	259	247,5	24.750	131	185	179	182	182.000
		1	174	210	242	226	22.600	61	128	53	57	57.000
		5	198	113	122	117,5	11.750	75	56	33	65,5	65.500
		10	103	108	122	105,5	10.550	73	75	72	72,5	72.500
		15	63	78	60	61,5	6.150	49	27	29	28	28.000
6	60	0	213	248	136	230,5	23.050	56	67	55	55,5	55.500
		1	87	84	75	85,5	8.550	24	26	8	25	25.000
		5	75	90	64	69,5	6.950	24	28	16	26	26.000
		10	53	53	74	53	5.300	23	21	10	22	22.000
		15	55	36	45	40,5	4.050	18	24	14	16	16.000

Contoh perhitungan:

$$\text{Total E.Coli (CFU/ml)} = \frac{\text{Jumlah Koloni}}{\{\text{Pengenceran Sampel} \times \text{Volume Sampel (mL)}\}}$$

$$= \frac{249,5 \text{ koloni}}{(10^{-1} \times 0,1 \text{ ml})} = 24.950 \text{ CFU/ml}$$

Lampiran 4. Pengaruh Variasi Volume Ekstrak Siwak terhadap Penyisihan Koloni E.Coli

No	Waktu Kontak (menit)	Volume Ekstrak (ml)	Jumlah Koloni (CFU/ml)		Penyisihan Koloni Bakteri		
			10 ⁻¹	10 ⁻²	%	Log Reduksi	N/N ₀
1	1	0		121500	-	-	-
		1		65000	46,502	0,272	0,535
		5		129500	-6,584	-0,028	1,066
		10		44500	63,374	0,436	0,366
		15		50500	58,436	0,381	0,416
2	5	0		5000	-	-	-
		1		3500	30	0,155	0,7
		5		11500	-130	-0,362	2,3
		10		9500	-90	-0,279	1,9
		15		1	99,980	3,699	2,00E-04
3	10	0		22000	-	-	-
		1		42000	-90,909	-0,281	1,909
		5		10000	54,545	0,342	0,455
		10		1	99,995	4,342	4,55E-05
		15		3500	84,091	0,798	0,159
4	15	0	6550		-	-	-
		1	9050		-38,168	-0,140	1,382
		5	100		98,473	1,816	0,015
		10	2800		57,252	0,369	0,427
		15	4000		38,931	0,214	0,611
5	30	0	3300		-	-	-
		1	2150		34,848	0,186	0,652
		5	700		78,788	0,673	0,212
		10	1400		57,576	0,372	0,424
		15	550		83,333	0,778	0,167
6	60	0	1050		-	-	-
		1	800		23,810	0,118	0,762
		5	1250		-19,048	-0,076	1,190
		10	18250		-	-1,240	17,381
		15	1250		-19,048	-0,076	1,190

Contoh perhitungan:

$$\text{Penyisihan Koloni Bakteri (P)} = \frac{N_0 - N}{N_0} \times 100\% = \frac{121.500 - 65.000}{121.500} \times 100\% = 46,502\%$$

$$\text{Log reduksi} = -(\log_{10} (-P/100 + 1)) = -(\log_{10} (-46,502/100 + 1)) = 0,272$$

**Lampiran 5. Pengaruh Variasi Waktu Kontak Ekstrak Siwak terhadap
Penyisihan Koloni E.Coli**

No	Volume Ekstrak (ml)	Waktu Kontak (menit)	Jumlah Koloni (CFU/ml)		Penyisihan Koloni Bakteri		
			10 ⁻¹	10 ⁻²	%	Log Reduksi	N/N ₀
1	0	1		121.500			
		5		5.000			
		10		22.000			
		15	6550				
		30	3300				
		60	1050				
2	1	1		65.000	46,502	0,272	0,535
		5		3.500	30	0,155	0,700
		10		42.000	-90,909	-0,281	1,909
		15	9050		-38,168	-0,140	1,382
		30	2150		34,848	0,186	0,652
		60	800		23,810	0,118	0,762
3	5	1		129.500	-6,584	-0,028	1,066
		5		11.500	-130	-0,362	2,300
		10		10.000	54,545	0,342	0,455
		15	100		98,473	1,816	0,015
		30	700		78,788	0,673	0,212
		60	1250		-19,048	-0,076	1,190
4	10	1		44.500	63,374	0,436	0,366
		5		9.500	-90	-0,279	1,900
		10		1	99,995	4,342	4,55E-05
		15	2800		57,252	0,369	0,427
		30	1400		57,576	0,372	0,424
		60	18250		-	-1,240	17,381
5	15	1		50.500	58,436	0,381	0,416
		5		1	99,980	3,699	2,00E-04
		10		3.500	84,091	0,798	0,159
		15	4000		38,931	0,214	0,611
		30	550		83,333	0,778	0,167
		60	1250		-19,048	-0,076	1,190

Contoh perhitungan:

$$\text{Penyisihan Koloni Bakteri (P)} = \frac{N_0 - N}{N_0} \times 100\% = \frac{121.500 - 65.000}{121.500} \times 100\% = 46,502\%$$

$$\text{Log reduksi} = -(\log_{10} (-P/100 + 1)) = -(\log_{10} (-46,502/100 + 1)) = 0,272$$

Lampiran 6. Pengaruh Variasi Massa Residu Siwak terhadap Penyisihan Koloni E.Coli

No	Waktu Kontak (menit)	Massa Residu (mg)	Jumlah Koloni (CFU/ml)		Penyisihan Koloni Bakteri 10 ⁻¹			Penyisihan Koloni Bakteri 10 ⁻²		
			10 ⁻¹	10 ⁻²	%	Log Reduksi	N/N ₀	%	Log Reduksi	N/N ₀
1	1	0	24950	54000	-	-	-	-	-	-
		1	12750	38500	48,898	0,292	0,511	28,704	0,147	0,713
		5	11850	42000	52,505	0,323	0,475	22,222	0,109	0,778
		10	11250	44500	54,910	0,346	0,451	17,593	0,084	0,824
		15	6150	45500	75,351	0,608	0,246	15,741	0,074	0,843
2	5	0	26500	136000	-	-	-	-	-	-
		1	14600	67000	44,906	0,259	0,551	50,735	0,307	0,493
		5	8600	34500	67,547	0,489	0,325	74,632	0,596	0,254
		10	8850	35500	66,604	0,476	0,334	73,897	0,583	0,261
		15	7850	28000	70,377	0,528	0,296	79,412	0,686	0,206
3	10	0	18650	187500	-	-	-	-	-	-
		1	12850	61500	31,099	0,162	0,689	67,200	0,484	0,328
		5	8500	54500	54,424	0,341	0,456	70,933	0,537	0,291
		10	9800	47500	47,453	0,279	0,525	74,667	0,596	0,253
		15	7300	21000	60,858	0,407	0,391	88,800	0,951	0,112
4	15	0	21300	97500	-	-	-	-	-	-
		1	12350	60000	42,019	0,237	0,580	38,462	0,211	0,615
		5	12950	44500	39,202	0,216	0,608	54,359	0,341	0,456
		10	13400	61000	37,089	0,201	0,629	37,436	0,204	0,626
		15	12750	39500	40,141	0,223	0,599	59,487	0,392	0,405
5	30	0	24750	182000	-	-	-	-	-	-
		1	22600	57000	8,687	0,039	0,913	68,681	0,504	0,313
		5	11750	65500	52,525	0,324	0,475	64,011	0,444	0,360
		10	10550	72500	57,374	0,370	0,426	60,165	0,400	0,398
		15	6150	28000	75,152	0,605	0,248	84,615	0,813	0,154
6	60	0	23050	55500	-	-	-	-	-	-
		1	8550	25000	62,907	0,431	0,371	54,955	0,346	0,450
		5	6950	26000	69,848	0,521	0,302	53,153	0,329	0,468
		10	5300	22000	77,007	0,638	0,230	60,360	0,402	0,396
		15	4050	16000	82,430	0,755	0,176	71,171	0,540	0,288

Contoh perhitungan:

$$\text{Penyisihan Koloni Bakteri (P)} = \frac{N_0 - N}{N_0} \times 100\% = \frac{24.950 - 12.750}{24.950} \times 100\% = 48,898\%$$

$$\text{Log reduksi} = -(\log_{10} (-P/100 + 1)) = -(\log_{10} (-48,898/100 + 1)) = 0,292$$

**Lampiran 7. Pengaruh Variasi Waktu Kontak Residu Siwak terhadap
Penyisihan Koloni E.Coli**

No	Massa Residu (mg)	Waktu Kontak (menit)	Jumlah Koloni (CFU/ml)		Penyisihan Koloni Bakteri 10 ⁻¹			Penyisihan Koloni Bakteri 10 ⁻²		
			10 ⁻¹	10 ⁻²	%	Log Reduksi	N/N ₀	%	Log Reduksi	N/N ₀
1	0	1	24950	54000						
		5	26500	136000						
		10	18650	187500						
		15	21300	97500						
		30	24750	182000						
		60	23050	55500						
2	1	1	12750	38500	48,898	0,292	0,511	28,704	0,147	0,713
		5	14600	67000	44,906	0,259	0,551	50,735	0,307	0,493
		10	12850	61500	31,099	0,162	0,689	67,200	0,484	0,328
		15	12350	60000	42,019	0,237	0,580	38,462	0,211	0,615
		30	22600	57000	8,687	0,039	0,913	68,681	0,504	0,313
		60	8550	25000	62,907	0,431	0,371	54,955	0,346	0,450
3	5	1	11850	42000	52,505	0,323	0,475	22,222	0,109	0,778
		5	8600	34500	67,547	0,489	0,325	74,632	0,596	0,254
		10	8500	54500	54,424	0,341	0,456	70,933	0,537	0,291
		15	12950	44500	39,202	0,216	0,608	54,359	0,341	0,456
		30	11750	65500	52,525	0,324	0,475	64,011	0,444	0,360
		60	6950	26000	69,848	0,521	0,302	53,153	0,329	0,468
4	10	1	11250	44500	54,910	0,346	0,451	17,593	0,084	0,824
		5	8850	35500	66,604	0,476	0,334	73,897	0,583	0,261
		10	9800	47500	47,453	0,279	0,525	74,667	0,596	0,253
		15	13400	61000	37,089	0,201	0,629	37,436	0,204	0,626
		30	10550	72500	57,374	0,370	0,426	60,165	0,400	0,398
		60	5300	22000	77,007	0,638	0,230	60,360	0,402	0,396
5	15	1	6150	45500	75,351	0,608	0,246	15,741	0,074	0,843
		5	7850	28000	70,377	0,528	0,296	79,412	0,686	0,206
		10	7300	21000	60,858	0,407	0,391	88,800	0,951	0,112
		15	12750	39500	40,141	0,223	0,599	59,487	0,392	0,405
		30	6150	28000	75,152	0,605	0,248	84,615	0,813	0,154
		60	4050	16000	82,430	0,755	0,176	71,171	0,540	0,288

Contoh perhitungan:

$$\text{Penyisihan Koloni Bakteri (P)} = \frac{N_0 - N}{N_0} \times 100\% = \frac{24.950 - 12.750}{24.950} \times 100\% = 48,898\%$$

$$\text{Log reduksi} = -(\log_{10} (-\frac{P}{100} + 1)) = -(\log_{10} (-\frac{48,898}{100} + 1)) = 0,292$$

**Lampiran 8. Laju Kematian Koloni E.Coli Setelah Penambahan Variasi
Volume Ekstrak Siwak**

No	Volume Ekstrak (ml)	Waktu Kontak (menit)	Jumlah Koloni (CFU/ml)		Laju Kematian (1/menit)
			10 ⁻¹	10 ⁻²	
1	0	1		121.500	
		5		5.000	
		10		22.000	
		15	6.550		
		30	3.300		
		60	1.050		
2	1	1		65.000	0,626
		5		3.500	0,071
		10		42.000	-0,065
		15	9.050		-0,022
		30	2.150		0,014
		60	800		0,005
3	5	1		129.500	-0,064
		5		11.500	-0,167
		10		10.000	0,079
		15	100		0,279
		30	700		0,052
		60	1.250		-0,003
4	10	1		44.500	1,004
		5		9.500	-0,128
		10		1	1,000
		15	2.800		0,057
		30	1.400		0,029
		60	18.250		-0,048
5	15	1		50.500	0,878
		5		1	1,703
		10		3.500	0,184
		15	4.000		0,033
		30	550		0,060
		60	1.250		-0,003

Contoh perhitungan:

$$k = - \left[\frac{\ln \left(\frac{N}{N_0} \right)}{t} \right] = - \left[\frac{\ln \left(\frac{65.000}{121.500} \right)}{1 \text{ menit}} \right] = 0,626$$

**Lampiran 9. Laju Kematian Koloni E.Coli Setelah Penambahan Variasi
Massa Residu Siwak**

No	Massa Residu (mg)	Waktu Kontak (menit)	Jumlah Koloni (CFU/ml)		Laju Kematian Bakteri (1/menit)	
			10 ⁻¹	10 ⁻²	10 ⁻¹	10 ⁻²
1	0	1	24.950	54.000		
		5	26.500	136.000		
		10	18.650	187.500		
		15	21.300	97.500		
		30	24.750	182.000		
		60	23.050	55.500		
2	1	1	12.750	38.500	0,671	0,338
		5	14.600	67.000	0,119	0,142
		10	12.850	61.500	0,037	0,111
		15	12.350	60.000	0,036	0,032
		30	22.600	57.000	0,003	0,039
		60	8.550	25.000	0,017	0,013
3	5	1	11.850	42.000	0,745	0,251
		5	8.600	34.500	0,225	0,274
		10	8.500	54.500	0,079	0,124
		15	12.950	44.500	0,033	0,052
		30	11.750	65.500	0,025	0,034
		60	6.950	26.000	0,020	0,013
4	10	1	11.250	44.500	0,797	0,193
		5	8.850	35.500	0,219	0,269
		10	9.800	47.500	0,064	0,137
		15	13.400	61.000	0,031	0,031
		30	10.550	72.500	0,028	0,031
		60	5.300	22.000	0,024	0,015
5	15	1	6.150	45.500	1,400	0,171
		5	7.850	28.000	0,243	0,316
		10	7.300	21.000	0,094	0,219
		15	12.750	39.500	0,034	0,060
		30	6.150	28.000	0,046	0,062
		60	4.050	16.000	0,029	0,021

Contoh perhitungan:

$$k = - \left[\frac{\ln\left(\frac{N}{N_0}\right)}{t} \right] = - \left[\frac{\ln\left(\frac{12.750}{24.950}\right)}{1 \text{ menit}} \right] = 0,671$$