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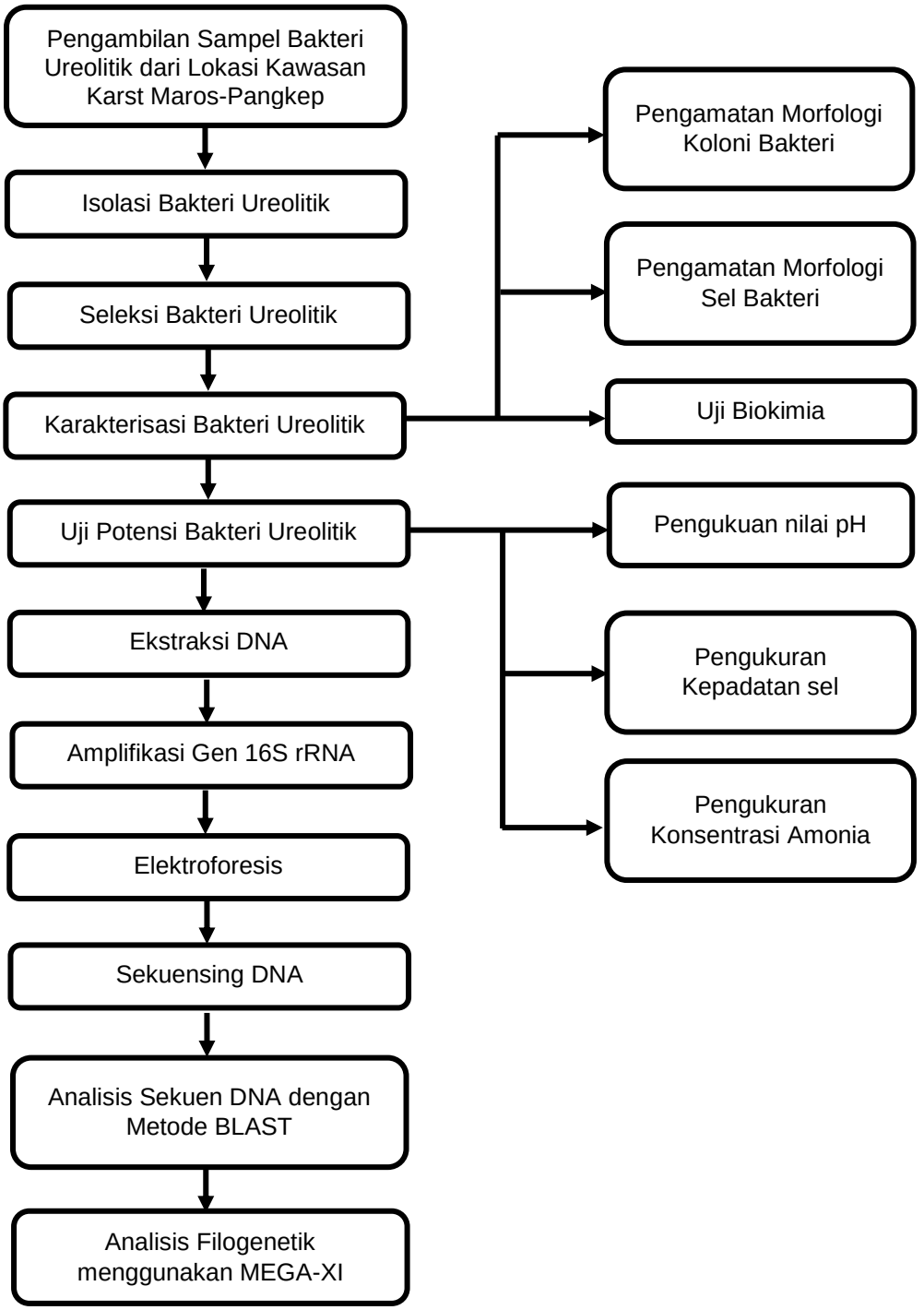
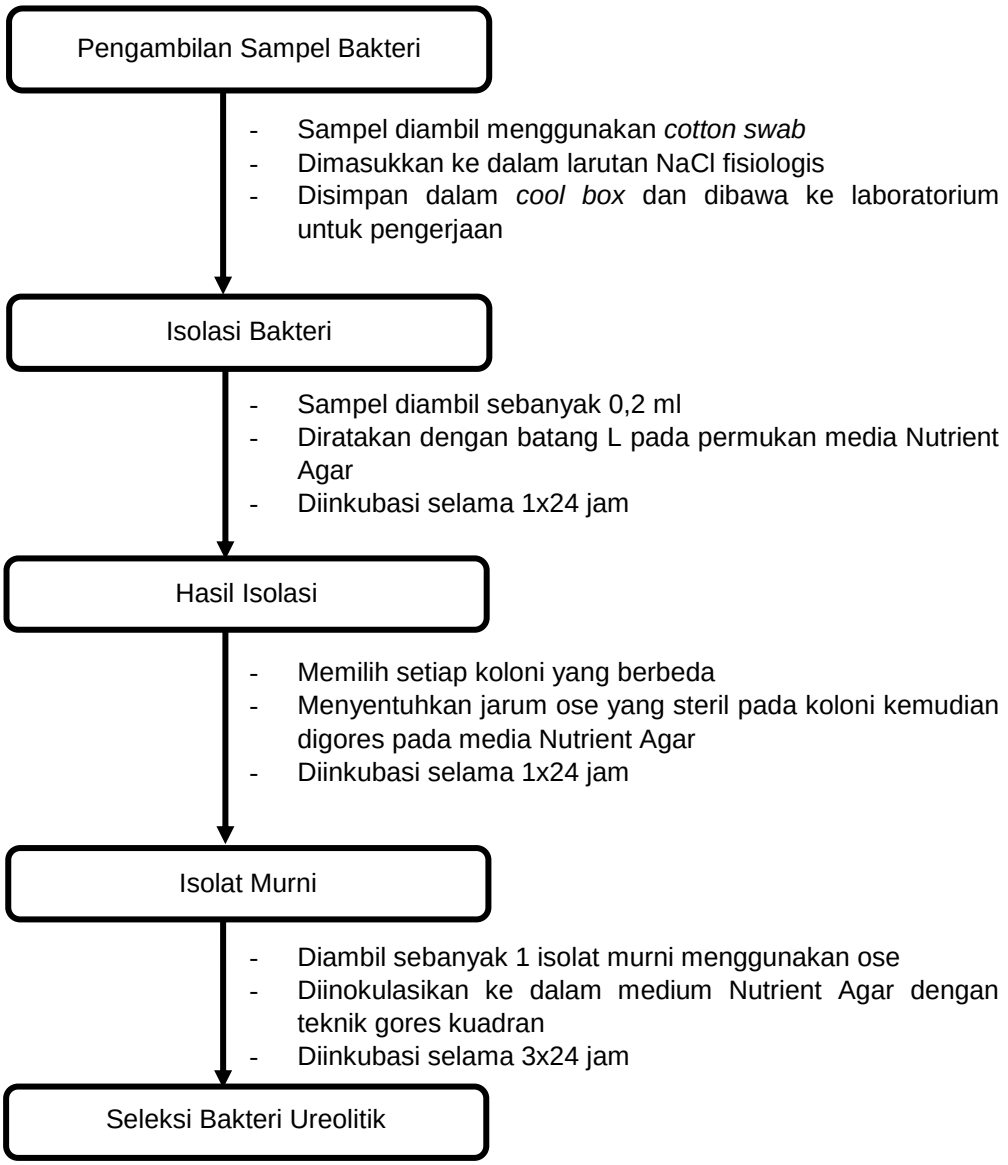
LAMPIRAN

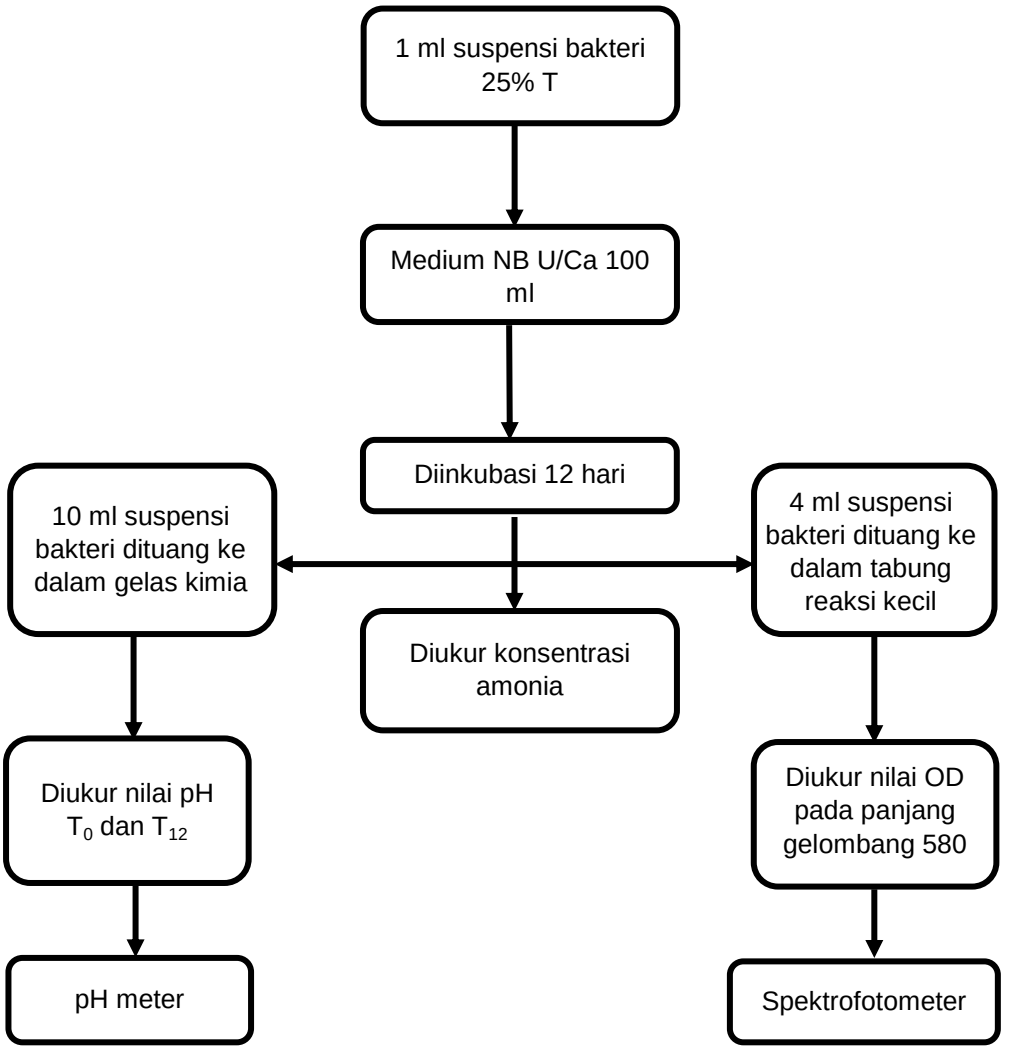
Lampiran 1. Skema Kerja Penelitian



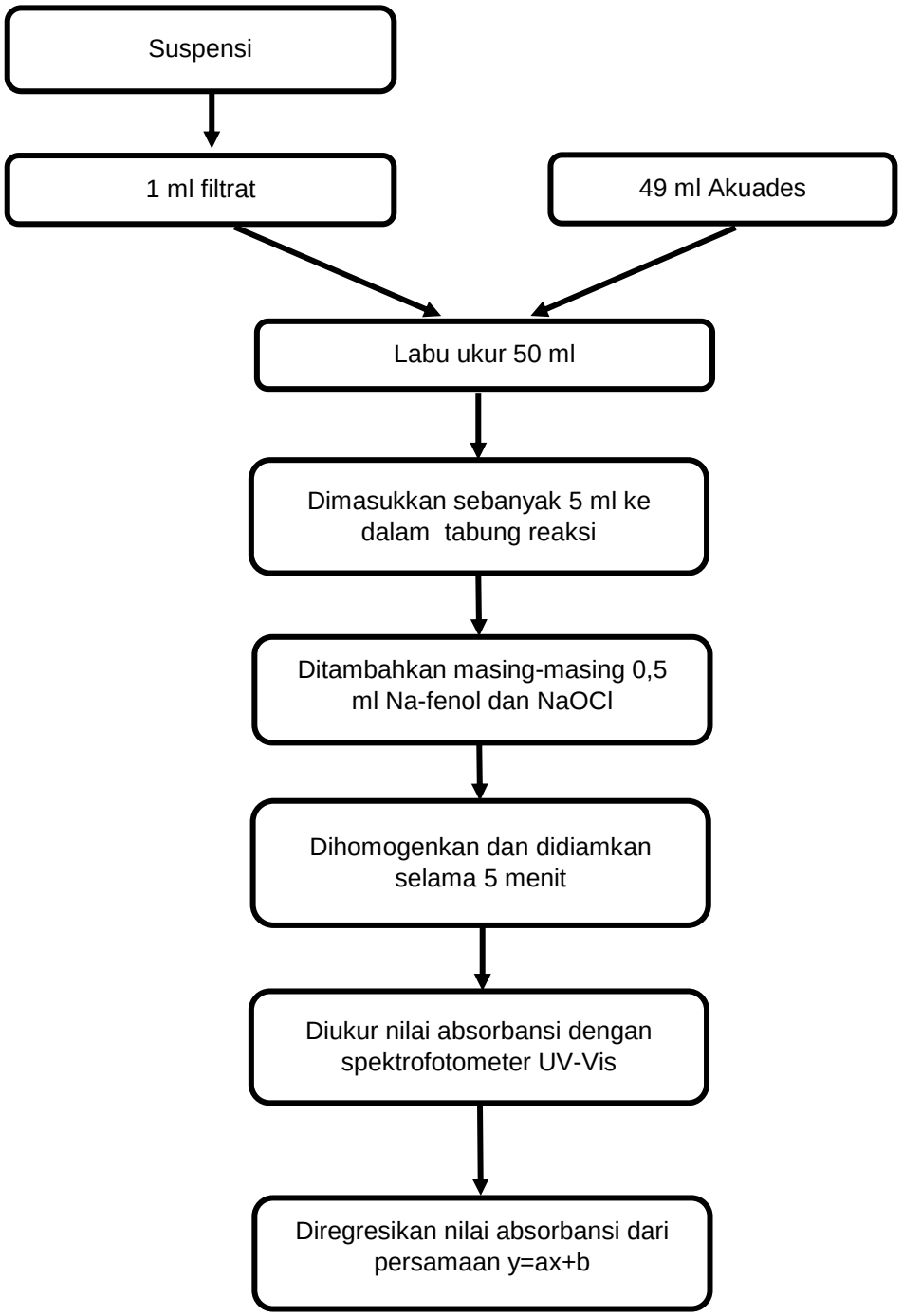
Lampiran 2. Skema Kerja Pengambilan Sampel, Isolasi dan Seleksi Bakteri Ureolitik



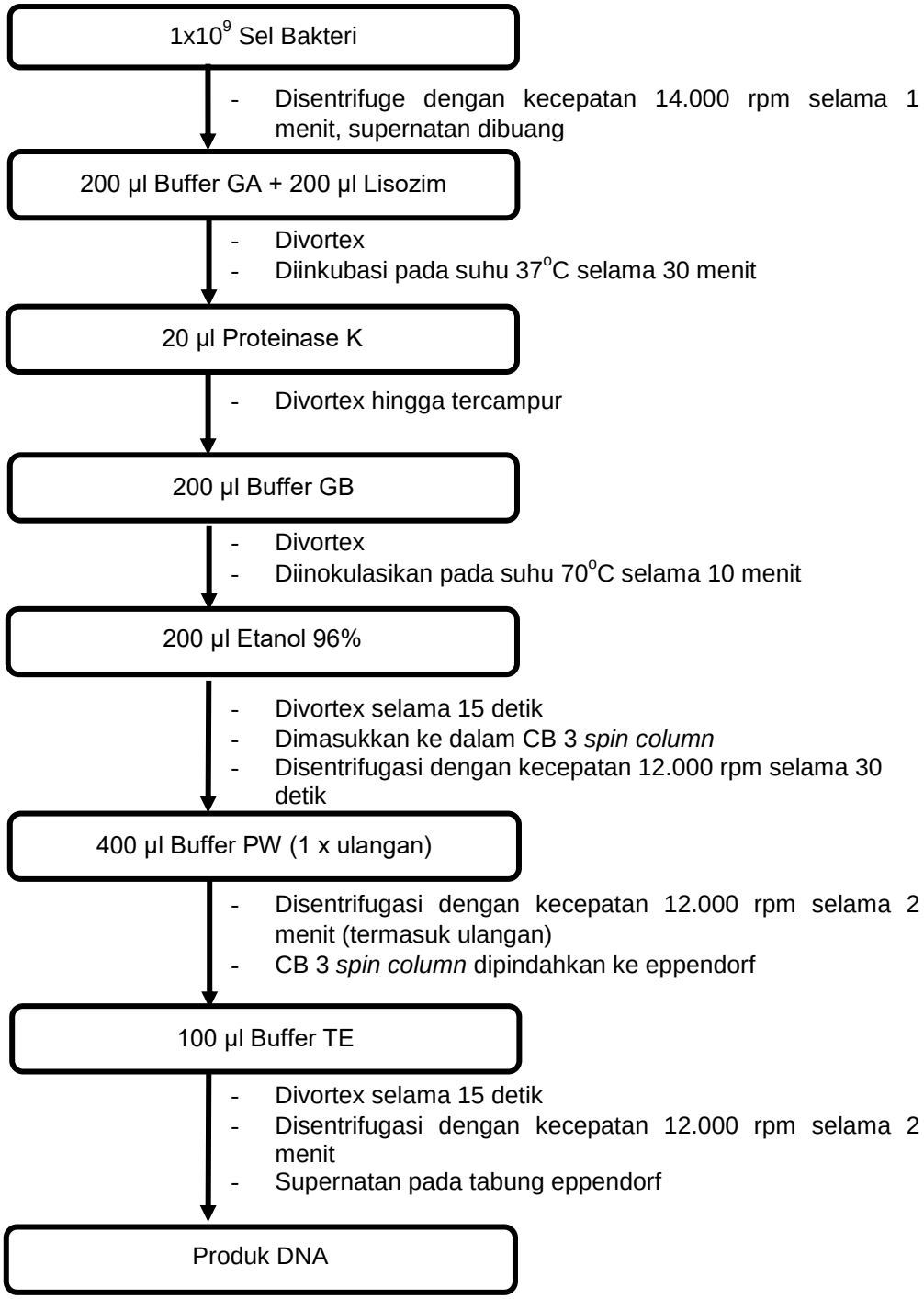
Lampiran 3. Skema Kerja Uji Potensi Bakteri Ureolitik



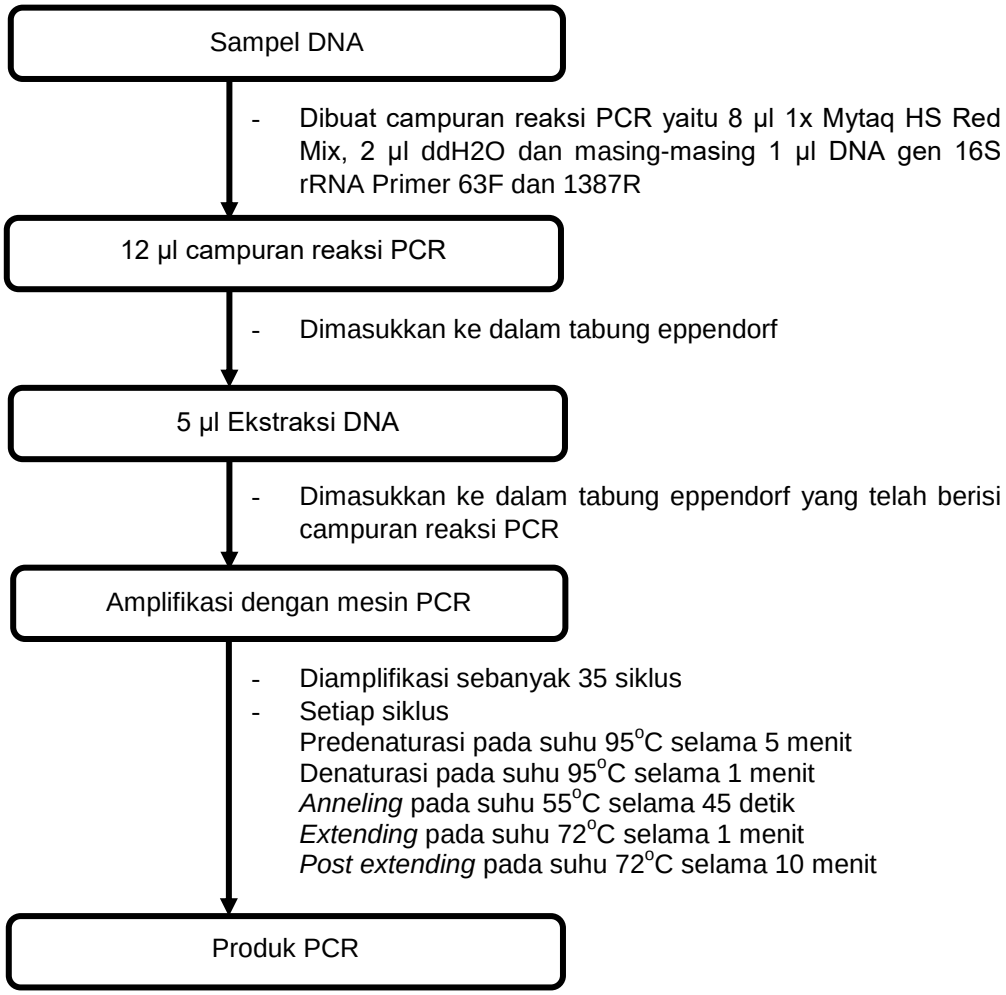
Lampiran 4. Skema Kerja Pengukuran Konsentrasi Amonia yang dihasilkan Bakteri Ureolitik



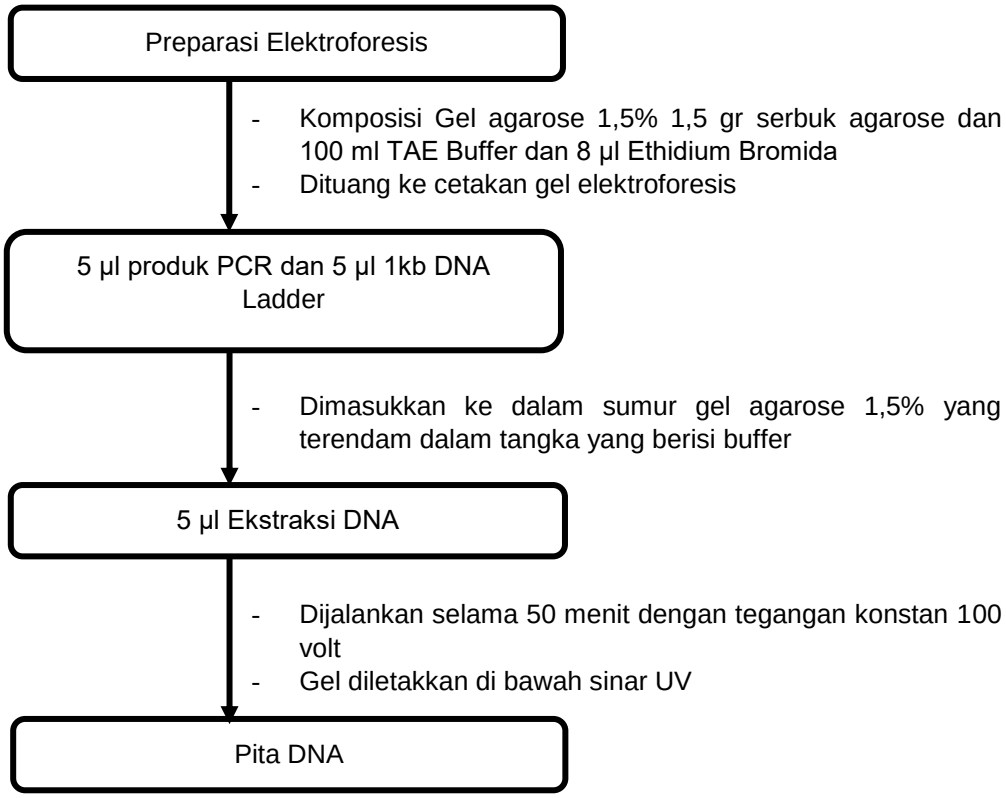
Lampiran 5. Skema Kerja Ekstraksi DNA Bakteri



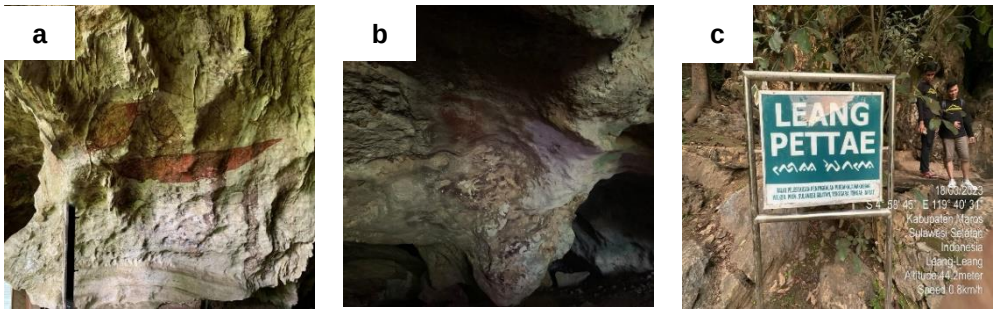
Lampiran 6. Skema Kerja Amplifikasi DNA dengan PCR



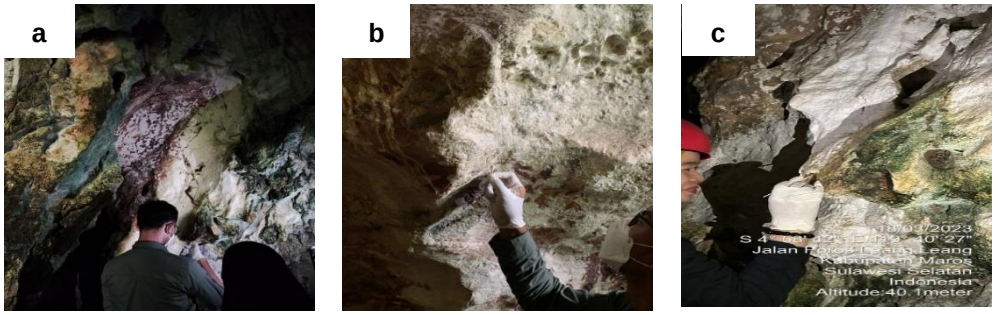
Lampiran 7. Skema Kerja Visualisasi Produk PCR dengan Elektroforesis



Lampiran 8. Lokasi Pengambilan Sampel

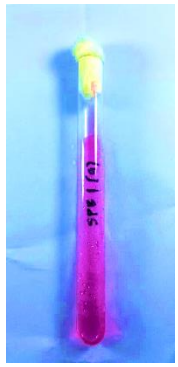


Lokasi pengambilan sampel (a) Gua Sumpang Bita (SPB), (b) Gua Leang Timpuseng (LTP), (c) Gua Leang Pettae (LPE)

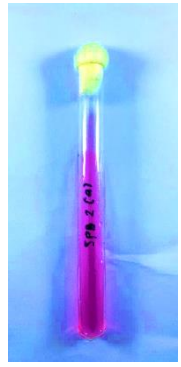


Titik Pengambilan Sampel (a) Gua Sumpang Bita(SPB), (b) Gua Leang Timpuseng (LTP), (c) Gua Leang Pettae (LPE)

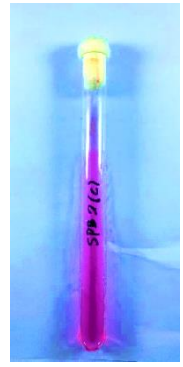
Lampiran 9. Hasil Seleksi Bakteri Ureolitik


SPB 1-a

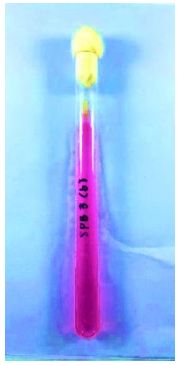

SPB 1-b


SPB 2-a

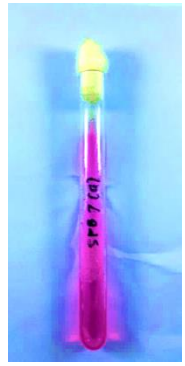

SPB 2-b


SPB 2-c


SPB 3-a

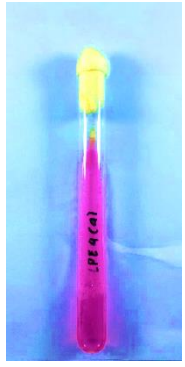

SPB 3-b

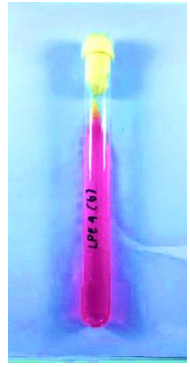

SPB 3-d


SPB 7-a


LTP 2-a


LTP 3-b


LPE 4-a


LPE 4-b

Seleksi Isolat Bakteri Ureolitik pada Medium Christensen Urea Agar

Lampiran 10. Uji Potensi Bakteri Ureolitik


SPB 1-a


SPB 1-b


SPB 2-a


SPB 2-b


SPB 2-c


SPB 3-a


SPB 3-b


SPB 3-d


SPB 7-a


LTP 2-a


LTP 3-b


LPE 4-a


LPE 4-b

Kultur Bakteri Ureolitik pada Medium NB U/Ca

Lampiran 11. Hasil Perhitungan Kepadatan Sel Bakteri Ureolitik

Kode Sampel	% T		Nilai OD (nm)	
	T_0	T_{12}	T_0	T_{12}
SPB 1-a	50	6	0,301	1,221
SPB 1-b	57	3	0,244	1,522
SPB 2-a	77	11	0,113	0,958
SPB 2-b	80	5	0,096	1,301
SPB 2-c	81	11	0,091	0,958
SPB 3-a	82	3	0,086	1,522
SPB 3-b	91	33	0,040	0,481
SPB 3-d	88	20	0,055	0,698
SPB 7-a	95	4	0,022	1,397
LTP 2-a	91	18	0,040	0,744
LTP 3-b	93	18	0,031	0,744
LPE 4-a	97	20	0,013	0,698
LPE 4-b	89	10	0,050	1

Lampiran 12. Hasil Perhitungan Konsentrasi Amonia Bakteri Ureolitik

Kode Sampel	Pengenceran			Absorbansi (Y)		X		Amonia (ppm)		Amonia (mMol)	
	Sampel	H_2O	FP	T_0	T_{12}	T_0	T_{12}	T_0	T_{12}	T_0	T_{12}
SPB 1-a	1	49	50	0,012	0,021	0,626	1	31,327	50	2,237	3,571
SPB 1-b	1	49	50	0,010	0,035	0,543	1,580	27,178	79,045	1,941	5,646
SPB 2-a	1	49	50	0,008	0,039	0,460	1,746	23,029	87,344	1,644	6,238
SPB 2-b	1	49	50	0,005	0,042	0,336	1,871	16,804	93,568	1,200	6,683
SPB 2-c	1	49	50	0,002	0,023	0,211	1,082	10,580	54,149	0,755	3,867
SPB 3-a	1	49	50	0,015	0,032	0,751	1,456	37,551	72,821	2,682	5,201
SPB 3-b	1	49	50	0,008	0,065	0,460	2,825	23,029	141,286	1,644	10,091
SPB 3-d	1	49	50	0,007	0,106	0,419	4,526	20,954	226,348	1,496	16,167
SPB 7-a	1	49	50	0,010	0,060	0,543	2,618	27,178	130,912	1,941	9,350
LTP 2-a	1	49	50	0,013	0,056	0,668	2,452	33,402	122,614	2,385	8,7587
LTP 3-b	1	49	50	0,018	0,065	0,875	2,825	43,775	141,286	3,126	10,091
LPE 4-a	1	49	50	0,009	0,058	0,502	2,535	25,103	126,763	1,793	9,054
LPE 4-b	1	49	50	0,017	0,053	0,834	2,327	41,701	116,39	2,978	8,313

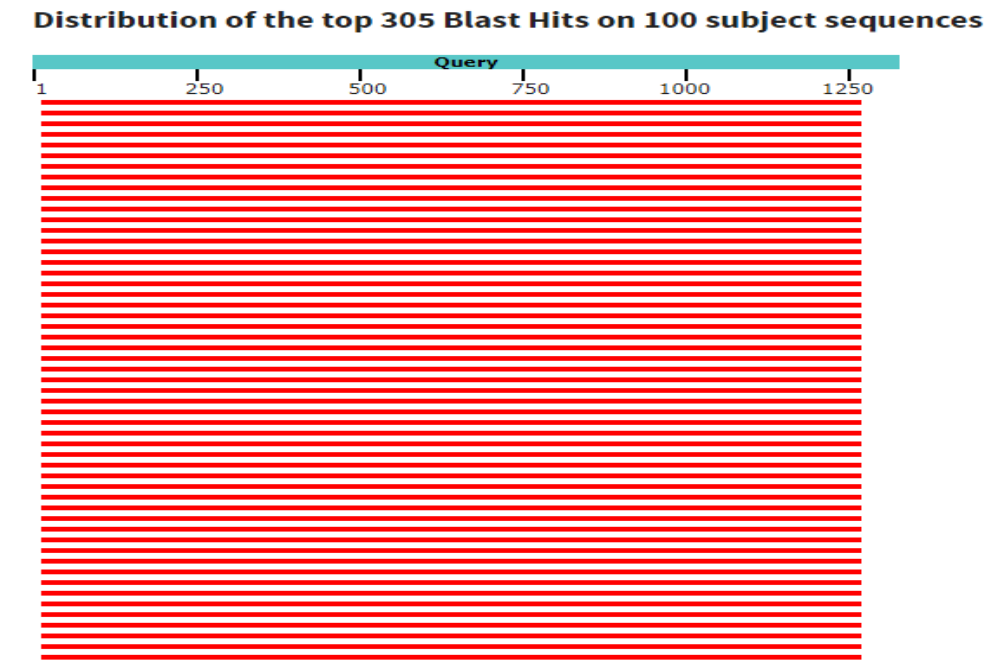
Lampiran 13. Hasil Karakterisasi Isolat Bakteri Ureolitik

Kode Isolat	Morfologi Koloni				Morfologi Sel		Uji Biokimia						
	Bentuk	Elevasi	Tepi	Warna	Bentuk	Sifat Gram	Uji SIM			Uji Sitrat	Uji MR-VP		Katalase
							Motilitas	H_2S	Indol		MR	VP	
SPB 1-a	Circular	Convex	Undulate	Putih gading	Basil	Negatif	+	+	-	-	+	-	+
SPB 1-b	Circular	Convex	Undulate	Kuning kecokelatan	Basil	Negatif	-	-	-	-	+	-	-
SPB 2-a	Circular	Convex	Entire	Putih gading	Basil	Negatif	-	-	-	-	+	-	-
SPB 2-b	Circular	Convex	Entire	Putih gading	Basil	Positif	-	-	-	-	+	-	-
SPB 2-c	Circular	Convex	Entire	Putih gading	Basil	Negatif	-	-	+	-	+	-	-
SPB 3-a	Circular	Convex	Undulate	Putih gading	Basil	Positif	-	-	+	-	+	-	-
SPB 3-b	Irreguler	Convex	Undulate	Putih gading	Basil	Negatif	+	-	+	-	+	-	-
SPB 3-d	Circular	Convex	Undulate	Putih gading	Basil	Negatif	+	-	+	-	+	-	-
SPB 7-a	Circular	Convex	Undulate	Kuning kecokelatan	Basil	Negatif	+	-	+	-	-	-	-
LTP 2-a	Circular	Convex	Undulate	Putih gading	Coccus	Positif	-	-	-	-	-	-	+
LTP 3-b	Circular	Convex	Undulate	Putih gading	Basil	Positif	+	-	-	-	-	-	-
LPE 4-a	Irreguler	Convex	Undulate	Putih Gading	Basil	Negatif	+	-	-	-	-	-	-
LPE 4-b	Circular	Convex	Entire	Kuning kecokelatan	Basil	Positif	+	-	-	-	-	-	-

Lampiran 14. Identifikasi Jenis Bakteri Menggunakan Marka Molekuler Isolat SPB 3-d, LTP 3-b dan LPE 4-a

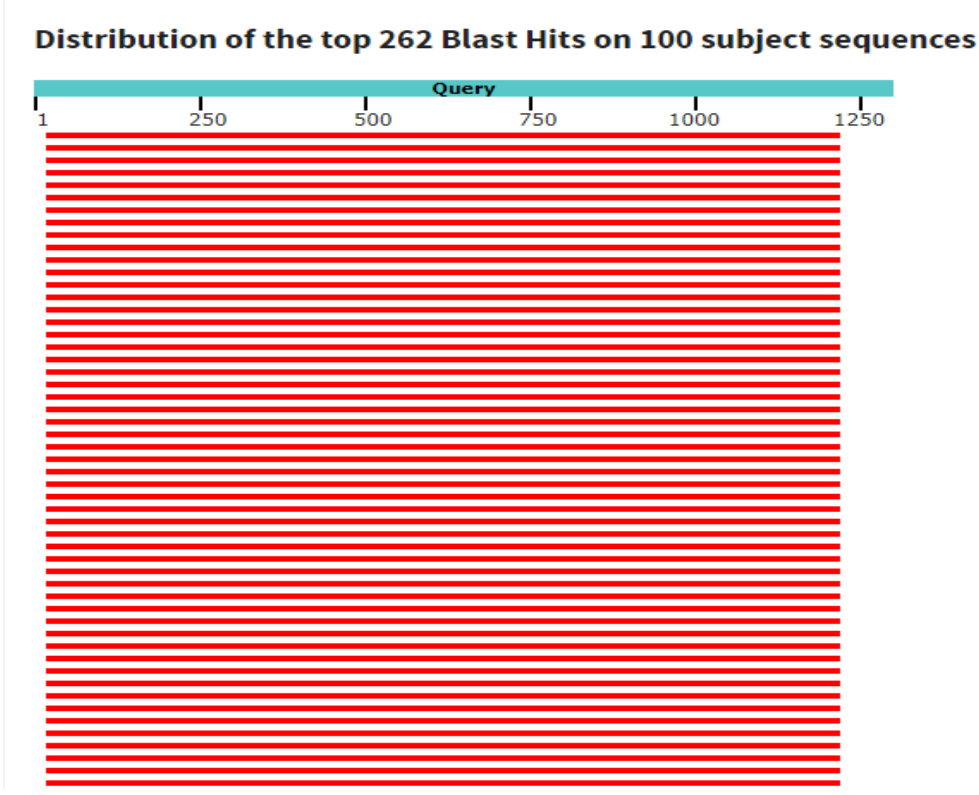
1. Hasil Sekuensing Isolat Bakteri SPB 3-d

Description	Scientific Name	Max Score	Total Score	Query Cover	E value	Per. Ident	Acc. Len	Accession
Proteus mirabilis strain HN2p chromosome HN2p, complete sequence	Proteus mirabilis	2207	15320	94%	0.0	98.49%	4172466	CP046048.1
Proteus mirabilis strain MPE4069 chromosome, complete genome	Proteus mirabilis	2207	15311	94%	0.0	98.49%	4055965	CP053718.1
Proteus mirabilis strain MPE5203 chromosome, complete genome	Proteus mirabilis	2207	15432	94%	0.0	98.49%	3920300	CP053685.1
Proteus mirabilis strain MPE0027 chromosome, complete genome	Proteus mirabilis	2207	15347	94%	0.0	98.49%	4120711	CP053683.1
Proteus mirabilis strain MPE0346 chromosome, complete genome	Proteus mirabilis	2207	15342	94%	0.0	98.49%	4203751	CP053719.1
Proteus mirabilis strain MPE0767 chromosome, complete genome	Proteus mirabilis	2207	15342	94%	0.0	98.49%	4055642	CP053616.1
Proteus mirabilis strain L90-1 chromosome, complete genome	Proteus mirabilis	2207	15455	94%	0.0	98.49%	4218783	CP045257.1
Proteus mirabilis strain JPM24 chromosome, complete genome	Proteus mirabilis	2207	15379	94%	0.0	98.49%	3983870	CP053894.1
Proteus mirabilis strain STP3 chromosome, complete genome	Proteus mirabilis	2207	15455	94%	0.0	98.49%	4115975	CP051260.1
Proteus mirabilis strain P8 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1410	MT276305.1
Proteus mirabilis strain P9 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1338	MT276304.1
Proteus mirabilis strain P13 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1410	MT276300.1
Proteus mirabilis strain BSFL-2 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1397	MT232428.1
Proteus mirabilis strain IGM6-14 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1408	MT197284.1
Proteus mirabilis strain IGM6-13 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1409	MT197283.1
Proteus mirabilis strain IGM6-12 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1408	MT197282.1
Proteus mirabilis strain IGM6-11 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1408	MT197281.1
Proteus mirabilis strain IGM4-11 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2207	2207	94%	0.0	98.49%	1411	MT197252.1



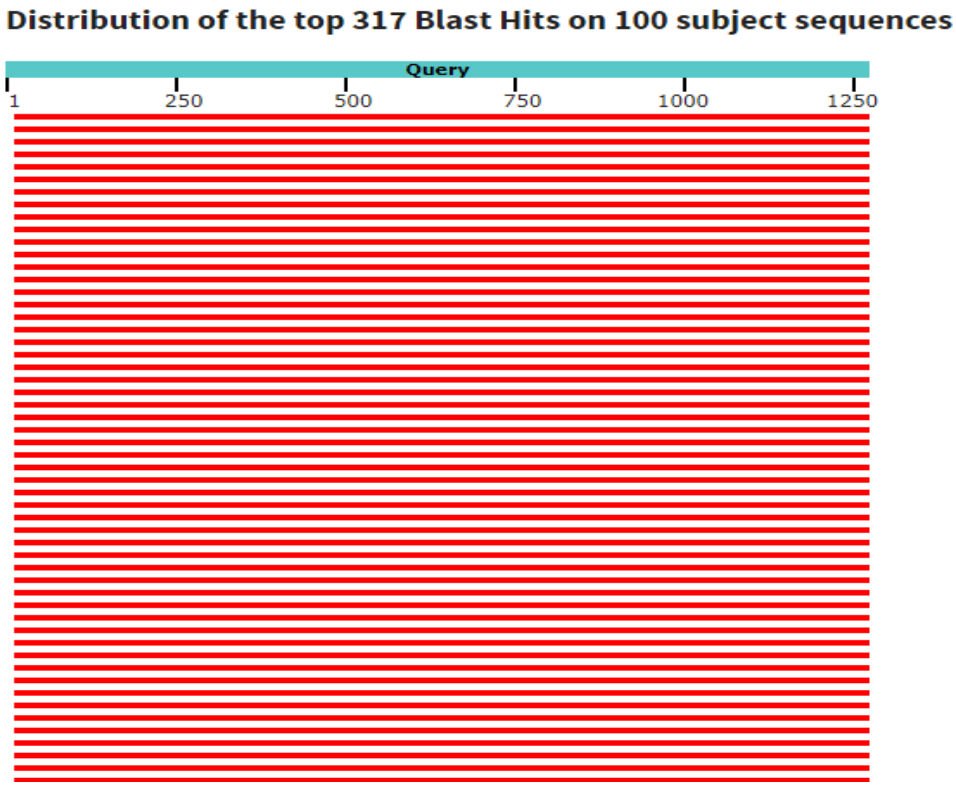
2. Hasil Sekuensing Isolat Bakteri LTP 3-b

Description	Scientific Name	Max Score	Total Score	Query Cover	E value	Per. Ident	Acc. Len	Accession
Proteus mirabilis strain PJC11 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	1343	1343	92%	0.0	87.09%	1472	MK802114.1
Proteus mirabilis strain P12 chromosome, complete genome	Proteus mirabilis	1343	9338	92%	0.0	87.09%	4167230	CP148134.1
Proteus mirabilis strain P13 chromosome, complete genome	Proteus mirabilis	1343	9350	92%	0.0	87.09%	4286715	CP148136.1
Proteus mirabilis strain 51661 chromosome, complete genome	Proteus mirabilis	1343	9344	92%	0.0	87.09%	3818756	CP096893.1
Proteus sp. D43 16S ribosomal RNA gene, partial sequence	Proteus sp. D43	1343	1343	92%	0.0	87.07%	1442	KF788146.1
Proteus mirabilis strain MPE5139 chromosome, complete genome	Proteus mirabilis	1341	9224	92%	0.0	87.09%	4104163	CP053684.1
Proteus mirabilis strain MPE0767 chromosome, complete genome	Proteus mirabilis	1341	9303	92%	0.0	87.08%	4055642	CP053616.1
Proteus mirabilis strain W2 chromosome, complete genome	Proteus mirabilis	1341	9331	92%	0.0	87.07%	4037899	CP126338.1
Proteus mirabilis strain S62-3-2-2 chromosome, complete genome	Proteus mirabilis	1341	9276	92%	0.0	87.08%	3952956	CP073247.1
Proteus mirabilis strain LCX7 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	1339	1339	92%	0.0	87.03%	1413	KY646084.1
Proteus sp. 118_34 16S ribosomal RNA gene, partial sequence	Proteus sp. 118_34	1339	1339	92%	0.0	87.01%	1352	KP120822.1
Proteus mirabilis strain MPE5203 chromosome, complete genome	Proteus mirabilis	1338	9338	92%	0.0	87.01%	3920300	CP053685.1
Proteus mirabilis strain M3-1-17 chromosome, complete genome	Proteus mirabilis	1338	9333	92%	0.0	87.01%	3970238	CP053681.1
Proteus mirabilis strain MPE0027 chromosome, complete genome	Proteus mirabilis	1338	9279	92%	0.0	87.01%	4120711	CP053683.1
Proteus mirabilis strain MPE0734 chromosome, complete genome	Proteus mirabilis	1338	9274	92%	0.0	87.01%	4055574	CP053615.1
Proteus mirabilis strain YPM35 chromosome, complete genome	Proteus mirabilis	1338	9292	92%	0.0	87.01%	4161306	CP053898.1
Proteus mirabilis strain JPM24 chromosome, complete genome	Proteus mirabilis	1338	9311	92%	0.0	87.01%	3983870	CP053894.1



3. Hasil Sekuensing Isolat Bakteri LPE 4-a

Description	Scientific Name	Max Score	Total Score	Query Cover	E value	Per. Ident	Acc. Len	Accession
Proteus mirabilis strain MPE4069 chromosome, complete genome	Proteus mirabilis	2217	15359	98%	0.0	98.27%	4055965	CP053718.1
Proteus mirabilis strain MPE5203 chromosome, complete genome	Proteus mirabilis	2217	15493	98%	0.0	98.27%	3920300	CP053685.1
Proteus mirabilis strain MPE0027 chromosome, complete genome	Proteus mirabilis	2217	15399	98%	0.0	98.27%	4120711	CP053683.1
Proteus mirabilis strain MPE0346 chromosome, complete genome	Proteus mirabilis	2217	15401	98%	0.0	98.27%	4203751	CP053719.1
Proteus mirabilis strain MPE0767 chromosome, complete genome	Proteus mirabilis	2217	15407	98%	0.0	98.27%	4055642	CP053616.1
Proteus mirabilis strain L90-1 chromosome, complete genome	Proteus mirabilis	2217	15519	98%	0.0	98.27%	4218783	CP045257.1
Proteus mirabilis strain JPM24 chromosome, complete genome	Proteus mirabilis	2217	15442	98%	0.0	98.27%	3983870	CP053894.1
Proteus mirabilis strain STP3 chromosome, complete genome	Proteus mirabilis	2217	15519	98%	0.0	98.27%	4115975	CP051260.1
Proteus mirabilis strain P8 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1410	MT276305.1
Proteus mirabilis strain P9 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1338	MT276304.1
Proteus mirabilis strain P13 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1410	MT276300.1
Proteus mirabilis strain BSFL-2 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1397	MT232428.1
Proteus mirabilis strain IGM6-14 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1408	MT197284.1
Proteus mirabilis strain IGM6-13 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1409	MT197283.1
Proteus mirabilis strain IGM6-12 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1408	MT197282.1
Proteus mirabilis strain IGM6-11 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1408	MT197281.1
Proteus mirabilis strain IGM4-11 16S ribosomal RNA gene, partial sequence	Proteus mirabilis	2217	2217	98%	0.0	98.27%	1411	MT197252.1



Lampiran 15. Foto Prosedur Penelitian

Prosedur Penelitian (a) Isolasi, (b) Seleksi, (c) Pengukuran pH, (d) Pengukuran OD, (e) Pengukuran Konsentrasi Amonia