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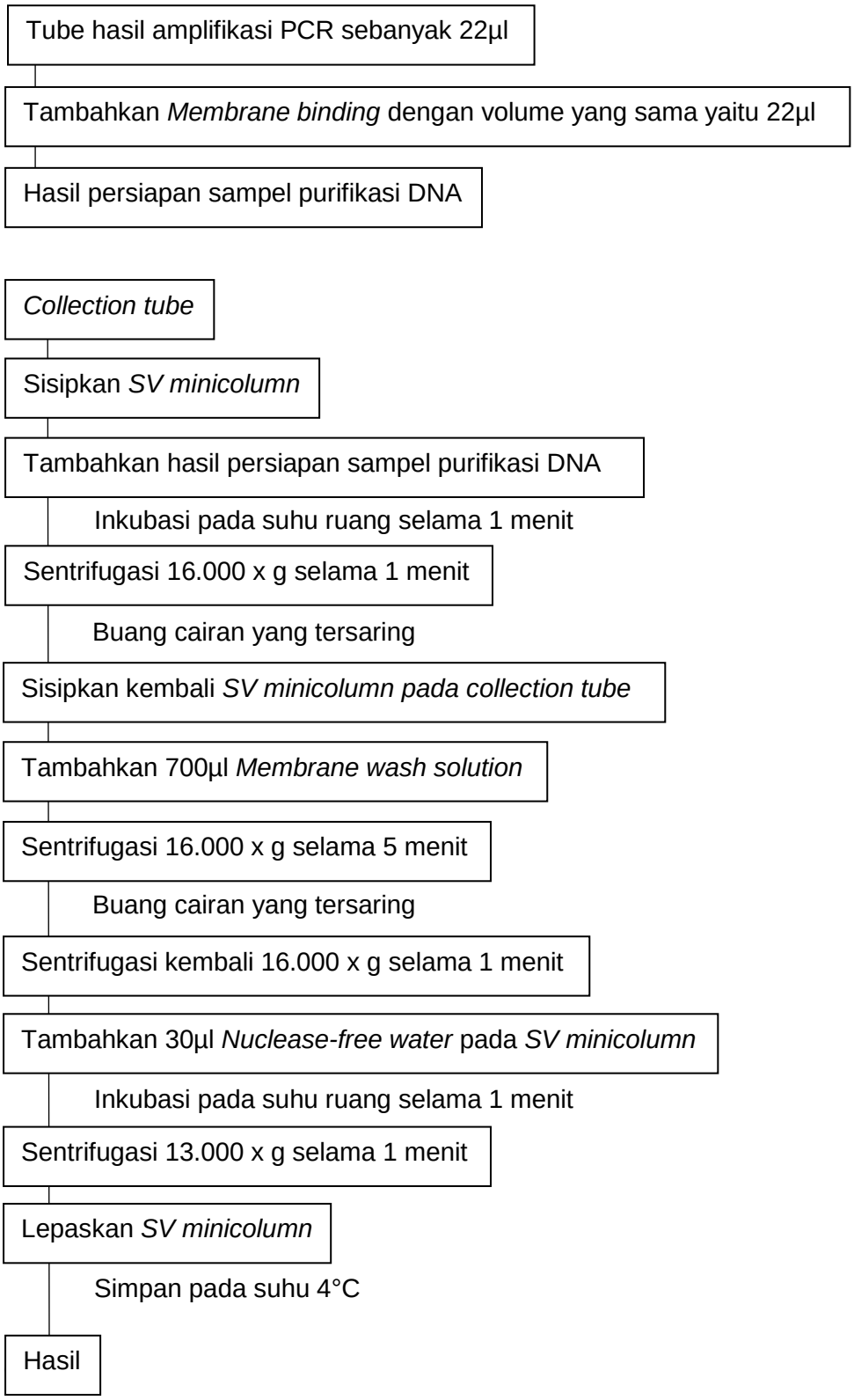
LAMPIRAN

Lampiran 1. Prosedur purifikasi DNA Wizard® SV Gel and PCR Clean-Up System (Promega)



Lampiran 2. Prosedur isolasi genom DNA dengan protokol Qiagen Genomic Tip 20/G

- Persiapan sampel

Sampel pellet bakteri

↓

Disuspensi dengan 1 ml *RNase A* + *Buffer B1*

↓ Vortex

Tambahkan 20µl *Lyzozyme stock solution* dan 45µl QIAGEN *Proteinase K solution*

↓ Inkubasi pada suhu 37°C selama 30 menit

Tambahkan 0.35 ml *Buffer 2*

↓ Vortex dan inkubasi pada suhu 50°C selama 30 menit

Hasil

- Isolasi genomic DNA

Menyeimbangkan QIAGEN Genomic-tip 20/G dengan 1 ml Buffer QBT

↓ Biarkan QIAGEN Genomic-tip kosong karena aliran gravitasi

Vortex sampel selama 10 menit dan diaplikasikan pada QIAGEN Genomic-tip

↓ Biarkan QIAGEN Genomic-tip kosong karena aliran gravitasi

QIAGEN Genomic-tip dicuci menggunakan 7 ml Buffer QC sebanyak 3 kali

↓

Elusi genomic DNA dengan 1 ml Buffer QF sebanyak 2 kali

↓

Presipitasi genomic DNA dengan menambahkan 1.4 ml Isopropanol

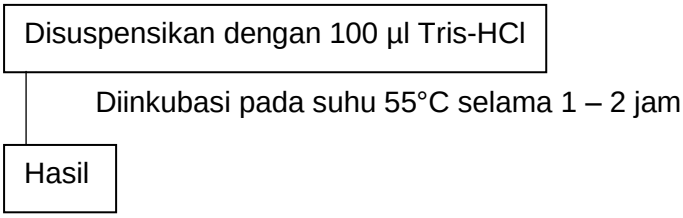
↓ Homogenkan dan sentrifugasi pada 8k rpm selama 15 menit di suhu 4°C. Setelah itu buang supernatannya

DNA pellet dicuci menggunakan 1 ml 70% Ethanol dingin

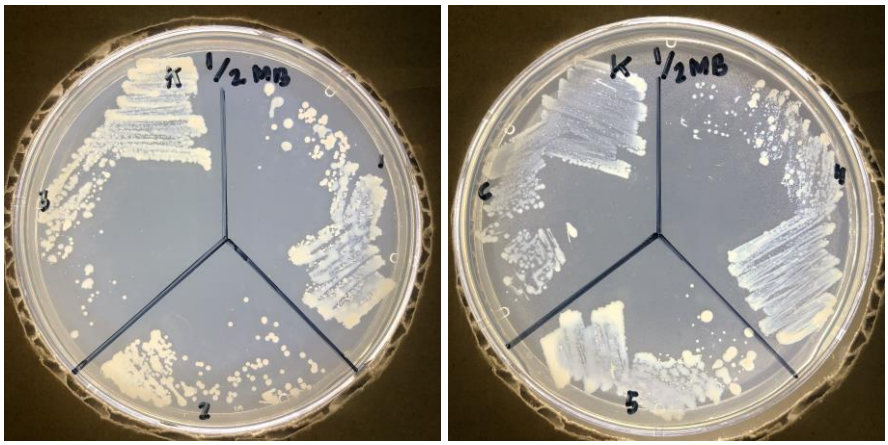
↓ Homogenkan dan disentrifugasi pada 8k rpm selama 10 menit di suhu 4°C. Setelah itu buang supernatannya

Dikeringanginkan selama 5 – 10 menit

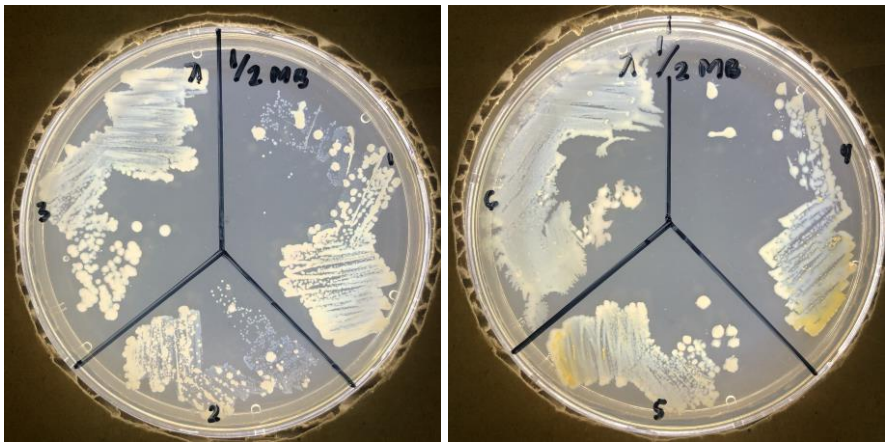
↓


Disuspensikan dengan 100 µl Tris-HCl
Diinkubasi pada suhu 55°C selama 1 – 2 jam
Hasil

Lampiran 3. Gambar isolasi bakteri yang diduga bersimbiosis dengan rumput laut *Kappahycus alvarezii* pada media agar *marine broth*

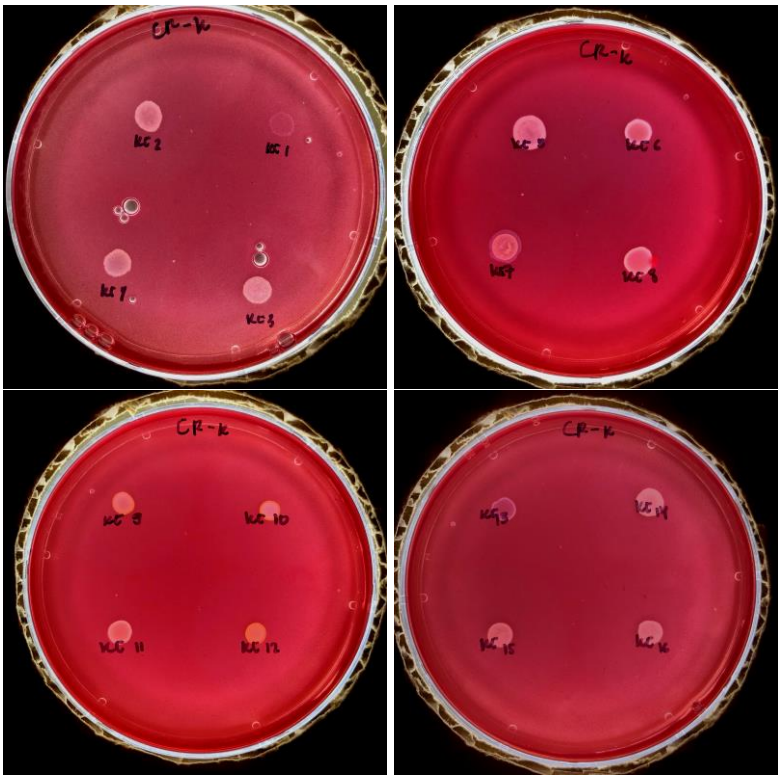


Media agar *marine broth* + 0.5% Wako κ-karagenan

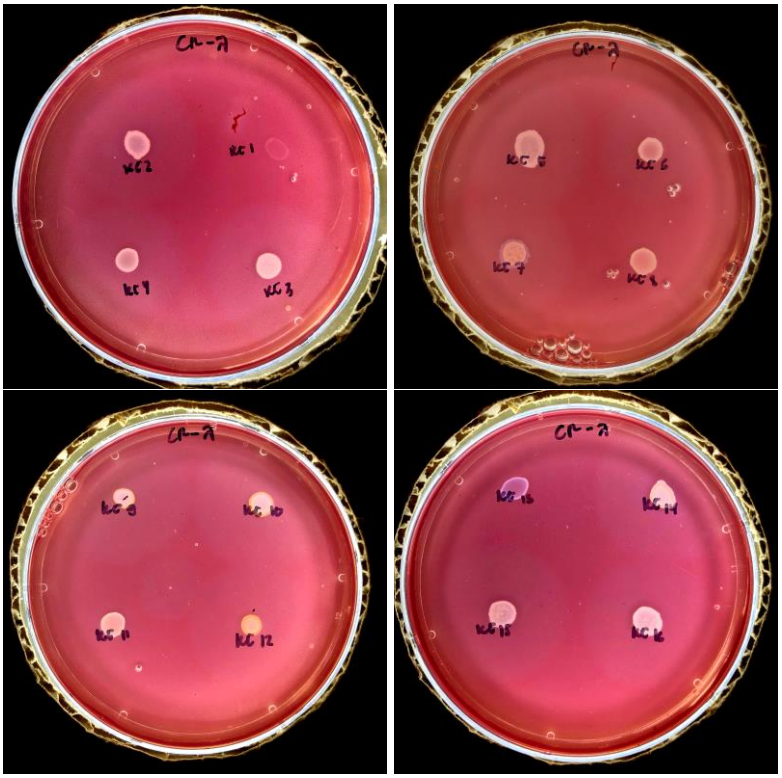


Media agar *marine broth* + 0.5 Wako λ-karagenan

Lampiran 4. Gambar analisis zona bening bakteri yang diduga bersimbiosis dengan rumput laut *Kappaphycus alvarezii* pada media agar *congo red*



Media agar *congo red* + 0.5% Wako κ-karagenan



Media agar *congo red* + 0.5% Wako λ-karagenan

Lampiran 5. Urutan basa nitrogen hasil sekuensing 16S rRNA

Kode	Bakteri	Urutan basa nitrogen
KC1	*Labrenzia* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC2	*Alteromonas* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC3	*Alteromonas* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC4	*Vibrio* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC5	*Alteromonas* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC6	*Vibrio* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC7	*Celeribacter* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC8	*Pseudoalteromonas* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC9	*Pseudoalteromonas* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC10	*Phaeobacter* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC11	*Pseudoalteromonas* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGAATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT

KC12	*Vibrio* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC13	*Cobetia* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT
KC14	*Alteromonas* sp.	AACGAACGCTGGNGGCAGGCTTAACACATGCAAGTCGAACGAACTCTTCGGAGTTAGTGGCAGACGGGTGAGTAACGCGTGGGAACCTACCTTTAGGTACGGAACAACAGTTGGAAACGACTGCTAATACCGTATGTG CCCTATGGGGGAAAGATTTATCGCCTAAGGATGGGCCCGCGTTGGATTAGCTAGTTGGTGGGGTAAAGGCCTACCAAGGCGACGATCCATAGCTGGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCC CAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCGCGTGAGTGATGAAGGCCCTAGGGTTGTAAAGCTCTTTCAGCGAGGAGGATAATGACGTTACTCGCAGAA GAAGCCCCGGCTAACTTCGT

Lampiran 6. Tabel nilai absorbansi uji DNS pada enzim aktif dan inaktif yang diperoleh dari bakteri yang bersimbiosis dengan rumput laut *Kappahycus alvarezii*

λ-karagenan	Inaktif	Aktif	κ-karagenan	Inaktif	Aktif
KC1	0.694	0.633	KC1	0.725	0.711
KC2	0.693	0.642	KC2	0.691	0.673
KC3	0.731	0.974	KC3	0.702	0.739
KC4	0.734	0.712	KC4	0.758	0.74
KC5	0.701	0.678	KC5	0.681	0.713
KC6	0.704	0.715	KC6	0.717	0.741
KC7	0.695	0.661	KC7	0.733	0.708
KC8	0.701	0.677	KC8	0.715	0.736
KC9	0.705	0.693	KC9	0.713	0.696
KC10	0.667	0.695	KC10	0.735	0.726
KC11	0.649	0.654	KC11	0.693	0.735
KC12	0.674	0.661	KC12	0.727	0.743
KC13	0.679	0.699	KC13	0.797	0.805
KC14	0.668	1.172	KC14	0.764	1.184

Lampiran 7. Tabel aktivitas enzim yang diperoleh dari 14 isolat bakteri yang bersimbiosis dengan rumput laut *Kappahycus alvarezii*

λ-karagenan	**UA (x 10^{-3})**	**κ-karagenan**	**UA (x 10^{-3})**
KC1	1.267	KC1	1.362
KC2	1.287	KC2	1.353
KC3	1.851	KC3	1.462
KC4	1.347	KC4	1.356
KC5	1.343	KC5	1.454
KC6	1.411	KC6	1.435
KC7	1.321	KC7	1.342
KC8	1.341	KC8	1.430
KC9	1.365	KC9	1.356
KC10	1.447	KC10	1.372
KC11	1.400	KC11	1.473
KC12	1.362	KC12	1.419
KC13	1.430	KC13	1.403
KC14	2.437	KC14	2.152

Lampiran 8. Tabel nilai absorbansi uji DNS pada hasil purifikasi enzim karagenase yang diperoleh dari bakteri yang bersimbiosis dengan rumput laut *Kappahycus alvarezii*

Bakteri KC3	κ-karagenase	λ-karagenase	Bakteri KC14	κ-karagenase	λ-karagenase
Kontrol	0.809	1.617	Kontrol	0.71	1.645
11	0.574	0.548	11	0.655	0.505
13	0.576	0.55	13	0.548	0.514
15	0.572	0.507	15	0.608	0.52
17	0.596	0.506	17	0.575	0.5
19	0.581	0.582	19	0.617	0.481
21	0.578	0.524	21	0.583	0.532
23	0.599	0.528	23	0.55	0.509
25	0.581	0.574	25	0.61	0.505
27	0.568	0.556	27	0.573	0.556
29	0.604	0.596	29	0.565	0.603
31	0.585	0.575	31	0.64	0.843
33	0.554	0.603	33	0.753	1.301
35	0.577	0.885	35	0.692	1.504
37	0.604	1.42	37	0.806	1.548
39	0.706	1.547	39	0.776	1.622
41	0.824	1.571	41	0.841	1.581
43	0.771	1.565	43	0.949	1.744
45	0.862	1.48	45	1.02	1.795
47	0.732	1.375	47	0.953	1.608
49	0.72	1.426	49	0.897	1.455
51	0.675	1.184	51	0.719	1.337
53	0.697	0.962	53	0.703	1.142
55	0.631	0.88	55	0.648	0.975
57	0.713	0.975	57	0.612	0.746
59	0.686	0.774	59	0.554	0.711

Lampiran 9. Tabel aktivitas enzim pada hasil purifikasi enzim karagenase yang diperoleh dari isolat bakteri *Alteromonas* sp. KC3 dan KC14 (x 10^{-3})

Bakteri KC3	UA κ-karagenase	UA λ-karagenase	Bakteri KC14	UA κ-karagenase	UA λ-karagenase
11	0.985	0.471	11	1.281	0.426
13	0.989	1.394	13	1.072	0.434
15	0.982	1.280	15	1.189	0.439
17	1.023	1.386	17	1.125	0.422
19	0.998	1.597	19	1.207	0.406
21	0.992	1.250	21	1.140	0.449
23	1.028	1.399	23	1.076	0.430
25	0.998	1.510	25	1.193	0.426
27	0.975	1.345	27	1.121	0.469
29	1.037	1.489	29	1.105	0.509
31	1.004	1.340	31	1.252	0.712
33	0.951	1.457	33	1.473	1.098
35	0.991	2.038	35	1.354	1.270
37	1.037	2.228	37	1.577	1.307
39	1.212	1.513	39	1.518	1.369
41	1.415	1.410	41	1.645	1.335
43	1.324	1.384	43	1.856	1.472
45	1.480	1.313	45	1.995	1.516
47	1.257	1.290	47	1.864	1.358
49	1.236	1.440	49	1.755	1.228
51	1.159	1.153	51	1.406	1.129
53	1.197	1.128	53	1.375	0.964
55	1.083	1.271	55	1.268	0.823
57	1.224	1.539	57	1.197	0.630
59	1.178	1.103	59	1.084	0.600

Lampiran 10. Tabel konsentrasi genom DNA pada QuantiFluor® ONE dsDNA dan perhitungan konversi dari ng/µl menjadi nM

Bakteri	Konsentrasi (ng/µl)
KC3	102
KC14	105

Rumus konversi ng/µl menjadi nM:

$$Concentration\ in\ nM = \frac{(Concentration\ in\ ng/\mu l)}{(660\frac{g}{mol} \times average\ library\ size)} \times 10^6$$

1. KC3

   Concentration in ng/µl = 102

   Average library size = 500 bp

   $$Concentration\ in\ nM = \frac{(102)}{(660\frac{g}{mol} \times 500)} \times 10^6$$

   $$Concentration\ in\ nM = 309.0909$$

2. KC14

   Concentration in ng/ µl = 105

   Average library size = 500 bp

   $$Concentration\ in\ nM = \frac{(105)}{(660\frac{g}{mol} \times 500)} \times 10^6$$

   $$Concentration\ in\ nM = 318.1818$$

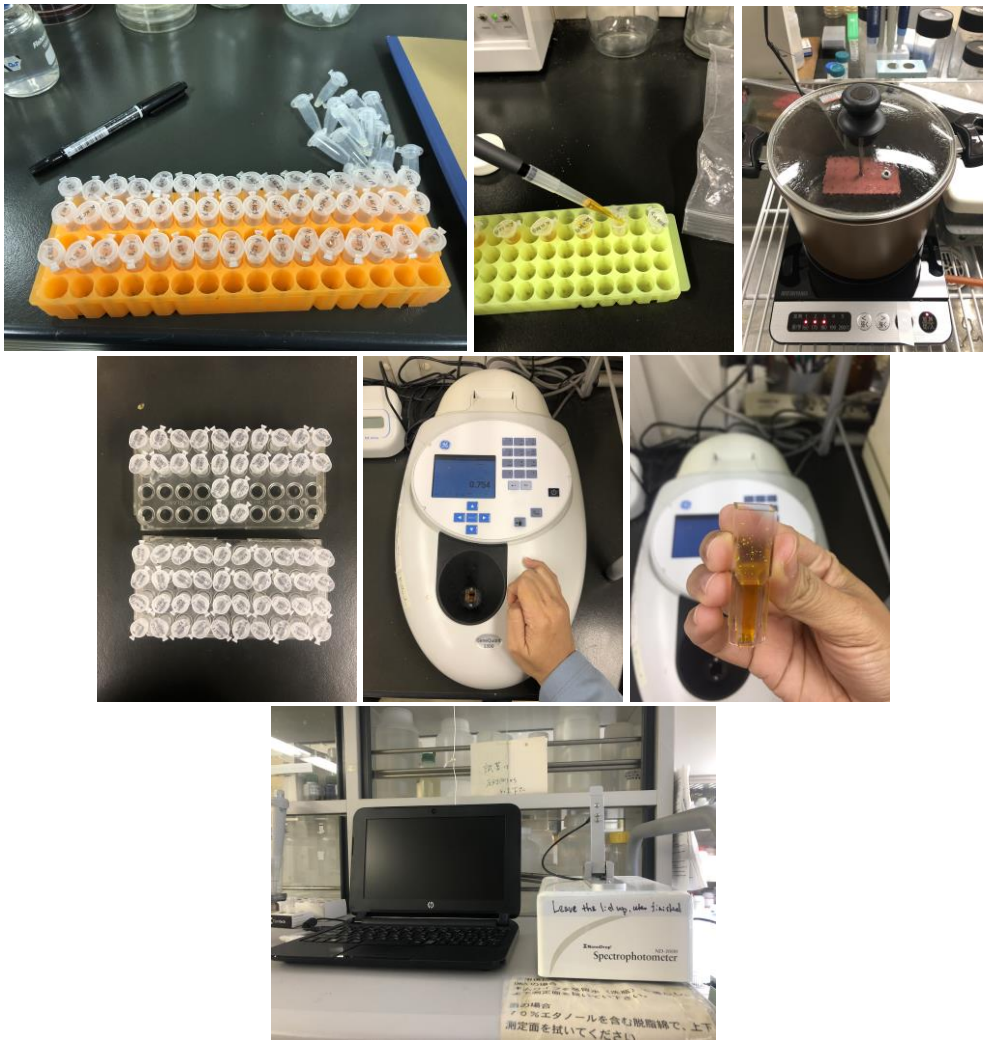
Lampiran 11. Tabel anotasi protein sekuensing pada bakteri *Alteromonas* sp. KC3 dan KC14 yang bersimbiosis dengan rumput laut *Kappahycus alvarezii*

***Alteromonas* sp. KC3**		
Locus	**Produk**	**Protein sekuens**
Locus_46410	Hypothetical protein	MVGLGEGFTIDLSIDRTPEPNERIAVFRMGDIENFRFANFTIEDNKTIFASFLVGVTQRDNDLH WPVNGIIEDITQHNSLFGYGLVQTYAADNILFRNLHSEGGITLRMETDNLSMKDFGKGGIRDIF AENIQGTDCLAPVMFGPHFQENGSVQVNGVVSNGCGFAVRVDEGFVELFSPQGESYTRNQ WRDEVNATYGDGCADVTYARGANQWATRITPTKVCLDAVHNRTKLKPGWFEESYVYNVTAN FDINAHLKLDNLNFIANCDNICIASPEQWSRRGQIFLGDSVAAIVNEQKEGVDYNFNINIDDPSF NGFPNAHYEKLDSLSVPLSSCRSNYQTALSNCSDVRWY
***Alteromonas* sp. KC14**		
Locus	**Produk**	**Protein sekuens**
Locus_17300	Hypothetical protein	MGFVLADFGSISLEDNGGVNSSSAISYTDTSVNTDIVNQSLLWHKWGSANPWSQALGGGAV DTEIQSVSLNVKVVKGVGNSSITPVTVKHHLLPWNVTLSGGKSGKVAAAQAITADYTATVEPE DFGDWVTITFINANNNEPSFSVPESWILTTGKRYY
Locus_17320	Hypothetical protein	MLIDYAVNNQDSIDDTQVLQEALDDISNNLGGGTLLIPAGDYYFRSVHLRSNVQIEVHEDARFY MAPFGGGYNTWMFEMGFGDGVKQKM
Locus_17330	Hypothetical protein	MVGLGEGFTIDLSIDRTPEPNERIAVFRMGDIENFRFANFTIEDNKTIFASFLVGVTQRDNDLH WPVNGIIEDITQHNSLFGYRLVQTYAADNILFRNLHSEGGITLRMETDNLSMKDFGKGGIRDILL KIFKEQIV
Locus_17340	Hypothetical protein	MFSPVMFGPHFQENGSVQVNGVVSNGCGFAVRVDEGFVELFSPQGESYTRNQWRDEVNAT YGDGCADVTYARGANQWATRITPTKVCLDAVHNRTKLKPGWFEESYVYNVTANFDINAHLKL DNLNFIANCDNICIASPEQWSRRGQIFLGDSVAAIVNEQKEGVDYNFNINIDDPSFNGFLMRITK S

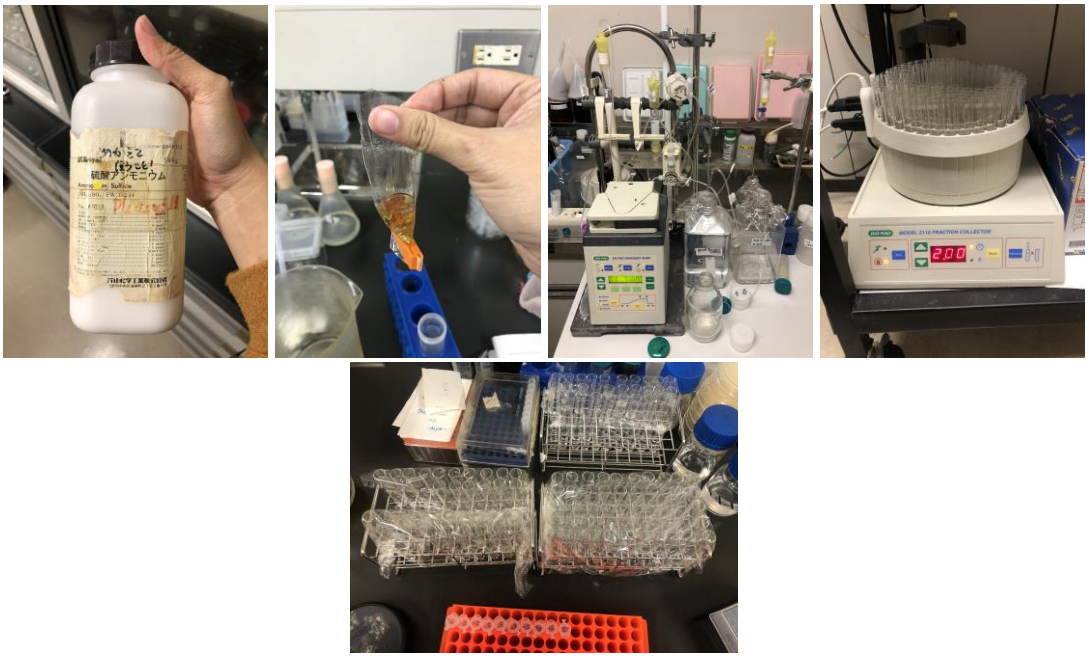
Lampiran 12. Foto penelitian

Pengambilan sampel bakteri

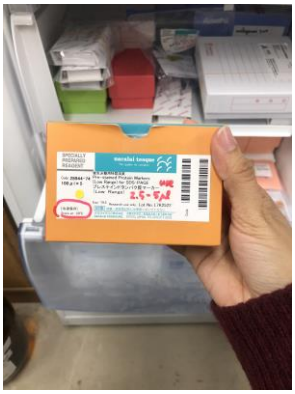
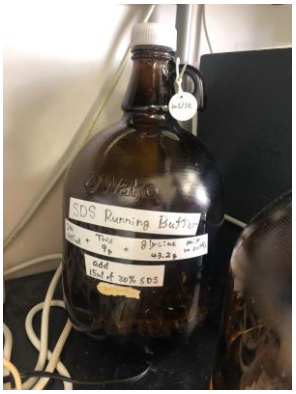
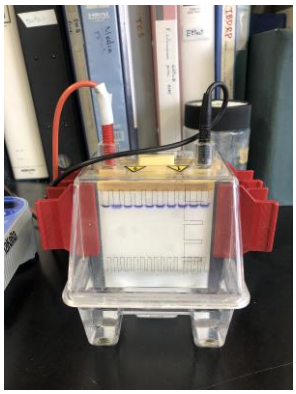
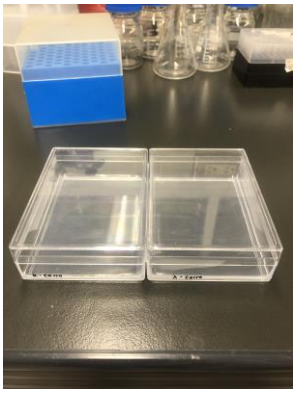
Identifikasi jenis bakteri yang bersimbiosis dengan *Kapphycus alvarezii*



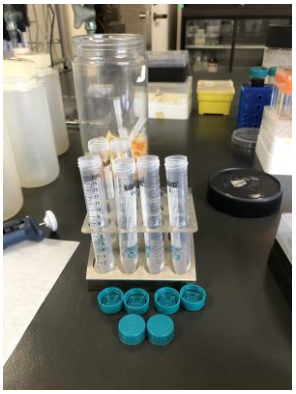
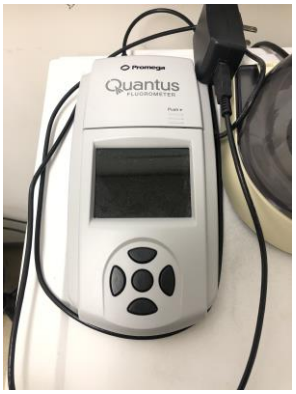
Identifikasi aktivitas enzim karagenase (Uji DNS)

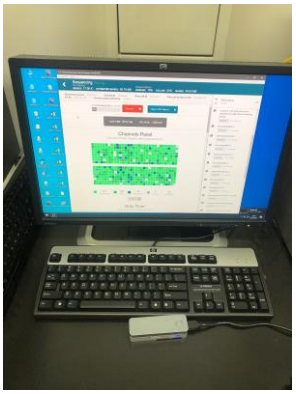
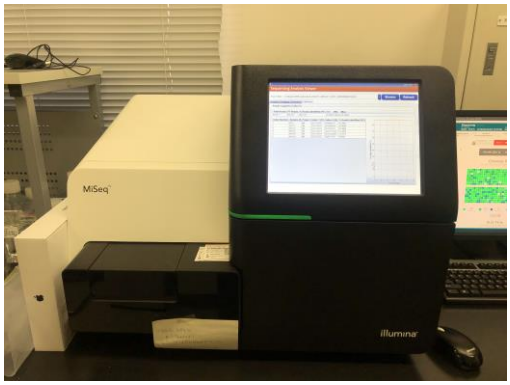


Purifikasi enzim


Identifikasi berat molekul enzim karagenase (SDS-PAGE)

Identifikasi jenis enzim (*Next generation sequencing*)