

V. SIMPULAN DAN SARAN

A. Simpulan

Berdasarkan hasil penelitian tersebut diatas, maka dapat disimpulkan:

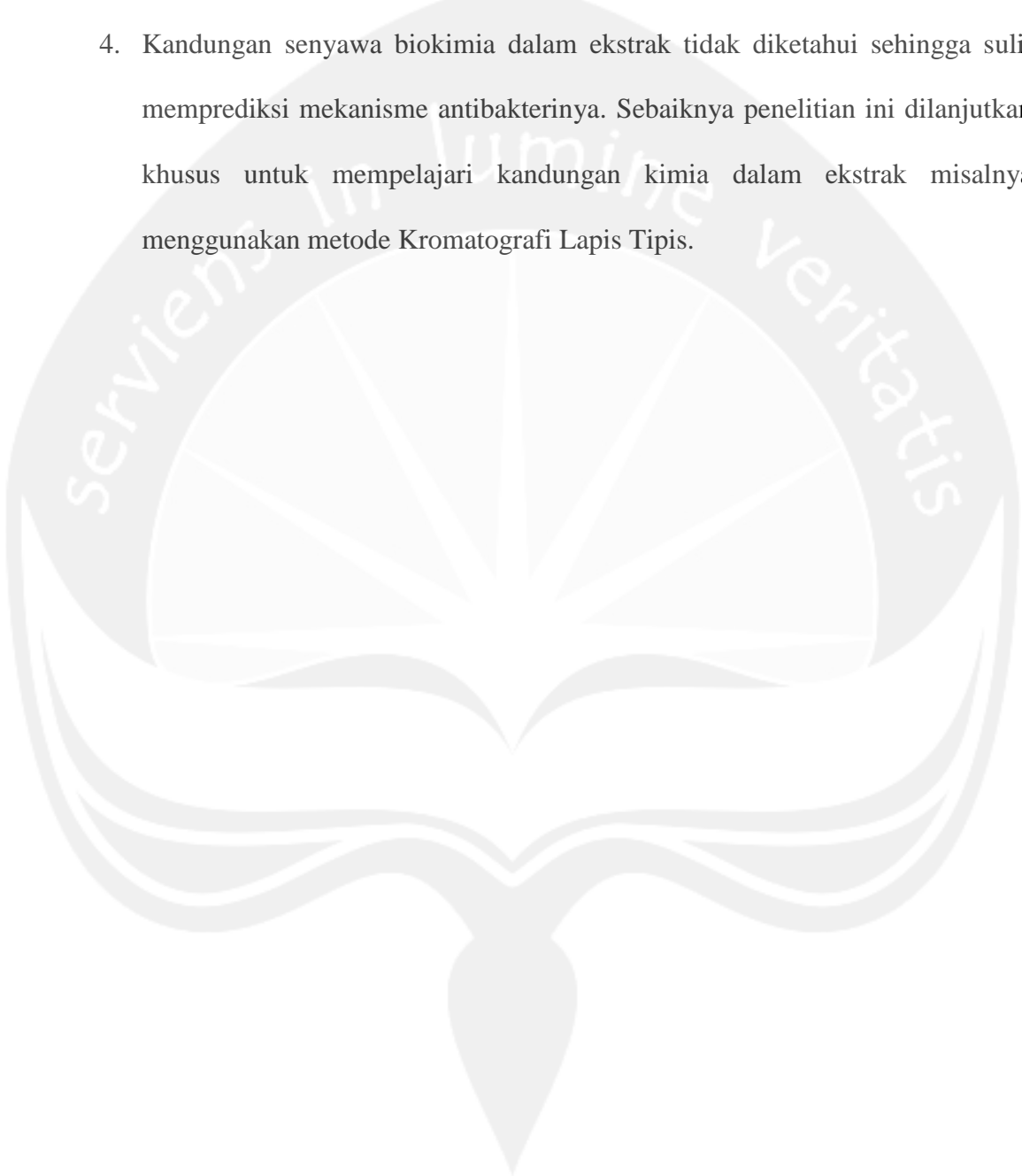
1. Ekstrak metanol *Sinularia* dan *Lobophytum* memiliki aktivitas antibakteri yang setara, dan lebing tinggi daripada keduanya adalah ekstrak *Sarcophyton*.
2. Luas zona hambat yang dihasilkan oleh ekstrak metanol terumbu karang lunak terhadap bakteri uji *E. coli*, *S. aureus* dan *S. pyogenes* setara, dan pada *P. aeruginosa* diperoleh zona hambat lebih luas dibanding bakteri lainnya.
3. Hasil aktivitas antibakteri tertinggi adalah ekstrak *Sarcophyton* terhadap *P. aeruginosa*.
4. Konsentrasi Hambat Minimum ekstrak *Sarcophyton* terhadap *P. aeruginosa* adalah 4% v/v.

B. Saran

Berdasarkan hasil penelitian tersebut diatas, maka dapat disarankan:

1. Agar tidak terluka atau tersengat, dalam proses pengambilan sampel sebaiknya digunakan pelindung atau sarung tangan.
2. Transportasi sampel dari lokasi sangat riskan, sehingga untuk menghindari kerusakan kandungan senyawanya, sebaiknya sampel langsung ditimbang dan dimaserasi di lapangan dengan methanol atau pelarut lainnya

3. Ekstrak yang dihasilkan masih memiliki kandungan air yang sangat tinggi, sebaiknya dilakukan proses lyofilisasi (*freeze dryer*) untuk mengeringkan air.
4. Kandungan senyawa biokimia dalam ekstrak tidak diketahui sehingga sulit memprediksi mekanisme antibakterinya. Sebaiknya penelitian ini dilanjutkan khusus untuk mempelajari kandungan kimia dalam ekstrak misalnya menggunakan metode Kromatografi Lapis Tipis.



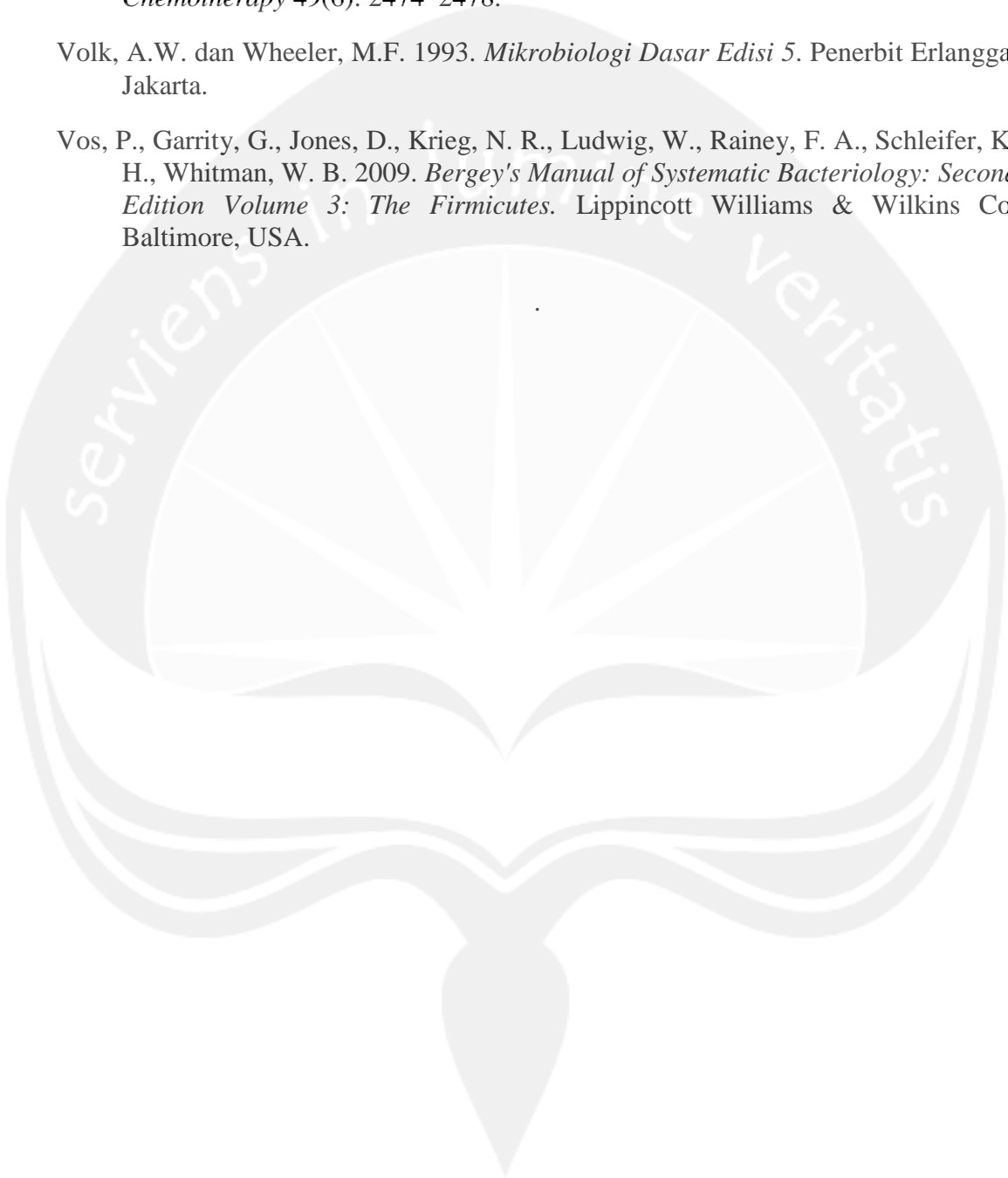
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LAMPIRAN

1. Kunci Dikotomi *Softcoral**Dichotomous key for soft coral identification*

By Adam Cesnales

Key Includes only true Octocorals excluding gorgonians.

- | | | | |
|----|----|---|-------------------|
| 1. | a. | Colony encrusting | Proceed to 2 |
| | b. | Colony massive | Proceed to 3 |
| | c. | Colony comprised of individual polyps arising from hard red tubes | Proceed to 4 |
| | d. | Colony with hard blue skeleton | Proceed to 5 |
| 2. | a. | Polyps retractile | Proceed to 6 |
| | b. | Polyps variously contractile, but not retractile | Proceed to 8 |
| 3. | a. | Colony unattached from substrate. Distinctively “Christmas tree shaped”, with branches radiating from a central stalk. Upper branched section can completely retract into branch free lower section | Proceed to 9 |
| | b. | Colony unattached from substrate. Distinctively “Club Shaped” with very elongated polyps radiating from upper section with bare, often curved lower section that burrows into soft substrate. | Proceed to 17 |
| | c. | Colony not as above and with dimorphic (two types) polyps and clearly distinct stalk and “head” | Proceed to 10 |
| | d. | Colony not as above, with monomorphic (one type) polyps | Proceed to 12 |
| 4. | | <i>Tubipora musica</i> (Organ Pipe Coral)
*could be confused with <i>Clavularia</i> or possibly <i>Anthelia</i> if skeleton not visible | |
| 5. | | <i>Heliopora</i> (Blue Ridge Coral)
*could be confused with <i>Millepora sp.</i> (fire coral) or true hard corals. Verify 8 tentacles per polyp. | |
| 6. | a. | Distinctly Stoloniferous, large bushy polyps retract into distinctively bulbous anthostele | <i>Clavularia</i> |
| | b. | Forming continuous or web like mat, polyps with reduced or nearly absent pinnules | Proceed to 7 |

7. a. Web-like to continuous mat, often weakly adhered to substrate, polyps usually retract into raised calyces *Briareum* (Star Polyps)
- b. Web-like to continuous mat, well adhered to substrate, polyps usually retract into mouth surface of may *Erythropodium* (Encrusting Gorgonian)
- c. Ribbon like to continuous mat, polyps retract into large calices surrounded by large obvious sclerites. *Rhytisma* (Encrusting Leather)
*Formerly (still often in aquarium literature) known as parerythropodium.
- Notes: *Briareum* and *Erythropodium* can be impossible to distinguish on the basis of gross physical since significant overlap occurs. Description above are generalities. Sclerite examination is required for definitive ID.
8. a. Wispy polyps with visible iridescent sclerites (Magnification may be required to see individual sclerites) *Sansibia* (Blue Xenia)
- b. Polyp with no visible sclerites, non-pulsing *Anthelia* (Waving Hand Polyp)
9. *Studeriotetes* (Christmas Tree Coral), formerly classified as *Sphaerella kremphi*.
10. a. Small smoothy/slimy colonies, with large (> 1/4 inch), bushy, usually pulsatile polyps *Heteroxenia*
- b. Colony sandpapery.leathery with small diameter (>1/4 across) polyps Proceed to 11
11. a. Polipary (“Head”) flat to wavy, but without raised lobes *Sarcophyton* (Toadstool/Umbrella Leather)
- b. Poliparu with raides, often radially arranged lobes that may appear branch like *Lobophytum* (Crown/Finger Leather)
12. a. Colony branching with retractile (or appearing so) polyps Proceed to 13
- b. Colony with a central stalk/base with non-retractile polyps Proceed to 14
- c. Colony with retractile polyps but non-branching Proceed to 16
13. a. Colony smooth and slimy/slippery *Klyxum* (Colt Coral)
*contains corals formerly classified as *Cladiella* and

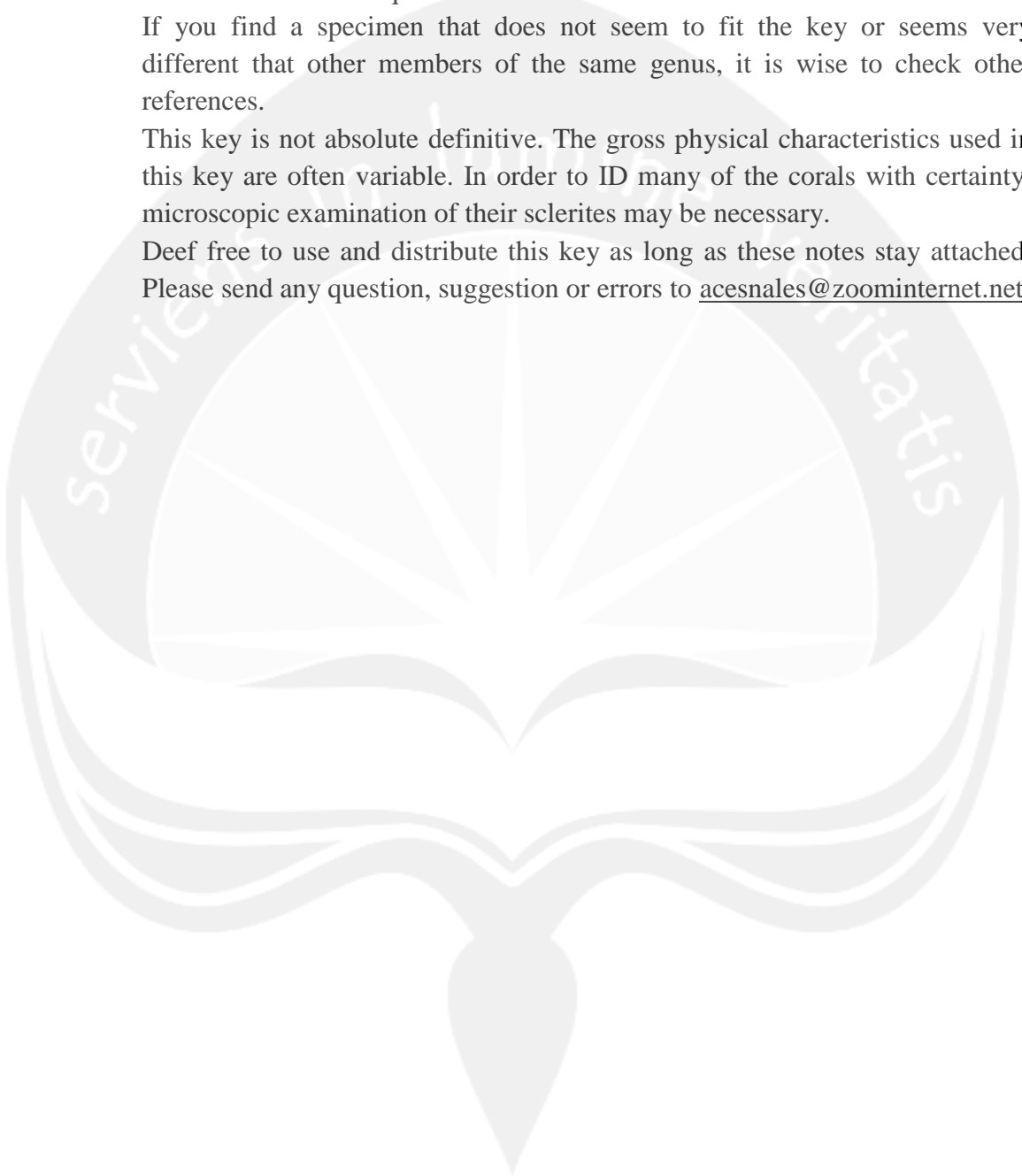
- Alcyonium*
- b. Colony sandpapery/leathery *Sinularia* (Finger Leather)
- c. Colony brightly colored or white, polyps retract into prominent calices *Nephyrogorgia* (Chilli Coral)
14. a. Small, smooth/slippery colony with large (usually >1/4 inch), elongated polyps arising from dome shaped summit or stalks. Stalks may occasionally branch. Polyps often pulsate. *Xenia*
- b. Small, smooth/slippery colony with short branches and elongated polyps that may arise from any part of the branches. Visible highly iridescent sclerites give the appearance of glitter imbedded in tissue *Cespitularia* (Blue Xenia, Phosphor polyps)
- c. Not as above Proceed to 15
15. a. Branches occur as upward projection from common low, stout base, rarely re-branching. Polyps concentrated on distal 2/3 of branches *Paralemnalia*
- b. Small colony with a central stalk and short simple branches polyps usually on distal 2/3 of branches. Contracted polyps may lay against branches “giving pine” cone appearance *Capnella*
- c. Colony with complex branching, may have muted colors *Nephthea*
Lemnalia
Litophyton
*These three genera have significant overlap. Distinguishing between them can be quite difficult without examination of sclerites. Colonies brightly colored, with numerous large sclerites visible through tissue and often protruding from tissue (especially around polyps) giving concentrated colonies a very prickly texture. These three genera are very similar. All are azooxanthellate (non-photosynthetic) and should be avoided by casual aquarist. *Dendronephthya*
Scleronephthya
Stereonephthya
16. a. Colony leafy with sparse polyps. Some polyps may retract into raised calyces, but most do not. *Sinularia*
- b. Colony low and broad with thick lobes. Polyps are concentrated on ridges and all polyps retract into prominent raised calyces giving the colony a bumpy or nubby appearance. *Dampia*
17. *Cavernularia* sp. (Sea Pen)

Notes:

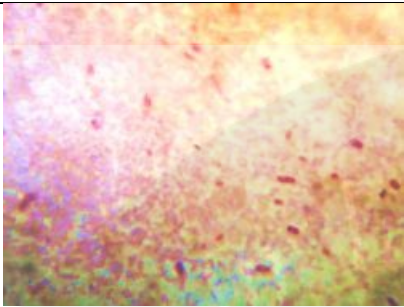
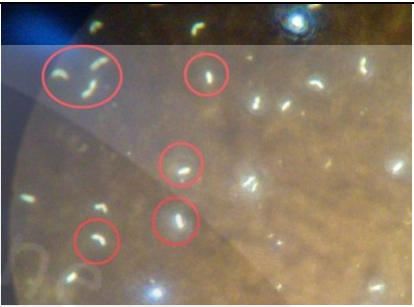


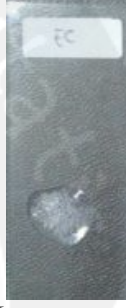


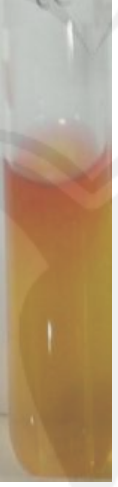
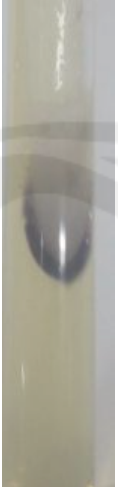


This key does not contain every soft coral that exists and not even every soft coral that enters the aquarium trade. It does contain most of the common ones. If you find a specimen that does not seem to fit the key or seems very different than other members of the same genus, it is wise to check other references.

This key is not absolute definitive. The gross physical characteristics used in this key are often variable. In order to ID many of the corals with certainty, microscopic examination of their sclerites may be necessary.

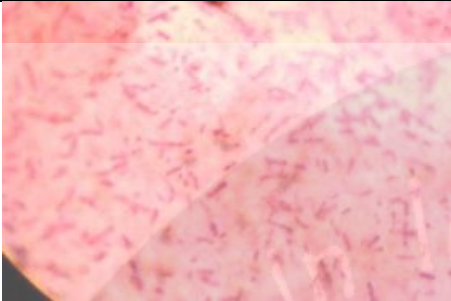






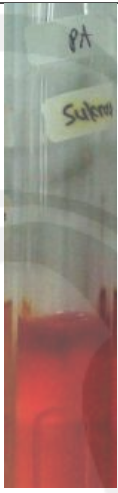



Deef free to use and distribute this key as long as these notes stay attached. Please send any question, suggestion or errors to acesnales@zoominternet.net.



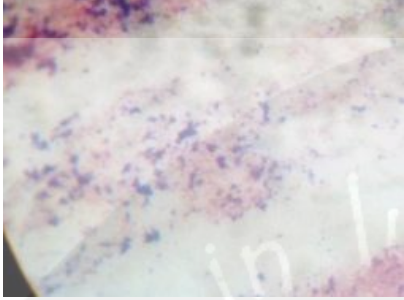
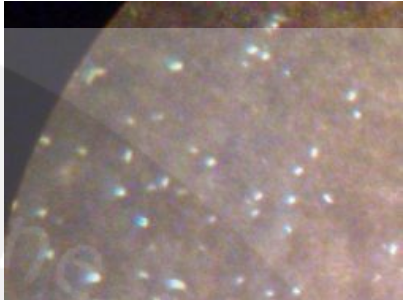









2. Dokumentasi Uji Kemurnian *E. coli*

 <p>Keterangan : pengecatan Gram. Hasil : berwarna merah, menunjukkan bahwa bakteri tergolong Gram Negatif.</p>	 <p>Keterangan : pengecatan Negatif. Hasil : Bakteri berbentuk batang, dilingkari berwarna merah.</p>				
 <p>Keterangan: pengamatan morfologi koloni <i>E. coli</i>. Hasil : berbentuk cembung, berkilau, putih keabuan</p>	 <p>Keterangan: uji motilitas. Hasil : nonmotil.</p>	 <p>Keterangan: uji katalase. Hasil : terbentuk gelembung, katalase positif.</p>			
 <p>Keterangan : uji hidrolisis glukosa. Hasil : positif</p>	 <p>Keterangan : uji hidrolisis laktosa. Hasil : positif.</p>	 <p>Keterangan : uji hidrolisis sukrosa. Hasil : positif.</p>	 <p>Keterangan : uji hidrolisis pati. Hasil : negatif.</p>	 <p>Keterangan : uji reduksi nitrat Hasil : positif.</p>	 <p>Keterangan: uji indol. Hasil : positif.</p>





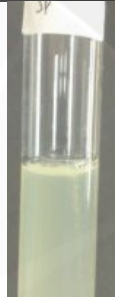




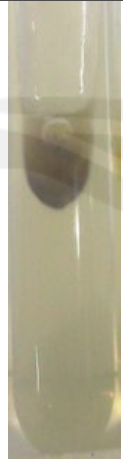


3. Dokumentasi Uji Kemurnian *P. aeruginosa*

 <p>Keterangan : pengecatan Gram. Hasil : berwarna merah, menunjukkan bahwa bakteri tergolong Gram Negatif.</p>	 <p>Keterangan : pengecatan Negatif. Hasil : Bakteri berbentuk batang, dilingkari berwarna merah.</p>				
 <p>Keterangan : pengamatan morfologi koloni. Hasil : koloni kecil, permukaan kasar dan cembung.</p>	 <p>Keterangan: uji motilitas. Hasil : motil</p>	 <p>Keterangan: uji katalase. Hasil : Berbusa saat ditetesi H₂O₂, menunjukkan katalase positif.</p>			
 <p>Keterangan : uji hidrolisis glukosa. Hasil : positif</p>	 <p>Keterangan : uji hidrolisis laktosa. Hasil : negatif</p>	 <p>Keterangan : uji hidrolisis sukrosa. Hasil : negatif</p>	 <p>Keterangan : uji hidrolisis pati. Hasil : negatif.</p>	 <p>Keterangan : uji reduksi nitrat Hasil : negatif.</p>	 <p>Keterangan: uji indol. Hasil : negatif.</p>

4. Dokumentasi Uji Kemurnian *S. aureus*

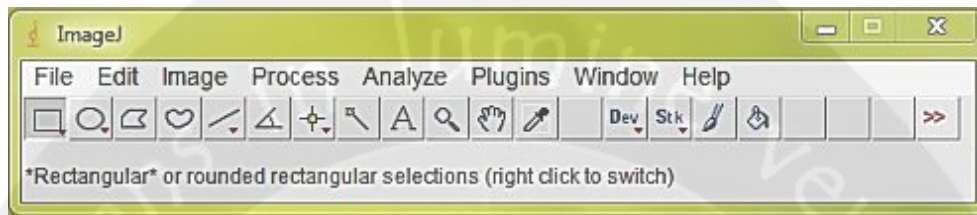
 <p>Keterangan : pengecatan Gram. Hasil : berwarna ungu, menunjukkan bahwa bakteri tergolong Gram Positif.</p>		 <p>Keterangan : pengecatan Negatif. Hasil : bakteri berbentuk coccus.</p>			
 <p>Keterangan : pengamatan morfologi koloni. Hasil : koloni bulat, halus, berwarna jingga keputihan, mengkilap</p>		 <p>Keterangan : uji motilitas. Hasil : nonmotil.</p>	 <p>Keterangan : uji katalase. Hasil : berbusa saat ditetesi H₂O₂, menunjukkan katalase positif</p>		
 <p>Keterangan : uji hidrolisis glukosa. Hasil : positif</p>	 <p>Keterangan : uji hidrolisis laktosa Hasil : positif</p>	 <p>Keterangan : uji hidrolisis sukrosa. Hasil : positif</p>	 <p>Keterangan : uji hidrolisis pati. Hasil : negatif.</p>	 <p>Keterangan : uji reduksi nitrat Hasil : positif.</p>	 <p>Keterangan: uji indol. Hasil : positif.</p>

5. Dokumentasi Uji Kemurnian *S. pyogenes*

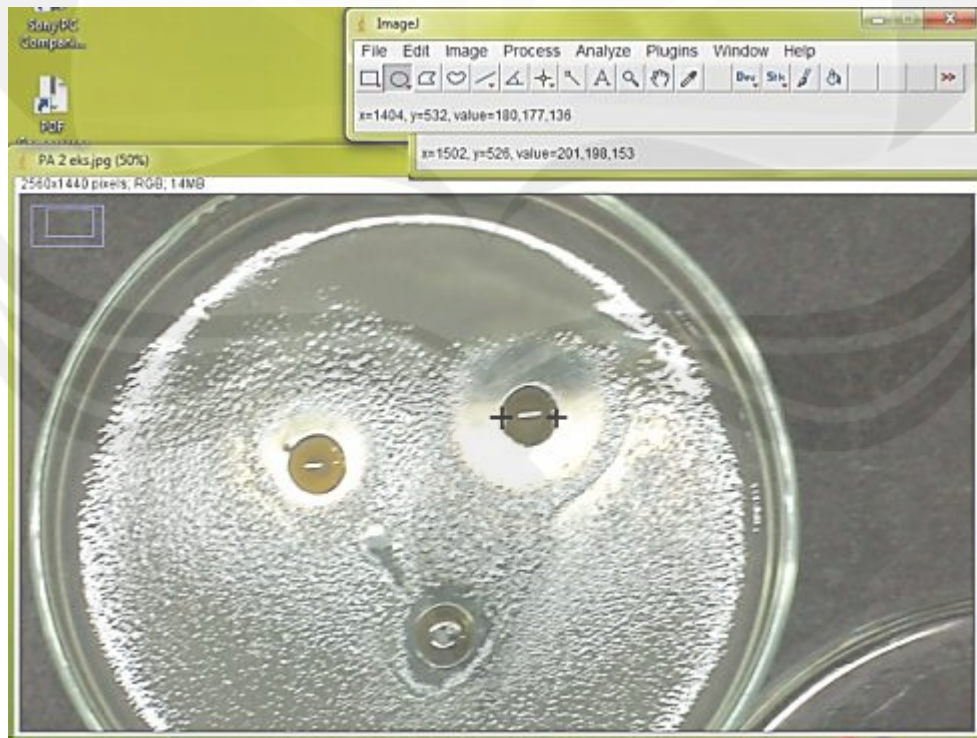
 <p>Keterangan : pengecatan Gram. Hasil : berwarna ungu, menunjukkan bahwa bakteri tergolong Gram Positif.</p>		 <p>Keterangan : pengecatan Negatif. Hasil : bakteri berbentuk coccus.</p>			
 <p>Keterangan : pengamatan morfologi koloni. Hasil : koloni <i>circulair</i>, <i>glossy</i> dan berwarna putih.</p>	 <p>Keterangan : uji haemolisis dengan <i>blood agar</i>. Hasil : positif.</p>	 <p>Keterangan : uji motilitas. Hasil : nonmotil.</p>	 <p>Keterangan : uji katalase. Hasil : tidak berbusa₂, menunjukkan katalase positif</p>		
 <p>Keterangan : uji hidrolisis glukosa. Hasil : positif</p>	 <p>Keterangan : uji hidrolisis laktosa. Hasil : positif</p>	 <p>Keterangan : uji hidrolisis sukrosa. Hasil : positif</p>	 <p>Keterangan : uji hidrolisis pati. Hasil : negatif.</p>	 <p>Keterangan : uji reduksi nitrat Hasil : positif.</p>	 <p>Keterangan : uji indol. Hasil : positif</p>

6. Cara Pengukuran Zona Hambat dengan ImageJ

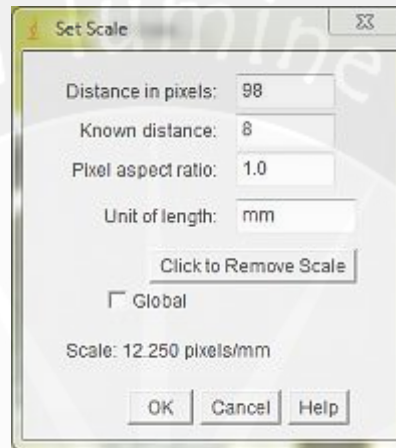
1. Buka Program ImageJ dengan mengklik ikon pada *desktop* atau melalui *start menu*.



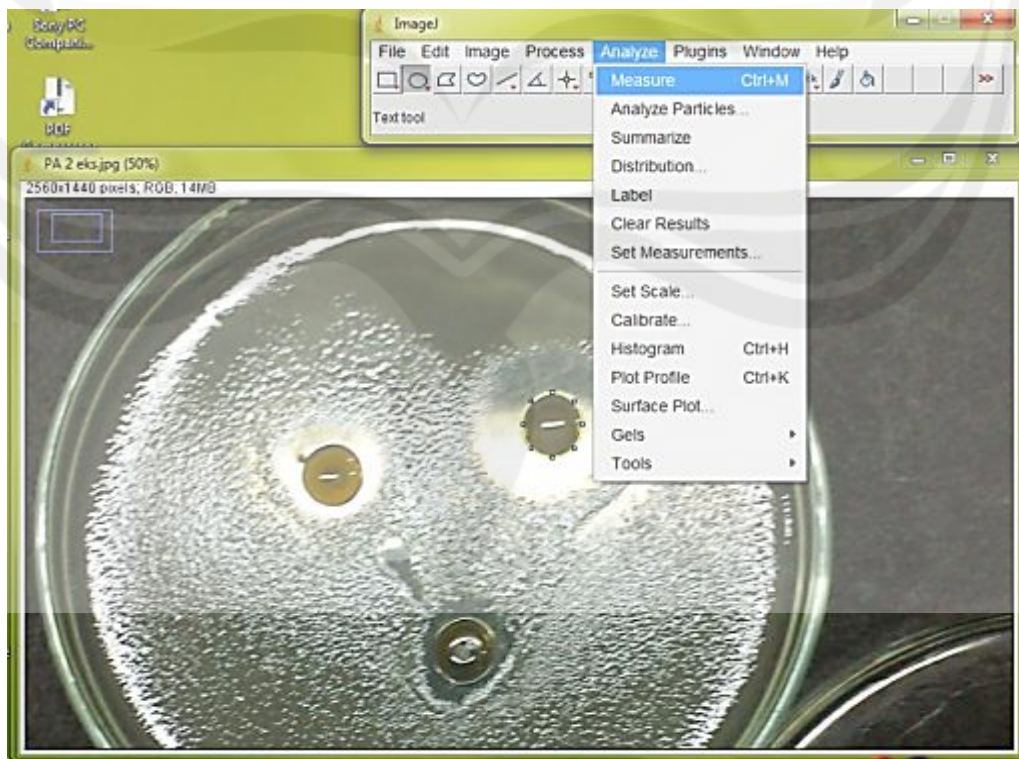
2. Buka file foto petridish yang akan diukur zona hambatnya melalui menu *file, open*. Gambar akan terbuka. Tempatkan kursor pada ujung paling kiri lubang perforator, dan lihat nilai x (dalam contoh 1404), geser kursor ke ujung paling kanan lubang perforator dan amati nilai x (dalam contoh 1502).



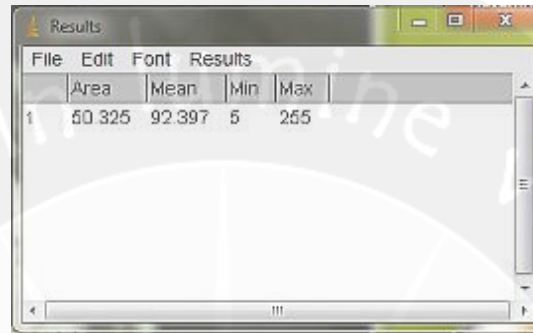
3. Buka menu *Analyze, Set Scale*. Pada kolom *Distance in pixels* masukkan nilai lebar perforator dalam pixel dari pengamatan sebelumnya ($1502-1404=98$ pixels). Pada kolom *Known distance* masukkan diameter perforator sebenarnya (perforator no. 4 dengan diameter 8mm). Pada kolom *Unit of length*, masukkan mm. Kemudian klik OK.



4. Gunakan lasso tool berbentuk lingkaran untuk melingkari lubang perforator. Kemudian klik menu *Analyze, Measure* atau tekan shortcut Ctrl-M.



5. Akan muncul jendela baru yang menunjukkan luas lubang perforator. Berdasarkan perhitungan manual, lingkaran dengan diameter 8mm adalah $50,24\text{mm}^2$. Hasil yang ditunjukkan harus tidak jauh berbeda dengan nilai tersebut.



	Area	Mean	Min	Max
1	50.325	92.397	5	255

6. Lakukan hal yang sama pada lingkaran zona hambatan. Kurangi hasil pengukurannya dengan luas perforator, dan didapat hasil luas zona hambatan $292,7\text{ mm}^2$



7. Hasil Uji ANAVA

Tests of Between-Subjects Effects

Dependent Variable: ZonaHambat

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	177165.533 ^a	11	16105.958	22.741	.000
Intercept	180401.667	1	180401.667	254.724	.000
Marga	18668.233	2	9334.117	13.180	.000
Bakteri	96678.200	3	32226.067	45.503	.000
Marga * Bakteri	61819.100	6	10303.183	14.548	.000
Error	33994.800	48	708.225		
Total	391562.000	60			
Corrected Total	211160.333	59			

a. R Squared = .839 (Adjusted R Squared = .802)

Signifikansi kurang dari 0,05, menyatakan bahwa ada perbedaan nyata dengan ketelitian lebih dari 95%

8. Hasil Duncan Multiple Range Test

Perbandingan antarekstrak

Duncan^{a,b}

Marga	N	Subset	
		1	2
<i>Sinularia</i>	20	36.5000	
<i>Lobophytum</i>	20	49.3500	
<i>Sarcophyton</i>	20		78.6500
Sig.		.133	1.000

Perbandingan luas zona hambat (dalam mm²), ekstrak *Sinularia* dan *Lobophytum* tidak berbeda nyata, *Sarcophyton* berbeda nyata dengan keduanya.

Perbandingan antibakteri

Duncan^{a,b}

Bakteri	N	Subset	
		1	2
<i>E. coli</i>	15	20.8000	
<i>S. aureus</i>	15	37.0000	
<i>S. pyogenes</i>	15	38.2000	
<i>P. aeruginosa</i>	15		123.3333
Sig.		.096	1.000

Perbandingan luas zona hambat (dalam mm²), tidak ada perbedaan nyata antara *S. aureus*, *E. coli* dan *S. pyogenes*. Ada perbedaan nyata antara *P. aeruginosa* dengan bakteri lainnya.

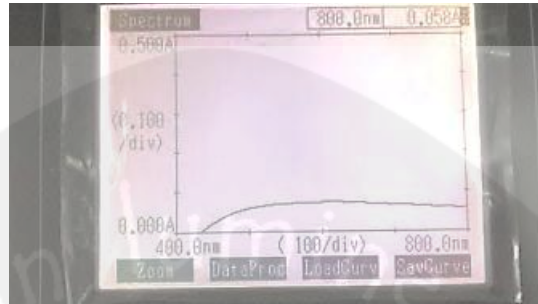
Perbandingan rata-rata Ekstrak - Bakteri

Duncan^{a,b}

Bakteri x Ekstrak	N	Subset			
		1	2	3	4
<i>Sarcophyton</i> x <i>E. coli</i>	5	10.8000			
<i>Sinularia</i> x <i>S. pyogenes</i>	5	21.0000	21.0000		
<i>Lobophytum</i> x <i>E. coli</i>	5	22.4000	22.4000		
<i>Sinularia</i> x <i>E. coli</i>	5	29.2000	29.2000		
<i>Sarcophyton</i> x <i>S. aureus</i>	5	29.8000	29.8000		
<i>Lobophytum</i> x <i>S. aureus</i>	5	38.0000	38.0000		
<i>Lobophytum</i> x <i>S. pyogenes</i>	5	40.8000	40.8000		
<i>Sinularia</i> x <i>S. aureus</i>	5	43.2000	43.2000		
<i>Sinularia</i> x <i>P. aeruginosa</i>	5		52.6000		
<i>Sarcophyton</i> x <i>S. pyogenes</i>	5		52.8000		
<i>Lobophytum</i> x <i>P. aeruginosa</i>	5			96.2000	
<i>Sarcophyton</i> x <i>P. aeruginosa</i>	5				221.2000
Sig.		.105	.115	1.000	1.000

Hasil terbaik ditunjukkan oleh ekstrak *Sarcophyton* terhadap *P. aeruginosa*, disusul oleh ekstrak *Lobophytum* terhadap *P. aeruginosa*.

9. Dokumentasi Optimasi Panjang Gelombang *P. aeruginosa*

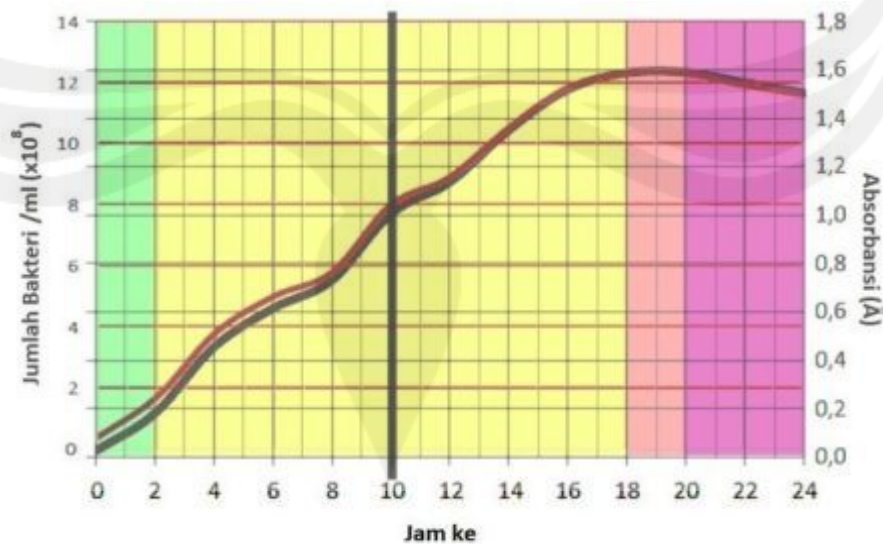


a. Grafik hasil optimasi dengan panjang gelombang 400-800 nm

λ (nm)	Abs
641.20	0.073
602.20	0.075
587.20	0.072

b. Hasil puncak yang ditemukan (panjang gelombang optimal bakteri). Puncak yang ditemukan adalah panjang gelombang 587 – 641 nm.

10. Grafik Fase Pertumbuhan *P. aeruginosa*


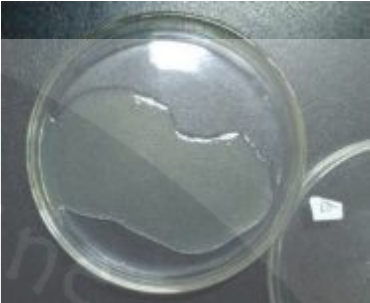
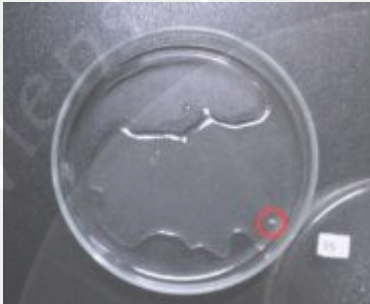
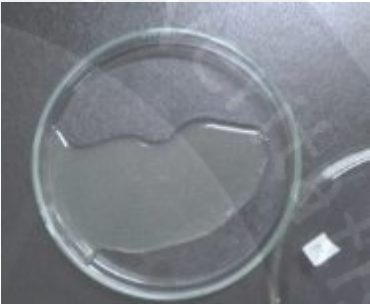



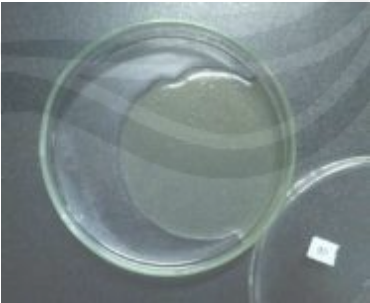
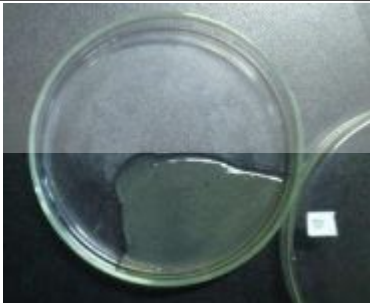


Keterangan Fase Pertumbuhan: Hijau-Lag, Kuning-Log, Pink-Stasioner, Ungu-Kematian, Garis Hitam-Pertengahan Fase Log (terletak pada jam ke-10)

11. Tabel Hasil Pengukuran Zona Hambat

Variasi Sampel	Ulangan	Zona hambat							
		<i>E. coli</i>		<i>P. aeruginosa</i>		<i>S. aureus</i>		<i>S. pyogenes</i>	
		D (mm)	L (mm ²)	D (mm)	L (mm ²)	D (mm)	L (mm ²)	D (mm)	L (mm ²)
<i>Sinularia sp.</i>	1	6,3	75	5,6	47	5,6	48	5,4	40
	2	5,68	51	5,90	59	6,24	72	5,21	35
	3	4,73	20	5,76	54	4,83	23	5,06	30
	4	4,00	0	5,90	59	5,51	45	4,00	0
	5	4,00	0	5,48	44	4,99	28	4,00	0
<i>Sarcophyton sp.</i>	1	5,27	37	9,66	243	5,54	46	5,54	46
	2	4,63	17	8,10	156	4,86	24	4,96	27
	3	4,00	0	10,53	298	5,06	30	4,00	0
	4	4,00	0	8,58	181	4,96	27	7,19	112
	5	4,00	0	9,41	228	4,80	22	6,42	79
<i>Lobophytum sp.</i>	1	5,15	33	6,44	80	5,54	46	5,24	36
	2	5,90	59	6,39	78	5,42	42	5,56	47
	3	4,73	20	6,87	98	4,96	27	4,99	28
	4	4,00	0	7,43	123	5,82	56	5,45	43
	5	4,00	0	6,96	102	4,70	19	5,65	50
Kontrol negatif (metanol)	1	4,00	0	4,00	0	4,00	0	4,00	0
	2	4,00	0	4,00	0	4,00	0	4,00	0
	3	4,00	0	4,00	0	4,00	0	4,00	0
Kontrol positif (ampisilin)	1	11,44	361	10,30	283	7,62	132	10,59	302
	2	11,06	334	8,58	181	11,81	388	11,43	360
	3	11,68	378	9,31	222	8,60	182	12,76	461

12. Dokumentasi KHM

10% (tumbuh bakteri)		60%	
20% (tumbuh bakteri)		70%	
30% (tumbuh bakteri)		80%	
40%		90%	
50%		100%	