IV. SIMPULAN DAN SARAN

A. Simpulan

Berdasarkan hasil yang telah didapat, disimpulkan bahwa :

1. Isolat A, isolat B, isolat C, isolat D dan isolat E merupakan bakteri yang tahan terhadap logam kadmium yang memiliki karakteristik berupa morfologi koloni bakteri, uji biokimia serta pengecatan Gram menyerupai genus *Pseudomonas* sp.
2. Isolat A, isolat B, isolat C, isolat D dan isolat E memiliki mekanisme *Plant Growth Promoting Rhizobacteria* (PGPR) yaitu *Indole Acetic Acid* dan Siderofor.

B. Saran

1. Pemilihan tanaman fitoremediator yang lebih mudah untuk tumbuh
2. Uji AAS ditambahkan untuk mengecek kadar kadmium pada tanah dan tanaman sebelum diberi tambahan kadmium dan setelah diberi tambahan kadmium
3. Uji biokimia serta identifikasi secara molekuler ditambahkan pada penelitian selanjutnya supaya dapat diketahui secara pasti spesies dari bakteri *indigenous* tersebut.

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LAMPIRAN

A. Perhitungan

1. Penambahan Logam Kadmium pada Tanaman Biduri

Mr $Cd(CH_3COO)_2$ = 230,5 g/mol

a) Logam konsentrasi 250 ppm

250 ppm = 250 mg/l

Cd = $Cd(CH_3COO)_2$

$\frac{250\ mg}{48\ g/mol}$ x $\frac{1}{1\ l}$ = $\frac{m}{230,5\ g/mol}$ x $\frac{1}{1\ l}$

1.200, 5 mg = massa

b) Logam konsentrasi 500 ppm

500 ppm = 500 mg/l

Cd = $Cd(CH_3COO)_2$

$\frac{500\ mg}{48\ g/mol}$ x $\frac{1}{1\ l}$ = $\frac{m}{230,5\ g/mol}$ x $\frac{1}{1\ l}$

3.601, 5 mg = massa

c) Logam konsentrasi 750 ppm

750 ppm = 750 mg/l

Cd = $Cd(CH_3COO)_2$

$\frac{750\ mg}{48\ g/mol}$ x $\frac{1}{1\ l}$ = $\frac{m}{230,5\ g/mol}$ x $\frac{1}{1\ l}$

7.203, 5 mg = massa

2) Penambahan Logam pada medium Agar

Larutan Stok Kadmium : 10.000 ppm = 1.000 mg/100 ml

Nutrient Agar : 200 ml

a) Nutrien Agar dan Larutan Stok Kadmium (untuk 250 ppm)

$V_1.M1 = V_2.M_2$

(200 ml+X ml) x 250 ppm = X ml x 10.000 ppm

50.000 ml.ppm + 250X ml.ppm = 10.000X ml.ppm

50.000 ml.ppm = 10.000X ml.ppm – 250X ml.ppm

50.000 ml.ppm = 9750X ml.ppm

5,13 ml = X

250 ppm = 200 ml medium Nutrien Agar + 5,13 ml larutan stok kadmium

b) Nutrien Agar dan Larutan Stok Kadmium (untuk 500 ppm)

$V_1.M1 = V_2.M_2$

(200 ml+X ml) x 500 ppm = X ml x 10.000 ppm

50.000 ml.ppm + 500X ml.ppm = 10.000X ml.ppm

50.000 ml.ppm = 10.000X ml.ppm – 500X ml.ppm

50.000 ml.ppm = 9.500X ml.ppm

10,26 ml = X

500 ppm = 200 ml medium Nutrien Agar + 10,26 ml larutan stok kadmium

c) Nutrien Agar dan Larutan Stok Kadmium (untuk 750 ppm)

$V_1.M1 = V_2.M_2$

(200 ml+X ml) x 750 ppm = X ml x 10.000 ppm

50.000 ml.ppm + 750X ml.ppm = 10.000X ml.ppm

50.000 ml.ppm = 10.000X ml.ppm – 750X ml.ppm

50.000 ml.ppm = 9.250X ml.ppm

15,39 ml = X

500 ppm = 200 ml medium Nutrien Agar + 15,39 ml larutan stok kadmium

3) Perhitungan Larutan Standar Indole Acetic Acid

Larutan Stok 100 ppm Indole Acetic Acid = 1mg/10 ml

Volume kuvet yang digunakan = 5 ml

1 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 1 ppm

V_1 = 0,05 ml

Volume 1 ppm= 0,05 ml Larutan IAA+ 2,95 ml aquades + 2 ml Reagen Salkowsky.

2 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 2 ppm

V_1 = 0,1 ml

Volume 2 ppm= 0,1 ml Larutan IAA+ 2,9 ml aquades + 2 ml Reagen Salkowsky

3 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 3 ppm

V_1 = 0,15 ml

Volume 3 ppm= 0,15 ml Larutan IAA+ 2,85 ml aquades + 2 ml Reagen Salkowsky

4 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 4 ppm

V_1 = 0,2 ml

Volume 4 ppm= 0,2 ml Larutan IAA+ 2,8 ml aquades + 2 ml Reagen Salkowsky

5 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 5 ppm

V_1 = 0,25 ml

Volume 5 ppm= 0,25 ml Larutan IAA+ 2,75 ml aquades + 2 ml Reagen Salkowsky

6 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 6 ppm

V_1 = 0,3 ml

Volume 6 ppm= 0,3 ml Larutan IAA+ 2,7 ml aquades + 2 ml Reagen Salkowsky

7 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 7 ppm

V_1 = 0,35 ml

Volume 7 ppm= 0,35 ml Larutan IAA+ 2,65 ml aquades + 2 ml Reagen Salkowsky

8 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 8 ppm

V_1 = 0,4 ml

Volume 8 ppm= 0,4 ml Larutan IAA+ 2,6 ml aquades + 2 ml Reagen Salkowsky

9 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 9 ppm

V_1 = 0,45 ml

Volume 9 ppm= 0,45 ml Larutan IAA+ 2,55 ml aquades + 2 ml Reagen Salkowsky

10 ppm

$V_1.M_1 = V_2.M_2$

V_1 x 100 ppm = 5 ml x 10 ppm

V_1 = 0,5 ml

Volume 10 ppm= 0,5 ml Larutan IAA+ 2,5 ml aquades + 2 ml Reagen Salkowsky

B. Tabel

Tabel 9. Pengukuran tinggi tanaman

Hari ke	Tinggi Tanaman (cm)			
	0ppm	250ppm	500ppm	750ppm
0	26,67	34,67	30	30,5
1	26,67	34,67	30	30,5
2	27,27	35	31	30,67

Lanjutan tabel 9

Hari ke	Tinggi Tanaman (cm)			
	0 ppm	250 ppm	500 ppm	750 ppm
3	27,27	36,33	31	31
4	27,33	36,63	32	32
5	27,67	36,83	32	32,17
6	28,17	36,83	32,27	33
7	28,27	38,83	33,33	33
8	29,03	38,83	33,37	33,13
9	29,3	39,5	33,67	33,67
10	29,33	40	34,3	34,13
11	29,67	40,67	34,3	34,17
12	29,83	40,5	34,33	34,47
13	29,83	40,1	34,67	34,83
14	30	40,83	34,67	35
15	30,83	41	34,83	35
16	30,83	41	34,83	35
17	31,27	41	35	35
18	31,33	41	35,17	35,17
19	31,33	41	35,17	35,17
20	31,33	41	35,17	35,5
21	31,5	41,17	35,17	35,33
22	31,5	41,17	35,33	35,33
23	31,5	41,17	35,67	35,83
24	31,5	41,33	35,83	36
25	31,67	41,33	36	36,17
26	31,67	41,33	36	36,17
27	31,83	41,5	36	36
28	31,83	41,5	36,17	36
29	32,33	41,67	36,17	36
30	32,5	41,67	36,5	36,5

Tabel 10. Pengukuran pH tanah

No	0 ppm	250 ppm	500 ppm	750 ppm
1	6,67	6,23	5,83	5,53
2	5,93	5,5	5,53	5,73
3	6,93	6,13	6,73	6,07
4	6,8	6,73	6,67	6,47
5	6,83	6,73	6,47	6,47
6	6,83	6,6	6	6,27
7	6,87	5,53	6,33	7

Lanjutan tabel 10

No	0 ppm	250 ppm	500 ppm	750 ppm
8	7,5	6,33	6,5	6,5
9	8	6,33	6,67	6,8
10	8	6,83	6,33	6,83
11	7,6	7,13	7	6,83
12	7,83	6,17	7	6,67
13	7,77	7	6,83	6,5
14	7,9	7,6	6,97	6,33
15	7,77	7,13	7,13	6,83
16	7,77	7	7,07	6,8
17	7,67	7,17	6,5	7,17
18	7	7	6,67	7,23
19	7,5	7	8	6,97
20	7,83	7	6,67	6,33
21	8	7	7,33	7,33
22	7,83	7,33	6,33	6,5
23	8	6,67	6	6,5
24	7,5	6,33	6,33	6,83
25	7,67	7,33	6,5	8
26	8	7,5	6,67	7,17
27	7,67	6,83	6,67	6,5
28	7,5	7,33	7,33	7,5
29	7	7,17	8	7
30	7,5	7	7	7,51
31	7,83	7	6,5	6,67

Tabel 11. Pengukuran kelembaban tanah

No	0 ppm	250 ppm	500 ppm	750 ppm
1	5,83	7,13	7,67	8
2	8	8	7,67	8
3	7	7,83	6,83	7,5
4	6,5	7,33	6,17	6,33
5	6,67	7,33	7,83	7,83
6	4,33	6,17	5,5	6,5
7	6,5	8,67	9	7,33
8	5	8,5	8,33	9
9	4,33	7,17	8,67	7,33
10	4,43	7,83	7,67	7,33
11	4,67	6,67	5,83	7,33
12	4,33	6,83	6,33	8,33
13	3,83	3,5	6	8
14	1,5	4	5,33	7,17
15	4	5	5,5	7,83
16	3,83	5,37	6,33	6,9

Lanjutan Tabel 11

No.	0 ppm	250 ppm	500 ppm	750 ppm
17	6,33	6	8,17	7,17
18	5,5	5,33	6,67	6,83
19	4,33	5,83	5,17	8,5
20	5,33	6	7,17	8,33
21	5,5	6,33	6,33	6,33
22	6,83	6,83	8,83	9,5
23	7	9,5	9,17	8,83
24	8	7,83	8,67	8,67
25	6,33	7,83	6,83	6,17
26	6,67	7,17	8	7,83
27	5,67	7,67	8	7,66
28	5,67	7,83	7,67	9
29	6,67	6,83	5,67	6,17
30	4,33	5,67	6	5,83
31	4,33	5,33	7,33	6,33

Tabel 12. Pengamatan warna dan jumlah daun hari ke 0 dan 28

Konsentrasi	Pengulangan	Warna Daun		Jumlah Daun	
		Hari ke- 0	Hari ke-28	Hari ke-0	Hari ke-28
	1	Hijau	Hijau	24	2
0 ppm	2	Hijau	Hijau	13	2
	3	Hijau	Hijau	13	2
	1	Hijau	HIjau	5	2
250 ppm	2	Hijau	Hijau	6	2
	3	Hijau	Hijau	4	2
	1	Hijau	HIjau	8	4
500 ppm	2	Hijau	Hijau	6	2
	3	Hijau	Hijau	6	1
	1	Hijau	HIjau	9	3
750 ppm	2	Hijau	Hijau	8	8
	3	Hijau	Hijau	3	2

Tabel 13. Hasil uji IAA beserta pengulangan

No	Nama	IAA			Rata-Rata	Konsentrasi (mg/l)
		1	2	3		
1	Isolat A	0,051	0,080	0,061	0,064	0,016088
2	Isolat B	0,041	0,098	0,053	0,064	0,016088
3	Isolat C	0,049	0,087	0,065	0,067	0,016139
4	Isolat D	0,052	0,097	0,033	0,060667	0,016031
5	Isolat E	0,044	0,091	0,100	0,078333	0,016332

Tabel 14. Hasil uji siderofor beserta pengulangan

No	Sampel	Absorbansi tanpa $FeCl_3$			Rata2	Absorbansi dengan $FeCl_3$			Rata2	Siderofor
		1	2	3		1	2	3		
1	Isolat A	0,020	0,013	0,06	0,031	0,187	0,258	0,258	0,23433333	0,20333333
2	Isolat B	0,016	0,015	0,010	0,013667	0,174	0,221	0,221	0,20533333	0,19166667
3	Isolat C	0,016	0,016	0,006	0,012667	0,235	0,254	0,254	0,24766667	0,235
4	Isolat D	0,020	0,012	0,007	0,013	0,231	0,234	0,234	0,233	0,22
5	Isolat E	0,014	0,014	0,006	0,011333	0,184	0,259	0,259	0,234	0,22266667

C. Gambar

Gambar 14. Tanaman yang tidak diberi cemaran kadmium

Gambar 15. Tanaman yang diberi cemaran kadmium sebesar 250 ppm

Gambar 16. Tanaman yang diberi cemaran kadamium sebesar 500 ppm

Gambar 17. Tanaman yang diberi cemaran kadmium sebesar 750 ppm