LAMPIRAN

Lampiran 1. Data Peningkatan Warna Ikan Cupang Selama Penelitian

Perlakuan	Ulangan	Pengamatan Hari Ke	
		Awal	Akhir
P0 Tanpa Perlakuan (Kontrol)	1	1	5
	2	1	4,23
	3	1	4,5
Jumlah		3	13,73
Rata-Rata		1	4,57
Perubahan		0	3,57
P1 (3%) 3% Sp 5% Pellet	1	1	8
	2	0	7,96
	3	1	7,40
Jumlah		2	23,36
Rata-Rata		0,67	7,78
Perubahan		0	7,11
P2 (5%) 5% Sp 5% Pellet	1	0	5
	2	0	6,5
	3	0	7,5
Jumlah		0	19

Rata-Rata		0	6,33
Perubahan		0	6,33
P3 (7%)	1	0	6
7% Sp	2	1	6,57
5% Pellet	3	0	6,46
Jumlah		1	19,03
Rata-Rata		0,33	6,34
Perubahan		0	6,01

Lampiran 2. Uji Normalitas dan Homogenitas Peningkatan Warna Ikan Cupang

Tests of Normality

Perlakuan		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
warna	P0	.244	3	.	.971	3	.674
	P1	.364	3	.	.800	3	.114
	P2	.219	3	.	.987	3	.780
	P3	.317	3	.	.888	3	.349

a. Lilliefors Significance Correction

Tests of Homogeneity of Variances

		Levene Statistic	df 1	df2	Sig.
warna	Based on Mean	2.639	3	8	.121
	Based on Median	1.442	3	8	.301
	Based on the Median and with adjusted df	1.442	3	3.596	.366
	Based on trimmed mean	2.556	3	8	.128

Lampiran 3. Analisi Sidik Ragam (ANSIRA) Peningkatan Warna Ikan Cupang

```
UNIANOVA Warna BY Perlakuan
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /POSTHOC=Perlakuan(DUNCAN LSD)
  /PLOT=PROFILE(Perlakuan) TYPE=LINE ERRORBAR=NO
MEANREFERENCE=NO YAXIS=AUTO
  /PRINT HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Perlakuan.
```

Univariate Analysis of Variance

Between-Subjects Factors

		N
Perlakuan	P0	3
	P1	3
	P2	3
	P3	3

Levene's Test of Equality of Error Variances [a,b]

Levene Statistic	df1	df2	Sig.
2.639	3	8	.121

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: warna

b. Design: Intercept + Perlakuan

Tests of Between-Subjects Effects

Dependent Variable: warna					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	15.530[a]	3	5.177	10.674	.004
Intercept	470.251	1	470.251	969.62	.000
Perlakuan	15.530	3	5.177	3	.004
Error	3.880	8	.485	10.674	
Total	489.661	12			
Corrected Total	19.410	11			

a. R Squared = .800 (Adjusted R Squared = .725)

Lampiran 4. Uji *Homogeneous Subset* (DUCAN) Peningkatan Warna Ikan Cupang

Homogeneous Subsets

warna

Perlakuan		N	Subset 1	Subset 2	Subset 3
Duncan[a,b]	P0	3	4.5767		
	P2	3		6.3333	
	P3	3		6.3433	
	P1	3			7.7867
	Sig.		1.000	.986	1.000

Means for groups in homogeneous subsets are displayed.

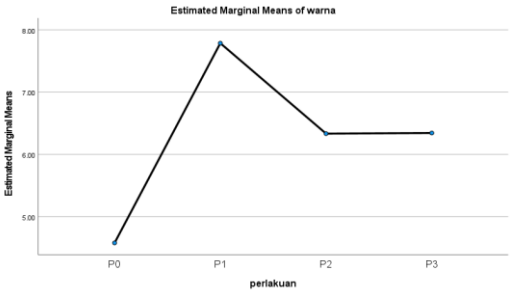
Based on observed means.

The error term is Mean Square (Error) = .485.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = ,05.

Profile Plots



Lampiran 5. Data Pertumbuhan Panjang dan Berat Ikan Cupang Selama Penelitian

Perlakuan	Ulangan	Pengukuran Awal		Pengukuran Akhir	
		Panjang (mm)	Berat (gram)	Panjang (mm)	Berat (gram)
P0	1	38	0,835	47	1,738
Tanpa Perlakuan	2	28	0,266	29	0,564
(Kontrol)	3	38	0,835	42	1,534
Jumlah		104	1,936	118	3,836
Rata-Rata		34,6	0,64	39,3	1,27
Perubahan		0	0	4,7	0,63
P1 (3%)	1	28	0,296	29	0,564
3% Sp	2	38	0,82	42	1,538
5% Pellet	3	38	0,835	49	1,946
Jumlah		104	1,951	120	4,048
Rata-Rata		34,6	0,65	40	1,34
Perubahan		0	0	5,4	0,69
P2 (5%)	1	28	0,266	29	0,295
5% Sp	2	38	0,867	48	1,998
5% Pellet	3	39	0,82	51	1,930
Jumlah		105	1,953	129	4,223
Rata-Rata		35	0,65	43	1,40
Perubahan		0	0	8	0,75
P3 (7%)	1	39	0,82	48	1,990
7% Sp	2	30	0,279	45	0,644
5% Pellet	3	39	0,82	44	1,653
Jumlah		108	1,919	137	4,287
Rata-Rata		36	0,64	45,6	1,42
Perubahan		0	0	9,6	0.78

Lampiran 6. Uji Normalitas dan Homogenitas Pertumbuhan Panjang dan Berat Ikan Cupang

a. Panjang

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Perlakuan		Statistic	df	Sig.	Statistic	df	Sig.
Panjang	P0	.369	3	.	.789	3	.089
	P1	.385	3	.	.750	3	.000
	P2	.339	3	.	.850	3	.241
	P3	.253	3	.	.964	3	.637

a. Lilliefors Significance Correction

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Panjang	Based on Mean	2.721	3	8	.115
	Based on Median	.205	3	8	.890
	Based on the Median and with adjusted df	.205	3	6.045	.889
		2.217	3	8	.164
	Based on trimmed mean				

b. Berat

Tests of Normality

Perlakuan		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Berat	P0	.326	3	.	.874	3	.308
	P1	.270	3	.	.948	3	.562
	P2	.374	3	.	.776	3	.059
	P3	.292	3	.	.923	3	.464

a. Lilliefors Significance Correction

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Berat	Based on Mean	.529	3	8	.675
	Based on Median	.041	3	8	.988
	Based on The median and with adjusted df	.041	3	5.607	.988
	Based on trimmed mean	.448	3	8	.726

Lampiran 7. Analisi Sidik Ragam (ANSIRA) Pertumbuhan Panjang dan Berat Ikan Cupang

a. Panjang

```
DATASET ACTIVATE DataSet2.
UNIANOVA Panjang BY Perlakuan
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /POSTHOC=Perlakuan(DUNCAN LSD)
  /PLOT=PROFILE(Perlakuan) TYPE=LINE ERRORBAR=NO
MEANREFERENCE=NO YAXIS=AUTO
  /PRINT HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Perlakuan.
```

Univariate Analysis of Variance

Between-Subjects Factors

		N
Perlakuan	P0	3
	P1	3
	P2	3
	P3	3

Levene's Test of Equality of Error Variances[a,b]

Levene Statistic	df1	df2	Sig.
2.721	3	8	.115

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Panjang

b. Design: Intercept + Perlakuan

Tests of Between-Subjects Effects

Dependent Variable: Panjang					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected	17.583[a]	3	5.861	.059	.980
Model	21930.750	1	21930.	219.6	.000
Intercept	17.583	3	750	74	.980
Perlakuan	798.667	8	5.861	.059	
Error	22747.000	12	99.833		
Total	816.250	11			
Corrected Total					

a. R Squared = .022 (Adjusted R Squared = -.345)

b. Berat

```
UNIANOVA Berat BY Perlakuan
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /POSTHOC=Perlakuan(DUNCAN LSD)
  /PLOT=PROFILE(Perlakuan) TYPE=LINE ERRORBAR=NO
MEANREFERENCE=NO YAXIS=AUTO
  /PRINT HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Perlakuan.
```

Univariate Analysis of Variance

Between-Subjects Factors

		N
Perlakuan	P0	3
	P1	3
	P2	3
	P3	3

Levene's Test of Equality of Error Variances[a,b]

Levene Statistic	df1	df2	Sig.
.529	3	8	.675

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Berat

b. Design: Intercept + Perlakuan

Tests of Between-Subjects Effects

Dependent Variable: Berat					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.042[a]	3	.014	.024	.99
Intercept	22.291	1	22.291	38.615	4
Perlakuan	.042	3	.014	.024	.00
Error	4.618	8	.577		0
Total	26.951	12			.99
Corrected Total	4.660	11			4

a. R Squared = .009 (Adjusted R Squared = -.363)

Lampiran 8. Uji *Homogeneous Subset* (DUCAN) Pertumbuhan Panjang dan Berat Ikan Cupang

a. Panjang

Panjang

	Perlakuan	N	Subset 1
Duncan[,b]	P0	3	41.3333
	P1	3	42.3333
	P2	3	42.6667
	P3	3	44.6667
	Sig.		.709

Means for groups in homogeneous subsets are displayed.

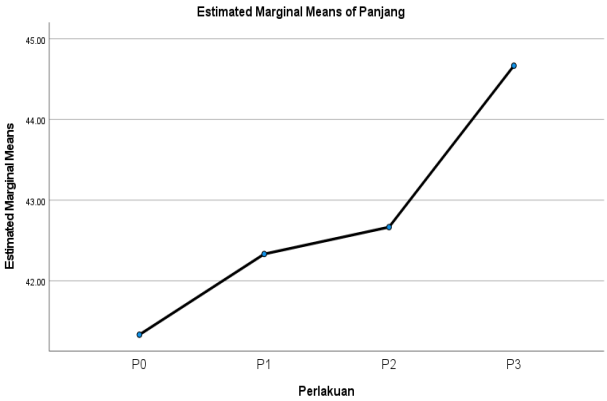
Based on observed means.

The error term is Mean Square(Error) = 99.833.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = ,05.

Profile Plots



b. Berat

Homogeneous Subsets

Berat

Perlakuan		N	Subset
			1
Duncan[a,b]	P0	3	1.2747
	P1	3	1.3447
	P2	3	1.4033
	P3	3	1.4290
	Sig.		.820

Means for groups in homogeneous subsets are displayed.

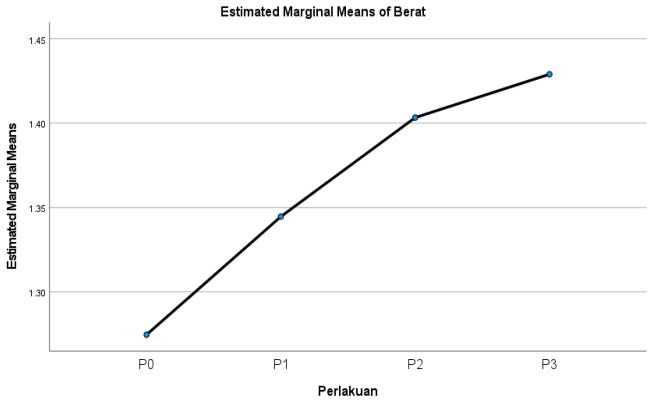
Based on observed means.

The error term is Mean Square(Error) = .577.

a. Uses Harmonic Mean Sample Size = 3.000.

b. Alpha = ,05.

Profile Plots



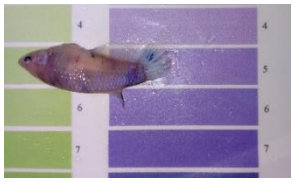
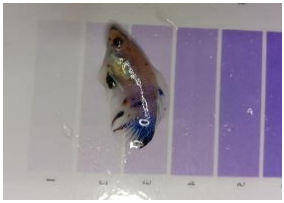
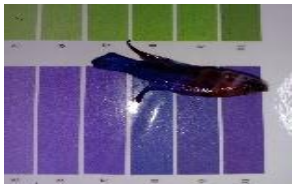
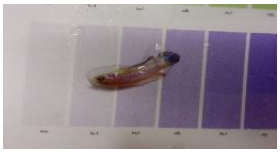
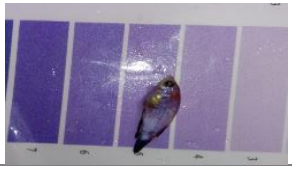
Lampiran 9. Data Pertumbuhan Kualitas Air Ikan Cupang Selama Penelitian

Perlakuan	Ulangan	Suhu (^{O}C)												Rata-rata	Total Rata-rata
		1	2	3	4	5	6	7	8	9	10	11	12		
P0 Tanpa Perlakuan (Kontrol)	1	27	27	27,2	27	27	27,5	27	27	27	27	27,2	27	27,07	27,07
	2	27	27	27	27	27	27,2	27	27	27	27	27	27	27,01	
	3	27	27,2	27	27	27	27,5	27	27	27	27	27,2	27	27,07	
P1 (3%) 3% Sp 5% Pellet	1	27	27,2	27	27	27	27,5	27	27	27	27	27,2	27	27,07	27,05
	2	27	27	27,2	27	27	27,5	27	27	27	27	27,2	27	27,07	
	3	27	27	27	27	27	27,2	27	27	27	27	27	27	27,01	
P2 (5%) 5% Sp 5% Pellet	1	27	27	27,2	27	27	27,5	27	27	27	27	27,2	27	27,07	27,05
	2	27	27,9	27	27	27	27	27	27	27	27	27	27	27,07	
	3	27	27	27	27	27	27	27	27	27	27	27	27	27	
P3 (7%) 7% Sp 5% Pellet	1	27	27,5	27	27	27	27	27	27	27	27	27	27	27,04	27,03
	2	27	27	27	27	27	27	27	27	27	27	27	27	27	
	3	27	27,2	27	27	27	27,5	27	27	27	27	27,2	27	27,07	

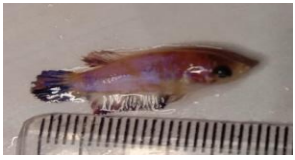
Perlakuan	Ulangan	pH												Rata-rata	Total Rata-rata
		1	2	3	4	5	6	7	8	9	10	11	12		
P0 Tanpa Perlakuan (Kontrol)	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	2	7	7	7	7	7	7	7	7	7	7	7	7	7	
	3	7	7	7	7	7	7	7	7	7	7	7	7	7	
P1 (3%) 3% Sp 5% Pellet	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	2	7	7	7	7	7	7	7	7	7	7	7	7	7	
	3	7	7	7	7	7	7	7	7	7	7	7	7	7	
P2 (5%) 5% Sp 5% Pellet	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	2	7	7	7	7	7	7	7	7	7	7	7	7	7	
	3	7	7	7	7	7	7	7	7	7	7	7	7	7	
P3 (7%) 7% Sp 5% Pellet	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	2	7	7	7	7	7	7	7	7	7	7	7	7	7	
	3	7	7	7	7	7	7	7	7	7	7	7	7	7	

Lampiran 10. Dokumentasi Selama Penelitian

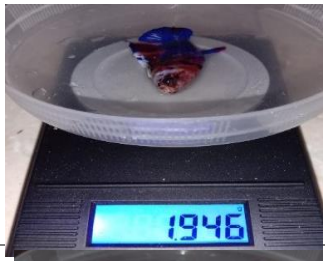
Peningkatan warna pada ikan cupang

Perlakuan	Awal Penelitian	Akhir Penelitian
P0 (0%)		
P1 (3%)		
P2 (5%)		
P3 (7%)		

Pertumbuhan panjang pada ikan cupang

Perlakuan	Awal Penelitian	Akhir Penelitian
P0 (0%)		
P1 (3%)		
P2 (5%)		
P3 (7%)		

Pertumbuhan berat pada ikan cupang

Perlakuan	Awal Penelitian	Akhir Penelitian
P0 (0%)		
P1 (3%)		
P2 (5%)		
P3 (7%)		

Persiapan alat dan bahan	Pembuatan Pakan

Pemeliharaan	Pengambilan Data Warna Ikan

Pengambilan Data Panjang Ikan

Pengambilan Data Berat Ikan

Pengamatan Kualitas air (Suhu) **Pengamatan Kualitas air (Ph)**


29.9
28.8

Lampiran 11 Perhitungan Pakan

Perhitungan pakan

Berat ikan x Jumlah ikan x persentase pakan

P0 (kontrol) = Berat ikan = 0,835 gram

Jumlah ikan = 1 ekor

Persentase pakan = 5% x 0,835 gram x 1

= 0,04175 gram (1x makan)

P1 (3%) = Berat ikan = 0,835 gram

Jumlah ikan = 1 ekor

Persentase pakan = 5% x 0,835 gram x 1

= 0,04175 gram (1x makan)

T. *Spirulina platensis* 3% = $\frac{3}{100}$ x 0,04175 g

= 0,00123 gram (1x makan)

Kandungan beta-karoten 250 mg/100gram

= $\frac{250}{100}$ x 0,00123 gram = 0,003 mg

Kandungan Protein 70% = 70000 mg/100gram

= $\frac{70000}{100}$ x 0,00123 gram = 0,07 %

P2 (5 %) = Berat ikan = 0,835 gram

Jumlah ikan = 1 ekor

Persentase pakan = 5% x 0,835 gram x 1

= 0,04175 gram (1x makan)

T. *Spirulina platensis* 5% = $\frac{5}{100}$ x 0,04175 g

= 0,0020875 gram (1x makan)

Kandungan beta-karoten 250 mg/100gram

$= \frac{250}{100}$ x 0,0020875 gram = 0,005 mg

Kandungan Protein 70% = 70000 mg/100gram

$= \frac{70000}{100}$ x 0,0020875 gram = 1,46 %

P3 (7 %) = Berat ikan = 0,82gram

Jumlah ikan = 1 ekor

Persentase pakan = 5% x 0,82 gram x 1

= 0,041 gram (1x makan)

T. *Spirulina platensis* 7% = $\frac{7}{100}$ x 0,00287 g

= 0,002875 gram (1x makan)

Kandungan beta-karoten 250 mg/100gram

$= \frac{250}{100}$ x 0,002875 gram = 0,00717 mg

Kandungan Protein 70% = 70000 mg/100gram

$= \frac{70000}{100}$ x 0,002875 gram = 2 %

PROGRAM STUDI BIOLOGI
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS PGRI ADI BUANA SURABAYA
Unipa Surabaya KAMPUS : Jl.Dukuh Menanggal XII, Telp.(031)8281183, 8281181, Surabaya 60234

FORM SKBIO. 05

BUKTI BIMBINGAN SKRIPSI

Nama : Bela Findisia Sahidi
NIM : 192500011
Judul Skripsi : Rekayasa Perubahan Warna Melalui Penambahan Tepung *Spirulina platensis* Pada Pakan Terhadap Intensitas Warna dan Pertumbuhan Ikan Cupang (*Betta Splendens*)
Dosen Pembimbing : Prof. Dr. Ir. Pungky Slamet Wisnu Kusuma, M.Si

No	Tanggal	Materi Bimbingan	Pembimbing
1.	22-05-2023	Bimbingan BAB V	
2.	23-05-2023	Bimbingan Revisi BAB V	
3.	26-05-2023	Bimbingan Revisi BAB V	
4.	07-06-2023	Bimbingan BAB V	
5.	19-06-2023	Bimbingan Revisi BAB V dan BAB VI	
6.	26-06-2023	Bimbingan Revisi BAB V dan BAB VI	
7.	27-06-2023	Bimbingan Revisi BAB V dan BAB VI	
8.	29-06-2023	Bimbingan BAB I sampai BAB VI	
9.	03-08-2023	Bimbingan revisi hasil sidang skripsi	

Mengetahui
Dekan FST,

Dra. Hj. Karunia Binawati, M.S.i
NIP. 196204081992022001

Dosen Pembimbing

Prof. Dr. Ir Pungky Slamet W.K, M.Si
NPP.1302652/DY

PROGRAM STUDI BIOLOGI
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS PGRI ADI BUANA SURABAYA
KAMPUS : Jl.Dukuh Menanggal XII, Telp.(031)8281183, 8281181, Surabaya 60234

FORM SKBIO.09

PERSETUJUAN PERBAIKAN SKRIPSI

Dosen Pembimbing dan Penguji dibawah ini telah menyetujui atas perbaikan naskah skripsi yang dilakukan oleh:

Nama : Bela Findisia Sahidi

NIM : 192500011 :

Prodi : Biologi

Judul : Rekayasa Perubahan Warna Melalui Penambahan Tepung *Spirulina platensis* Pada Pakan Terhadap Intensitas Warna dan Pertumbuhan Ikan Cupang (*Betta Splendens*)

DOSEN PEMBIMBING

No	Nama	Tanda tangan	Tanggal Persetujuan
1.	Prof. Dr. Ir. Pungky Slamet Wisnu Kusuma, M.Si		9/8 2023

DOSEN PENGUJI

No	Nama	Tanda tangan	Tanggal Persetujuan
1.	Prof. Dr. Ir. Tatang Sopandi, MP		9/8 2023