

Sustainable Valorization of Food Waste for Microalgal Production of Value-Added Compounds, Bio-Oil, and Biochar

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S Table 1: Proximate composition of raw FW

Parameters	Composition (%)
Moisture content	84.19 \pm 1.78
Ash content	1.11 \pm 0.86
Fat content	1.65 \pm 1.00
Protein content	8.98 \pm 0.00
Fiber content	0.68 \pm 0.07
Carbohydrate	3.37 \pm 1.29

Data are shown as mean \pm standard deviation.

S Table 2: Screening of SA inoculum and FW concentration for Optimum Growth

SA Inoculum (mL)	FW (mL)	Observed growth
90	10	Moderate
80	20	Highest
70	30	Low
60	40	Very low

SA- *Scenedesmus abundans*; FW-food waste

S Table 3: Summary statistics for physicochemical parameters of raw, diluted, and microalgae-treated wastewater used in one-way ANOVA

Parameter	Source of Variation	Degree of Freedom	Sum of Squares (SS)	Mean Squares (MS)	F-value	p-value	Significance
COD	Between Groups	2	3166112.00	1583056.00	114327.59	<0.0001	Significant
	Within Groups	6	83.08	13.85	-	-	-
TN	Between Groups	2	34518.42	17259.21	39437.60	<0.0001	Significant
	Within	6	2.63	0.44	-	-	-

	Groups						
TP	Between Groups	2	1088.54	544.27	429686.54	<0.0001	Significant
	Within Groups	6	0.0076	0.0013	-	-	-
Hardness	Between Groups	2	186050.00	93025.00	103745.35	<0.0001	Significant
	Within Groups	6	5.38	0.90	-	-	-
pH	Between Groups	2	10.64	5.32	35.47	<0.0001	Significant
	Within Groups	6	0.90	0.15	-	-	-

S Table 4: Two-way ANOVA with replication for physiochemical characteristics of raw FW, diluted FW (80:20) and algae water

ANOVA						
Source of Variation	Sum of Squares	Degree of Freedom	Measured Sum of Squares	F-value	P-value	F _{critical}
Sample	3167998.5	5	633599.7	1201288.7	0	2.477169
Columns	747816.58	2	373908.3	708920.48	0	3.259446
Interaction	2633161.6	10	263316.2	499240.64	0	2.106054
Within	18.9876	36	0.527433	-	-	-
Total	6548995.6	53		-	-	-

S Table 5: Summary statistics for biochemical parameters of control and treated FW sample used in Two-Way ANOVA with replication

SUMMARY	Parameter	Control (SA)	Total
Chl a (ug/mL)			
Count		3	3
Sum		2.7	8.52
Average		0.9	2.84
Variance		0.0064	0.0009
Chl b (ug/mL)			
Count		3	3

Sum	1.08	3.99	5.07
Average	0.36	1.33	0.845
Variance	0.0009	0.0361	0.29707

Car (ug/mL)

Count	3	3	6
Sum	0.6	4.62	5.22
Average	0.2	1.54	0.87
Variance	1E-04	0.0036	0.54016

Carbohydrates (%)

Count	3	3	6
Sum	43.11	52.08	95.19
Average	14.37	17.36	15.865
Variance	0.25	0.64	3.03803

Protein(%)

Count	3	3	6
Sum	90	65.25	155.25
Average	30	21.75	25.875
Variance	0.0064	0.0064	20.42387

Lipid (%)

Count	3	3	6
Sum	66	107.79	173.79
Average	22	35.93	28.965
Variance	0.25	0.9604	58.69763

Total

Count	18	18	
Sum	203.49	242.25	
Average	11.305	13.45833333	
Variance	145.5883912	175.0484029	

S Table 6: Two-way ANOVA with replication for biochemical characteristics of control and treated FW sample

ANOVA									
Source	of	Sum	of	Degree	of	Measured	F-value	P-value	F _{critical}

Variation	Squares	Freedom	Sum of Squares			
Sample	5071.9133	5	1014.383	5632.33	0	2.620654
Columns	41.7316	1	41.7316	231.7135	7.88E-14	4.259677
Interaction	374.5898	5	74.91796	415.9798	0	2.620654
Within	4.3224	24	0.1801	-	-	-
Total	5492.5571	35	-	-	-	-

S Table 7: One-way ANOVA for phenolic content of control and treated FW samples

Groups	Count	Sum	Average	Variance
Control	3	17.4	5.8	6.9169
Algae grown in FW water	3	36.21	12.07	6.9169

ANOVA

Source of Variation	Sum of Squares	df	MS	F-value	P-value	F critical
Between Groups	58.96935	1	58.96935	8.525401553	0.043250856	7.708647384
Within Groups	27.6676	4	6.9169			
Total	86.63695	5				

S Table 8: One-way ANOVA for flavonoid content of control and treated FW samples

Groups	Count	Sum	Average	Variance
Control	3	16.71	5.57	9.9225
Algae grown in FW water	3	33	11	0.6084

ANOVA

Source of Variation	Sum of Squares	df	MS	F-value	P-value	F critical
Between Groups	44.22735	1	44.22735	8.399538501	0.044197848	7.708647384
Within Groups	21.0618	4	5.26545			
Total	65.28915	5				

S Table 9: One-way ANOVA for DPPH content of control and treated FW samples

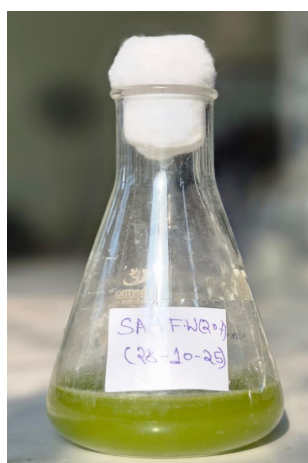
Groups	Count	Sum	Average	Variance
Control	3	37.35	12.45	0.64
Algae grown in FW water	3	33.15	11.05	0.0016

ANOVA						
Source of Variation	SS	df	MS	F-value	P-value	F critical
Between Groups	2.94	1	2.94	9.164588529	0.038883177	7.708647384
Within Groups	1.2832	4	0.3208			
Total	4.2232	5				

S Table 10: One-way ANOVA for ROS content of control and treated FW samples

Groups	Count	Sum	Average	Variance
Control	3	62.85	20.95	3.24
Algae grown in FW water	3	73.77	24.59	5.8564

ANOVA						
Source of Variation	SS	df	MS	F-value	P-value	F critical
Between Groups	19.8744	1	19.8744	4.369728684	0.104784568	7.708647384
Within Groups	18.1928	4	4.5482			
Total	38.0672	5				



A



B

S Figure 1: Optimized growth at 80:20 concentration (SA: FWC).

S Table 11. Fatty acid composition (% total fatty acids) of control and food waste culture (FWC)-treated microalgal biomass. Values are presented as mean \pm standard deviation ($n = 3$). Different superscript letters within the same row indicate statistically significant differences at $p < 0.05$.

	Fatty Acid	Control	FWC
	C14	0.00 \pm 0.00 ^a	2.57 \pm 0.45 ^b
	C16	42.60 \pm 0.40 ^a	47.40 \pm 0.52 ^b
	C16:1	2.57 \pm 0.45 ^a	15.13 \pm 0.12 ^b
	C18	14.33 \pm 0.31 ^a	14.97 \pm 0.23 ^a
	C18:1	8.37 \pm 0.60 ^a	4.60 \pm 0.20 ^b
	C18:2	8.63 \pm 0.35 ^a	3.97 \pm 0.85 ^b
	C18:3	18.03 \pm 0.15 ^a	0.00 \pm 0.00 ^b
	C20	1.67 \pm 0.49 ^a	3.03 \pm 0.15 ^b
	C20:1	0.00 \pm 0.00 ^a	2.60 \pm 0.44 ^b

