

Table 1: The variables and levels ranged parameters used in Plackett Burman design

Variable code	Variable name	Unit	High (+)	Low (-)
X ₁	Salad peel waste hydrolysate	gL ⁻¹	20.00	0.20
X ₂	Malt Extract	gL ⁻¹	30.00	0.30
X ₃	KH ₂ PO ₄	gL ⁻¹	10.00	0.10
X ₄	MgSO ₄ .7H ₂ O	gL ⁻¹	5.00	0.05
X ₅	NaCl	gL ⁻¹	5.00	0.05
X ₆	CaCl ₂	gL ⁻¹	5.00	0.05
X ₇	Inoculum Size	%v/v	8.000	0.400
X ₈	pH	-	8.0	5.0
X ₉	Temperature	°C	37	28
X ₁₀	Incubation period	Days	10	3

Table 2: Plackett-Burman design for screening the media components for enhanced production of SCP by PG5

Run	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	SCP production (g/L)
1	+	+	-	+	+	+	-	-	-	+	-	14.23
2	-	+	+	-	+	+	+	-	-	-	+	9.84
3	+	-	+	+	-	+	+	+	-	-	-	10.65
4	-	+	-	+	+	-	+	+	+	-	-	7.54
5	-	-	+	-	+	+	-	+	+	+	-	2.91
6	-	-	-	+	-	+	+	-	+	+	+	1.55
7	+	-	-	-	+	-	+	+	-	+	+	6.4
8	+	+	-	-	-	+	-	+	+	-	+	17.91
9	+	+	+	-	-	-	+	-	+	+	-	6.82
10	-	+	+	+	-	-	-	+	-	+	+	11.2
11	+	-	+	+	+	-	-	-	+	-	+	1.97
12	-	-	-	-	-	-	-	-	-	-	-	0.18

Table 3: The experimental range and levels of selected independent variables employed in response surface central composite design

Variable	Components	Range	Levels of variables studied				
			- α	-1	0	+1	+ α
X ₁	SPWH (g/L)	20-50	5	20	35	50	65
X ₂	Malt extract (g/L)	20-50	5	20	35	50	65
X ₃	CaCl ₂ (g/L)	7-20	0.5	7	13.5	20	26.5
X ₄	pH	3-8	0.5	3	5.5	8	10.5

Table 4: Physico-chemical characteristics of LFW and SPW

Parameters	LFW	SPW
Ash (% (w/w))	3.3	1.3
pH	6.04	4.87
Moisture (% (w/w))	29.6	11.1
Crude Protein	10.30	8.12
Total Nitrogen	0.164	0.13
Crude Fat	51.1	16.2
Hemicellulose (% (w/w))	5.5	7.6
Cellulose (% (w/w))	7.49	19.4
Lignin(% (w/w))	0.3	1.07
Crude Fibre (%)	2.1	3.6
Total Dissolved Solids (mg L ⁻¹)	33.42	27.13
Total Suspended solids (mg L ⁻¹)	24.16	18.7
Phosphorus (mg L ⁻¹)	2.017	1.336
Total Sugar (% (w/w))	11.6	13
Total Reducing Sugar (% (w/w))	4.04	7.64

Table 5: Evaluation of food scrap isolates for SCP production and its bioconversion efficiency

Strain No.	CDBW		Protein yield		Microbial conversion efficiency	
	(g/L)		(g/L)		(%)	
	LFWH	SPWH	LFWH	SPWH	LFWH	SPWH
PG ₁	2.49	2.90	37.81	44.12	90.96	92.88
PG ₂	0.93	1.19	11.45	8.09	69.40	79.58
PG ₃	1.01	1.11	12.38	22.35	89.02	82.59
PG ₄	2.25	2.18	7.49	12.16	82.45	88.4
PG ₅	3.02	3.46	42.01	54.27	91.49	97.27
PG ₆	1.09	1.31	34.09	26.45	44.7	61.23
PG ₇	0.94	0.89	7.95	10.12	62.5	73.2
PG ₈	0.9	1.2	37.30	31.58	81.63	73.96
PG ₉	2.59	0.98	11.86	9.86	72.60	83.14
PG ₁₀	0.99	0.90	41.09	34.84	13.6	23.71
PG ₁₁	1.0	0.72	15.98	13.27	78.6	70.30
PG ₁₂	0.70	0.79	6.64	7.96	44.21	48.72
PG ₁₃	1.39	0.31	29.75	27.7	68.54	77.62
PG ₁₄	0.30	1.40	10.85	13.61	28.81	37.05

Table 6: Efficiency of substrate conversion to SCP using *P. occidentalis* PG5 on each waste

Production media	Biomass (g/L)	Total Protein (g/L)	Microbial conversion efficiency
LFWH	8.47	0.801	63.84
SPWH	11.03	2.242	94.04
LFWH+SPWH	3.18	0.248	44.7

Table 7: Effect of each component for SCP production by *Pichia occidentalis* PG5 and their statistical parameters

Source	F- value	p-value	% CI
Salad peel waste hydrolysate	13.4669	0.0054	99.45
Malt Extract	45.017	0.0005	99.95
KH ₂ PO ₄	0.456761	0.6926	30.73
MgSO ₄ .7H ₂ O	0.22179203	0.8450	15.49
NaCl	0.6868	0.5631	43.68
CaCl ₂	12.347	0.0065	99.35
Inoculum Size	0.7332	0.53973	46.02
pH	18.8839	0.00279	99.72
Temperature	4.4524872	0.0469	95.30
Incubation period	0.57983335	0.62064	37.93

Table 8: ANOVA for the response surface quadratic model for SCP production from *Pichia occidentalis* PG₅

Sources	Sum of Squares	Degree of freedom	Mean Square	F-value	p-value	
Model	1168.11	14	83.44	8.50	< 0.0001	significant
A-SPWH	123.31	1	123.31	12.56	0.0029	
B-ME	7.27	1	7.27	0.7408	0.4030	
C-CaCl ₂	9.78	1	9.78	0.9961	0.3341	
D-pH	540.62	1	540.62	55.08	< 0.0001	
AB	5.19	1	5.19	0.5287	0.4784	
AC	7.58	1	7.58	0.7725	0.3933	
AD	62.90	1	62.90	6.41	0.0230	
BC	6.64	1	6.64	0.6763	0.4238	
BD	17.42	1	17.42	1.78	0.2026	
CD	4.06	1	4.06	0.4140	0.5296	
A ²	163.70	1	163.70	16.68	0.0010	
B ²	84.68	1	84.68	8.63	0.0102	
C ²	36.74	1	36.74	3.74	0.0721	
D ²	259.29	1	259.29	26.42	0.0001	
Residual	147.21	15	9.81			
Lack of Fit	50.37	10	5.04	0.2600	0.9667	not significant
Pure Error	96.85	5	19.37			
Cor Total	1315.33	29				
R ²	0.8881					
Adjusted R ²	0.7836					
Predicted R ²	0.7019					
CV%	19.81					
Std. Dev.	3.13					

Table 9: Experimental matrix in CCD and response prediction by RSM and SVM.

Run	SPWH (gL ⁻¹)	ME (gL ⁻¹)	CaCl ₂ (gL ⁻¹)	pH	SCP Production (g/L)		
					Experimental	RSM Predicted	SVM Predicted
1	35	35	13.5	0.5	3.44	1.04	1.5185
2	20	20	7	3	6.24	8.89	8.76507
3	20	20	7	8	17.34	16.77	15.5427
4	35	35	0.5	5.5	21.44	19.52	19.3571
5	50	50	20	3	8.45	9.18	10.9874
6	35	35	13.5	5.5	14.11	22.64	21.0051
7	50	50	7	3	9.34	9.62	10.2603
8	50	50	20	8	21.23	19.92	19.7651
9	35	5	13.5	5.5	18.37	16.28	18.3571
10	5	35	13.5	5.5	10.05	8.55	9.8437
11	20	50	7	8	15.3	16.00	15.4003
12	50	50	7	8	22.02	21.75	21.0379
13	35	35	13.5	10.5	18.78	19.66	18.6798
14	35	35	13.5	5.5	25.32	22.64	23.0051
15	20	50	7	3	11.87	12.48	11.62266
16	35	35	13.5	5.5	26.28	22.64	24.0051
17	65	35	13.5	5.5	17.23	17.21	17.3303
18	20	20	20	3	7.31	7.74	7.49223
19	50	20	7	3	7.67	8.41	8.4027
20	50	20	20	3	10.03	10.66	10.1298
21	20	20	20	8	13.17	14.23	13.2699
22	50	20	7	8	23.74	24.89	21.1803
23	35	35	13.5	5.5	22.34	22.64	20.0051
24	20	50	20	3	8.45	8.63	8.34982
25	35	35	13.5	5.5	24.34	22.64	22.0051
26	50	20	20	8	26.21	25.75	25.9075
27	35	65	13.5	5.5	13.47	14.04	14.3571
28	20	50	20	8	11.36	10.77	11.1275
29	35	35	13.5	5.5	23.46	22.64	22.0051
30	35	35	26.5	5.5	16.14	16.54	16.3571
<i>R</i> ²					0.8881		0.9772
<i>Adj R</i> ²					0.7836		0.9560
<i>Pred R</i> ²					0.7019		0.9103