

Appendices

APPENDIX A

Appendix A.1

Regression coefficients, and statistical parameters of the responses (full grain)

Coefficients	Tannin content	Phytic acid content
α_0	173.17***	744.34**
α_1	-7.42**	-34.23**
α_2	-2.28	-6.74
α_3	-0.1758	10.93
α_{12}	-19.43***	-61.01***
α_{13}	-9.34**	-35.89*
α_{23}	-5.59*	-23.67
α_{11}	-6.65*	-38.63***
α_{22}	-7.38*	-33.82*
α_{33}	-9.45**	-48.55**
MSE	8.1636	182.6461
RMSE	2.8572	13.5146
NMSE	0.0505	0.2667
NRMSE	0.0176	0.0197
AAD	2.4723	12.0036
MPE	1.5132	1.7592
R^2	0.9602	0.9478
Adj. R^2	0.9089	0.8807
Pred. R^2	0.7190	0.4365
Lack of fit	Not significant	Not significant

Note: α represents the coefficients of the model equation; α_0 signifies the constant terms; the linear effects are indicated by α_1 , α_2 and α_3 ; interaction effect are denoted by α_{12} , α_{13} and α_{23} and quadratic terms are expressed as α_{11} , α_{22} , α_{33} ; 1, 2 and 3 corresponding to the voltage, treatment time and electrode distance, respectively

*Significant at $p < 0.05$

**Significant at $p < 0.01$

***Significant at $p < 0.001$

Abbreviations: MSE, mean square error; RMSE, root mean square error; NMSE, normal mean square error; NRMSE, normal root mean square error; AAD, average absolute deviation; MPE, mean percentage error;

Appendix A.2

Regression coefficients, and statistical parameters of the responses (dehusked millet)

Coefficients	Tannin content	Phytic acid content
α_0	94.21**	353.75**
α_1	-3.87*	-16.23*
α_2	-1.23	-3.19
α_3	0.0400	5.18
α_{12}	-10.47***	-28.92**
α_{13}	-5.31*	-17.01
α_{23}	-3.01	-11.22*
α_{11}	-4.15	-18.78
α_{22}	-4.28*	-16.50*
α_{33}	-5.66*	-23.48*
MSE	5.6335	77.9501
RMSE	2.3735	8.8289
NMSE	0.0646	0.2399
NRMSE	0.0272	0.0271
AAD	1.8596	0.3628
MPE	2.0705	2.1382
R ²	0.9154	0.9070
Adj. R ²	0.8066	0.7875
Pred. R ²	0.6225	0.4027
Lack of fit	Not significant	Not significant

Note: α represents the coefficients of the model equation; α_0 signifies the constant terms; the linear effects are indicated by α_1 , α_2 and α_3 ; interaction effect are denoted by α_{12} , α_{13} and α_{23} and quadratic terms are expressed as α_{11} , α_{22} , α_{33} ; 1, 2 and 3 corresponding to the voltage, treatment time and electrode distance, respectively

*Significant at $p < 0.05$.

**Significant at $p < 0.01$.

***Significant at $p < 0.001$

Abbreviations: MSE, mean square error; RMSE, root mean square error; NMSE, normal mean square error; NRMSE, normal root mean square error; AAD, average absolute deviation; MPE, mean percentage error;

Appendix A.3

Regression coefficients, and statistical parameters of the responses (finger millet flour)

Coefficients	Tannin content	Phytic acid content
α_0	135.542	483.126
α_1	-5.5625*	-24.66**
α_2	-1.765	-6.8625
α_3	0.0575	4.5775
α_{12}	-15.065*	-54.495***
α_{13}	-7.635*	-18.235
α_{23}	-4.335	-15.32
α_{11}	-5.9735	-28.153*
α_{22}	-6.1535*	-20.038*
α_{33}	-8.1435*	-34.573
MSE	11.6567	145.3920
RMSE	3.4142	12.0579
NMSE	0.0925	0.3265
NRMSE	0.0271	0.0271
AAD	2.6741	9.6162
MPE	2.0705	2.1382
R^2	0.9154	0.9070
Adj. R^2	0.8066	0.7875
Pred. R^2	0.6225	0.4027
Lack of fit	Not significant	Not significant

Note: α represents the coefficients of the model equation; α_0 signifies the constant terms; the linear effects are indicated by α_1 , α_2 and α_3 ; interaction effect are denoted by α_{12} , α_{13} and α_{23} and quadratic terms are expressed as α_{11} , α_{22} , α_{33} ; 1, 2 and 3 corresponding to the voltage, treatment time and electrode distance, respectively

*Significant at $p < 0.05$.

**Significant at $p < 0.01$.

***Significant at $p < 0.001$

Abbreviations: MSE, mean square error; RMSE, root mean square error; NMSE, normal mean square error; NRMSE, normal root mean square error; AAD, average absolute deviation; MPE, mean percentage error;

APPENDIX B

Appendix B.1

ANOVA for the effect of phytic acid content in full grain finger millet

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	56393.08	9	6265.90	14.13	0.0010	significant
A-Voltage	9375.12	1	9375.12	21.14	0.0025	
B-Treatment time	363.34	1	363.34	0.8191	0.3955	
C-electrode distance	956.31	1	956.31	2.16	0.1855	
AB	14889.90	1	14889.90	33.57	0.0007	
AC	5153.39	1	5153.39	11.62	0.0113	
BC	2240.40	1	2240.40	5.05	0.0594	
A ²	6282.91	1	6282.91	14.16	0.0070	
B ²	4815.06	1	4815.06	10.86	0.0132	
C ²	9923.23	1	9923.23	22.37	0.0021	
Residual	3104.98	7	443.57			
Lack of Fit	1986.29	3	662.10	2.37	0.2118	not significant
Pure Error	1118.69	4	279.67			
Cor Total	59498.07	16				
Std. Dev.	21.06					
		R²	0.9478			
Mean	687.40	Adjusted R²	0.8807			
C.V. %	3.06	Predicted R²	0.4365			
		Adeq Precision	11.7928			

Appendix B.2

ANOVA for the effect of tannin content in full grain finger millet

Source	Sum of Squares	df	Mean Square	F-value	p-value		
Model	3348.24	9	372.03	18.74	0.0004	significant	
A-Voltage	440.74	1	440.74	22.21	0.0022		
B-Treatment time	41.44	1	41.44	2.09	0.1917		
C-electrode distance	0.2474	1	0.2474	0.0125	0.9142		
AB	1509.36	1	1509.36	76.05	<0.0001		
AC	349.30	1	349.30	17.60	0.0041		
BC	124.98	1	124.98	6.30	0.0404		
A ²	186.33	1	186.33	9.39	0.0182		
B ²	229.60	1	229.60	11.57	0.0114		
C ²	376.05	1	376.05	18.95	0.0033		
Residual	138.94	7	19.85				
Lack of Fit	52.83	3	17.61	0.8181	0.5475		not significant
Pure Error	86.10	4	21.53				
Cor Total	3487.17	16					
Std. Dev.	4.46		R² 0.9602				
Mean	162.12		Adjusted R² 0.9089				
C.V. %	2.75		Predicted R² 0.7190				
			Adeq Precision 15.7145				

Appendix B.3

ANOVA for the effect of phytic acid content in dehusked finger millet

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	12928.37	9	1436.49	7.59	0.0070	significant
A-Voltage	2106.23	1	2106.23	11.13	0.0125	
B-Treatment time	81.63	1	81.63	0.4312	0.5324	
C-electrode distance	214.85	1	214.85	1.13	0.3221	
AB	3345.19	1	3345.19	17.67	0.0040	
AC	1157.77	1	1157.77	6.12	0.0426	
BC	503.33	1	503.33	2.66	0.1470	
A ²	1485.56	1	1485.56	7.85	0.0265	
B ²	1146.68	1	1146.68	6.06	0.0434	
C ²	2322.16	1	2322.16	12.27	0.0100	
Residual	1325.15	7	189.31			
Lack of Fit	446.24	3	148.75	0.6770	0.6102	not significant
Pure Error	878.91	4	219.73			
Cor Total	14253.52	16				
Std. Dev.	13.76		R² 0.9070			
Mean	326.10		Adjusted R² 0.7875			
C.V. %	4.22		Predicted R² 0.4027			
			Adeq Precision 8.5561			

Appendix B.4

ANOVA for the effect of tannin content in dehusked finger millet

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	1036.25	9	115.14	8.42	0.0052	significant
A-Voltage	119.59	1	119.59	8.74	0.0212	
B-Treatment time	12.04	1	12.04	0.8801	0.3794	
C-electrode distance	0.0128	1	0.0128	0.0009	0.9765	
AB	438.61	1	438.61	32.06	0.0008	
AC	112.66	1	112.66	8.23	0.0240	
BC	36.32	1	36.32	2.65	0.1473	
A ²	72.59	1	72.59	5.31	0.0547	
B ²	77.03	1	77.03	5.63	0.0494	
C ²	134.91	1	134.91	9.86	0.0164	
Residual	95.77	7	13.68			
Lack of Fit	19.24	3	6.41	0.3351	0.8021	not significant
Pure Error	76.53	4	19.13			
Cor Total	1132.02	16				
Std. Dev. 3.70			R² 0.9154			
Mean 87.58			Adjusted R² 0.8066			
C.V. % 4.22			Predicted R² 0.6225			
			Adeq Precision 10.1083			

Appendix B.5

ANOVA for the effect of phytic acid content in finger millet flour

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	30726.35	9	3414.04	11.32	0.0021	significant
A-Voltage	4864.92	1	4864.92	16.12	0.0051	
B-Time	376.75	1	376.75	1.25	0.3007	
C-Electrode Distance	167.63	1	167.63	0.5556	0.4803	
AB	11878.82	1	11878.82	39.37	0.0004	
AC	1330.06	1	1330.06	4.41	0.0739	
BC	938.81	1	938.81	3.11	0.1211	
A ²	3337.23	1	3337.23	11.06	0.0127	
B ²	1690.62	1	1690.62	5.60	0.0498	
C ²	5032.81	1	5032.81	16.68	0.0047	
Residual	2112.06	7	301.72			
Lack of Fit	472.73	3	157.58	0.3845	0.7708	not significant
Pure Error	1639.33	4	409.83			
Cor Total	32838.42	16				
Std. Dev.	17.37					
		R²	0.9357			
Mean	444.18	Adjusted R²	0.8530			
C.V. %	3.91	Predicted R²	0.6917			
		Adeq Precision	11.8831			

Appendix B.6

ANOVA for the effect of tannin content in finger millet flour

Source	Sum of Squares	df	Mean Square	F-value	p-value	
Model	2144.78	9	238.31	8.42	0.0052	significant
A-Voltage	247.53	1	247.53	8.74	0.0212	
B-Time	24.92	1	24.92	0.8801	0.3794	
C-Electrode Distance	0.0264	1	0.0264	0.0009	0.9765	
AB	907.82	1	907.82	32.06	0.0008	
AC	233.17	1	233.17	8.23	0.0240	
BC	75.17	1	75.17	2.65	0.1473	
A ²	150.24	1	150.24	5.31	0.0547	
B ²	159.43	1	159.43	5.63	0.0494	
C ²	279.23	1	279.23	9.86	0.0164	
Residual	198.22	7	28.32			
Lack of Fit	39.81	3	13.27	0.3351	0.8021	not significant
Pure Error	158.41	4	39.60			
Cor Total	2343.00	16				
Std. Dev. 5.32			R² 0.9154			
Mean 126.00			Adjusted R² 0.8066			
C.V. % 4.22			Predicted R² 0.6225			
			Adeq Precision 10.1083			

APPENDIX C
STORAGE STUDIES
Appendix C1. Details of samples

Sl. No	Notation	Details
1	T1	Control sample stored in LDPE packs
2	T2	Treated sample stored in LDPE packs
3	T3	Control sample stored in laminated pouches
4	T4	Treated samples stored in laminated pouches

Appendix C2
Quality of CP treated finger millet samples during storage
Appendix C2.1
Changes in phytic acid content (mg/100 g) during storage per

Weeks	Full grain finger millet				Dehusked finger millet				T1
	T1	T2	T3	T4	T1	T2	T3	T4	
0	783.34	545.97	783.34	545.96	330.14	266.12	330.14	266.12	616.00
1	783.35	545.98	783.29	545.97	330.35	266.18	330.29	266.14	616.35
2	783.29	546.01	783.19	545.90	330.29	266.19	330.19	266.15	616.29
3	783.51	546.19	783.20	545.92	330.51	266.29	330.20	266.22	616.61
4	783.73	546.38	783.41	545.95	330.73	266.48	330.41	266.35	616.73
5	783.95	546.56	783.75	545.94	330.95	266.76	330.75	266.53	616.95
6	784.18	546.61	783.95	546.12	331.18	266.71	330.95	266.41	617.18
7	784.15	546.62	784.11	546.33	331.15	266.92	331.11	266.69	617.42
8	784.44	546.64	784.34	546.51	331.44	267.14	330.94	266.93	617.64
9	784.78	546.68	784.59	546.58	331.78	267.58	331.19	267.25	617.88
10	785.19	546.72	784.49	546.65	331.99	267.72	331.49	267.51	618.19
11	785.23	546.81	784.73	546.56	331.93	267.81	331.83	267.63	618.23
12	785.46	546.92	784.95	546.52	332.16	267.92	332.15	267.84	618.46
13	785.33	546.85	785.33	546.66	332.33	267.85	332.23	267.84	618.63
14	785.71	546.93	785.51	546.72	332.51	267.93	332.41	267.42	618.81
15	785.99	547.17	785.69	546.91	332.74	268.27	332.59	267.75	618.99
16	786.21	547.48	785.88	547.23	332.91	268.48	332.71	267.88	619.21
17	786.12	547.54	785.95	547.19	333.12	268.54	332.99	267.95	619.12
18	786.93	547.47	786.13	547.25	333.93	268.47	333.23	268.15	619.93

Appendix C2.2
Changes in tannin content (mg/100 g) during storage period

Weeks	Full grain finger millet				Dehusked finger millet				T1
	T1	T2	T3	T4	T1	T2	T3	T4	
0	164.19	124.09	164.19	124.09	81.23	68.74	81.23	68.74	139.69
1	164.25	124.08	164.22	124.07	81.20	68.75	81.10	68.74	139.69
2	164.29	124.11	164.19	124.00	81.13	68.73	80.90	68.72	139.70
3	164.41	124.19	164.32	124.12	81.38	68.82	81.11	68.75	139.83
4	164.73	124.38	164.51	124.25	81.54	68.99	81.32	68.81	139.91
5	164.95	124.56	164.75	124.44	81.79	68.95	81.42	68.94	139.82
6	165.18	124.61	164.95	124.32	81.91	69.00	81.68	68.93	139.92
7	165.15	124.62	165.01	124.45	82.24	69.25	81.84	69.01	139.95
8	165.44	124.64	165.34	124.51	82.35	69.49	81.99	69.11	140.12
9	165.78	124.68	165.59	124.58	82.58	69.58	82.15	69.18	140.10
10	166.19	124.72	165.49	124.65	82.72	69.53	82.27	69.25	140.29
11	166.23	124.81	165.73	124.56	82.69	69.79	82.59	69.46	140.11
12	166.46	124.92	165.95	124.52	82.95	69.91	82.65	69.32	140.23
13	166.53	124.85	166.33	124.66	83.41	69.92	82.85	69.56	140.45
14	166.61	124.93	166.51	124.72	83.56	70.46	82.84	69.72	140.36
15	166.89	125.17	166.69	124.91	83.58	70.53	83.11	69.91	140.17
16	167.21	125.48	166.88	125.23	84.59	70.61	83.15	70.13	140.23
17	167.12	125.54	166.95	125.19	84.48	70.63	83.29	70.20	140.59
18	167.93	125.47	167.13	125.25	84.36	70.91	83.53	70.25	140.92

Appendix C2.3

Changes in total phenolic content (mg/100 g) during storage period

Weeks	Full grain finger millet				Dehusked finger millet				T1
	T1	T2	T3	T4	T1	T2	T3	T4	
0	280.14	269.77	280.18	269.77	330.14	266.12	330.14	266.121	283.21
1	280.35	269.98	280.29	269.79	330.35	266.18	330.29	266.14	283.43
2	280.29	269.89	280.19	269.81	330.29	266.19	330.19	266.15	283.65
3	280.51	270.19	280.20	269.95	330.51	266.29	330.20	266.22	283.57
4	280.73	270.48	280.41	270	330.73	266.48	330.41	266.35	283.89
5	280.95	270.76	280.75	270.23	330.95	266.76	330.75	266.53	284.11
6	281.18	270.71	280.95	270.41	331.18	266.71	330.95	266.41	283.93
7	281.15	270.92	281.11	270.39	331.15	266.92	331.11	266.69	284.25
8	281.44	271.14	280.94	270.53	331.44	267.14	330.94	266.93	284.47
9	281.78	271.58	281.19	270.75	331.78	267.58	331.19	267.25	284.69
10	281.99	271.72	281.49	270.91	331.99	267.72	331.49	267.51	284.71
11	282.93	271.81	281.83	270.99	331.93	267.81	331.83	267.63	285.23
12	283.16	271.92	282.15	271.1	332.16	267.92	332.15	267.84	286.05
13	283.33	271.85	282.43	271.3	332.33	267.85	332.23	267.84	286.37
14	283.51	271.93	282.71	271.42	332.51	267.93	332.41	267.42	286.59
15	283.74	272.27	282.99	271.75	332.74	268.27	332.59	267.75	286.71
16	283.91	272.48	283.11	271.85	332.91	268.48	332.71	267.88	286.62
17	284.12	272.54	282.98	271.99	333.12	268.54	332.99	267.95	286.94
18	283.93	272.47	283.23	272.15	333.93	268.47	333.23	268.15	286.86

Appendix C2.4

Changes in moisture content (%) during storage period

Weeks	Full grain finger millet				Dehusked finger millet				F
	T1	T2	T3	T4	T1	T2	T3	T4	
0	8.62	7.45	8.62	7.45	8.67	7.82	8.67	7.82	11.56
1	8.62	7.46	8.62	7.46	8.68	7.83	8.68	7.80	11.57
2	8.63	7.45	8.63	7.46	8.67	7.82	8.67	7.81	11.57
3	8.62	7.49	8.64	7.47	8.69	7.84	8.69	7.83	11.59
4	8.64	7.51	8.68	7.5	8.70	7.85	8.68	7.85	11.61
5	8.71	7.54	8.71	7.53	8.73	7.87	8.69	7.88	11.65
6	8.77	7.57	8.72	7.59	8.75	7.88	8.71	7.90	11.67
7	8.75	7.61	8.74	7.59	8.78	7.92	8.72	7.93	11.68
8	8.79	7.63	8.74	7.61	8.77	7.96	8.73	7.95	11.72
9	8.83	7.62	8.77	7.62	8.80	7.93	8.75	7.94	11.73
10	8.86	7.66	8.78	7.63	8.82	7.99	8.77	7.96	11.76
11	8.89	7.69	8.79	7.65	8.85	8.00	8.78	7.99	11.79
12	8.85	7.71	8.81	7.65	8.84	8.13	8.82	8.01	11.81
13	8.91	7.72	8.82	7.68	8.87	8.12	8.84	8.10	11.83
14	8.93	7.74	8.83	7.71	8.89	8.15	8.84	8.13	11.83
15	8.94	7.86	8.83	7.75	8.90	8.17	8.86	8.10	11.84
16	8.94	7.89	8.84	7.81	8.92	8.19	8.86	8.15	11.84
17	8.95	7.92	8.86	7.85	8.91	8.21	8.88	8.18	11.85
18	8.97	7.95	8.87	7.86	8.93	8.2	8.89	8.17	11.87

Appendix C2.5
Changes in pH during storage period

Weeks	Full grain finger millet				Dehusked finger millet				T1
	T1	T2	T3	T4	T1	T2	T3	T4	
0	6.7	6.9	6.7	6.9	6.6	6.8	6.6	6.8	6.2
1	6.8	6.91	6.8	6.9	6.6	6.8	6.61	6.79	6.2
2	6.7	6.89	6.6	6.98	6.59	6.79	6.6	6.78	6.19
3	6.68	6.88	6.69	6.95	6.57	6.77	6.58	6.79	6.18
4	6.69	6.87	6.67	6.93	6.55	6.74	6.57	6.77	6.15
5	6.67	6.85	6.65	6.95	6.53	6.73	6.55	6.75	6.13
6	6.66	6.83	6.67	6.93	6.5	6.74	6.52	6.76	6.11
7	6.67	6.82	6.66	6.92	6.49	6.72	6.53	6.77	6.1
8	6.66	6.8	6.64	6.9	6.47	6.72	6.49	6.74	5.99
9	6.61	6.78	6.62	6.85	6.45	6.71	6.48	6.75	5.97
10	6.58	6.74	6.6	6.84	6.44	6.65	6.5	6.69	5.94
11	6.6	6.72	6.59	6.82	6.41	6.63	6.45	6.66	5.95
12	6.57	6.69	6.6	6.79	6.39	6.6	6.45	6.63	5.92
13	6.52	6.67	6.57	6.77	6.37	6.58	6.43	6.62	5.9
14	6.51	6.68	6.55	6.78	6.38	6.54	6.45	6.63	5.89
15	6.49	6.65	6.51	6.77	6.37	6.56	6.42	6.6	5.87
16	6.46	6.65	6.53	6.75	6.35	6.53	6.43	6.55	5.88
17	6.45	6.63	6.54	6.73	6.33	6.49	6.41	6.52	5.85
18	6.44	6.62	6.53	6.72	6.32	6.44	6.4	6.51	5.83

Appendix C2.6

Changes in free fatty acid (%) during storage period

Weeks	Full grain finger millet				Dehusked finger millet				F
	T1	T2	T3	T4	T1	T2	T3	T4	
0	1.21	1.01	1.21	1.01	1.32	1.24	1.32	1.24	1.38
1	1.23	1.10	1.20	1.00	1.31	1.23	1.31	1.24	1.39
2	1.22	1.13	1.21	1.11	1.32	1.24	1.3	1.25	1.40
3	1.24	1.13	1.20	1.09	1.34	1.26	1.32	1.24	1.41
4	1.24	1.17	1.22	1.12	1.35	1.26	1.33	1.25	1.43
5	1.24	1.17	1.23	1.14	1.37	1.28	1.31	1.24	1.44
6	1.26	1.19	1.24	1.11	1.36	1.27	1.34	1.25	1.45
7	1.28	1.19	1.26	1.14	1.38	1.28	1.35	1.26	1.47
8	1.3	1.22	1.25	1.16	1.40	1.30	1.38	1.28	1.47
9	1.29	1.24	1.27	1.17	1.41	1.32	1.37	1.29	1.47
10	1.34	1.23	1.31	1.19	1.40	1.34	1.39	1.3	1.49
11	1.32	1.25	1.31	1.21	1.43	1.33	1.40	1.31	1.47
12	1.34	1.26	1.32	1.23	1.46	1.35	1.42	1.30	1.51
13	1.34	1.28	1.32	1.24	1.46	1.37	1.41	1.32	1.54
14	1.37	1.31	1.34	1.25	1.47	1.36	1.44	1.34	1.53
15	1.39	1.32	1.34	1.24	1.48	1.38	1.45	1.36	1.55
16	1.38	1.34	1.36	1.26	1.49	1.37	1.46	1.36	1.58
17	1.42	1.35	1.37	1.26	1.47	1.39	1.45	1.37	1.59
18	1.41	1.39	1.39	1.29	1.49	1.38	1.44	1.36	1.63