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Supplementary materials

Food Fortification of Instant Pulse Porridge Powder with Improved Iron and Zinc Bioaccessibility Using Roselle Calyx

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Supplementary Table S1:

Proximate, iron and zinc contents of instant porridge powders (per 100 g fresh weight).

Nutritive values (per 100 g fresh weight)	Formulations		
	ICP	ICF	IPP
Moisture (%)	3.96 ± 0.12 [a]	3.97 ± 0.05 [a]	6.03 ± 0.01 [b]
Energy (kcal)	440.62 ± 0.90 [c]	429.33 ± 0.62 [b]	423.50 ± 0.71 [a]
Protein (g)	19.35 ± 0.08 [c]	15.94 ± 0.11 [b]	15.50 ± 0.00 [a]
Fat (g)	14.44 ± 0.14 [c]	12.17 ± 0.22 [a]	12.90 ± 0.00 [b]
Carbohydrate (g)	58.32 ± 0.18 [a]	64.02 ± 0.23 [c]	61.45 ± 0.07 [b]
Total dietary fiber (g)	16.48 ± 0.53 [c]	11.08 ± 0.24 [a]	12.97 ± 0.00 [b]
Ash (g)	3.94 ± 0.57 [a]	3.91 ± 0.07 [a]	4.18 ± 0.01 [b]
Iron (mg) [ns]	4.08 ± 0.13	4.07 ± 0.16	4.59 ± 0.23
Zinc (mg)	2.82 ± 0.18 [a]	2.61 ± 0.13 [a]	3.71 ± 0.20 [b]

All data are shown as the mean ± standard deviation (SD) of triplicate determination (n=3). Different lowercase letters denote significantly different contents of the same proximate composition or zinc content at $p < 0.05$, while [ns] denotes no significant differences of iron content at $p \geq 0.05$ in different instant porridge powder formulations using one-way ANOVA, followed by Duncan's multiple comparison test. ICP: instant chickpea powder using pre-gelatinized chickpea flour (PCPF); ICF: instant composite flour using PCPF and pregelatinized foxtail millet flour (PFMF); IPP: instant pulse porridge powder using PCPF, PFMF and roselle calyx powder (RCP).

Supplementary Table S2:

Sensory evaluation of instant porridge powders with different amount of roselle calyx powder.

Instant Porridge Powders	Sensory attributes					
	Appearance ^{ns}	Color ^{ns}	Odor	Taste ^{ns}	Texture ^{ns}	Overall liking
IPP-4	6.73 ± 1.38	6.70 ± 1.36	7.10 ± 1.21 ^{a}	6.60 ± 1.35	6.73 ± 0.93	6.85 ± 1.10 ^{a}
IPP-6	6.75 ± 1.48	6.78 ± 1.46	6.48 ± 2.00 ^{b}	6.25 ± 1.76	6.33 ± 1.33	6.33 ± 1.64 ^{ab}
IPP-8	6.65± 1.53	6.70 ± 1.51	6.50 ± 1.36 ^{b}	5.95 ± 1.91	6.50 ± 1.36	6.00 ± 1.64 ^{b}

All data are shown as the mean ± standard deviation (SD) of 40 untrained panelists (n = 40). Different lowercase letters denote significantly different of the sensory attributes on odor and overall liking at $p < 0.05$, while ^{ns} denotes no significantly different values at $p \geq 0.05$ of the sensory attributes on appearance, color, taste and texture in different instant porridge powder formulations using one–way ANOVA, followed by Duncan's multiple comparison test. IPP-4: instant pulse porridge powder using pre-gelatinized chickpea flour (PCPF), pregelatinized foxtail millet flour (PFMF) and 4.99% (*w*/*w*) roselle calyx powder (RCP); IPP-6: instant pulse porridge powder using PCPF, PFMF and 6.65% (*w*/*w*) RCP; IPP-8: instant pulse porridge powder using PCPF, PFMF and 8.31% (*w*/*w*) RCP. Based on information in this table, the sensory evaluation showed better odor in IPP-4 than IPP-6 and IPP-8. Besides, no significant differnce on overall liking was observed between IPP-4 and IPP-6, while IIP-8 exhibited the significant lowest overall liking score.

Supplementary Table S3:

In vitro iron and zinc bioaccessibility of instant porridge powders with different amount of roselle calyx powder.

Formulations	% Bioaccessibility	
	Iron ^{ns}	Zinc ^{ns}
IPP-4	11.08 ± 0.86	45.83 ± 2.90
IPP-6	11.98 ± 0.20	49.70 ± 1.41

All data are shown as the mean ± standard deviation (SD) of 40 untrained panelists (n = 40). The ^{ns} denotes no significantly different values at $p \geq 0.05$ of the in vitro iron and zinc bioaccessibility in different instant porridge powder formulations using using Student's unpaired *t*-test. IPP-4: instant pulse porridge powder using pre-gelatinized chickpea flour (PCPF), pregelatinized foxtail millet flour (PFMF) and 4.99% (*w*/*w*) roselle calyx powder (RCP); IPP-6: instant pulse porridge powder using PCPF, PFMF and 6.65% (*w*/*w*) RCP. Based on information in Supplementary Table S2 and S3 with no significant differences in in vitro iron and zinc bioaccessibility between IIP-4 and IPP-6, IPP-4 was selected for this study due to lower cost with more desirable odor and taste comparing to IPP-6.