Summary of Optimized Parameters

The following table consolidates the optimized parameters for the modified QuEChERS extraction and CAS/Fe(III) colorimetric assay, ensuring reproducibility and sensitivity for CAP determination in food matrices:

Table S1: Optimized Parameters for QuEChERS Extraction and CAS/Fe(III) Assay

Parameter	Optimized Value	Significance
QuEChERS Extraction		
Solvent Composition	ACN:acetone:H_2O (75:20:5, v/v/v)	Enhanced CAP solubility (15.8 mg/mL) and reduced matrix effects (9%).
Solvent Volume	10 mL per 5 g sample	Balanced recovery (94%) and minimized lipid co-extraction.
Salt Ratio ($MgSO_4$:NaCl)	4:1 (6 g:1.5 g)	Efficient phase separation and emulsification prevention.
Extraction Time	10 min	Equilibrium partitioning with minimal matrix interference.
CAS/Fe(III) Assay		

Parameter	Optimized Value	Significance
CAS Concentration	0.1% (w/v) in acetate buffer (pH 5.5)	Maximized ternary complex formation; minimal background noise.
Fe(III) Concentration	1 mM in 0.1 M HCl	Stoichiometric binding without precipitation.
pH	5.5 (acetate buffer)	Optimal hydroxyl deprotonation and Fe(III) stability.
Reaction Time	10 min at 25°C	Equilibrium achieved; avoids matrix interference.
Temperature	25°C	Ideal kinetics and stability; aligns with ambient lab conditions.