Supplementary Information

Syringe Pressure-Assisted Switchable Hydrophilicity Solvent Microextraction with Smartphone Digital Image Colorimetry: A Rapid Method for Trace Cobalt Determination

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1 Samples collection and preparation

Water samples were sealed in polyethylene bottles and stored at 4–10°C until analysis. Prior to analysis, samples were filtered through a microporous membrane to remove larger impurities.

Soil samples after natural drying, the soil was ground into powder using a mortar and sieved through a 200-mesh sieve. An accurate 0.3 g of the powdered sample was weighed into a digestion vessel. Subsequently, 6 mL of HNO_3, 3 mL of HCl, and 2 mL of HF were added sequentially. Digestion was performed using the microwave digestion program specified in Table S1. After digestion, the mixture was heated for 4 h on an acid evaporator at 140°C. When the residual liquid in the digestion vessel reached approximately 1 mL, it was removed, cooled to room temperature, and transferred to a 50 mL volumetric flask. The volume was adjusted to the mark with ultrapure water. The adjusted solution was centrifuged and filtered to obtain the test solution.

Gentiana rigescens Franch. samples were washed with ultrapure water to remove impurities, then dried in a 55°C oven to constant weight. After processing in a pulverizer, the powder was sieved through a 120-mesh screen. An accurate 0.5 g of the sample powder was weighed into a digestion vessel. The following reagents were added sequentially: 8 mL HNO_3, 2 mL H_2O_2 (30%), and 2 mL H_2O. Digestion was performed using the microwave digestion protocol listed in Table S1. After digestion, place the vessel on an acid-removal apparatus at 130°C for approximately 3.5 h. When approximately 1 mL of liquid remains in the digestion vessel, remove it and cool to room temperature. Transfer the contents to a centrifuge tube and dilute to 15 mL with ultrapure water. Centrifuge and filter the diluted solution to obtain the test solution.

After hand washing, nails were trimmed and loose debris was manually removed. Samples were pooled, minced, and soaked overnight in 15% detergent solution. They were then sonicated at 300 cycles/min for 20 min on an automatic shaker and thoroughly washed with ultrapure water. Subsequently, 30 mL of Triton X-100 solution (0.5%) was added, followed by another 20 min agitation. The mixture was then washed with an excess of ultrapure water before being placed in a 60°C oven for overnight drying. Accurately weigh 5.0 g of sample into a digestion vessel. Add sequentially 5 mL HNO_3 (65%) and 1 mL $HClO_4$ (70%). Seal the vessel and let it stand at room temperature for 30 min. Place it on a digestion apparatus and heat at 80°C for 1 h. Raise the temperature to 130°C until dense white fumes appear, then continue heating for approximately 10 h. When the liquid volume in the digestion vessel reaches approximately 1 mL, remove the vessel and transfer the solution to a centrifuge tube. Dilute to 15 mL with 0.1% HNO_3. Centrifuge and filter the diluted solution to obtain the test solution.

2 Tables

Table S1 Microwave digestion program of soil and *Gentiana rigescens* Franch.

Samples	Step	Temperature (°C)	Rising time (min)	Retention time (min)	Power (W)
Soil	1	120	5	10	1500
	2	160	5	10	1500
	3	190	5	20	1500
Gentiana rigescens Franch.	1	120	12	22	1500
	2	180	6	45	1500

Table S2 Optimal instrumental parameters for ICP-OES.

Parameter	Optimal condition
ICP RF power (W)	1300
Plasma gas flow rate (Ar)/(L/min)	15
Auxiliary gas flow (Ar)/(L/min)	0.2
Atomizer gas flow (Ar)/(L/min)	0.55
Pump injection volume/(mL/min)	1.50
Reading delay time/(s)	40
Co analysis line/(nm)	228.616
Peak algorithm	Peak area