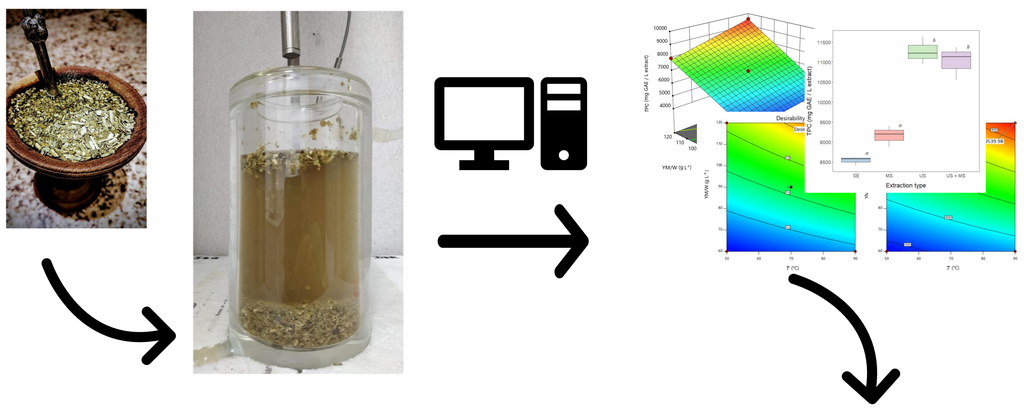
An herbal **infusion** and a **clay** for **chromium removal from water**

Green and cost-effective two-step process for Cr(VI) removal.

Green extraction of polyphenols from yerba mate leaves (YM)
Green two-step process for Cr(VI) removal

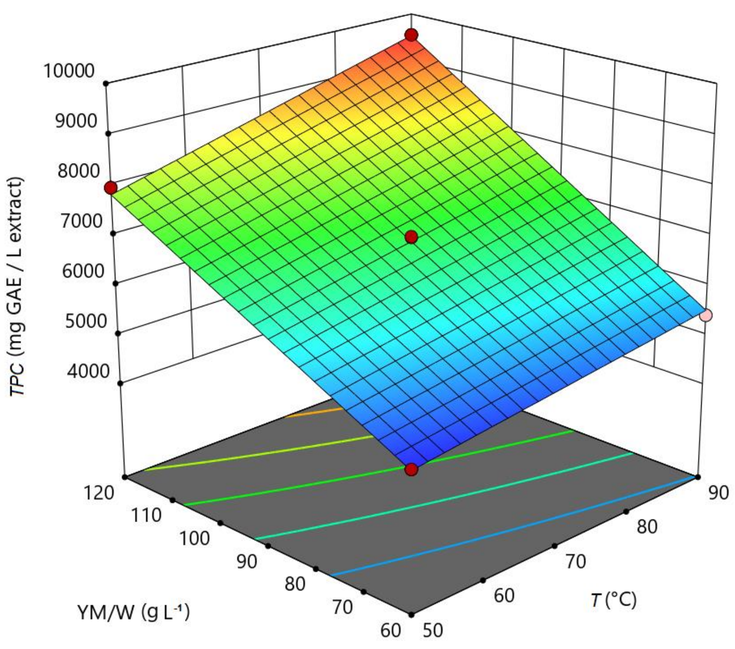
Green extraction of Polyphenols

- Response surface methodology (RSM) was used to attain the optimal conditions for extraction of polyphenols from yerba mate leaves (YM, typical South-America infusion) using water as solvent under ultrasound (US)
- Varied parameters: mass of YM/volume of water (YM/W), pH, temperature (T), and time



Effect of T and YM/W on the total polyphenol content (TPC) of the YM extracts.

Optimal conditions of extraction!



Optimal conditions:
- T = 90 °C
- YM/W = 150 g L^{-1}
- Time = 5 min

Polyphenols:
✓ TPC = 11,300 mg GAE L^{-1}
✓ antioxidant activity of 132 mmol Trolox equivalent (TE) L^{-1}

Scan for paper

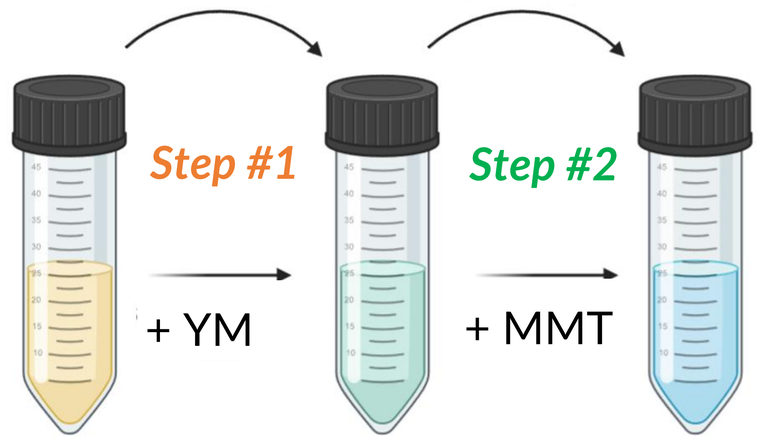
Scan for contact

Two-step process for Cr(VI) removal

RSM was used to attain the optimal conditions for:

step #1: Cr(VI) reduction using YM extracts and **step #2:** Cr_{tot} removal using a mineral clay (montmorillonite, MMT)

Cr(VI) → Cr(III) Cr_{tot} adsorption

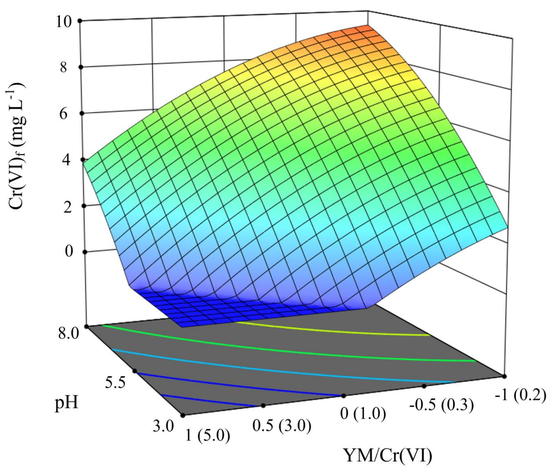


Cr(VI) → Cr(III)
- pH (3 – 8)
- $Cr(VI)_0$ (2 – 17.5 mg/L)
- YM/Cr(VI) molar ratio (1:5–5:1)

Cr(III) adsorption
- pH (3 – 8)
- MMT dosage (0.05 – 2 g/L)
- $Cr_{tot,0}$ (2 – 17.5 mg/L)

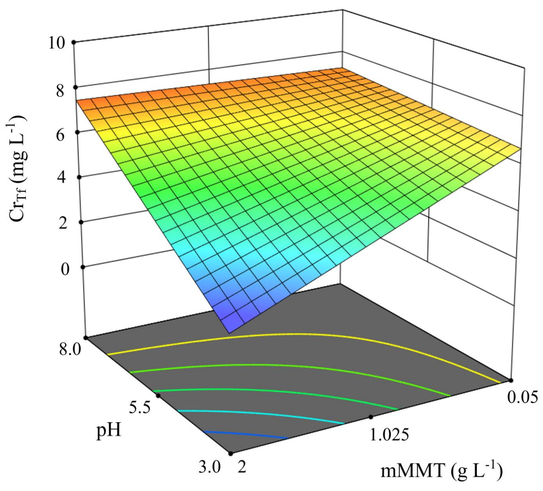
Step #1:

Effect of pH and YM/Cr(VI) on the Cr(VI) reduction



Step #2:

Effect of pH and MMT dose on the Cr_{tot} removal



Optimal conditions:
- pH = 3.0
- YM/Cr(VI) = 0.60

Optimal conditions:
- pH 3.0
- MMT dose = 1.94 g/L

Main results

✓ $Cr(VI)_f$ = 0.1 mg/L

✓ $Cr_{tot,f}$ = 3.24 mg/L

Green extraction of polyphenols from yerba mate leaves (YM)
Green two-step process for Cr(VI) removal

Arencibia, N., Litter, M.I., **Marco-Brown J.L.**
josemarcobrown@gmail.com
@josemarcobrown @NicoDianas

IIIA CONICET UNSAM
Instituto de Investigación e Ingeniería Ambiental
3iA_EHyS_UNSAM
CONICET