Green solvents for lupin debittering: a sustainable twist to improve lupin-beer synergy

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Problem

Lupin beans have been widely cultivated but the presence of **toxic quinolizidine alkaloids (QAs)** limits their industrial applications. The traditional debittering process is commonly accomplished by a soaking process that uses large amounts of fresh water.

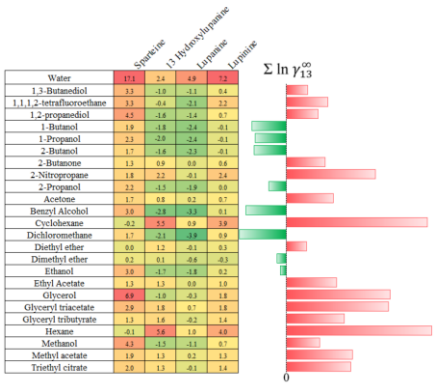
Solution

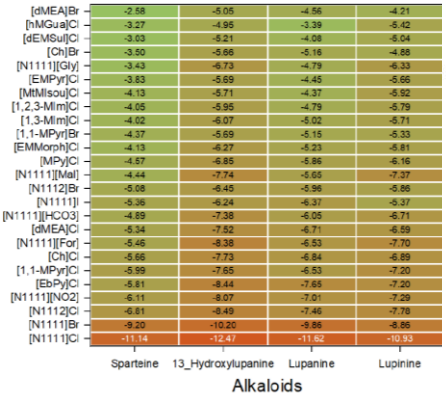
Use of **green solvents** as hydrotropes & $scCO_2$ co-solvents for improving the **debittering** of Andean lupin beans.

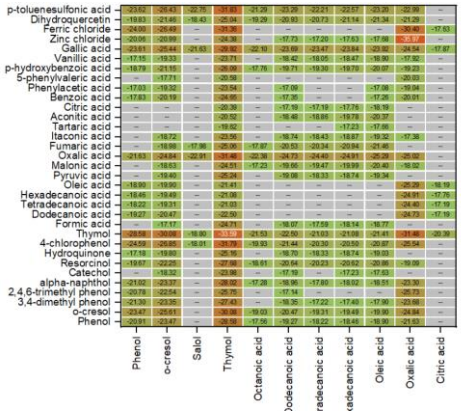
Results

COSMO-RS predictive tool was used to screen the dissolution behavior of QAs in alternative solvents:

Traditional solvents | **Ionic Liquids / Molten Salts** | **Eutectic mixtures**







COSMO-RS $\ln \gamma_{13}^{\infty}$ of QAs in different pure solvents at 298.15 K

Lower the $\ln \gamma_{13}^{\infty}$ value → Substances more mutually soluble → **Greater the solvent capacity**

- **COSMO-RS** is a useful **predictive tool** for the **screening** of ILs and eutectic solvents in lupin bean debittering;
- Preliminary results indicate the potential of **economic molten salts** and/or **terpene-based mixtures**, warranting experimental exploration.

The research aims to sustainably debitter Andean lupin beans using supercritical carbon dioxide and green solvents, enhancing food security, reducing water use and contamination, fostering innovation, and minimizing environmental impact.

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