EXTRACTION OF CAFFEINE FROM GUARANÁ SEEDS USING AQUEOUS IONIC LIQUID SOLUTIONS

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Abstract:

The separation and recovery of bioproducts from natural sources is, nowadays, a hot topic of research. The search for efficient and safer methodologies to these processes has led, in the past few years, to a rising interest in the use of ionic liquids (ILs) as greener alternatives to conventional and volatile organic solvents.

Caffeine, a well known alkaloid, with antibacterial and antifungal properties, is present in several natural sources, such as beans, leaves, and fruits. In these natural goods, caffeine acts as a natural biocide. In agriculture, common products used in the pest control present drawbacks to human health, namely, high toxicity and volatility that pose environmental concerns. In this context, caffeine could be used as a potential and environmentally safe repellent/toxicant for the control of pest on food crops. Therefore, the recovery and purification of caffeine from natural sources, as guaraná seeds, by cost-effective and environmentally-safe processes display an enhanced interest. Guaraná is a climbing plant particularly common in Brazil which possesses around twice the caffeine typically found in coffee beans.

In this work, aqueous solutions of ionic liquids were explored for the extraction of caffeine from guaraná seeds. Several operational parameters were investigated with the goal of achieving an improved process regarding the caffeine extraction. The parameters evaluated aiming at improving the extraction of caffeine from guaraná seeds were the ionic liquid structural features and concentration, contact time of extraction, solid–liquid ratio, particle size, and temperature of extraction. The experiments were performed according to a 2^3 factorial planning. The time of extraction (at least above 30 min) has a small influence through the amount of caffeine extracted, while smaller solid-liquid ratios, higher concentrations of ionic liquid, and temperatures around 70 °C, lead to improved extractions of caffeine. The data obtained revealed a high potential of ionic-liquid-based systems for the extraction of caffeine from natural matrices providing extraction efficiencies up to 10 wt % of caffeine from guaraná seeds.