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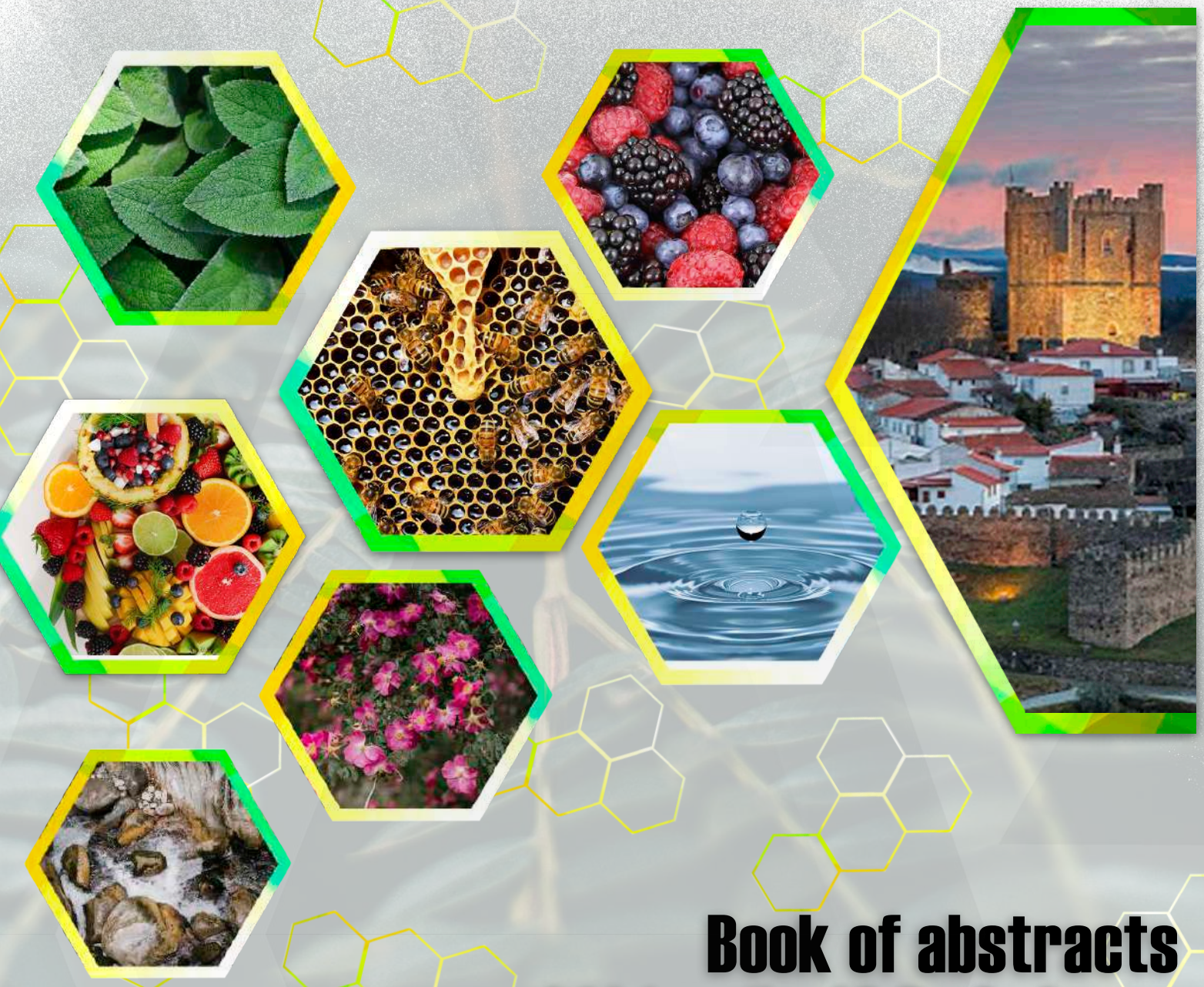

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OPTIMISATION OF A TANNIN-RICH EXTRACT USING RESPONSE SURFACE METHODOLOGY

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Tannins are a class of phenolic compounds commonly found in plants and studied for their *in vitro* bioactive and enzyme inhibitory properties [1,2]. *Cytinus hypocistis* (L.) L. is a wild edible parasitic plant on various Cistaceae family members, which biological properties (antioxidant, anti-tyrosinase, anti-inflammatory, and antimicrobial) have been correlated with its high tannin content. Thus, studying the extraction optimisation of tannins from *C. hypocistis* will give comprehensive clues for the enhanced recovery of these high added- value bioactive compounds and their potential cosmeceutical applications [2].

The present work used Response Surface Methodology (RSM) to optimise tannins extraction using both a conventional (Heat-Assisted Extraction – HAE) and a sustainable extraction method (Ultrasound-Assisted Extraction – UAE). Two three-factor Rotatable Central Compound Designs (RCCDs) were applied to evaluate the linear, quadratic, and interactive effects of the independent variables X_1 [*t*: time (min)], X_2 [*T*: temperature (°C) or *P*: ultrasonic power (W)], and X_3 [*S*: solvent ratio (% of ethanol/water, *v/v*)]. The software Design-Expert v11 was used to generate the 20 experimental runs by entering the factor ranges in alphas (α = 1.68). Each variable to be optimised was coded at five levels: -1.68, -1, 0, +1, and +1.68.

The constructed polynomial models were statistically validated based on high R^2 values and non-significant lack-of-fit and used to predict the optimal extraction conditions. The obtained results from both extraction systems revealed higher ethanol percentages as the critical factor for increasing the final response (mg total tannins/g extract). The optimum global processing conditions predicted by the models were 95 min, 46 °C, and 74% ethanol for HAE, and 18 min, 327 W, and 69% ethanol for UAE. Following these conditions, 234 mg and 175 mg of total tannins per g of extract were recovered using HAE and UAE, correspondingly.

Even though the HAE technique presented a higher final response, the UAE offers sustainable and economic advantages in time and energy consumption. These results confirm the scale-up potential of *C. hypocistis* as a valuable source of a tannin-rich extract.

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