Book of Abstracts

Transcolab Summit

Trend in grain-based foods

March 23-25th 2022

Title

Trends in grain-based foods

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ISBNs

978-972-745-299-6

Edition

Instituto Politécnico de Bragança (IPB) - 2022

5300-253 Bragança, Portugal

Tel. (+351) 273 303 382

http://www.ipb.pt

URL

http://esa.ipb.pt/graintrends/

RESPONSE SURFACE METHODOLOGY APPLIED TO ESSENTIAL OIL EXTRACTION OF EUCALYPTUS LEAVES

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Plant volatiles are secondary metabolites with a wide range of applications in several industries, namely the textile, food, pharma, and perfumery. These molecules are usually from three major groups, the terpenoid, phenylpropanoid/benzenoid and fatty acid derivatives group. This work focused on applying the response surface methodology technique towards optimizing the yield in essential oils of *Eucalyptus globulus* Labill, extracted by hydro distillation. For this, three factors were varied, namely the time of extraction (variation between 180 to 270 min), particle size (varying between 1 and 3 mm), and solid/liquid ration (varying between 10 and 50 g/L). The response recorded was the amount (g) of recovered essential oil. Using the optimization function, the optimal points were set at 260 minutes of extraction time, particle size of 1.2 mm and 50 g/L ratio. The model was significant, and the lack of fit was not, allowing for an R^2 of 0.9911 and an adjusted R^2 of 0.9777. Figure 1 shows the 3D charts of the response-surface.

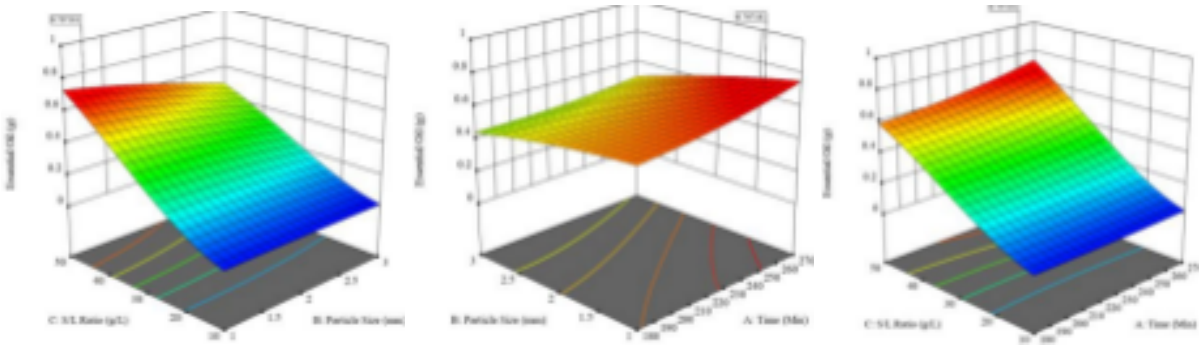

Figure 1- Response surface charts showing the optimal point, in which the amount of essential oil is maximized.

The model predicted that, at the optimal point, the yield in essential oils is 0.707 g, an amount above the one found in any of the 17 extraction conditions performed. Overall, the most important of the three factors was the solid to liquid ratio, showing that this factor accounts for most variations in the amount of pure essential oil, followed by particle size and finally, the least important factor, extraction time. This study allows an optimization of the extraction of essential oils from eucalyptus by showing that larger amounts of extract render more oil, as well as smaller particle sizes, while the extraction time has a low influence, thus allowing for shorter extraction times, which corresponds to lower energetic waste. The results herein are important for the food industry, specifically for new food additives, but also as flavorings for grain based foods.

Acknowledgments

The authors thank the foundation for Science and Technology for financing CIMO (UIDB/00690/2020) as also the research contracts of S. Heleno (CEECIND/03040/2017), L. Barros, and M. Carocho (CEECIND/00831/2018) and M.C. Pedrosa's PhD grant (SFRH/BD/2021.04531)