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Optimization of lavender essential oil extraction: Method comparison and identification of key parameters

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Essential oils, as mixtures of different organic substances, play an important role in several industrial fields. Lavender essential oil is one of the most widely used worldwide. Its calming effect and pleasant fragrance make it a key ingredient in many cosmetic products. Essential oils are industrially extracted from plant raw materials by various physicochemical processes. During these processes, it is critical to assess the importance of extraction and plant cultivation conditions to optimize essential oil yield and composition of lavender oil.

The aim of our study is to compare how plant cultivation conditions, as well as extraction methods and parameters, influence the composition of *Lavandula angustifolia* essential oil. Different regression models were employed to estimate the essential oil composition and yield as functions of plant rearing conditions and extraction methods, and quantify the importance of each predictor variable.

In our work, lavender oil obtained through supercritical fluid extraction (SFE) and steam distillation was analyzed. The relative importance of extraction methods and parameters along with environmental factors (average temperature, precipitation) on the essential oil yield and composition were ranked with the parameters of the fitted regression models. The results indicate that environmental factors significantly influence the quality of the essential oil. When comparing the two methods, it can be concluded that supercritical extraction is more advantageous in terms of both composition and yield. However, its industrial use for producing essential oils is still not widespread.