

## Pesticides in essential oils : analysis and regulation

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### I INTRODUCTION

Nowadays, about 3000 essential oils (EOs) are produced worldwide and are used every day more and more mainly in fields related to human consumption. Therefore it is essential to characterize their degree of contamination by pesticides, which is a very complex matter from both regulatory and analytical perspectives. As transformed products, no regulatory limits are established for pesticides in EOs. In addition, EOs are produced worldwide meaning the raw materials are exposed to a wide range of agricultural practices according to geographical origins. The variable regulations from one country to another regarding the use of pesticides makes very difficult to establish a pertinent list of pesticides to look for. If some publications already showed that EOs could contain some pesticides, they are limited either by the number of analyzed pesticides or samples, and mostly dedicated to citrus EOs. Therefore, very few public data are available regarding the state of contamination of EOs by pesticides.

### II MATERIALS AND METHODS

Through a review of the bibliography, we will try to go around the theme treated while focusing on the regulatory and analytical aspects.

### III RESULTS AND DISCUSSION:

- Very often, the presence of residues in organically produced EOs is the result of accidental contamination during production due to old or accidental contamination of the environment; it is rarely associated with fraud or non-compliance with organic production methods. As a reminder, organic farming is an obligation of means and not of results. The way in which EOs are processed, transported or stored can also lead to cross-contamination, or even the concentration of subsidiary contamination, which then becomes detectable.
- EOs, like all processed products (ready meals and others), are not on the list of foodstuffs for which MRLs have been set by legislation. To our knowledge, the only limits that may apply to EOs have been set by the US EPA for around forty pesticides, but only for citrus EOs.
- A list of 75 priority pesticides (active substances and derivatives) was drawn up during the collective action coordinated by the PASS competitiveness cluster. It was drawn up on the basis of 400 analysis reports collected from industrial partners. To our knowledge, this is the most comprehensive database to have been published to date.
- All the results collected, supplemented by the few data available in the scientific literature or at professional seminars, do not allow us to differentiate relevant lists of pesticides according to botanical and/or geographical origin.
- EOs obtained by expression, such as citrus EOs, seem to be subject to greater pesticide contamination (number and concentrations) than EOs obtained by distillation.

Generally, an LOQ is set to meet a regulatory requirement (typically to check that the residue does not exceed the MRL). With the LC-MS/MS and GC-MS/MS techniques conventionally used, we can expect LOQs of between 0.01 and 0.1 mg/kg (or ppm, i.e. between 10 and 100 ppb) for most pesticides and in most samples.



### IV CONCLUSION

The analysis of pesticides in EOs is a complex challenge whose results may present some variability. The analytical complexity comes from the great hydrophobicity of these phytochemical class of secondary metabolites, characterized by hundreds to thousands of compounds, but also by their great variety.

#### REFERENCES

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