**Cinnamon essential oil encapsulation: controlled release for biosourced pesticides**

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**Abstract**

The long-term harmful effects of synthetic pesticides are one of the major controversies these days. Following the objective of reducing the use of these products without decreasing crop yield, essential oils (EOs) are a prime candidate for biocontrol. However, high volatility of EOs begets a challenge: increasing the duration of efficient activity of EOs.

In this project, an innovative green matrix for essential oil retention is proposed. Indeed, glycerol carbonate surface-modified polypropilenimine dendrimers (GD-PPIs) have shown their ability to encapsulate some metallic complexes and organic compounds (Balieu et al., 2013; Menot et al., 2015). *Cinnamomum zeylanicum* Blume EO has been chosen for their herbicide properties (Lins et al., 2019). After the optimization of the encapsulation of cinnamon EO with GD-PPI-3 (Maes et al., 2021), the release profile of the formulation was study in different environmental conditions with a volatile collect system (figure 1).

Charcoal

Sample

Tenax

Pump

: Air flow

The optimal concentration of EOs encapsulation for germination inhibition of *Arabidopsis Thaliana* was first determined in closed and opened petri dishes: 0.125 and 3.6 mg per mL of GD-PPI-3 solution (2 mM) respectively. The release profiles of this optimized herbicide formulation express an initial burst followed by a controlled release of trans-cinnamaldehyde over 90 hours for all tested parameters (temperature, carrier matrix, storage). In addition, microscopy and granulometry showed a monodisperse droplet size distribution, which confirms the stability of the formulation. Finally, bioassays demonstrate the efficiency of the herbicide formulation on inhibition of germination of *Arabidopsis Thaliana* after a storage at room temperature in dark for 8 weeks (more than 60% inhibition) and on soil (60% inhibition).

Figure . Volatile collection system for the controlled release study

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