Optimisation of slow-release formulations as biological control devices

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Abstract

E-*β*-Farnesene, the alarm pheromone of many aphid species and *β*-caryophyllene, recently identified as one of the possible component of the aggregation pheromones of the Asian ladybeetles *Harmonia axyridis* Pallas, are considered as two sesquiterpenes attractive for aphids' predators and parasitoids, *Epysirphus balteatus* De Geer and *Aphidius ervi* Haliday, respectively.

In the present research, alginate gel beads formulations were optimised as semiochemical slow-release devices. The formulations were evaluated in terms of volatiles release capacity, protection efficiency of sesquiterpenes against oxidation, and biological activity towards *Epysirphus balteatus* and *Aphidius ervi*.

Moreover, the sesquiterpenes used in the formulations were obtained from natural matrices. Indeed, they were purified by flash chromatography fractionation of essential oils of *Matricaria chamomilla* L. and *Nepeta cataria* L., for obtaining *E*-*β*-farnesene and *β*-caryophyllene, respectively. The purities of the fractions were determined by means of a fast GC analytical method optimised for a good resolution of terpenes in less than five minutes.

The experiments can conclude that the alginate gel beads formulations are efficient as biological control devices considering the results obtained with the various biological tests led on predators and parasitoids. Moreover, the sesquiterpenes are more protected when formulated in alginate beads than without formulation. The devices allow also a slow-release of semiochemicals during a long time (at least 40 days) depending on physico-chemical parameters (temperature, relative humidity). A mathematical modelisation of semiochemicals release is presently in study.

Keywords : Semiochemicals; *E*-*β*-Farnesene; *β*-caryophyllene; biological control; slow-release formulations; aphids