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Keywords

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2. Materials and methods

3. Results and discussion

4. Conclusions

Acknowledgements

Appendix A. Supplementary data

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Figures and tables

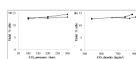
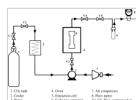
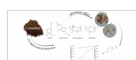


Table 1

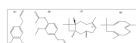


Table 2

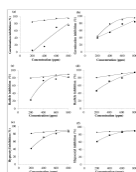


Table 3

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Chemical composition and phytotoxic activity of clove (*Syzygium aromaticum*) essential oil obtained with supercritical CO₂

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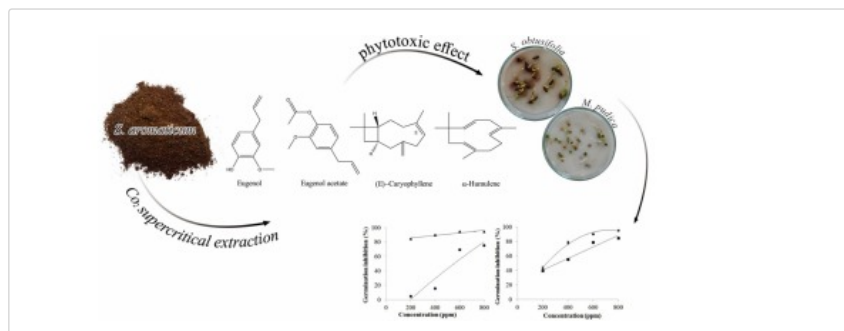
Highlights

- ☐ Different fractions of clove essential oil were obtained with supercritical CO₂.
- ☐ The highest mass yield was achieved at 50 °C and 300 bar.
- ☐ The species *M. pudica* had the greater inhibition of seed germination.
- ☐ The radicle and hypocotyl of *S. obtusifolia* were more resistant to the phytotoxic effects.
- ☐ Eugenol proved to be the main phytotoxic activity promoter.

Abstract

Clove (*S. aromaticum*) essential oils were obtained with supercritical CO₂ in the experimental conditions of 40 °C and 50 °C and pressures of 100, 200, and 300 bar. The oils were characterized by gas chromatography (GC) coupled to a mass spectrometer (MS). The phytotoxic effects of the fractions initially at 600 ppm were analyzed. From the results observed in the phytotoxic effect analysis, the fraction obtained in the condition of 50 °C and 300 bar was analyzed at concentration levels ranging from 200 to 800 ppm. The highest mass yield in dry basis (db) (14.49 ± 0.2%) was obtained at 50 °C and 300 bar. Over 99% of the volatile compounds were identified in clove essential oil, comprising 24 substances. In global means, 19.72% of the compounds are composed of sesquiterpene hydrocarbons, 19.79% of phenolic compounds, 0.59% of oxygenated sesquiterpenes, 59.75% of oxygenated monoterpenes, and 0.055% of other compounds. All fractions showed phytotoxic activity to inhibit seed germination and elongation of the radicle and hypocotyl. The best results were shown by the extract obtained at 50 °C and 300 bar. The results showed that eugenol plays an active role as a phytotoxic-activity-promoting agent. In terms of minimum concentration to inhibit 50% and 90% of seed germination and elongation of the radicle and hypocotyl, the extract obtained at 50 °C and 300 bar was the most effective.

Graphical abstract



Keywords

Supercritical fluid; Allelopathy; Inhibition; Weed; Seed; Radicle; Hypocotyl

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