

## In vitro allelopathic activity of *Saccharum officinarum* leaves

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Key words: *Saccharum officinarum*, allelochemicals, *Lactuca sativa*, *Calopogonium mucunoides*

### Abstract

Allelopathic potential of *Saccharum officinarum* leaves on *Lactuca sativa* L. and *Calopogonium mucunoides* (weed) was studied.

### Introdução

Allelopathy is defined as any process involving secondary metabolites produced by plants, fungi and microorganisms which, upon release into the environment, influence the development and growth of biological systems, including both inhibitory and stimulatory effects.<sup>1</sup>

The retention of sugarcane (*Saccharum officinarum*) straw on soil surface after harvest is a widespread practice in Brazil and other countries. Many benefits accrue from this practice, such as the reduction of weeds and erosion, increase in carbon sequestration, and supply of such nutrients.

This study aimed to identify compounds of sugarcane leaves having allelopathic activity on *Lactuca sativa* (lettuce) and *Calopogonium mucunoides*, an invasive weed of sugarcane crops. In order to support the application of sugarcane fractions as allelochemicals.

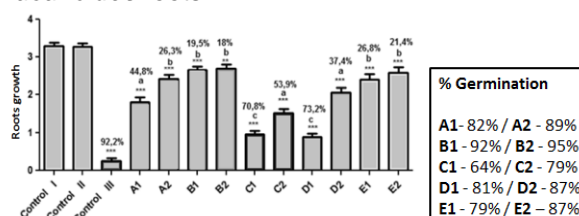
### Resultados e Discussão

The allelopathic potential of the crude extract, hexane, dichloromethane and ethyl acetate extracts, as well as the aqueous residue from *S. officinarum* leaves, was tested on the germination and radical length of lettuce (Figure 1).

The IC<sub>50</sub> value calculated for dichloromethane extract using lettuce as a species test was 62,94 µg/mL, which reveals great allelopathic potential of this extract.

Dichloromethane extract was subjected to GC/MS analysis and it was possible to identify the following as major constituents: 3,4-dimethoxy- and 3,4,5-trimethoxybenzoic acids, the alcohol (*E*)-5-isopropyl-6-methylhepta-3,5-dien-2-ol and the norsesquiterpene (*Z*)-4-(1-hydroxy-3-oxobut-1-enyl)-3-methylcyclohex-2-enone, *p*-methoxy-cinnamic and 3,4-methoxy-cinnamic acids, in addition to palmitic

acid. Because of its higher allelopathic activity in assays with lettuce, dichloromethane extract was chosen for the bioguided fractionation. It was chromatographed on a Diaion HP-20 column, and two fractions were eluted, Fr A (in ethyl acetate) and Fr B (in MeOH). Fr B was submitted to Sephadex LH-20 column chromatography, and fractions F1 (eluted in MeOH 100%), F2, F3, and F4 (eluted in MeOH:H<sub>2</sub>O, 1:1, v/v) were obtained. *Calopogonium mucunoides* was used as a test species for allelopathic growth assay with fractions from dichloromethane extract at 62.94 µg/mL (IC<sub>50</sub> previously calculated on lettuce). Fr B affected *C. mucunoides* germination (65% of seed germination) and growth. However, fractions F1, F2, F3 and F4, obtained from Fr B, had no significant effect on *C. mucunoides* roots.



**Figura 1. Effects of extracts on lettuce roots growth.** Control I= water; Control II= DMSO 0.1% in water; Control III= Menadione (143 µg/mL); A1-A2= crude extract (0.5-0.2 mg/mL); B1-B2= hexane extract (0.5-0.2 mg/mL); C1-C2= dichloromethane extract (0.5-0.2 mg/mL); D1-D2= ethyl acetate extract (0.5-0.2 mg/mL); E1-E2= aqueous residue (0.5-0.2 mg/mL).

### Conclusões

This work reported the allelopathic effect of sugarcane leaves that can be explained by the high content of cinnamic acid derivatives and palmitic acid in dichloromethane extract. Such compounds are widely reported in the literature as allelochemicals by altering permeability and protein functions of the cell membrane.

### Agradecimentos

CNPq

<sup>1</sup> Carmo, F. M. S. et al. Acta Bot Bras, 2007, 21, 697.