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Use of Cistus aqueous extracts as botanical fungicides in the control of Citrus sour rot

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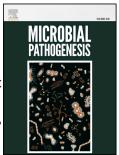
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### Use of Cistus aqueous extracts as botanical fungicides in the control of Citrus sour rot

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2

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### 11 Abstract

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- 12 In this work, we investigated the *in vitro* and *in vivo* antifungal activity of aqueous extracts obtained from eight
- 13 Cistus plant species against the development of *Geotrichum citri-aurantii*, the causal agent of citrus sour rot.
- 14 The results demonstrate the *in vitro* effectiveness of all tested Cistus species aqueous extracts against G. citri-
- aurantii, the inhibition of mycelial growth ranged between 80 and 100%. Furthermore, Cistus aqueous extracts
- totally inhibited germination of G. citri-aurantii arthrospores at a concentration of 5 mg/mL. Among the plant
- species tested, C. laurifolius, C. salviifolius, C. monspeliensis, C. ladanifer and C. populifolius displayed the
- best fungistatic activity since the minimum inhibitory concentration (MIC) was < 0.625 mg/mL. Under in vivo
- 19 conditions, incidence of sour rot was lowered to 8.33% when fruits were treated with aqueous extracts of C.
- 20 populifolius and C. creticus compared to 100% in the control. Disease severity was lowered to 3.74, 4.47 and
- 21 5.13 % when fruits were treated with C. creticus, C. ladanifer and C. populifolius aqueous extracts,
- 22 respectively. Using such these biopesticides in a replacement for synthetic fungicides or in combination with
- 23 other established disease management practices could help control citrus postharvest decay in a more
- sustainable and eco-friendly way.
- **Keywords**: Antifungal activity, *Cistus* plant aqueous extracts, Sour rot, *Geotrichum citri-aurantii*, Citrus fruit

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