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

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11 Abstract

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-*
15 *aurantii*, the inhibition of mycelial growth ranged between 80 and 100%. Furthermore, *Cistus* aqueous extracts
16 totally inhibited germination of *G. citri-aurantii* arthrospores at a concentration of 5 mg/mL. Among the plant
17 species tested, *C. laurifolius*, *C. salviifolius*, *C. monspeliensis*, *C. ladanifer* and *C. populifolius* displayed the
18 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
24 sustainable and eco-friendly way.

26 **Keywords:** Antifungal activity, *Cistus* plant aqueous extracts, Sour rot, *Geotrichum citri-aurantii*, Citrus fruit

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