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Herbicidal activity of essential oils extracted from different Mediterranean species against *Echinochloa crus-galli*

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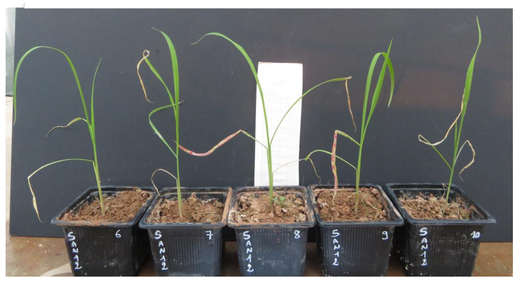
Introduction Echinochloa crus-galli (L.) P.Beauv. (barnyardgrass) is one of the greatest yields limiting weeds in rice cultivation systems. The success of this weed may be attributed to its resistance to herbicides. Thus, the best way to control it in a sustainable approach is to develop effective alternative means based on natural allelochemicals, such as essential oils (EOs).Recently, the interest in exploring EOs with phytotoxic effects from aromatic plants for weed control has increased.

Objectives To test the herbicidal activity of different EOs by foliar spray and irrigation modes of application in post-emergence on E. crus-galli plants.

Materials and Methods

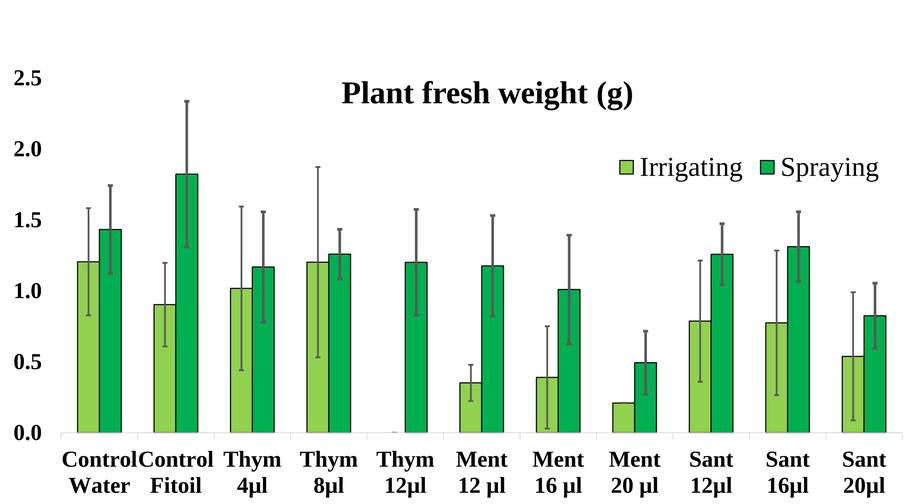
EOs extracted from Thymbra capitata (L.) Cav.; (Thym); Mentha x piperita L. (Ment) and Santolina chamaecyparissus L (Sant), were purchased from "Bordas Chinchurreta", "Sigma-Aldrich" and "Aromas de Ademuz"

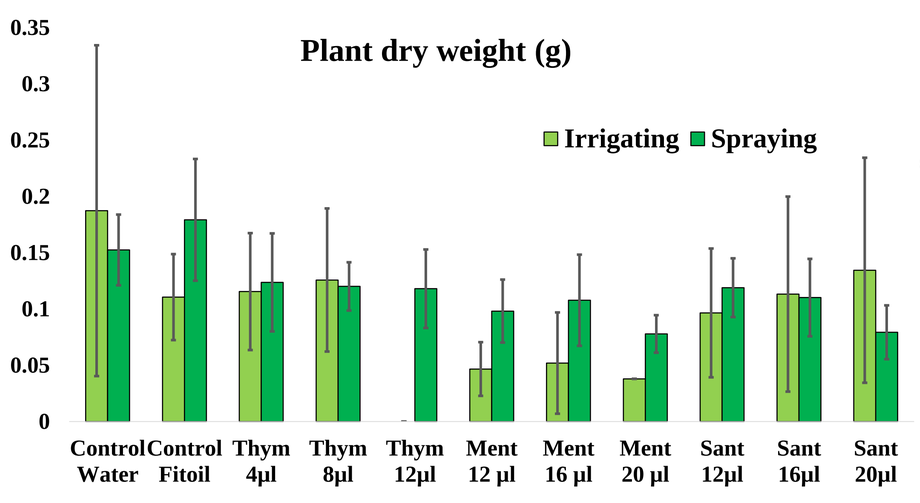
Experimental desing Ten pots (8x8x7 cm) per treatment were filled with 2 cm (7 g) of perlite at the bottom and 5 cm (220 g) of the topsoil from a *Citrus* field non treated with herbicides, air-dried and sieved at 1 cm. E. crus-galli seeds were germinated in a growth chamber at 30 ± 0.1 °C, 16 h in light and 20 ± 0.1 °C, 8 h in dark. Plants of barnyardgrass were treated at two-leaf stage by irrigating and spraying mode of application, different concentrations were used: 12, 16 and 20 µL/mL for Mentha and Santolina EOs and 4, 8 and 12 µL/mL for Thymbra EO. Fitoil was used as emulsifier at a concentration of 0.05% (v/v).

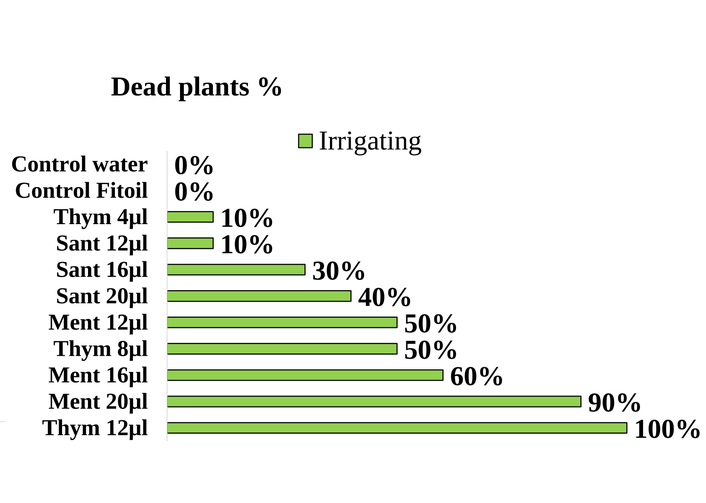


Plant analysis
-Treatment efficacy (died plants)
-Plant fresh weight
-Plant dry weight

Results and discussions







Remark: The plant fresh and dry weight was obtained only on alive plants.
Both plant fresh and dry weight were affected by all the treatments varying with the different doses, a high reduction was observed in the irrigating mode of application for the three used EOs, Thym EO showed the highest efficacy, followed by Ment EO and Sant EO respectively.
In the percentage of dead plants calculated for all the treatments by the irrigation mode of application can be observed that Thym EO applied at 12µl/ml showed 100% efficacy.

CONCLUSIONS

From all EOs tested, barnyardgrass plants were more affected by the EO extracted from T. capitata and M. piperita when they were applied irrigated at the dose of 12µl/ml and 20 µl/ml respectively. The results of dead plants showed that even the lower doses of the most effective EOs applied irrigated, which were 8 µl/ml and 16 µl/ml respectively, were able to reach 50% efficacy.
This work showed the importance of the mode of application of the EOs and demonstred the remarkable difference of the efficacy of the two modes, which can help to investigate more about the mode of action of the used EOs.

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