



# Herbicidal activity of essential oils extracted from different Eucalyptus and Citrus species against *Avena fatua*



A. Jouini<sup>1</sup>, A. Ioppolo<sup>1</sup>, R. Puleo<sup>1</sup>, A. Maaloul<sup>3</sup>, L. Badalucco<sup>1</sup>, V.A. Laudicina<sup>1\*</sup>,  
E. Palazzolo<sup>1</sup>, M. Verdeguer<sup>2</sup>

<sup>1</sup> Department of Agricultural, Food and Forestry Sciences, University of Palermo, Viale delle Scienze, Edificio 4, 90128 Palermo, Italy  
<sup>2</sup> Instituto Agroforestal Mediterraneo, Universitat Politècnica de València, Camino de Vera s/n, C.P. 46022 València, Spain  
<sup>3</sup> UR Environnement, Catalyse et Analyse des Procédés, École nationale d'Ingénieurs de Gabès, Université de Gabès, 6029 Gabès, Tunisia

\*e-mail [vitoarmando.laudicina@unipa.it](mailto:vitoarmando.laudicina@unipa.it)

**Introduction** *Avena fatua* L. is one of the ten worst annual weeds of agricultural regions of the world. Is one of the most important weeds in cereal crops. It could reduce annual crop yields by as much as 70%, is the fourth most resistant weed to synthetic herbicides in the world. It is important to control its interference but also preventing environmental pollution and health hazards by integrated weed management. Essential oils (EOs) are natural plant products, biodegradable. Some of them are classified as Generally Recognized As Safe (GRAS) for ingestion by the U.S. Food and Drug Administration's (FDA).

**Objectives** To test the phytotoxic potential of the EOs extracted from different *Eucalyptus* and *Citrus* species for the management and control of *A. fatua*.

## Materials and Methods

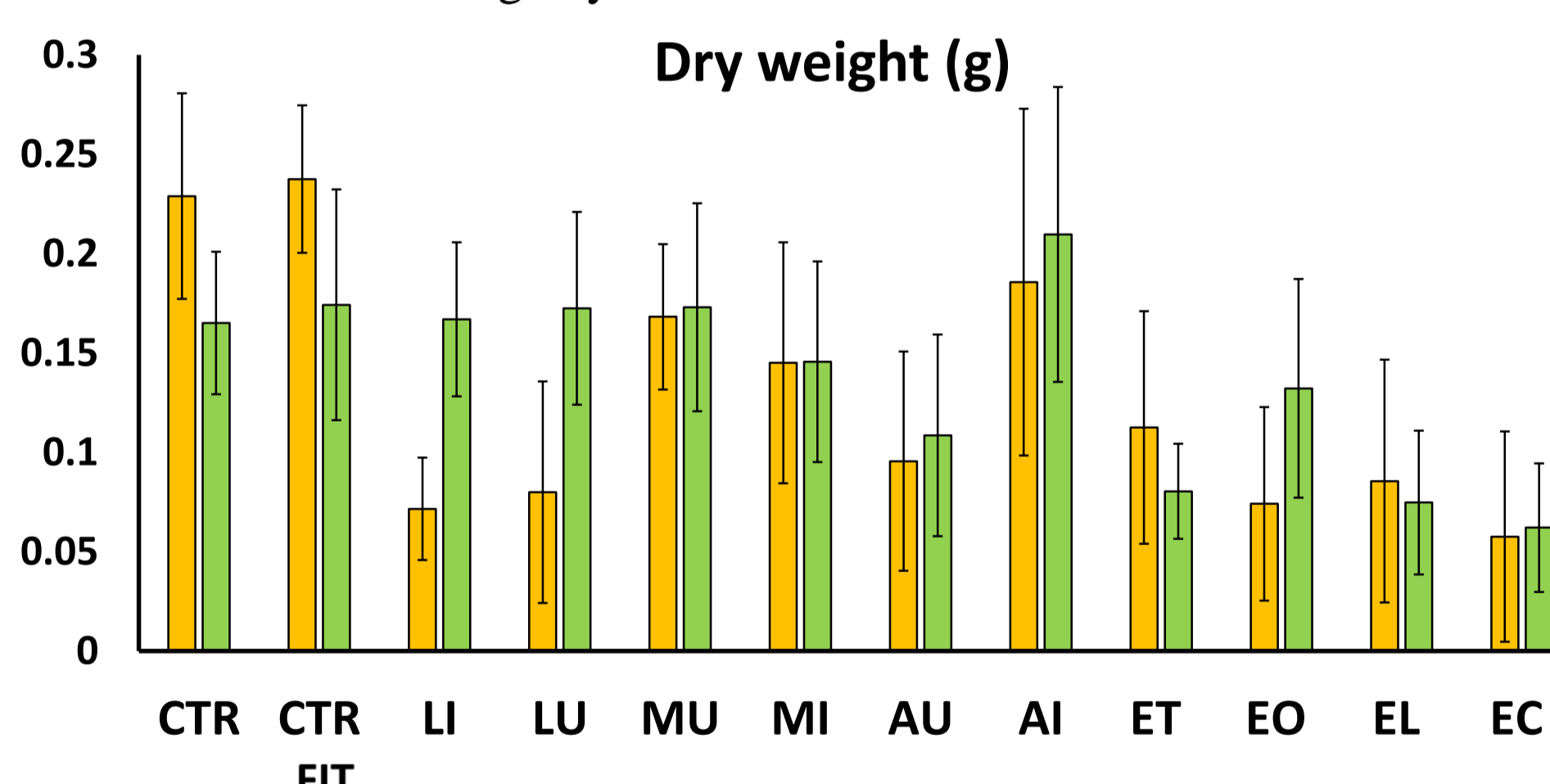
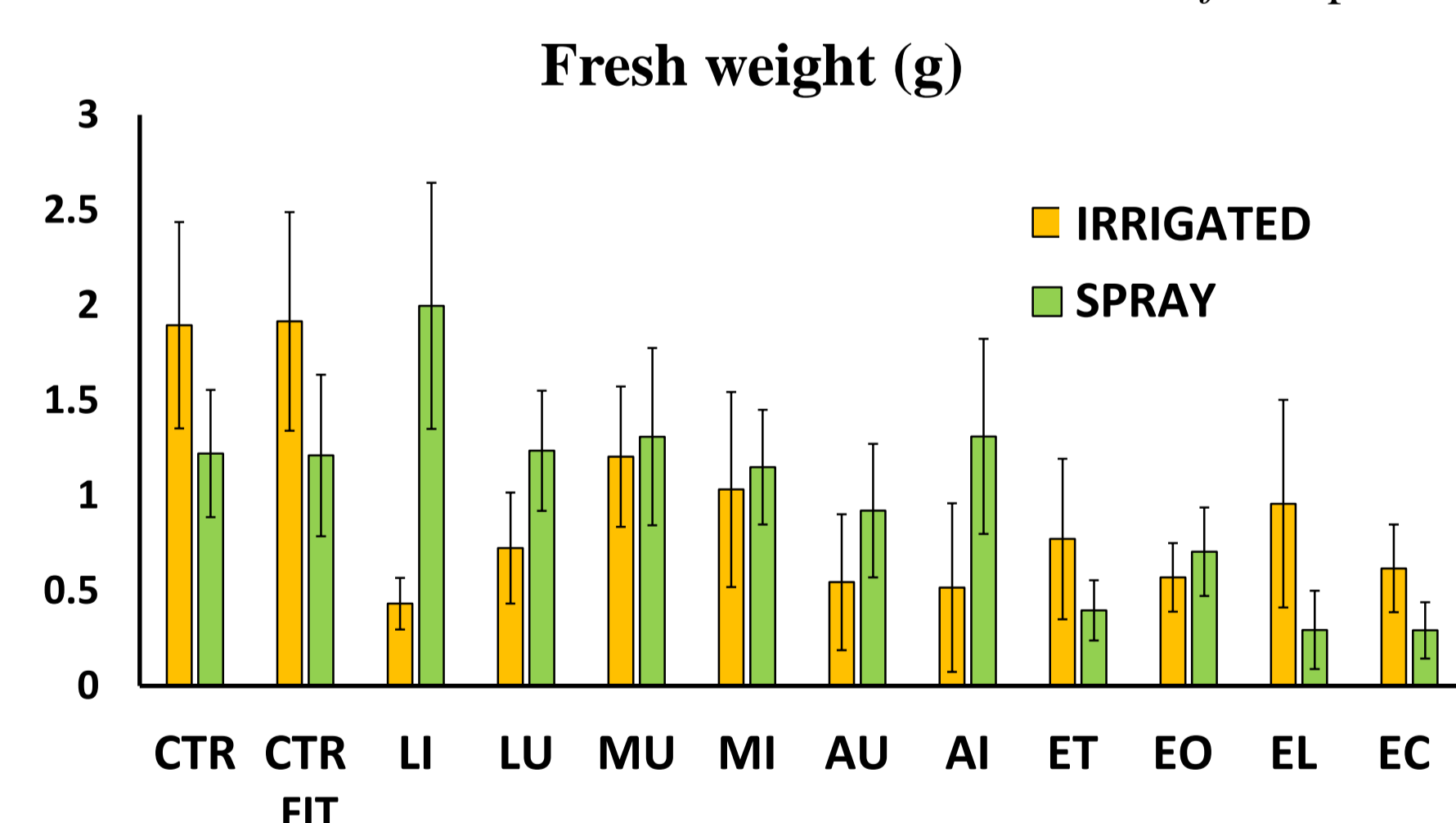


**EO's extraction** EO's from the fruit peel of three *Citrus* species *C. sinensis*, *C. limon*, *C. reticulata* were extracted by Clevenger-apparatus (hydrodistillation) (LU, MU, AU) and by cold pressing (LI, MI, AI). EO's from *Eucalyptus occidentalis* (EO), *E. camaldulensis* (E.C.), *E. lesouefii* (EL) and *E. torquata* (ET) leaves were extracted by Clevenger-apparatus method (hydrodistillation)

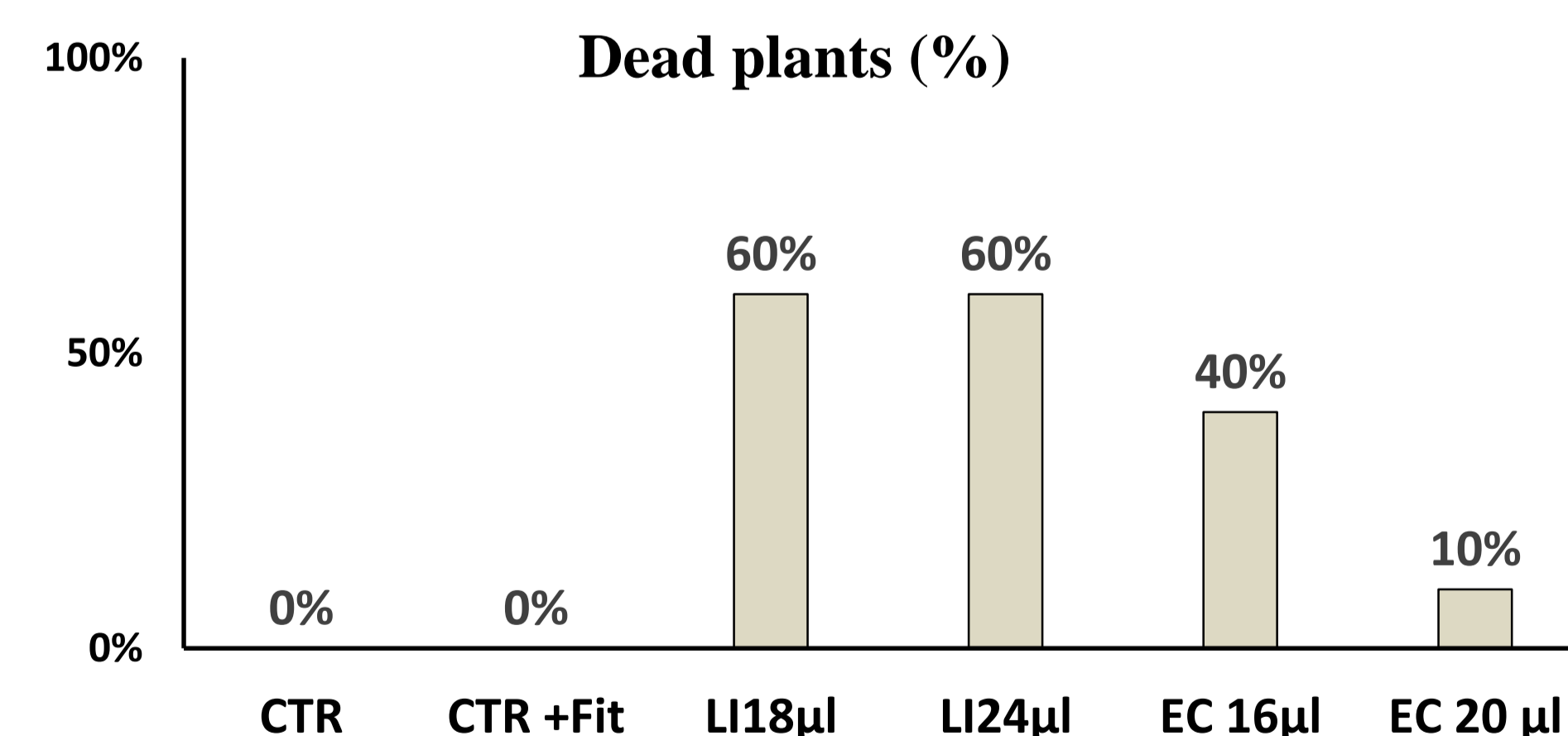
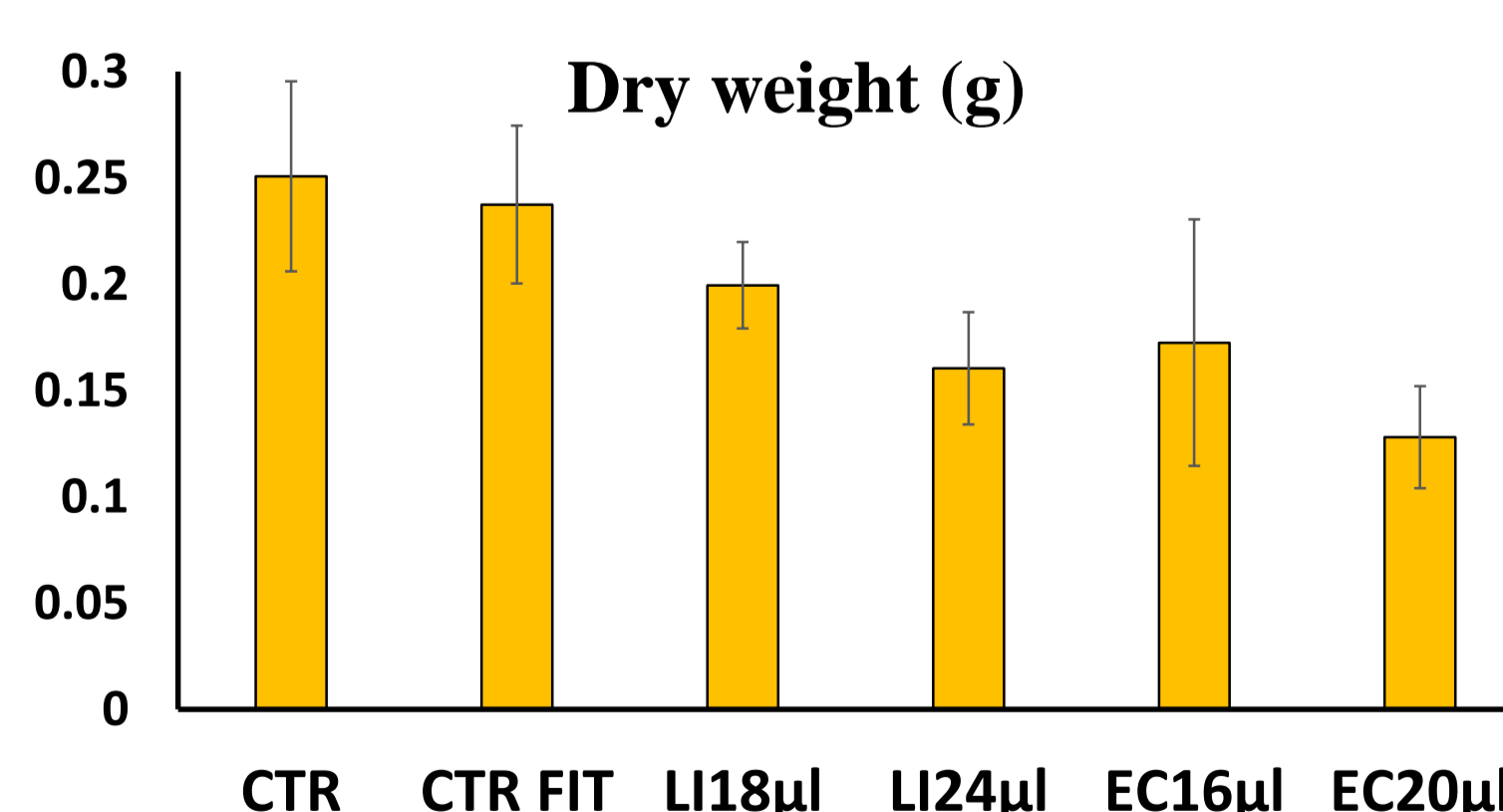
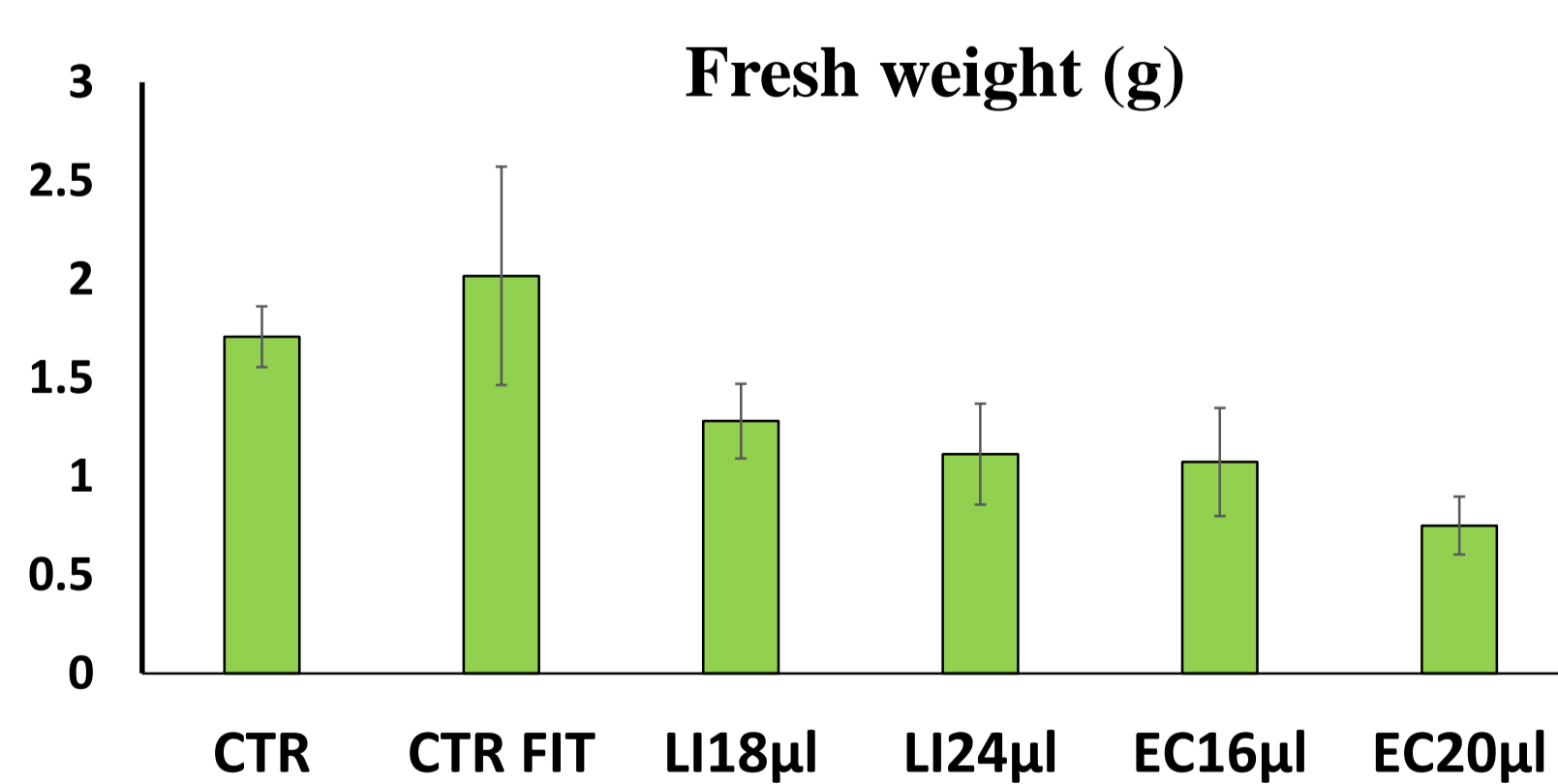
**Experimental desing** Ten pots (8x8x7 cm) per treatment were filled with 1 cm (7 g) of perlite at the bottom and 5 cm (220 g) of the topsoil from a *Citrus* field non treated with herbicides, air-dried and sieved at 1 cm. *A. fatua* seeds were germinated in a growth chamber. Five days after incubation, emerged seedlings were transplanted on the pots and placed in the greenhouse. The seedlings were treated with 12 µL/mL solution of all essential oils by two modes of application: irrigating and spraying. Then the best treatments were selected and the oils were applied at the doses of 16 and 20 µL/mL solution for *Eucalyptus* species and 18 and 24 µL/mL for *Citrus* species. Fitoil was used as emulsifier at a concentration of 0.05% (v/v). *A. fatua* plants were treated at two-leaf stage by.

### Plant analysis

- Treatment efficacy (died plants)
- Biometric measurement
- Plant fresh weight
- Plant dry weight



From the results of the first experiment LI and EC EOS were selected as they were the most effective with the irrigating mode of application at the dose 12 µL/ml. In order to gain more efficacy to control the plants, two higher doses from LI and EC were tested.



Plant fresh weight was affected by all the treatments. The lowest fresh weight, was obtained by EC with the dose 20 µl/ml.

Plant dry weight was affected by the highest doses tested for both essential oils.

For the percentage of dead plants, LI showed similarly effects with the two used doses, 18 µl/ml and 24 µl/ml while EC with 16µl/ml reached higher percentage respect of the higher dose 20 µl/ml.

## CONCLUSSIONS

- From all oils tested, *A. fatua* plants were more affected by the EO's extracted from *C. limon* and *E. camaldulensis* when they were applied irrigated at the doses of 12 µl/ml.
- The results of the percentage of dead plants showed that *C. lemon* was as effective at the two doses applied while EC was more effective with the lower dose. This result could be explained because the plants could not absorb well the compounds so concentrated. More research must be done on this aspect.