

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

**A. Jouini¹, A. Ioppolo¹, R. Puleo¹, A. Maaloul³, L. Badalucco¹,
V.A. Laudicina^{1*}, E. Palazzolo, M. Verdeguer²**

¹Department of Agricultural, Food and Forestry Sciences, University of Palermo, Viale delle Scienze, Edificio 4, 90128 Palermo, Italy

²Instituto Agroforestal Mediterraneo, Universitat Politècnica de Valencia, Camino de Vera s/n, C.P. 46022 València, Spain

³UR Environnement, Catalyse et Analyse des Procédés, École nationale d'Ingénieurs de Gabès, Université de Gabès, 6029 Gabès, Tunisia

E-mail: vitoarmando.Laudicina@unipa.it (Vito Armando Laudicina)

Weeds are a serious threat for crop yield and quality since they compete for water, light, soil nutrients and space. *Avena fatua* L. is one of the ten worst annual weeds of temperate agricultural regions of the world. It could reduce annual crop yields by as much as 70%. The main traits of this species include high fecundity, self-pollination, and variable degrees of primary seed dormancy. *A. fatua* is in the 4th position of herbicide resistant weeds in the world. It has developed resistance to eight different modes of action. .. The European legislation also supports weed control by means of Integrated Pest Management. It is important to manage *A. fatua* interference preventing environmental pollution and health hazards. Essential oils (EOs) are natural plant products, biodegradable, that contain natural flavors and fragrances. Some of them are classified as Generally Recognized As Safe (GRAS) for ingestion by the U.S. Food and Drug Administration's (FDA). EOs from *Eucalyptus* and *Citrus* species had shown strong inhibitory effects on germination of seeds of many crops and weeds. Besides, each species was demonstrated to have different biological activity. The aim of this study was to verify the phytotoxic potential of the EOs extracted from different *Eucalyptus* and *Citrus* species for the management and control of *A. fatua*.. EOs were obtained by hydrodistillation from leaves of four *Eucalyptus* species (*E. camaldulensis* Dehnh., *E. lesouefii* Maiden, *E. occidentalis* Endl., *E. torquata* Luehm.) growing wild in Sicily and Tunisia and from peel fruits of three *Citrus* species (*C. sinensis* (L.) Osbeck, *C. limon* (L.) Osbeck, *C. reticulata* Blanco) from Sicily. The experiments were performed *in vivo* applying essential oils in postemergence, irrigated and sprayed. Soil for the experiments was collected from the topsoil (<5 cm) of a citrus field non treated with herbicides, air-dried and sieved at 1 cm. *A. fatua* seeds were purchased from Herbiseed (England), and germinated in a germination-growth chamber during April and May 2018, at 23.0 +/- 0.1 °C, 8 h in light and 18.0 +/- 0.1 °C, 18 h in dark. Once the seedlings of *A. fatua* emerged, they were placed on pots (8x8x7 cm) previously filled with 2 cm of perlite and 5 cm of soil. Ten replicates per treatment were prepared. Pots were placed in the greenhouse of the UPV. In order to find the most effective dose of EOs and its adequate mode of application, different concentrations were used: 12, 16, 20 µL/mL for *Eucalyptus* species and 12, 18, 24 µL/mL for *Citrus* species. Fitoil was used as emulsifier at a concentration of 0.05% (v/v). Plants

of *A. fatua*, were treated at two-leaf stage, using two methods: irrigating and spraying. To monitor the experiments, photos were taken after 24, 48 and 72 hours; and then once a week. The photos were processed with Digimizer software to take different data: efficacy of the treatment, level of damage, height of plants.