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

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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 word.
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* Luehlm.) 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
reated 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.