Phytotoxic potential of Citrus essential oils on weed species

Ioppolo A.[1], Jouini A.[1], Laudicina V. A.[1], Palazzolo E.[1], Verdeguer Sancho M. [2]

[1]Dipartimento di Scienze Agrarie, Alimentari e Forestali, Università degli Studi di Palermo Viale delle Scienze – edificio 4, 90128 Palermo, Italia

[2]Agroforestal Mediterranean Institute, Uiniversidad Politécnica de Valencia Camino de Vera, s/n Edificio 3H, 46022 Valencia

Environmental constraints of crop production systems have stimulated interest in alternative weed management strategies. In fact, the continued use of synthetic herbicides may threaten sustainable agricultural production and has resulted in serious ecological and environmental problems, such as the increased incidence of resistance in weeds to important herbicides and increased environmental pollution and health hazards. Public awareness and demand for environmentally safer herbicides with less persistence and less contaminating potential make searches for new weed control strategies.
Citrus Essential oils are generally used in the cosmetic, medicinal, and food industries, and are thought to be safe compounds for humans, animals, and the environment. EOs can be extracted by hydro distillation and cold pressing. The two methods are based on different procedures. Hydro distillation is carried out with a Clevenger-apparatus that conducts the distillation process by boiling, condensing and decantation to separate the EOs. The cold pressing consist of crushing and pressing the peels thus leading to the formation of a watery emulsion. Then, the emulsion is centrifuged to separate out the EOs. Since no external substance are needed, this process ensures that the resulting EOs retains all their properties.
The allelopathic and phytotoxic effects of EOs obtained from other species and their potential use for weed management has been well documented.
The objectives of this study were to evaluate in vitro the phytotoxic effects of *Citrus* EOs (*Citrus sinensis*, *Citrus limon* and *Citrus reticulata*) extracted by hydro distillation and cold pressing on main weed species (*Amaranthus retroflexus, Portulaca oleracea., Echinochloa crus-galli, Avena sativa*). For all EOs six concentrations were tested (0.5, 1, 2, 4, 8, 12) µl/ml and 5 repetitions with 20 seeds each (for dicotyledons) or 10 repetitions with 10 seeds each (for monocotyledons) were performed. They were applied for one hundred seeds for concentration.
Twenty seeds were placed into 9 cm diameter Petri dishes for *Amarantus* and *Portulaca*. In each Petri dish, 5 ml of distilled water were added. This volume kept the filter papers uniformly soaked-wet without flooding. For *Avena* and *Echinocloa* ten seeds were placed into petri dishes and 6 ml of distilled water was added. The essential oil was placed in a sheet of filter papers in contact with the seeds. The controls were prepared with the same quantities of distilled water. Petri dishes were incubated in the room germination (EQUITEC) at 20/30 °C (±1 °C), alternating temperature (6/18 h dark and light (cool white Radium NL 36W/840; 3100 lm)). Dishes were sealed to reduce evaporation, and no more additional water was supplied during the tests. To evaluate the possible phytotoxic effects of the essential oils and their main compounds on seed germination and seedling growth data were registered by taking photos after 3,5, 7, 10 and 14 days after incubation and will be processed using Digimizer. Then data will be analysed and discussed.