

IN VITRO AND IN VIVO ANTIFUNGAL ACTIVITY OF TEA TREE (*MELALEUCA ALTERNIFOLIA*) AND THYME (*THYMUS VULGARIS*) ESSENTIAL OILS AGAINST SOME PATHOGENIC SEEDBORNE FUNGI

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In recent years interest has grown in developing alternative measures to chemicals for crop protection, including the use of plant extracts (Tinivella *et al.*, 2007). Many studies have been mainly focused on the pharmacological actions of essential oils derived from aromatic and medicinal plants due to their antimicrobial and antioxidant properties. Among them, tea tree (*Melaleuca alternifolia* Cheel) and thyme (*Thymus vulgaris* L.) oils have been reported to possess antifungal activity (Terzi *et al.*, 2007; Pina-Vaz *et al.*, 2004; Carson *et al.*, 2006) and to be the most interesting in agriculture due to their effectiveness, low cost and availability. Seed borne diseases represent a critical problem for successful production, especially in organic farming systems, where less efficient plant protection agents are available for managing plant diseases. The aim of this study is to test the efficacy of those two essential oils for seed treatments against some important pathogenic seed borne fungi, e.g.: *Fusarium graminearum*, *F. culmorum*, *Drechslera avenae*, *Alternaria radicina*, *A. dauci*, *Ascochyta rabiei*, *Colletotrichum lindemuthianum*.

Here we present the results of the antifungal activity of the two oils, through *in vitro* and *in vivo* assays. The mycelial growth was evaluated on solid PDA medium amended with TTO and TO up to 1% v/v. Results confirm that both the oils have a clear reducing effect on fungal growth, as already reported in literature, with TO to be the most potent agent against all the fungi. The efficacious concentration, that causes no mycelial growth, was determined for each couple pathogen/oil to obtain the minimum effective concentration that produce the desired effect on the whole group of pathogens: 1% for TTO and 0.25% for TO.

To perform *in vivo* analysis, the two essential oils were applied as liquid seed treatments on naturally infected seeds of a durum wheat cultivar. Stocks of seeds were treated by immersion in solutions prepared with sterile distilled water at different concentrations of the oils. Seeds treated with sterile distilled water and untreated seeds were used as control. Seeds were analysed using blotter test method, to determine seed infection after treatment and evaluate treatment efficacy against the pathogens. Moreover, in order to evaluate essential oils phytotoxicity, germination tests were performed on durum wheat seeds by dipping the seeds for 30 min in a solution with different oil concentrations.

The results showed that tea tree oil had a good activity against the fungi with

a very low toxicity even at the maximum concentration investigated (2.5%), as it did not inhibit seed germination; on the contrary, thyme oil is very effective against the fungi present on the seeds even at very low concentration (0.1%), but is also very toxic because it inhibits the seeds germination for more than 50% if applied at concentration of 0.3 %. The identification of the best solution concentration of the thyme oil, which combines the highest antifungal activity and the lowest toxic effect, is in progress.

Key words: Essential oils, Antifungal activity, Seed, Seed treatment

Acknowledgements

This study was carried out within the programme PRO.BI.SE.BIO. 'Protezione della vite e delle sementi in agricoltura biologica', and financed by the Italian 'Ministry of Agricultural, Food and Forestry Policies'.

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