



UNIVERSITÀ DI PISA



Scuola Superiore  
Sant'Anna

di Studi Universitari e di Perfezionamento

*Corso di Dottorato Congiunto/Joint PhD Course in  
SCIENZA DELLE PRODUZIONI VEGETALI (CROP SCIENCE)*

**Artificial growing system of sweet basil  
(*Ocimum basilicum* L.) for agro-industrial  
production of secondary metabolites**

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## PREFACE

*Medicinal plants, including sweet basil (Ocimum basilicum L.), are commonly cultivated in open field and used worldwide mainly for culinary purposes. Though generally employed for food preparations, sweet basil is also an important source of bioactive compounds, such as essential oils and antioxidant phenolics, and can be used for cosmetic, herbal, medicinal and plant protection products. Among phenolics, rosmarinic acid (RA) is one of the most abundant compound contained by sweet basil tissues.*

*The general aim of this PhD thesis was to develop a cost-effective artificial cultivation techniques of sweet basil for RA extraction. Both in vitro and in vivo (greenhouse hydroponics) systems were investigated. Several experiments were conducted in order to identify the optimal growing conditions that maximize both biomass production and RA accumulation in plant tissues.*

*In addition, in the third year of the doctorate a study was initiated under the supervision of Dr. Tommaso Giordani (Department of Crop Plant Biology, Genetics Section, University of Pisa, Italy) to investigate the RNA expression levels of genes encoding key-enzymes involved in the biosynthesis of RA and other caffeic acid derivatives in sweet basil. The results of this work were not exhaustive and thus were not included in this thesis.*

*The analytical method applied for RA and other caffeic acid derivatives identification was developed in collaboration with Dr. Andrea Raffaelli (Institute for the Chemistry of Organo Metallic Compounds (ICCOM), National Council of Research (CNR), Pisa, Italy).*

*The manuscript is structured in six chapters. Along with general introduction and conclusions, four chapters were prepared, each reporting the results of specific study conducted in vitro and/or in vivo. Chapter 2 corresponds to an article published in 2011 (Kiferle C, Lucchesini M, Mensuali-Sodi A, Maggini R, Raffaelli A, Pardossi A. - Rosmarinic acid content in basil plants grown in vitro and in hydroponics. Cent. Eur. J. Biol. 6: 946-957, DOI: 10.2478/s11535-011-0057-1), whereas Chapter 3 and 4 report two papers recently submitted for publication to international journals.*