

## NEW TECHNOLOGIES FOR THE REDUCTION OF ENVIRONMENTAL IMPACTS

There is a growing interest in environmental protection and the rational use of resources. Three main strategies are currently used: soilless cultivation, integrated pest management, study of the soil biomass. The aim is to improve water management, to refine the use of fertilizers and pesticides, and to acquire a better knowledge of plant-soil interactions. To this end, fungal diseases and insect pests are treated with low toxicity substances of natural origin in combination with alternative defense strategies. Integrated pest management with low environmental impact is one of such strategies and its introduction in agricultural practice is recommended. The main research themes in this field are:



- ❖ Identification of plant derived molecules that can be used as pesticides with low environmental impact
- ❖ Use of associated antagonistic microorganisms and natural products for pest management

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The Agricultural and Economic Research Council (**crea**) is an Italian Public Research Organization supervised by the Italian Ministry of Agriculture with expertise in agriculture, agroindustry, fisheries, forestry, nutrition and economy. The **Ornamental Plant Research Unit (crea-fso)** is one of the **crea** structures spread on the Italian territory and it derives from the Experimental Institute of Floriculture. **Crea-fso** deals with recovery, enhancement and genetic improvement of vegetable crops and species of ornamental interest. It promotes agricultural science

for the sustainability of horticultural and ornamental crops and nursery productions in open field and in greenhouses. It carries out studies on the safety of fresh vegetable foods cultivated in open field and protected environments. It analyzes the use of natural substances, antagonistic microorganisms, compost and derivatives to protect species of interest in horticulture and floriculture from pest attacks. Education and training are implemented through internships, PhD, organization of thematic courses.

### THE STAFF

Currently, about forty people are working at the Unit, including researchers, PhD and graduate students, Italian and foreign visitors, administrative staff and field workers.

### RESEARCH ACTIVITY

**Crea** research lines are in compliance with the agricultural policy of the European Union and with Italian national and regional policies. The research activities are also directed to support the demands of local farmers and stakeholders. The results are disclosed in scientific publications on national and international journals and with congress presentations. Dissemination takes place through articles in specialized magazines and through the organization of open days and thematic events. **Crea-fso** collaborates with University Institutions and national and international Research Centers.

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## MAIN RESEARCH LINES

### DIVERSIFICATION OF ORNAMENTAL PRODUCTION

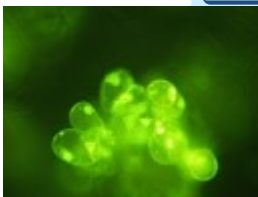


The introduction of new varieties represents one of the most important strategies to compete on the national and international market of ornamental productions. The exploitation of unknown native and exotic species is fundamental for the development of new ornamental products characterized by aesthetic and olfactory characters, good agronomic performances and adaptation to mediterranean climate. The main activities of this research line are:



- ❖ Maintenance of collections and germplasm characterization of *Salvia*, *Rosmarinus*, *Helichrysum*, *Viburnum*, *Hibiscus*, *Passiflora*
- ❖ Introduction of new species and varieties from South Africa (*Lachenalia*, *Protea*, *Leucospermum*)
- ❖ Agronomic and ornamental evaluation of introduced plant material
- ❖ Study of new products derived from old cultivars (Rose)
- ❖ Design of propagation and cultivation protocols for new species and varieties
- ❖ Selection of new cultivars with peculiar ornamental and aromatic characters

### SECONDARY METABOLITES IN AROMATIC PLANTS



The aromatic plants are rich in secondary metabolites, structurally diverse chemical compounds having curative, antimicrobial and preservatives effects. By studying these plants it is possible to identify new molecules, to select genotypes and chemotypes, to apply *in vitro* culture and molecular technologies to enhance the production of several compounds: poliphenols, diterpenes and essential oils. The research themes are:

- ❖ Micropropagation and tissue culture of aromatic species (*Salvia* and *Rosmarinus*)
- ❖ Use of molecular technologies to increase the production of secondary metabolites.
- ❖ Production of secondary metabolites through cell suspension cultures and bioreactors.



## BIOTECHNOLOGIES FOR ORNAMENTAL SPECIES

New basic knowledge in the field of plants genetics, structural and functional genomics and biotechnology help to understand complex events such as developmental and metabolic processes, plant-pathogen interaction, resistance to abiotic stress. Current research focus on the following topics:

- ❖ Functional genomics of asexual reproduction
- ❖ Molecular detection of pathogens
- ❖ Genotypic identification through molecular markers
- ❖ Genetic mapping
- ❖ New technologies to improve propagation efficiency



### GENETIC IMPROVEMENT FOR CULTIVATION IN MEDITERRANEAN ENVIROMENT

Knowledge derived from innovative technologies combined with classical approaches like vegetative propagation, mutagenesis, somaclonal variation, polyploidy, androgenesis, interspecific hybridization, provides great potential for genetic improvement to establish new ornamental varieties. These varieties are characterized by good production performances, resistance to stress and reduced production requirements (energy, water, fertilizers, pesticides). The main topics of this research line are:

- ❖ Establishment of F1 hybrids through androgenesis (*Anemone*)
- ❖ Genetic improvement and exploitation of *Hibiscus x rosa-sinensis*, *Passiflora*, *Hippeastrum*, *Zantheschia*



### PLANT BIOMASS EXPLOITATION

Agriculture, urban green and selected uncultivated land are source of plant biomass that can provide biofuel or long term carbon storage. To pursue key objectives in this field two main research lines were undertaken:

- ❖ Transcriptome analysis and functional genomics of *Arundo donax* and *Kalanchoe x houghtonii*
- ❖ Dissemination of technologies for compost and bio char production and exploitation