RESEARCH AND DEVELOPMENT FOR NEW FERTILIZERS AND BIOSTIMULANTS

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ABSTRACT

The research group Agricultural Chemistry of the University of Alicante has extensive knowledge and experience in the development of new fertilizers, biostimulants, iron chelates and inductors for plant defense system. It also has plant growth chambers, greenhouses and scientific-technological equipment to carry out different types of analysis.

We offer our services to companies interested in developing R&D&i, specific training related to the research and any scientific and technical support.



TECHNICAL DESCRIPTION

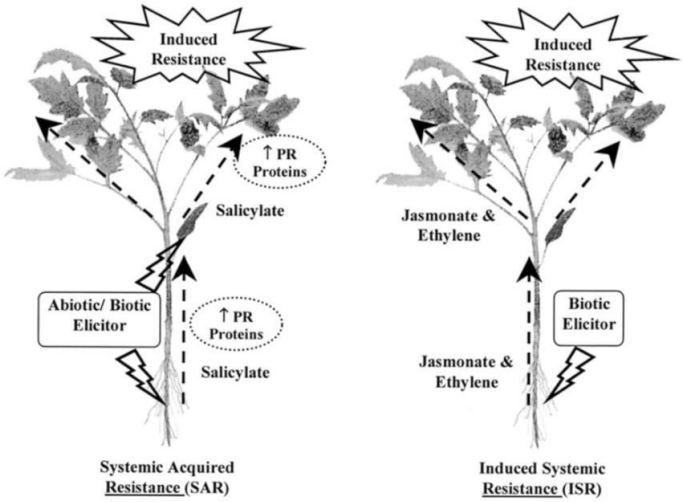
The research group of Agricultural Chemistry of the University of Alicante is composed by a young and multidisciplinary team committed to finding the most appropriate solutions to problems and technical needs related to the agricultural chemistry, such as scientific and technological solutions:

- Improving plant nutrition.
- Optimization of plant growth.
- Plant physiological action of biostimulants (humic substances and amino acids) and its impact on the mobilization of nutrients in the soil.
- Study of effectiveness of chelates of micronutrients, especially iron.

The main research lines of the group are:

1) Biostimulants: Any improvement in the agricultural system that produces an increase in harvest should reduce the environmental impact of agriculture and improve the sustainability of the system. In the last years, there has been widespread the use of biostimulants obtained from different organic materials, such as peptides, amino acids, polysaccharides, humic acids, phytohormones, seaweed extracts... They can be absorbed by plants and soil microorganisms, developing a positive effect not only on growth but also on quality and crop production. The purpose of these products is not provide nutrients but enhance and stimulate plant metabolism and reducing the effects of abiotic and/or biotic stress on plants. It is leading to the development of new biostimulants by the industry. In addition, these products are developed with an initial idea: to reduce the environmental impact of agriculture.

2) Development of inductors immunological system in plants: the mechanisms of plant defense against pathogens and pests has revealed the existence of defense systems based on the recognition by membrane receptors or intracellular molecules characteristic of pathogens, which determines the activation of inducible defense barriers. These defense mechanisms are systemic, i.e. not only activing the tissue where the recognition of the pathogen/pest occurs, but also in the rest of the plant that has not been exposed to infection. This systemic response protects the plant against further attack of pathogens/pests. This property has a very interesting potential agronomic application.



Mechanisms of plant response to biotic and abiotic stress: System Induced Resistance (ISR) and System Acquired Resistance (SAR) (Vallad and Goodman, 2006).



Activation System Acquired Resistance in tomato plants by bacteriosis.

3) Improving the effectiveness of chelates of micronutrients, particularly iron: iron chlorosis traditionally has been the main nutritional disorder in crops grown in calcareous soils, although we must also consider the effects of the lack of other micronutrients as zinc and manganese. These deficiencies are particularly important in fruit and vegetables, causing losses in plant growth, harvest and quality loss in crops. In these cases, the micronutrient application to the soil or foliarly becomes practically mandatory. For iron, synthetic chelates, especially FeEDDHA have been the most effective solution, however low biodegradability in soil has sparked interest in finding solutions equally effective, but sustainable. In recent years, research on correcting micronutrient deficiencies have focused on three ways mainly:

- Development of new fertilizers (including controlled release fertilizers, compatible fertilizers with the environment and development fertilizer with high purity).
- Study implementation strategies.
- Development of new methods of analysis of compounds of more specific and sensitive iron, including NMR.

For the development of the different research lines, our group has:

1) **Plant growht chamber** of seedlings in conditions of light, temperature and humidity controlled. This type of camera is best suited for short essays (e.g. for product evaluation, etc.).

2) **Greenhouse** for experiments of longer duration. It is also possible to control all growing conditions (light, temperature, humidity, etc.).

3) **Technical Services Research** of University of Alicante, where the main analytical techniques and the most modern equipment are met, including:

- High performance liquid chromatography (HPLC).
- Emission spectroscopy inductived coupled plasma (ICP-OES).
- Thermal analysis (TG, DTA).
- Mass spectrometry (MS).
- Elemental analysis.
- IR and UV spectroscopy.
- Microscopy Unit.
- Nuclear Magnetic Resonance (NMR).
- X-Ray Analysis



Plant growth chambers at the University of Alicante





Greenhouse at the University of Alicante

CURRENT STATE OF DEVELOPMENT

After more than twenty years of research, our group is enoughly consolidated to implement any project successfully. This is borne out with more than 20 projects in different public research organisms and 11 private companies.

MARKET APPLICATIONS

The research lines have allowed us to have a broad knowledge of:

- Analysis, improvement and development of fertilizers (humic substances, amino acids, chelates, etc.).
- Characterization and study of humic fractions and iron complexes.
- New and complex iron chelates.
- Analysis of soils.
- Foliar analysis.
- Water analysis.
- Validation of commercial products.
- Recycling of organic waste in different types of agriculture: tropical, Mediterranean, sustainable, etc.
- Key aspects of the behavior of organic matter.
- Seaweed extracts.

- Resistance of plants to salinity.

COLLABORATION SOUGHT

- Research and development projects with the aim of opening new lines of work or implement new technological developments.
- Technical support and scientific consulting.
- Specific training in: agricultural chemistry, plant nutrition, fertilizers, bio-activators, inducers of plant defense system, etc.
- Technical support in those techniques that require high qualification or sophisticated instruments that are not available to the applicant.

INTELLECTUAL PROPERTY RIGHTS

The technology is protected by the know-how of the research group.

MARKET APPLICATION (6)

Agri-food and Fisheries
Biology
Molecular Biology and Biotechnology
Pollution and Environmental Impact
Geological and Geophysical Studies
Chemical Technology