IMPROVING CROP PRODUCTIVITY

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RESUMEN

The research group Applied Plant Physiology of the University of Alicante has an extensive knowledge and experience in the analysis of nutrients in plants and its interpretation, use of mycorrhizal fungi as biofertilizers and bioprotectors against diseases, as well as rules for nutritional diagnosis of crops.

Companies interested in receiving specific training or who wish to develop new products and R&D projects could contact with us.



DESCRIPCIÓN TÉCNICA

The research group Applied Plant Physiology of the University of Alicante consists of a multidisciplinary team, with extensive experience in irrigation and crop production, ecophysiology and nutrition, engaged to search for the most appropriate scientific and technological solutions to solve the problems and technical needs related to the plant physiology:

1. Analysis of nutrients in plants and their interpretation.

The research group performs **analysis of plant nutrition** (macro elements such as: nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, etc., microelements and organic molecules), and **soil**, with the aim of obtaining an accurate **nutritional diagnosis** of plants that optimizes its **growth and productivity**. Advances in the field of plant nutrition and water use are very important to optimize water resources and nutrients.

Studies based on foliar analysis of crops, should obtain in addition data relevant to its interpretation by different methods: RN (normal ranges), RS (sufficiency ranges), DOP (deviation from the optimal percentage), CND (compositional nutrient diagnosis) and DRIS (diagnosis and recommendation integrated system). This last method is currently well considered because it is not time or plant phenology dependent.

The DRIS is a dynamic system for interpreting foliar analyses because it uses rates determined for each nutrient and the overall balance of all nutrients involved in the nutrition of the plant determines the performance and productivity of the crop.

The objective of obtaining DRIS standards consists to **stablish optimal leaf concentration of nutrients to get high productivity**. To obtain these standards, the following phases are followed:

- Sampling.
- Analysis of the samples.
- Statistical study using specific software.
- Obtaining standards for developing the DRIS.
- Conclusions after the application of the DRIS.

So, we offer:

a) Studies of foliar evolution of nutrients in crops and obtaining of foliar interpretation standards.
b) Technical training on foliar analysis and interpretation.
c) Technical training on water and nutrient needs of crops, crop production systems and other related plant physiology.

2. Development of new nutritional products (amino acids, micronutrients, fertilizers, etc.) to increase crop production.

The research group carries out cooperation agreements with companies and advises on new products that may have acceptance in markets. In addition, we test new products and perform experiments to establish the optimum application doses of products.

So, we offer:

- Advice in the development of new nutritional products.
- Experiments to observe the efficiency and to establish the optimal dose of the product.

3. Mycorrhiza as biofertilizer and/or bioprotector.

Mycorrhiza are symbiotic associations between fungi and roots of plants which have a very important role in physiology of plants. The research group has experience in the **evaluation of the effectiveness of commercial mycorrhiza** and **developing inocula** from different species to **improve crop production and increase disease resistance**.

The main advantages that provide mycorrhizal symbiosis include the improvement of mineral nutrition and water availability of the plant, better growth and acceleration of the life cycle, reduction of the deleterious effects caused by pathogens and the increase in tolerance to drought, salinity, etc.

Mycorrhiza are especially interesting as biofertilizers and bioprotectoras in **horticultural and ornamental plants, fruit and forest trees, nurseries, greenhouses**, etc.

So, we offer:

- Viability assays of commercial inocula.
- Test the mycorrhization of truffle plants.
- Recommendations for plant mycorrhization.

4. Ecophysiological factors that alter plant production.

The research group works on a scientific basis to **improve agricultural productivity**, responding to nutritional problems and stress in plants with total respect for the environment.

Climatic factors (temperature, humidity, light...), edaphic (soil conditions) that lead to stress represent significant losses in crops. Understanding ecophysiological processes and mechanisms of plant adaptation and acclimation to environmental stress is therefore of great importance to agriculture and environment.

The Group performs projects related with **nutrition and water availability, diagnosis of diseases** and determines the corresponding. They have experience in strawberry, wheat, orange, lemon, potato, capsicum, artichoke, Palm tree and rose, among others.

So, they offer:

- Studies of water use efficiency in crops through the use of sensors for soil-plant-atmosphere system monitoring.
- Applications of strategies of controlled deficit irrigation and partial roots irrigation in tree crops.
- Optimization in fertigation.
- Sustainable agriculture techniques.
- Precision agriculture.
- Studies of plant responses against environmental stress such as: salinity, extreme temperature, insolation, etc.
- Monitoring of pests and plant diseases through remote weather sensors.

VENTAJAS Y ASPECTOS INNOVADORES

Traditionally, monitoring of agricultural crops is done through field inspections performed by farmers, producers and scientists, with the disadvantages associated with the limited number of samples within the field and the cost associated with this task.

New remote sensing techniques and other forms of remote data collection have demonstrated significant potential in support of agricultural practices in terms of **optimization of resources and integration of information**. In this sense, the multispectral systems provide accurate data on certain crop parameters (for example: shape, size of the fruit...) which may be related to the crop quality and field conditions. Therefore, remote sensing allows **tracking growth, needs of irrigation, the maturity of the crop and, accordingly, it should be established the fertigation**.



ESTADO ACTUAL

For the development of the different research lines, the Group uses the **Research Technical Services** at University of Alicante, where there are the main analytical techniques and the most modern equipment, including:

- Greenhouses and plant growth chambers.
- Crop plots.
- High performance liquid chromatography.
- Inductively coupled plasma emission spectroscopy.
- Mass spectrometry.
- Elemental analysis.
- Microscopy unit.
- Etc.

APLICACIONES DE LA OFERTA

The research lines of the Group Applied Plant Physiology at the University of Alicante are of interest for the following **industrial sectors**:

- Plant production
- Manufacturers of nutritional products.
- Plant protection products.
- Fruit-growing.
- Human food.
- Animal feed.
- Nurseries (horticultural and ornamental plants, forest and fruit trees, etc.).
- Greenhouses.

COLABORACIÓN BUSCADA

The research group looks for companies or research organizations:

- Establish R&D projects of mutual interest in order to open new lines of work or implement innovative technological applications.

- Carry out technical and scientific advice for business reports.

- Specific training in the area of the plant physiology: needs of irrigation and plant nutrition, fertilizers, bio-activators, optimization of plant growth conditions, etc.

- Provide technological support in those techniques that require a high training or sophisticated instrumentation that is not available to the applicant company.

DERECHOS DE PROPIEDAD INTELECTUAL

The technology is protected under the know-how of the research group, being patentable some future results about projects being carried out at present.

SECTORES DE APLICACIÓN (6)

Agri-food and Fisheries
Biodiversity and Landscape
Biology
Molecular Biology and Biotechnology
Geological and Geophysical Studies
Water Resources