Plant defence strategies in the arms race with fungal disease (ARMSRACE)

Resumen:

In less than 40 years, humanity will face the challenge of having to feed 9 billion inhabitants, which will require a 70% increase in global agricultural productivity. Currently, losses in crop yields caused by fungal diseases account for approximately $60 billion annually. *Fusarium oxysporum* is a devastating soil-borne pathogen that provoques vascular wilt in over a hundred field and greenhouse-grown crops both in industrialized and developing countries.
Current methods of control of *F. oxysporum* depend on the extensive use of chemical pesticides, which is increasingly regarded as unsustainable. We propose here that the exploitation of the plant's innate immune system provides a powerful source for future Integrated Disease Management of vascular fusariosis. The resistance response that plants mount against *F. oxysporum* is multigenic, i.e. it involves the regulation of a network of genes that function in specific defence signalling pathways. *F. oxysporum* has developed sophisticated strategies to suppress the activation these defence mechanisms. Recently, the host group has demonstrated that this pathogen secretes a peptide that mimicks RALF (Rapid ALkalinization Factor), a family of plant regulatory peptides which triggers alkalinisation of the host tissue to enhance fungal colonization. It was proposed that *Fusarium* (F)-RALF target plant defence responses, however, the underlying mechanisms are currently unknown.
ARMSRACE will investigate the mode of action of FRALF in the manipulation of plant defence mechanisms upon infection, by genetically and biochemically dissecting the key defence pathways in the *Arabidopsis-Fusarium* interaction. This will reveal novel plant components and signalling modules targeted by fungal pathogens, which can be manipulated to increase resistance. The proposal addresses a crucial objective in food security, namely the sustainable control of plant diseases.

Objetivos:

1. To determine whether F-RALF targets the JA-dependent signalling pathway.
2. To identify the downstream plant defence pathways affected by *F. oxysporu*m-mediated alkalinisation and to investigate the possible functional links with JA-associated signalling.

Impacto:

Understanding how plants use their strategies during the arms race with fungal pathogens opens a novel and exciting research line in the host group, for which the ER will become the "talk-to" expert. Therefore, this fellowship will channel the extraordinary research abilities of the ER and the impressive scientific standing of the host lab for the candidate to become an independent scientist and world-leader in the field of plant-microbe interactions.

Presupuesto: 170,121.60

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Enlace: https://cordis.europa.eu/project/id/747363/es

Estado: published

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