

# EIC-PATHFINDER

The European Innovation Council (EIC) Programme support innovative research groups with brilliant ideas that are radically different from existing products, through projects with high international potential and high risk.

The EIC Pathfinder arises as part of the Horizon Europe Programme to promote inter-disciplinary research and innovation on science-inspired and radically new future technologies.

The Pathfinder-Open line aims to support early stage development of these future technologies based on high-risk/high-gain research in science towards technological breakthrough.



Max Planck Institute  
of Molecular Plant Physiology



Pollinator-assisted plant  
natural selection and  
breeding under climate  
change pressure

## DARKWIN Natural Selection

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*"This project has received funding from the European Union's Horizon Europe - EIC PathFinder research and innovation programme under grant agreement No 101098680".*

European  
Innovation  
Council



Funded by  
the European Union





## CONCEPT

Food security is threatened by climate change, with heat and drought being the main stresses affecting crop physiology and ecosystem services, such as plant-pollinator interaction.

Leveraging the fact that flowers are better indicators of plant well-being than leaves, the DARKWIN Project proposes to track and rank pollinators' preferences for flowers of tomato mapping population exposed to heat and drought as a measure of functional source-to-sink relationship.

This radical new approach can change the current paradigm of plant phenotyping and find new paths for crop breeding assisted by ecological decisions.

## OBJECTIVES

- Developing a new geo-positioning device to automatically detect and quantify the sequential spatial-temporal interactions between plants and the pollinating insects.
- Elaborating the first worldwide-automated platform based on ecological plant-insect interactions to phenotype floral metabolic traits of resilience to climate change for a completely new pollinator-assisted selection and breeding.
- Development of a pollinator-assisted plant breeding software, as a basis for a new plant breeding technique (NPBT).
- Analysis of pollinator-floral phenotyping in predicting agronomic resilience and crop quality.
- Establishing a unique and unprecedented multi-omics database on the nutritional, hormonal, metabolomic, and transcriptomic profile and underlying QTLs and candidate genes.
- Modelling pollinator's foraging decisions in response to the environment, and plant x pollinators networks.
- Developing an unprecedented set of new tomato F1 hybrids based on pollinator-driven selection of parental lines.

## APPROACH

**DARKWIN solution:** a new selection and phenotyping platform based on ecological 'flower x pollinator' interactions. DARKWIN's radical new vision will use 'Living IoT' to quantify the optimization degree of source-sink relationships through plant lifespan by analysing Genotype x Pollinator x Environment (GxPxE) interaction. Pollinator preference will identify the best performing genotypes under environmental pressure. This new approach will change current paradigm of plant phenotyping and will open new perspectives on breeding pollinator-dependent crops, by animal-assisted selection of floral traits. DARKWIN platform will phenotype the reproductive stage of flowering plants in relation to their metabolic, physiological, and agronomical performance. It will integrate the most radically new Living IoT, that will use wireless communication operations on flying insects to track and score their floral preferences, into a selection and breeding software.

