

# Impact of Colorado potato beetle gut microbiome in the adaptation of plants to drought and heat stresses associated to climate change



Carolina Rausell, Inmaculada García-Robles, M. José López-Galiano, M. Dolores Real

Department of Genetics, University of Valencia, Burjassot (Valencia), Spain

## Abstract

The detrimental effects of intensification practices in modern agriculture have created the need of new environmentally-friendly approaches to maintain sustainable agricultural production and to overcome threats that lead to loss of crop yield, including plant stresses associated with adverse environmental conditions, such as drought, high temperature or soil salinity, as well as biotic stress induced by plant pathogens and pests. In this context, exploiting natural microbial communities for improved plant performance in integrated plant disease management systems appears as a promising effective alternative since microorganisms have been proved beneficial for plants directly by enhancing crop nutrition or indirectly by reducing damage caused by pathogens or environmental stress. Herbivores possess diverse microbes in their digestive systems, and recent research has demonstrated that these gut microbes can manipulate plant-insect interactions and in turn, modify the plant response to other biotic or abiotic stresses. In the case of the Colorado potato beetle (CPB, *Leptinotarsa decemlineata*), an exceptionally devastating pest of Solanaceae plants, it has been reported that when larvae were reared on different hosts, variation in the composition and structure of CPB bacterial communities was observed, which correlated with differential plant defense response to insect attack.

The aim of our present work is to identify gut bacterial communities in CPB larvae fed on tomato varieties resistant to drought and high temperature by means of metagenomic analysis using 16 S rRNA amplicon sequencing and to investigate their potential to induce resistance to abiotic stresses in a tolerant tomato variety.

### 1. WORK PLAN

Control tomato plants



Drought tolerant tomato plants



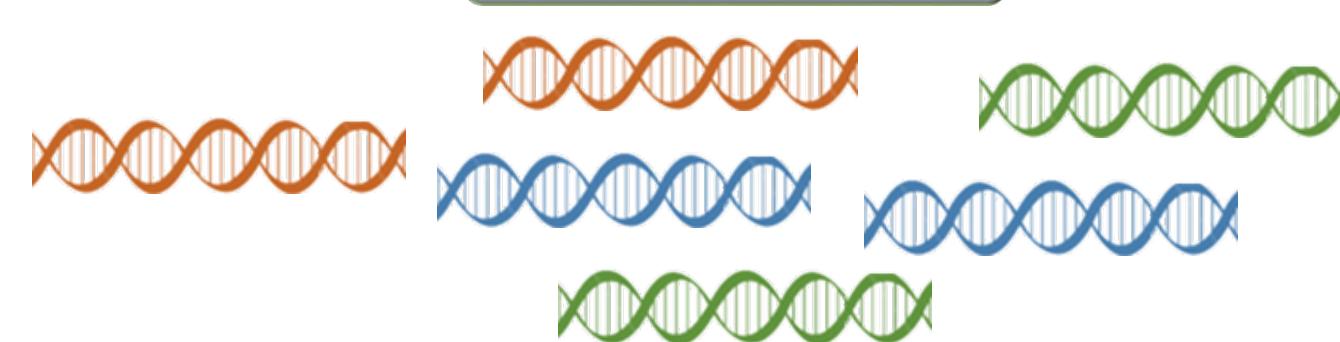
Heat tolerant tomato plants



CPB gut juice and midgut sampling to obtain microbiota



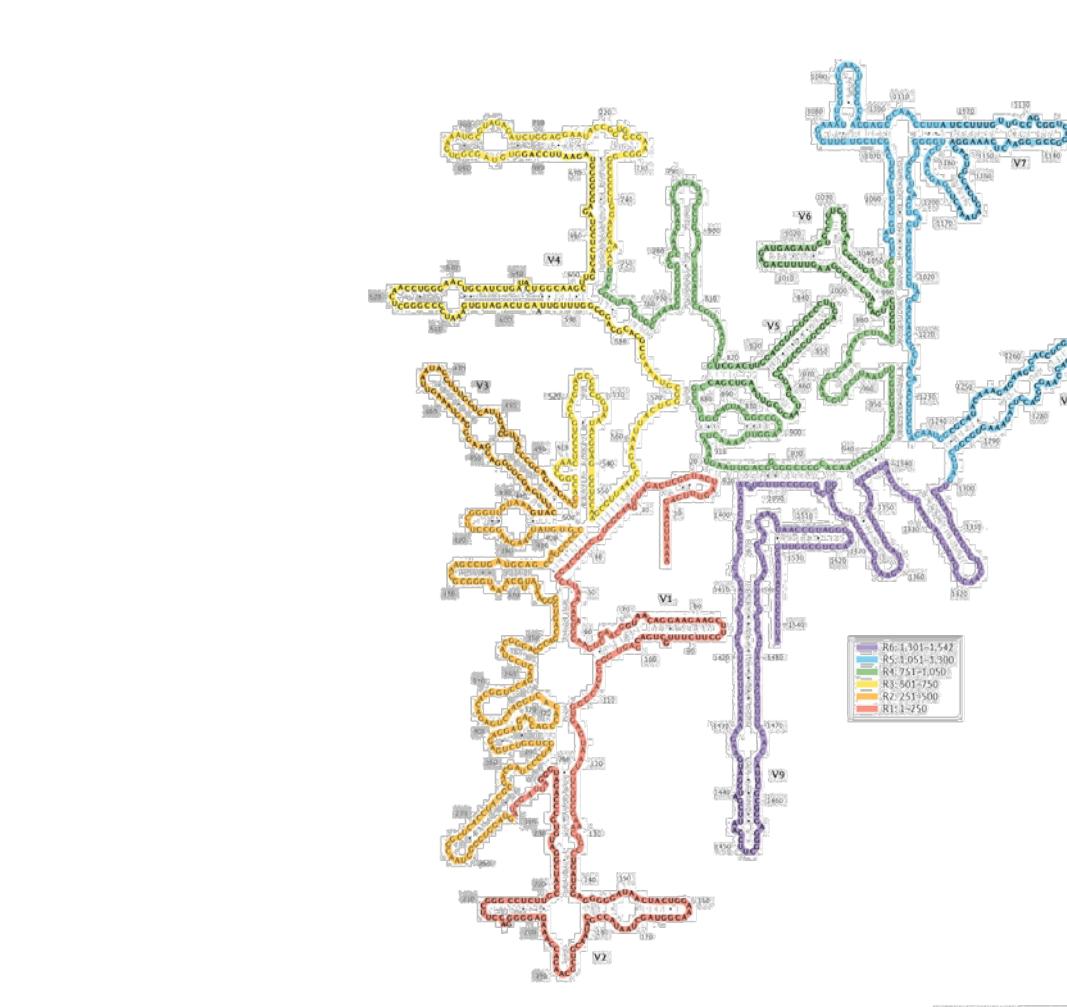
DNA extraction



16 S rRNA genes sequencing



### 2. SEQUENCING DATA ANALYSIS PIPELINE



Raw data

Quality control

Clean data

Rarefaction curve

Rank abundance curve

Alpha indices table

OTU cluster

Species annotation

Beta diversity

Unifrac distance heatmap

PCA

PCoA

UPGMA

Krona

Heatmap

Phylogenetic tree

Classification tree

### 3. AIM OF THE PROJECT

Control tomato plants treatment with gut microbiota of CPB larvae reared on drought and/or heat tolerant tomato plants



Heat and/or drought stress

Tolerant???



### Expected results

- Selection of bacterial strains conferring tolerance to heat and/or drought
- Bacterial formulation for field application

