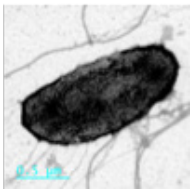
VITISMART

TOWARD A SUSTAINABLE VITICULTURE: IMPROVED GRAPEVINE PRODUCTIVITY AND TOLERANCE TO ABIOTIC AND BIOTIC STRESSES BY COMBINING RESISTANT CULTIVARS AND BENEFICIAL MICROORGANISMS

Resilient new cultivars
e.g. Calardis blanc



Efficient Biological control agents

Enhanced Resilience toward abiotic and biotic stress

1° Call:	2015
Project period:	02/2016 - 04/2019
Topic:	Agricultural production system, Plant production and horticulture, Pest / disease control, Climate and climate change, Genetic resource, Plant Microbe Interaction.
Keywords:	Sustainable viticulture, resilient cultivars, beneficial micoorgansims, climate change, grapevine diseases.
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Total funding:	1.517.000 €
Website:	faccesurplus.org/research-projects/vitismart; www.univ-reims.fr/site/vitismart/

FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

Vitismart
Toward a sustainable viticulture

BACKGROUND

Average global temperatures are projected to rise by 3–5 ¬°C by 2100. A changing climate leads to changes in the frequency; intensity, spatial extent, duration, and can result in unprecedented extreme weather and climate events. Climate change (CC) will affect the ecosystem processes such as primary production, and the distribution and abundance of plant species. Climate change will also alter the plant diseases since the rate at which pathogens evolve and overcome host resistance may increase. Because abiotic factors such as temperature affect host susceptibility to pathogens and pathogen aggressiveness, interactions between plant resistance traits and abiotic stress tolerance may represent the most substantial impact of CC on plant productivity. Objectives are:

- Strengthen climate change models on grapevine crop systems by understanding how climate change will affect cropping systems (as opposed to crop productivity);
- Improve both preventive and curative strategies for more grapevine cultivars tolerant to pathogen under a CC context;
- Understanding of the molecular and physiological pathways underlying the interaction between grape cultivars/beneficial microbial agents/pathogens/climate change;
- Facilitate interdisciplinary research integrating innovative adaptive strategies with socio-economical aspects of grapevine production;
- Support the European grapevine growers by matching consumer demands for top quality grapes and food safety;

METHODOLOGY

Vineyard management to face effects of climate change was accomplished by i) using a set of varieties for empirical data recording and ii) evaluating agronomic practices to adapt vineyard agricultural system to climate change.
Grapevine genetic resources to screen resilient cultivars were based on identified resistance loci to powdery mildew and downy mildew. For Botrytis, QTL mapping approaches was monitored. Further, non-invasive evaluation of abiotic stress was accessed using digital and hyperspectral images.
Bioprospection and characterization of beneficial microbes effective against grapevine diseases were accomplished by using fingerprinting method and sequencing tools (16S rRNA targeted metagenomics) of the grapevine microbiome from cultivars resistant to biotic and abiotic stresses.
Molecular, biochemical and physiological responses were investigated by i) measuring the impact of climate change on agronomical parameters related to plant growth, photosynthesis, primary and secondary metabolites, ii) deciphering how selected beneficial microorganisms enhance grapevine resistance by using omic tools and analyzing targeted genes by qRT-PCR and metabolites by UPLC.
Socio-Economic impacts was evaluated through assessment of i) external effects and internal economics and organization of existing selected viticultural production systems (VPS); ii) economic impact of introduced innovative practices in the VPS, and iii) developing decision support tools for innovative VPS.
Technology Transfer was investigated by assessing i) climate-related adaptation strategies at the farm scale; ii) field demonstration and validation of diagnostic and modeling methodologies combating biotic stress; and iii) field scale demonstration and evaluation of adaptive strategies based on novel agronomic methods for combating abiotic stress.
Dissemination of the project results was done through kickoff meentings every 6 months, skype meetings, flyers, drop boxes, publications in national and international journals

RESULTS AND KEY FINDINGS

- Vineyard management to face effects of climate change
- Grapevine genetic resources exploitation to screen resilient cultivars
- Bioprospection and characterization of beneficial microbes effective against grapevine diseases under climate change
- Molecular, biochemical and physiological investigation of the intricate networks underlying the tripartite interaction under CC
- Socio-Economic impacts
- Technology Transfer

KEY PUBLICATIONS

- Chrysargyris A, Xylia P, Antoniou O, Tzortzakis N, 2018. Climate Change due to heat and drought stress can alter the physiology of Maratheftiko local Cyprian grapevine variety. Journal of Water and Climate Change. In Press.
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BOOK CHAPTERS

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