molecular identification by PCR amplification. Eleven isolates obtained from the samples from different areas have been identified as *G. smithogilvyi* with 99.9% nucleotide sequence identity. Sensitivity tests were conducted on the eleven isolates with 4 commercial formulations, relating to 3 categories of fungicides: "biological" (tribasic copper sulphate; Eugenol + Geraniol + Thymol); succinate dehydrogenase inhibitors (Fluxapyroxad), triazoles (Tetraconazole). In addition, in vitro tests were carried out to evaluate the resistance to the various active ingredients. The results obtained in this work suggest that in addition to good agronomic practices, in the rational management of the orchard, such as the removal of residues and infected organs and the use of effective phytoiatric interventions can contribute to control the pathogen.

Dissecting foliar fitness of a *Pseudomonas mediterranea* strain nonpathogenic to citrus to understand the interaction with *Plenodomus tracheiphilus*

M.C. Bazzano[1], P. Bella[2], A.F. Catara[1], G. Scuderi[1], G. Dimaria[3], F. Modica[3], V. Catara[3], M. Russo[1]

[1]Agrobiotech soc. coop. ZI Blocco Palma I, Str.le V. Lancia 57, 95121 Catania; [2]Department of Agricultural, Food and Forestry Sciences, University of Palermo, Italy; [3]Department of Agriculture, Food and Environment, University of Catania, Italy. E-mail: mrusso@agrobiotech.it

Citrus mal secco disease is the most limiting factor of lemon industry. The use of biological control agents to mitigate its symptoms is based on the capability of bacteria to colonize the same ecological niche invaded by the causal agent *Plenodomus tracheiphilus.* We have investigated several strains of *Pseudomonas mediterranea* (Pme), a bacterial nonpathogenic to citrus, for the frequent and rich presence in plants' rhizosphere, the arsenal of secondary metabolites, the plant growth-promoting traits present in the genome, and the direct antagonism against a class of plant pathogens. The strain Pme 3C was tested in greenhouse and field on lemon grafted on sour orange to understand its foliar fitness and capability to reduce the penetration of *P. tracheiphilus* and to mitigate the symptoms of the disease. Results of dual tests in vitro show that the strain penetrates the leaves through the wounds and reduces the conidia germination and mycelial growth of the pathogen at different levels. Other tests, based on detection of bacterial DNA by real time PCR, evidence Pme survives epiphytically on leaf surfaces, penetrates the leaf wounds, and colonizes the mesophyll veinlets. Field tests confirm a reduction of penetration of the pathogen into the leaves, and a minor extension of the host xylem colonization, associated to a delayed expression of symptoms of the disease. Over all, the pathogen is not killed but is temporarily confined by the bacterium, and it competes for nutrient sources essential for hyphal elongation and host penetration.

This work was supported by the project S.I.R.P.A. funded by PO FESR 2014–2020 Sicilia action 1.1.5.

Climate change, new pathogens and multi-trophic interactions threaten forest ecosystems in the Mediterranean basin

A. Benigno, C. Aglietti, S. Moricca

Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Piazzale delle Cascine 18, 50144 Florence, Italy. E-mail: alessandra.benigno@unifi.it

In recent decades, forest ecosystems of the Mediterranean basin (a renowned hotspot for climate change) have been severely impacted by climate warming. Anomalous periods of rainfall, with recurrent droughts, have strongly stressed forest trees in a variety of situations (natural/artificial forests), predisposing trees to the attack by various fungal and oomycete pathogens. While, on the one hand, there has been a resurgence of old and known diseases, on the other hand new pathogens have arrived in uncontaminated territories, heavily infecting trees and spreading at extremely rapid rates (invasive species) over forest areas. Due to a lack of host–pathogen coevolution, these alien invaders often cause huge damage, posing a serious threat to tree populations and questions about the future management of the attacked forest ecosystems. Furthermore, a combined attack by immigrant and/or resident pathogens is in some instances observed, with lethal effects on the impaired tree species. This work reports some new and emerging pathogens that are threatening some Italian forest ecosystems. There is evidence that thermophilic or thermotolerant pathogens, which normally live as opportunistic endophytes in the tissues of host plants at an asymptomatic state, are capable to extensively colonize hosts that are impaired by climate anomalies (e.g. water stress). Some examples of multiple attacks by different pathogens on the same tree host are also reported. It becomes increasingly clear that in forest ecosystems we are often dealing not with single host–pathogen interactions but with multi-trophic interactions that can seriously compromise the stability and resilience of tree populations that are already heavily compromised by climate change.