

## The journal of plant pathology editors' choice November 2023

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In our changing and globalized world, novel plant diseases are emerging and spreading through various pathways associated with the trade and marketing of plants and plant products. Understanding the importance of each of these pathways is paramount to prevent the further spread of emergent diseases. The importance of avoiding the arrival of emergent diseases in new world regions, or of minimizing their spread within a region cannot be overstated. The situation is even more complex, given that, currently, the emergence of several diseases, although driven by climate change, is associated with pathogens that have been moved around the world by humans. “One ounce of prevention is worth a pound of cure” said Benjamin Franklin, and prevention requires understanding practices that need to be monitored closely or completely avoided. Pathways can be investigated at different scales. In this November 2023 issue of the Journal of Plant Pathology, two studies (United Kingdom; Germany and Slovenia) confirm the spread of certain viruses and viroids through infected fruits and provide proof of concept that fruits can be contagious. The results of both studies are unexpected and relevant for policymaking, hence they are included in the Editors' Choice section of the Journal.

Our attention was also peaked by two studies investigating novel options for the management of plant diseases that may be already widespread or regionally important and that may be intensifying. The first study (Egypt, Saudi Arabia and the United Arab Emirates) focuses on the use of Plant Growth Promoting Rhizobacteria (PGPR) to enhance plant growth, while additionally controlling two important root diseases. Not only this approach, if effective, is a definite win-win, but the choice of testing extremophilic bacteria from extreme environments is novel and of great importance, given that these organisms may be already adapted to warmer and drier conditions of a future world. The second study (Ethiopia) deals with one of the most devastating diseases of banana worldwide which has recently emerged as a significant threat to Ethiopian banana growers. Given its recent emergence in that part of the world, many knowledge gaps exist. The authors must be commended for a fully

integrated survey approach, in which interviews with various levels of stakeholders were combined with direct field assessments. The study manages to convincingly identify climatic variables, cultivars and agronomic practices associated with high disease severity, and vice versa to identify those variables associated with low disease incidence and severity. This paper provides pivotal information for Ethiopian banana growers who are facing a new threat.

Finally, the plant pathology community specialized on woody crop species is becoming increasingly concerned about the massive emergence of diseases caused by latent pathogens, i.e., pathogens that can alternate between an endophytic, a pathogenic and a saprobic lifestyle. These latent pathogens are emerging at incredible speed due to mounting physiological plant stress caused by changing climate. The Diaporthales and Botryosphaeriales are two fungal orders rich in latent pathogens. Hence, a study (Spain, California) comparing the aetiology and disease progression of model pathogens in these two orders is extremely timely and welcome, particularly considering the significant differences and similarities identified between selected members the two orders.

Details about the EC papers are provided below.

Since its discovery in 2015, tomato brown rugose fruit virus (ToBRFV) has wreaked havoc in tomato production in several countries due to its ability to overcome the resistance genes currently deployed worldwide to control tobamoviruses. This has led many countries to implement phytosanitary measures aiming to eradicate outbreaks and to limit the spread of the virus. In Europe, fruits from infected plants are considered a pathway of minor significance and their commercialization is consequently accepted, but no information was available on the important question of the extent of ToBRFV circulation through this pathway. Skelton et al. (United Kingdom) have now addressed this question through a survey performed in spring 2023 on 54 samples of imported tomatoes obtained from retail stores in the UK. Using a Q-PCR assay, they show that over 20% of fruit tested were likely from infected plants and that over 80% had detectable ToBRFV. The fruits came from Morocco,

Spain, Italy, and the Netherlands. Taken together these results provide the first solid evidence for the very wide circulation in the European retail trade of ToBRFV-contaminated tomatoes.

In a parallel effort targeting viroids, Hagemann et al. (Germany and Slovenia) have addressed the circulation of several viroids through commercialized citrus fruits (grapefruit, orange, lemon, lime, mandarin...) in Slovenia and Germany. A more restricted survey was also performed on commercialized grapes and melon in Germany. The results obtained using specific RT-PCR assays show the presence, sometimes frequent, of the 6 viroids tested [citrus bark cracking viroid (CBCVd), hop stunt viroid (HSVd), citrus exocortis viroid (CEVd), citrus dwarfing viroid (CDVd), citrus viroid V (CVdV), and citrus bent leaf viroid (CBLVd)] in commercial citrus fruit samples from a range of exporting countries and of HSVd in commercialized grapes. Further experiments showed that CBCVd and HSVd could be transmitted from infected citrus fruits, including by contact between test plants and contaminated citrus fruit peels. Sequence comparisons also showed close relationships between some CBCVd and HSVd variant identified in Citrus and those previously identified in hop crops. Taken together, the results of this interesting study led the authors to suggest that commercialized citrus fruit might represent a pathway for the spread to hop crops of viroids and, in particular, of CBCVd which causes a severe disease in this important crop.

In “Extremophilic bacterial strains as plant growth promoters and biocontrol agents against *Pythium ultimum* and *Rhizoctonia solani*”, El-Tarabily et al. (Egypt, Saudi Arabia and the United Arab Emirates) tested a large number of extremophilic bacterial isolates obtained from a variety of arid and drastic soils in Egypt for their potential as plant growth-promoting rhizobacteria and biological control agents against two of the most important soil-borne plant pathogens, i.e. *Pythium ultimum* and *Rhizoctonia solani*. The authors were able to show that several bacterial isolates produced diffusible antifungal metabolites, cell-wall degrading enzymes, and several fixed atmospheric nitrogen, solubilized insoluble phosphate and zinc, and produced indole-3-acetic acid (IAA) and salicylic acid. Three bacterial isolates belonging to different species, showing multiple modes of action, were identified as the most promising. In greenhouse conditions, the application of the three bacterial isolates as individual or combined treatments significantly reduced the growth of the soil-borne pathogens and increased the rate of survival and growth of tomato and maize, thus showing a clear potential as an alternative to

agrochemicals with the potential of being employed in variable climatic and soil conditions.

In “Agronomic practices and environmental factors influenced the distribution and severity of Black Sigatoka (*Mycosphaerella fijiensis*) of banana in southern Ethiopia”, Mengesha et al. (Ethiopia) investigated the epidemiology of one of the most threatening limiting factors for the production of banana worldwide, the Black Sigatoka disease caused by *Mycosphaerella fijiensis*. In Ethiopia, this disease has become emergent only recently, and, consequently, many knowledge gaps exist regarding the epidemiology of the disease. By surveying more than 300 banana fields, the authors were able to determine both the distribution and the association of the disease with agronomic practices and environmental factors. Based on the results of their investigation and outcomes of a logistic regression model, they identified the factors associated with disease severity and provided practical guidelines for disease control, which is pivotal not only for Ethiopia but for a large portion of East Africa.

In “Effects of cultivar susceptibility, fruit maturity, and natural wounds on the infection of English walnut (*Juglans regia*) fruits by Botryosphaeriaceae and *Diaporthe* fungi”, Agustí-Brisach et al. (Spain, California) clarified the infection biology of three species belonging to the Botryosphaeriaceae and to two species belonging the genus *Diaporthe* on European walnut. By setting specific experiments, they showed that Botryosphaeriaceae fungi were able to colonize the entire surface of the inoculated fruit, reaching the peduncle and infecting the attached shoot, while *Diaporthe* spp. were not able to colonize the surface of the inoculated fruit quickly enough to infect the attached shoot before the peduncle was naturally separated from the shoot. In addition, the authors demonstrated that both groups of fungi are able to infect shoots through natural fruit abscission wounds in the field. This study appears particularly relevant considering that diseases caused by these fungi are on the rise because of climate change.

We hope you will enjoy reading them as much as we did. Please join us in honouring the outstanding research groups behind the research featured in the November Editors’ Choice issue of the Journal of Plant Pathology.

**Matteo Garbelotto, Editor in Chief.**

**Luisa Rubino, Managing Editor.**

**Paolo Gonthier and Thierry Candresse, Senior Editors.**

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