



Plant health in the interview with Matteo Garbelotto

May 12 is the **International Plant Health Day** , a celebration established by FAO – the Food and Agriculture Organization of the United Nations. The initiative was created to raise awareness of the importance of preserving **plant health** and its role in protecting biodiversity and the environment. To learn more about the topic, here is the interview with **Matteo Garbelotto** , a specialist in Forest Pathology, conducted exclusively for the *Coltiva to* website by journalist **Luca Fiocchetti** .

Globalization makes pathogens run fast: is stopping the importation of unnecessary exotic plants, as you have long been calling for, or swabbing them, as you have done in California, enough to contain the spread of these new diseases?

First we should ask ourselves if it is really necessary to import all these exotic plants. Beautiful ornamental species are produced in all regions of the world, so why not use native plants? There are numerous scientific studies that demonstrate the direct correlation between the

volume of plants in import/export and the number of alien organisms introduced. If we could reduce the amount of imported plants, then new diagnostic tests could make a difference. In my laboratory in Berkeley, the first molecular swab ever officially used by a nation to diagnose a plant disease was developed. Imported ornamental plants infected with Sudden Oak Death caused the greatest environmental tragedy of the twenty-first century in California, decimating hundreds of millions of oak trees. Thanks to the swab and the restriction of sales of plants carrying Sudden Oak Death, the disease is now well under control. However, I believe that governments should increase the pressure on those who produce, sell and transport the plants over long distances to charge these industries for both the costs of monitoring and the environmental costs. The cost of repairing and restoring the environment should fall on the perpetrators and not just on the society and communities most affected by these biological cataclysms.

And how does climate change affect the health of plants?

It's the icing on the cake, so to speak, because the climate is having two main effects on the plant world. The first, which in my opinion is less important, is directly on pathogenic microbes: diseases of tropical and subtropical origin are increasing precisely because Italy is becoming tropicalized (*Xylella* is an example), while psychrophilic pathogens, that is, those that love cold climates, are decreasing. The second effect, in my opinion much more harmful, is instead on the plant. Plants, trees in particular, have very long life cycles and, unable to move to chase cooler climates at higher altitudes, end up living in areas that are no longer suitable for them. In extreme cases, plants weaken and are also attacked by pathogens considered not particularly virulent.

What are the other risks?

There is a much bigger threat, which I have been studying for about a decade, and it is represented by those beneficial microbes that, in a plant with a physiology altered by climate change, transform into pathogens. I call them Dr. Jekyll and Mr. Hyde. The problem is that these organisms are already present in the plants because they are part of their microbiome. Over the past 6 years I have studied a dozen large-scale die-offs of forest trees and shrubs that are occurring in California. Each of these new large die-offs is caused by organisms that have increased virulence due to the physiological stress of the plants. We were able to test this hypothesis in the laboratory by comparing the severity of symptoms in plants stressed by drought (artificially created in controlled environments) with those of plants that were given abundant water. The plants exposed to drought showed more acute symptoms and died more often, but only if the drought was coupled with one of these "Dr. Jekyll and Mr. Hyde" microbes that change biology.

In short, many plants are now in unfavorable climatic conditions and, not being able to move, are more subject to pathologies. So there is no solution and epidemics on plants will be more and more frequent...

There is a solution, it is conceptually easy, but difficult to implement. We must accept that plants in a permanent, or almost permanent, state of stress cannot survive, so our forests and parks must change. Many species dear to us must be replaced by plants accustomed to warmer climates, which will not be subject to diseases linked to the physiological stress caused by rising temperatures. This change will occur naturally, but over a very long time, and if we were able to accelerate it, we would avoid future generations living in a natural world characterized by infectious epidemics and, therefore, degraded and incapable of providing those essential environmental services that trees and plants in general offer. Degradation means even higher temperatures, geological erosion, contaminated water, lack of pure air.

What is the role of research in preventing these risks?

I think that the responsible role of us researchers is precisely that of educating society and facilitating the process of change using scientific evidence, without forgetting to do everything possible to save what can be saved. This ethical integrity must push us to preserve what can still grow well and to suggest new alternatives where traditional plant species begin to suffer and decay. So be careful not to promote a tabula rasa mentality. Our task must be done with cultural, social and scientific finesse to progressively create a new natural environment that, although different from the current one, is equally biodiverse, functional and, why not, equally beautiful.

The second edition of *Coltiva to* is approaching, what contribution can this Festival give to the complex agricultural system and therefore to our diet?

The health of natural and agri-food systems is truly a global problem. The problems of useless or “dirty” trade, that is, of infected plants, the need to change the species of plants we grow, but also those in nature, to create more stable ecosystems for the new climatic conditions, are problems that require the participation of multiple actors. Politicians, scientists, industry, local communities (including indigenous ones) and the general public who must accept and perhaps choose between the different options for the future. None of these actors can act individually and the interconnection between the parties is, in my opinion, the greatest challenge of our time. We have the “know how” and the means to address the current crises, but success can only be achieved if the parties act in concert and by engaging with each other. The first step to establish these collaborations is to raise awareness of the problems, to make them understood in depth. The second step is to create a forum for discussion between all the actors. Here a Festival like *Coltiva to* has the potential to make us take these two steps, very important precisely because the different parties in question are present and have their own voice. They are only two steps but, as we all know, you get to the goal one step at a time.