

Viruses prefer cultivated areas to natural areas

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Agricultural areas are more affected by viral epidemics than non-agricultural areas. This is the finding of an international study carried out as part of a France-South Africa collaboration in floristic areas from the Western Cape and Camargue regions. These results were published in January 2018 in the *ISME Journal*, a journal of microbial ecology.

Agriculture has a considerable influence on the distribution and prevalence of plant viruses in the environment. In [agricultural areas](#), viral infections are significantly more frequent than in natural areas. This is the conclusion of a study conducted by a team of international scientists in the Camargue (France) and in the Western Cape regions (South Africa), the results of which were published in January in *The ISME Journal*.

"The clustering and concentration of genetically similar organisms, as with crop varieties, fuel epidemics," explains Philippe Roumagnac, a researcher in plant virology at CIRAD. This study also indicates that the "natural compartment," which is still largely unexplored in terms of the biodiversity of microorganisms, contains a large number of viruses. "The areas adjacent to agricultural land could enable us to better understand the emergence of [plant diseases](#)," he says.

Although 50 percent of emerging plant diseases are viral, knowledge of the diversity of plant viruses is still dramatically lacking. Officially, to date, around 1,400 species of plant viruses have been characterised and taxonomically assigned. This figure is probably well below the true

diversity of plant viruses, as shown by recent explorations of terrestrial and marine ecosystems. Moreover, this count is undoubtedly distorted on two levels. First, the description of viruses has been conducted almost exclusively based on a very small number of agricultural plant species and, second, most of the viruses were only characterised after the appearance of symptoms in their hosts. "Our knowledge of the world of plant viruses therefore remains extremely partial in terms of diversity, but also in terms of distribution at the agroecosystem level," says Denis Filloux, a researcher in plant virology at CIRAD. "This lack of knowledge is an obstacle to our understanding of the global functioning of agroecosystems, and to the definition and quantification of risk factors in the emergence of new plant viral diseases or the design of strategies to tackle these diseases." The majority of the viruses remaining to be identified are found in areas with little human activity.

To achieve this result, the scientists adopted a new viral metagenomics approach. "Metagenomics is a method that conducts high-throughput sequencing on all genomes of the microbes populating a given environment," explains Philippe Roumagnac. "It enables us, for example, to access the virome, in other words, all of the viral sequences contained in a host organism or in a sample containing several potential hosts."

Since 2009, a new generation of metagenomics research has emerged in plant pathology, making it possible not only to analyse the overall genome of an ecosystem or organism, but also to directly link sequences of pathogenic agents to their host and/or to a geographical position. This original research in spatial metagenomics has revolutionised the view of plant [virus](#) distribution by revealing that many of the [plants](#) analysed were virus-infected.

More information: Pauline Bernardo et al. Geometagenomics illuminates the impact of agriculture on the distribution and prevalence of plant viruses at the ecosystem scale, *The ISME Journal* (2017). [DOI:](#)

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