Plain language summary (layman)

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Plants are very important for the ecosystem: They provide sources of food and oxygen, while capturing CO_2 and cleaning the air of certain pollutants. Unfortunately, certain microbes can have detrimental influences on plant health, causing disease or even wasting of whole plant populations. This is especially cumbersome for plantations, where large amounts of the same crops are being grown for food supply. The disease-causing microbes, also called pathogens, can sometimes be controlled with pesticides. However, certain pathogens are immune to these chemical products, and can therefore keep on growing and destroying harvests. Besides human interventions like pesticides, plants can defend themselves against harmful microorganisms. This happens through the plant immune system, which can recognize and antagonize pathogens. Also, plants live together with certain beneficial microbes, which can help protect against pathogens. These helpful microbes can secrete defensive compounds that limit the growth or even kill the bad microorganisms, or activate the plant immune system, letting the plant know that there are intruders present. The microorganisms are present on top of plant tissue, and some can even reside within the plant. The total collection of microorganisms associated to a plant is called the microbiome.

When certain pathogens successfully infect a plant, the microbiome composition is changed. This both happens because of direct influences of the pathogens on microbes, and because of the reaction of the plant; extra beneficial microorganisms are attracted in stressful situations. It is unknown whether different pathogens influence the microbiome in similar ways. Potentially, pathogens can only infect plants if certain microorganisms are removed first. Alternatively, pathogens might only be able to cause disease if they are aided by the presence of certain other microorganisms, which may provide nutrients or shut down the local plant immune system.

In this research, the bacterial compositions of pathogen-infected and healthy plants were compared to one another. It was determined that the relative abundance of the bacterial order of the Sphingomonadales decreased upon pathogen infection. This decrease happened within all plant species, and by all different pathogen types that were investigated. The decreased relative abundance of the Sphingomonadales was only present at the site where the pathogen infected the plant, not in the other plant tissues. It was shown that local plant stress caused by pathogen invasion could not be responsible for the reduction. Immune system suppression on the other hand could contribute to the decreased relative abundance of the Sphingomonadales; the bacterial compositions of mutants of the *Arabidopsis thaliana* plant with altered immune system functioning were examined and showed a similar decrease in the Sphingomonadales as pathogen-infected plant microbiomes.

This research has provided new insights in the influence of pathogens on the bacterial compositions within the plant microbiome, showing that the relative abundance of the Sphingomonadales is consistently decreased in pathogen-infected plants. A next step would be to examine the reason for the decrease. It should be researched why immune system suppression causes a reduction in the relative abundance of the Sphingomonadales. Also, it should be examined whether there are direct interactions between the pathogens and the Sphingomonadales which can cause suppression of the bacterial order.