surrounding plant roots: the rhizosphere. To better characterize the multiple factors involved in rhizosphere colonization, we assembled a collection of 63 worldwide representative phenazine-producing *Pseudomonas* strains. The different strains were inoculated in the rhizosphere of *Arabidopsis thaliana* grown in peat-based potting soil. Rhizosphere colonization was then assessed by quantitative PCR using a newly developed TaqMan probe/primer set targeting the phenazine biosynthesis operon. In parallel, we also investigated the metabolic profiles of the 63 strains using the BIOLOG phenotype microarray technology. In total, 270 out of 758 tested substrates were differentially metabolized by the 63 strains. Substrate utilization profiles correlated with previously obtained phylogenomic data. The strains also exhibited differential rhizosphere colonization capabilities on *A. thaliana*. These results have led to the identification of specific genes potentially involved in rhizosphere colonization abilities. Their implication are presently being assessed through a reverse genetic approach.

Biological control of plant-parasitic nematodes in carrot and wheat by the fungus *Clonostachys rosea*
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Biological control is a promising approach to reduce plant diseases caused by nematodes. We tested the effect of the fungus *Clonostachys rosea* strain IK726 inoculation on nematode community composition in a naturally nematode infested soil in a pot experiment, and the effect of *C. rosea* on plant health. The numbers of plant-parasitic nematodes extracted from soil and plant roots decreased by 40 to 73% when *C. rosea* was applied, while nonparasitic nematodes were not affected. Soil inoculation of *C. rosea* increased fresh shoot weight and shoot length of wheat plants by 20 and 24%, respectively, while only shoot dry weight increased by 48% in carrots. Light microscopy of *in vitro C. rosea* – nematode interactions did not reveal evidence of direct parasitism. However, culture filtrates of *C. rosea* growing in potato dextrose broth, malt extract broth and synthetic nutrient broth exhibited toxicity towards nematodes and immobilised 57, 62 and 100% of the nematodes, respectively, within 48 h. A metabolomics approach using ultra-high performance liquid chromatography-mass spectrometry (UHPLC-MS) indicated that culture filtrates of *C. rosea* contained the compound 10-hydroxy-8-decenoic acid, previously reported to have nematicidal activity. This study demonstrates that *C. rosea* can control plant-parasitic nematodes and thereby improve plant growth. The most likely mechanism responsible for the antagonism is antibiosis through production of nematicidal compounds, rather than direct parasitism.

Elucidation of the mechanism of action of essential oils to control postharvest diseases of apples and peaches
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Essential oils are considered a powerful and natural resource to control postharvest pathogens of pome and stone fruit. The efficacy of these natural products has been deeply investigated *in vitro* but only few of them are applied *in vivo*. Essential oils can be applied by dipping, spraying, or fumigation the fruit surface. Thyme and savory essential oils were successfully applied through biofumigation at 0.5% and 0.1% against brown rots on nectarines and peaches. The application of thyme or savory essential oils favored a reduction of brown rot incidence, caused by *Monilinia fructicola*, but an increase of gray mold, caused by *Botrytis cinerea*. Tests *in vitro* confirmed that *M. fructicola* was more sensitive to essential oil vapors than *B. cinerea*. Essential oil volatile components were characterized in storage cabinets during postharvest. The antifungal components of the essential oils increased during storage, but they were a low fraction of the volatile organic compounds in storage chambers. In addition to direct inhibition of pathogen growth, essential oils can induce resistance in the fruit host. Thyme essential oil can promote the expression of the pathogenesis related gene PR-8 in apple, which is involved in host defense response. Moreover, essential oils showed a positive role in slowing down senescence processes reducing weight loss and preserving vitamin C and carotenoid content during storage.

Significant *in vitro* antagonism of the laurel wilt pathogen by endophytic fungi from avocado does not predict their ability to control the disease
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Raffaelea lauricola (Ascomycota, Ophiostomatales) causes laurel wilt, a lethal vascular disease of avocado, *Persea americana*. We examined biological control of the disease with endophytic fungi from avocado. Xylem (the infection court for *R. lauricola*) of 112 trees (seven commercial cultivars) was sampled, and 64 operational taxonomic units (OTUs) were identified with partial sequences of ITS rDNA. Thirty-two OTUs were evaluated against *R. lauricola* with *in vitro* dual culture assays, and nine OTUs that strongly antagonized the pathogen *in vitro* were tested *in planta* against laurel wilt. In three greenhouse experiments, grafted plants of 'Simmonds' or 'Russell', cultivars that are susceptible to laurel wilt, were inoculated with endophytes and, after 10-16 days, inoculated with *R. lauricola*. As expected, laurel wilt developed in plants that were not treated with endophytes within 14 days of inoculation with the pathogen (positive controls), but did not develop in mock (water)-inoculated plants (negative controls). However, laurel wilt also developed in endophyte-treated plants to the extent observed in the positive controls (P=0.05). The pathogen colonized plants rapidly and systemically, but the endophytes generally did not colonize xylem more than 2 cm above the point at which plants were inoculated. We will discuss the management of laurel wilt and the value of *in vitro* data when developing biological control measures for it and other vascular wilt diseases.

Biological control of sugarcane red rot pathogen *Colletotrichum falcatum* by native rhizospheric bacteria
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Red rot, caused by *Colletotrichum falcatum* is a severe disease of sugarcane. To develop a new biocontrol product we collected 226 rhizobacteria from the six sugarcane variety and screened against three pathogenic *Colletotrichum falcatum* strains, namely cfNAV, cfCHA and cf8436. Accordingly best five antagonistic rhizobacteria were chosen for further *in vitro* assay by dual culture technique on PDA and *in vivo* assay by pot trial on highly susceptible sugarcaane variety CoC 671 under green house conditions for 60 days. Sugarcane plants without any microbial treatment were served as control. All five isolates were characterized for biochemical and plant growth promoting activities such as IAA production, Phosphate mobilization, Nitrogen fixation and siderophore production. Molecular identification by 16S rRNA gene sequencing reveals five strains as *Ochrobactrum intermedium* TRD14*; Acinetobacter sp* PK9*; Bacilli sp* RSC29*; Bacillus sp* KR91 and *Escherichia sp* VRE34. In dual culture assay *Acinetobacter sp* PK9 gave maximum 71.64±1.34% inhibition against cfCHA followed by *Escherichia sp* VRE34 against cfNAV (60.44±2.38%). In pot trail, sugarcane plants separately inoculated with each pathogen were died within one month while co-inoculation of each antagonist protected the plant for two month and also supported good growth. In case of *Escherichia sp* VRE34 treatment, plant height and stem diameter were increased from 13.27±0.67 inches to 24.03±1.40 inches and 6.07±0.45 mm to 9.87±0.93 mm respectively. All the five isolates have shown antagonistic activity and in both *in vitro* and *in vivo* conditions. In conclusion, mentioned isolates with potential to suppress red rot pathogen efficiently and growth promotion in sugarcane can be use for making biofertilizer/biopesticide against red rot disease for sustainable agriculture.