

P39.017 *Bacillus* and *Streptomyces* spp. as potential biocontrol agents to control soil-borne pathogens of chickpea and sorghum*M. Sreevidya* and *S. Gopalakrishnan*

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Chickpea and sorghum are mainly affected by biotic factors such as insect pests and pathogenic microorganisms. The main objective of present study is to isolate and identify antibiotics from culture filtrates of *Bacillus* and *Streptomyces* spp. against soil-borne fungal pathogens of chickpea (*Sclerotium rolfsii*, *Rhizoctonia bataticola* and *Fusarium oxysporum* f. sp. *ciceri* causing collar rot, dry root rot and wilt) and sorghum (*Macrophomina phaseolina* causing charcoal rot). Bacteria and actinomycetes isolated from rhizosphere soils and herbal vermicompost were screened for their antagonistic potential against above mentioned fungal pathogens by dual culture assay. A total of 20 bacteria and 19 actinomycetes were selected for characterization of their plant growth promoting traits and biocontrol traits. In order to identify the antibiotic(s), cell free culture filtrates were partitioned against ethyl acetate and the resultant organic and aqueous phases were checked for their antagonistic potential. Organic phases of five bacterial isolates (VBI-4, VBI-19, VBI-23, SBI-23, and SBI-27) and four actinomycetes (SAI-13, SAI-29, VAI-7 and VAI-40) were found effective in controlling the growth of *S. rolfsii*, *R. bataticola* and *M. phaseolina*, whereas none of the aqueous phase samples were found effective. The bacterial isolates were identified as *Bacillus* spp. and the actinomycetes were identified as *Streptomyces* spp. in 16S rDNA analysis. The active metabolite(s) against fungal pathogens will be purified and chemical structure will be elucidated. The purified compound(s) will be tested for efficacy in greenhouse and field conditions against fungal pathogens.

P39.018 Reaction of canola to inoculation with primary and secondary zoospores of *Plasmodiophora brassicae**M.R. McDonald*, *K. Sharma*, *B.D. Gossen*, *J. Feng*, *A. Deora* and *S.F. Hwang*

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Plasmodiophora brassicae causes clubroot of canola (*Brassica napus*) and many other Brassica crops. Resting spores of the pathogen germinate and release primary zoospores that infect root hairs. Secondary zoo-

spores are produced in root hairs, released, and then infect the root cortex. Studies were conducted to investigate the role of these two spore types on cortical infection and subsequent clubroot severity in canola cv. Zephyr. Plants were inoculated with resting spores (RS, as a source of primary zoospores) or secondary zoospores (SZ) of either a virulent (P3) or an avirulent (P6) pathotype, singly or with secondary zoospores of P3 added with resting spores of either P3 or P6. Percent area of the root cortex infected was assessed 10 days after inoculation and clubroot severity was assessed 42 days after inoculation. The pattern of response for cortical infection and severity were similar. Inoculation with RS-P6 (avirulent) resulted in almost no infection (0.1%) or severity (0%), but inoculation with SZ-P6 produced low levels of both infection (4%) and severity (31%). Inoculation with RS-P3 produced more infection (33% vs 12%) and higher severity (67% vs 100%) than SZ-P3. Adding SZ-P3 to RS-P3 did not increase cortical infection (34% vs 33%), but adding RS-P3 + SZ-P6 produced lower infection (18% vs 34%) and severity (84% vs 100%) than RS-P3 + SZ-P3. These results indicate that pathogen effectors act at the root hair infection stage and suppress (P3) or induce (P6) resistance in the host.

P39.020 Aquatic ecology of zoosporic oomycetes*P. Kong* and *C. Hong*

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Zoosporic oomycetes including *Phytophthora* and *Pythium* attack hundreds of agriculturally and economically important plant species worldwide. The destructiveness of these pathogens is attributed partly to their multiple dispersal strategies. Some are soil borne plant pathogens, some are airborne, producing caducous sporangia, and others can be water borne by motile zoospores. Numerous species have been recovered from irrigation systems and natural waterways which are the most efficient means for the pathogen dispersal in nature. However, the aquatic ecology of zoosporic oomycetes is poorly understood which hampers the development of effective methods for control of disease spread. We recently investigated the effects of electrical conductivity (EC), dissolved oxygen (DO), pH and CO₂ on zoospore survival. All species tested survived a wide range of EC from 0.11 to 3.58 dS m⁻¹ although their survival rate decreased when EC was lower than 0.21 dS m⁻¹. Many species tolerated a broad range of DO from 0.3 to 11 ppm, but they were sensitive to higher DO levels. Zoosporic response to water pH was species-dependent. Dissolved CO₂ is a factor that can significantly reduce zoospore survival in water. Over 90% zoospores of test species were killed in 2 hours at 210 ppm of dissolved CO₂ or higher. Lower CO₂ concentrations were less effective but suppressed pathogen infectivity.