PP-465 [Bee Biology]
Mycorrhizal fungi associated with vetch increases honeybee nutrition and honey production examined with biomarker fatty acids

John Larsen, Tsiri Diaz
Institute for Ecosystem Research and Sustainability, National Autonomous University of Mexico

Plants associate with a complex network of biota both below and above-ground, including microorganisms and arthropods, important for crop health and nutrition. Among plant-associated arthropods honeybees (Apis mellifera L.) play a key role in agroecosystems, particularly in terms of crop pollination and honey production. On the other hand, root associated microorganisms like arbuscular mycorrhizal fungi (AMF) and Rhizobium are key players in plant growth and nutrition, which may affect flowering and the quality of pollen and nectar, and thereby indirectly affect honeybee nutrition. Despite this clear above and belowground link between honeybees and plant growth promoting microorganisms, the knowledge of soil-plant-honeybee interactions is still limited. Here we present results from a greenhouse experiment on the influence of root associated plant growth promoting microorganisms (AMF and Rhizobium) on honeybee performance in terms of honeybee nutrition, health and honey production with vetch (Vicia sativa L.) as host plant. Besides common soil-plant-honeybee variables we measured the fatty acid composition in all soil-plant-honeybee compartments including soil, roots, honeybee and bee bread. Fatty acids are present in all organisms principally as phospholipids in membranes and as energy reserves in terms of neutral lipid fatty acids. Fatty acids have been used as biomarkers to study soil microbial communities and for the quantification of the abundance of specific groups of microorganisms in soil and roots including AMF (16:1ω5) and Rhizobium (17:0cyclo), while the fatty acid composition in honeybees and beebread has been less explored. Our results show that the fatty acid composition in the different soil-plant-honeybee compartments clearly differed. Interestingly, we found a clear positive correlation between the AMF biomarker fatty acid 16:1ω5 in soil and the fatty acid 20:4ω6,9,12,15 in honeybees. Furthermore, honey production was also positively correlated with the abundance of 16:1ω5 in soil. On the other hand, no clear associations between the Rhizobium fatty acid 17:0cyclo in roots and honeybee performance were observed, though 17:0cyclo correlated positively with host plant growth. In conclusion, here we show clear indirect positive effects of AMF on honeybee nutrition and honey production.