Universität Basel

Research Project

Population dynamics of arbuscular mycorrhizal fungi under transgenic strawberries and their wild relatives

Third-party funded project

Project title Population dynamics of arbuscular mycorrhizal fungi under transgenic strawberries and their wild relatives
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Genetically modified (GM) crops are currently produced on large surface areas worldwide, and much work has been done already about their benefits and risks in terms of agronomy, economy, and human health. One of the important aspects of the Swiss programme NRP59 is to look also at the impact of GM crops to non-target organisms and to biodiversity and ecosystems. Our project is designed to study one group of such non-target organisms, the arbuscular mycorrhizal fungi. All major crop plants form a symbiosis with arbuscular mycorrhizal fungi, and this symbiosis is particularly relevant for some horticultural crops.

We have selected strawberries, a charismatic and highly symbolic crop for the Swiss population for our study, and we share the interest in transgenic strawberries with our partners, Andreas Erhardt and Peter Stoll (Institut für Natur-, Landschafts- und Umweltschutz, Universität Basel): In their project, they intend to investigate potential benefits and risks of transgenic strawberries with a particular focus on the potential ecological consequences of ”gene escape”. They will use experimental plots grown in greenhouses, and they will evaluate their data using matrix models to investigate basic demographic parameters of their experimental plants.

Strawberry plants live always in symbiosis with arbuscular mycorrhizal (AM) fungi, both under natural and agronomic conditions, and it becomes increasingly apparent that this symbiosis is not only important in reducing fertilizer loads (AM fungi as ”bio-fertilizers”) but also in protecting plants from root pathogens (AM fungi as biocontrol agents). Obviously, the introduction of (trans-)genes that influence the hormone balance, photosynthetic partitioning and root architecture (as in the case of the transgenic strawberries we study) may also influence the population dynamics of the AM fungi, and conversely, the AM symbiosis may influence the demographic parameters of the plants. Here, we propose a study ”below-ground” on the population dynamics of AM fungi to complement the studies ”above-ground” of our partners. Our partners, A. Erhardt and P. Stoll, will use normal agricultural soil with its natural AM fungal population in their study. At the beginning of the greenhouse experiments, we will ”spike” this soil with spores of a well-characterized strain of *Glomus intraradices*, an AM fungus common in agricultural soils. We are developing microsatellite markers for the identification and quantitation of the ”spiked” strain, so that its population can be followed over time in the rhizosphere of the experimental strawberry plants. Sampling of rhizosphere soil and roots will be co-ordinated with the harvests necessary for the above-ground plant studies. We will conduct conventional analyses of mycorrhiza formation and symbiotic performance of AM fungi and of the diversity of their spores over the time of the experiments. In addition,

we will do competition experiments between GM and non-transgenic strawberries, both in the presence and absence of AM fungi, and we hope to adapt the matrix models used by A. Erhardt and P. Stoll to parametrize basic demographic characteristics of the ”spiked” AM fungal strain in these systems.

Together with the data from our partner project, our project will provide important insights into the potential benefits and risks of transgenic horticultural crop plants, particularly with regard to the arbuscular mycorrhiza, an important non-target organism, and it may contribute to building a decision catalogue as to whether such genetically modified crops should be considered in programmes promoting sustainable agriculture in Switzerland.

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