Review: Potential impact of *S. vermifera*, a unique root symbiont, on agronomics of biofeedstocks

**Background**
- Research performed with orchid mycorrhizal fungus *Sebacina vermifera* clearly indicates significant growth-promoting abilities in a remarkably broad spectrum of plants, including switchgrass, that rivals or even surpasses that of arbuscular mycorrhizae.
- Despite their proven beneficial impact on plant growth and their apparent but cryptic ubiquity, studies with *Sebacinoid* fungi are relatively few, particularly regarding agricultural applications.

**Approach**
- The vast unexplored agronomic potential of *Sebacina vermifera* for beneficial applications in the areas of sustainable agriculture was thoroughly reviewed.

**Outcome**
- Several properties of these fungi can be a very valuable to facilitate low-input agriculture.
  - They are culturable and can be manipulated fairly easily in the lab. Large amounts of inoculum can be readily generated relatively cheaply. We have used bentonite clay as a carrier, and find it to be stable over time and effective in transferring the fungus to the target host plant(s). We are currently pursuing additional technologies such as seed coating and broadcast application that could provide additional routes for inoculation.
  - More importantly, we have found no evidence of host specificity to date. Of particular note, we and others have successfully colonized *Arabidopsis thaliana*, which has been touted as a non-mycorrhizal plant, along with most of its Brassicaceae family members.

**Significance**
- *Sebacinoid* fungi should be considered as a previously hidden, but amenable and effective microbial tool for enhancing plant productivity and stress tolerance which has been validated in switchgrass, an important biofeedstock for biofuels.
- Harnessing the potential of the plant microbiome can play an important role in promoting low-input agriculture, along with improving cultural practices such as precision fertilizer application and continued improvements in breeding efforts led by high-throughput SNP genotyping; this can help make a second green revolution a reality.


Root enhancement in winter wheat due to *S. vermifera* colonization *in vitro*.