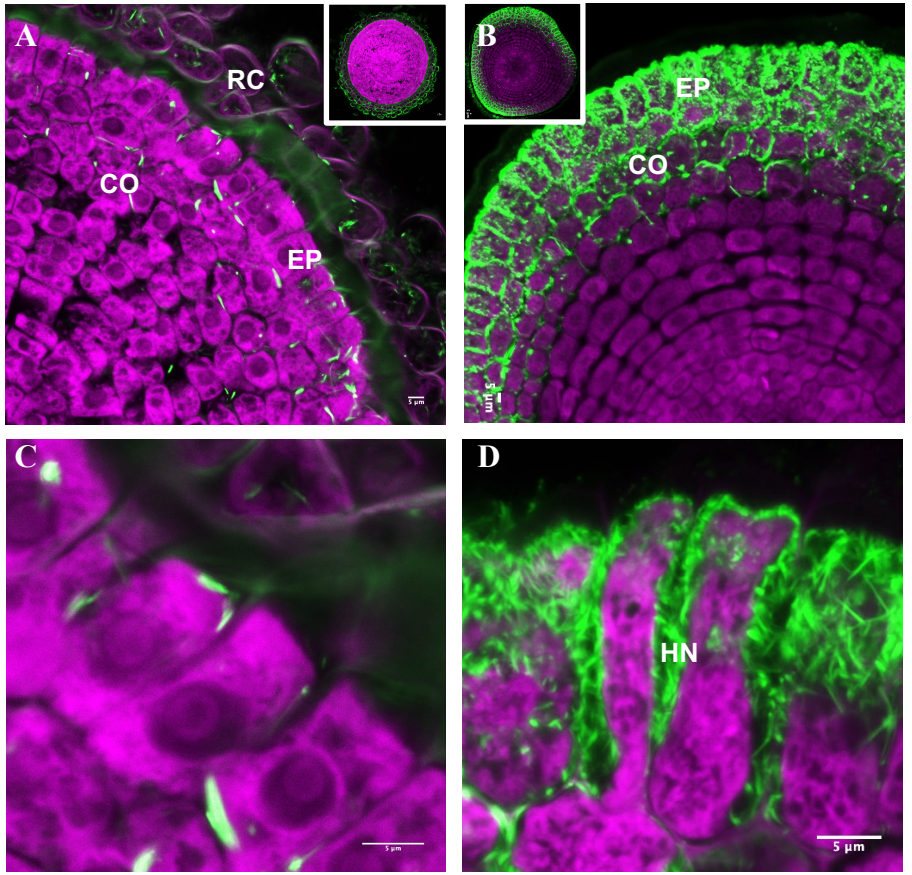
Foundational Genomics Research, PMI SFA

U.S. DEPARTMENT OF ENERGY | Office of Science

High Impact Publication: Engineering beneficial mycorrhization into a non-host perennial plant

Objective	• To introduce a key regulator (PtLecRLK1) of ectomycorrhizal fungus root-colonization into a non-host perennial plant and evaluate its potential to enhance plant productivity and fitness in marginal lands.
New science	• A lectin receptor-like kinase gene, *PtLecRLK1,* that was demonstrated to be a key regulator of root colonization in *Populus* by *L. bicolor*, was successfully introduced into switchgrass (*Panicum virgatum*), a perennial grass known to be a non-host of *L. bicolor.* • Introduction of *PtLecRLK1* into switchgrass rendered the ability to be colonized by *L. bicolor*, illustrating the conversion of a non-host to a host of *L. bicolor*. • Inoculation and phenotypic assays indicate that *L. bicolor*-inoculated switchgrass transgenic plants tend to be more tolerant to phosphorus limitation than the wild type plants.
Impact	• The ability to engineer the long-lasting beneficial relationships between ectomycorrhizal fungi and select hosts can maximize the utility and productivity of important bioenergy crops.



***Laccaria bicolor* colonization in roots of wild type switchgrass (left panels) and *ZmUbipro-PtLecRLK1* transgenic switchgrass (right panels).** A) Dual fluorescence-stained transverse root section of wild type. B) Dual fluorescence-stained transverse root section of *ZmUbipro-PtLecRLK1* transgenic switchgrass. C) and D) Zoom-ins from A) and B). RC: Root cap; Co, Cortex; Ep, epidermis; HN, Hartig net. Images shown are representative images from three experiments. Bars = 5 µm. Colonization including Hartig net formation is illustrated by green fluorescence.

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Qiao Z, et al. (2021) Towards engineering ecto-mycorrhization into switchgrass bioenergy crops via a lectin receptor-like kinase. *Plant Biotechnology Journal*, DOI: 10.1111/pbi.13671

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