195. Demonstrating Agrobacterium-mediated transformation of Pennycress (Thlaspi arvense) by expressing EaDAcT to alter seed oil composition

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Project Goals: Develop pennycress into a new oilseed crop that can be intercropped between corn and soybeans in the Upper Midwest.

Pennycress (Thlapsi arvense) is a Brassica species related to Arabidopsis and rapeseed that holds considerable agronomic and economic potential due to its unique combination of attributes including extreme cold tolerance, rapid growth, over-wintering growth habit, and natural ability to produce copious amounts of seeds high in oil and protein content.

Pennycress could be grown on millions of hectares of farmland throughout temperate regions of the world including the U.S. Midwest Corn Belt, e.g. being planted in the fall near the time of corn harvest and harvested the following spring in time for planting soybeans. While pennycress could potentially generate billions of liters of oil annually without displacing food crops or requiring land use changes, work must be done to develop pennycress varieties having improved seed germination and in-field stand establishment as well as improved seed oil and meal quality. To facilitate research on pennycress, we have developed a pennycress genetic transformation protocol using an Agrobacterium- mediated floral dip method. We found that, as with camelina, pennycress transformation was enhanced by applying a vacuum to floral spikelets while submerged in a sucrose- and Silwet L77-containing Agrobacterium solution. Hygromycin and DsRED worked well for selection of/screening for transformants, whereas pennycress seedlings exhibited naturally high resistance to kanamycin. We will discuss targets and approaches to genetically improving pennycress and will present data showing that we have successfully generated pennycress plants stably transformed with the Euonymus alatus diacylglycerol acetyltransferase (EaDAcT) gene; these plants produce seeds accumulating 3-acetyl-1,2-diacyl-sn-glycerols (acTAGs), a low---viscosity oil.

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