0203-MA-074 Development of Environment-Friendly Fusarium Head Blight Resistant Transgenic Plants in Barley and Durum Wheat.

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PROJECT ABSTRACT
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Fusarium head blight (FHB), caused primarily by *Fusarium graminearum*, has been one of the most destructive diseases of barley and durum wheat since the early 1990s, resulting in huge economic losses for the growers. The fungus also produces the mycotoxin, deoxynivalenol (DON), which is harmful to humans and livestock. The objectives of this project are to 1. produce transgenic durum wheat expressing an anti-toxin gene that may reduce FHB infection and DON level; 2. produce transgenic barley expressing anti-toxin genes that may limit FHB infection and DON level; 3. produce transgenic barley expressing anti-fungal genes that may reduce FHB infection; and 4. produce transgenic barley expressing both anti-toxin and anti-fungal genes. For all four objectives, we intend to produce transgenic plants without inserting any antibiotic or herbicide resistant genes, thereby addressing one of the primary concerns of anti-GMO groups. Only the promoter, open reading frame and terminator will be used for bombardment by digesting out vector backbone sequences that contain antibiotic genes. Instead of using a herbicide resistant gene (*bar*) for selection, we intend to use *Cah* (Cyanamide hydratase), a gene that converts cyanamide into fertilizer apart from facilitating selection of transgenic plants. Two anti-toxin genes, *TRI* 101 *and TRI* 12 and two rice anti-fungal genes, chitinase and thaumatin-like protein (*tlp)* will be used to generate transgenic durum wheat and barley plants. *TRI* 101 encodes a 3-OH trichothecene acetyltransferase from *Fusarium sporotrichioides* that converts DON to a less toxic acetylated form while *TRI* 12 encodes a trichothecene pump from *Fusarium sporotrichioides* that is expected to transport DON into the cell vacuoles. Chitinase and *tlp* both are pathogen response proteins, which may prevent fungal infection and spread. Chitinase hydrolyzes chitin in the fungal cell wall and *tlp* is believed to alter membrane permeability and/or cellular signal transduction cascades. A combination of anti-fungal and anti-toxin genes may provide transgenic plants that exhibit better resistance against fungi, preventing economic loss and reducing DON levels in barley and durum wheat grain. Agronomically important barley cultivars Conlon and Drummond and the durum wheat cultivar Monroe will be used for generating transgenic plants.