PI: Abebe, Tilahun **PI's E-mail: Tilahun.Abebe@uni.edu**

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Project Title: Engineering Barley with Antifungal Gene Gastrodianin to Enhance Resistance to Scab Disease.

PROJECT 1 ABSTRACT

(1 Page Limit)

Fusarium head blight (FHB) or scab of barley caused by the fungus *Fusarium graminearum* is responsible for huge economic losses to growers in the northern mid-west of the United States. Scab-infected kernels become shriveled and accumulate the mycotoxin deoxynevalenol (DON) making them unusable for malting and animal feed. Introduction of anti-fungal genes is one strategy being pursued to improve resistance of barley to FHB. However, engineering cereals with genes for pathogenesis-related proteins, such as chitinases, glucanases, and thaumatin-like proteins (TLPs) have not produced effective resistance against FHB as these genes are not specific to *F. graminearum*. Apparently, genes known to specifically inhibit *F. graminearum* are required to give adequate protection. The objective of this project is to develop transgenic barley plants expressing the antifungal gene *GAFP* (gastrodianin antifungal protein). *GAFP* is isolated from the orchid *Gastrodia elata*, which leads a symbiotic relationship with the fungus *Armillaria mellea*. The fungus can grow in older corms but infection of new corms is prevented by *GAFP*. *GAFP* is also known to inhibit other saprophytic fungi, including *F. graminearum in vitro.* Conlon, a malting barley variety, will be transformed with an expression plasmid containing the coding region of *GAFP* to determine if gastrodianin is effective against *Fusarium* infection of cereals. Expression of *GAFP* will be targeted to the spike tissue using the spike-specific *Lem2* promoter we isolated recently from Morex barley (Abebe *et al*., 2005). Spikes of transgenic barley will be infected with *F. graminearum* to test the anti-*Fusarium* potential of gastrodianin. This research corresponds to USWBSI Genetic Engineering and Transformation (GET) goal of transforming barley with anti-*Fusarium* genes to limit *Fusarium* infection, growth and spread.