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PROJECT 1 ABSTRACT
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Plant-derived volatile organic compounds (VOCs) are produced when plants are under both abiotic and biotic stress. They play important roles in plant growth regulation, plant-plant communications, plant-microbe interactions and defense. However, it is not clear how specific VOCs impact plant pathogenesis. In preliminary studies we have shown that that a green leaf volatile (GLV), (E)-2-hexenal, completely inhibits the growth of *F. graminearum* and retards the development of disease symptoms on detached wheat leaves. It is not known if VOC concentration correlates with resistance to Fusarium head blight (FHB) and whether increasing their production in wheat would protect against FHB. The main objective of this study is to determine if VOCs affect susceptibility of wheat to FHB and whether production of these volatiles in wheat would enhance resistance. In response to the RC recommendations (March 18th, 2019), additional efforts will be focused on objective 3:

1) Determine the effect of volatile treatment on susceptibility of wheat to *F. graminearum*.
2) Determine if the volatile treatment induces expression of the defense genes in wheat.
3) Determine if FHB resistance can be improved by increasing the production of volatiles in wheat.
RNAseq will be utilized to catalog the genes associated with response to volatile exposure and GLV synthesis.

We will determine the effect of volatile treatment on the enhancement of wheat resistance to *F. graminearum* and DON accumulation. We will identify concentrations of VOCs which induce expression of plant defense genes and determine if FHB resistant wheat lines produce higher levels of volatiles than susceptible lines both before and after treatment with *F. graminearum*. Lastly, we will overexpress fatty acid hydroperoxide lyase (HPL) gene in wheat to measure its impact on volatile production and FHB resistance. This project addresses the following FY18-19 priorities of GDER: 1) Identify wheat or barley gene variants that improve FHB resistance and/or reduce DON accumulation; 3) Develop effective FHB resistance and/or reduced DON accumulation through transgenic strategies. Harnessing VOCs from plants for control of FHB will open up an exciting field of research. Stakeholders will benefit from this research by the identification of new genes and new mechanisms of FHB resistance that can be introduced into wheat and barley.