INSECT PHYSIOLOGY

Impact of Host Plant on the Digestive Enzymes of the Southern Green Stink Bug

DESCRIPTION

The southern green stink bug is an increasingly important agricultural pest. Stink bugs rely on a complex of digestive enzymes for digestion of plant materials in a two-step process. They inject saliva that contains digestive enzymes into the host plant to preprocess plant material, with digestion completed in the midgut. This project addresses how the southern green stink bug responds to the defenses of corn and bean, specifically to the multiple serine protease inhibitors employed for defense against herbivores.

In the first year of the project, we found using biochemical assays that 1) each midgut compartment differs in the prevalent proteolytic enzymes, with aminopeptidase activity higher in the anterior and cysteine protease activity higher in the posterior regions. 2) The enzymatic profiles for both proteases and nucleases were comparable between nymph and adult reared on the same plant, and 3) enzyme activity profiles between insects reared on corn or on green bean were similar. Analysis of transcriptomic data will indicate whether enzyme transcription is altered by exposure to host plant inhibitors with some enzymes upregulated to maintain overall enzyme activity levels.

HOW THIS IS DIFFERENT THAN RELATED RESEARCH

The influence of host plant on the digestive physiology of this insect has not previously been addressed. This is the first examination of digestion in stink bug nymphs and the first analysis of the specific roles of different stink bug midgut compartments in the digestion process.

MEMBER BENEFITS

- Detailed profiles of protease and nuclease activities in saliva and in different regions of the digestive tract of the southern green stink bug, and in different life stages when reared on corn or green bean.
- Information on genes differentially regulated in the gut and salivary gland when reared on corn or green bean.
- This comprehensive understanding of southern green stink bug digestive processes and response to host plant may allow for new approaches for management of this damaging pest.

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