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Characterization of Protein Changes in Buffalograsses Challenged by Blissus Occiduus

Tiffany Heng-Moss
thengmoss2@unl.edu

Gautam Sarath
University of Nebraska - Lincoln, Gautam.sarath@ars.usda.gov

Frederick P. Baxendale
University of Nebraska - Lincoln, fbaxendale1@unl.edu

D. Novak
University of Nebraska - Lincoln

S. Bose
University of Nebraska - Lincoln

See next page for additional authors

Research Project: Improved Plants and Production Practices for Grasslands and Biomass Crops in the Mid-Continental Usa

Location: Grain, Forage & Bioenergy Research

Title: Characterization of Protein Changes in Buffalograsses Challenged by Blissus Occiduus

Authors

- Heng-Moss, T - UNI OF NE-LINCOLN
- Sarath, Gautam
- Baxendale, F - UNI OF NE-LINCOLN
- Novak, D - UNI OF NE-LINCOLN
- Bose, S - UNI OF NE-LINCOLN
- Xinhi, N - MONTANA STATE UNI
- Quisenberry, S - MONTANA STATE UNI

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Interpretive Summary: Plant-insect interactions are of profound importance in agriculture. Herbivorous insects can inflict substantial damage to susceptible plants. Thus understanding the mechanisms of plant tolerance to herbivory can lead to breeding resistant plants. Although this area has been studied for many years, we are still largely unaware of the plant-related biochemical changes that result in tolerance or resistance mechanisms. This paucity of data is further complicated by the great range of insect herbivores and in several cases by an almost complete lack of molecular and biochemical information of the agronomically important plant species. We investigated

the role of plant proteins and some oxidative enzymes in the defense response of buffalograss, Buchloë dactyloides (Nuttall) Engelmann, to the chinch bug, Blissus occiduus Barber. Changes in catalase and peroxidase activity were observed in both resistant and susceptible buffalograsses in response to chinch bug feeding. Susceptible plants were shown to have a lower level of catalase activity when compared to their respective control plants. By contrast, catalase activities of resistant plants were similar between infested and control buffalograsses throughout the study. Resistant plants had higher levels of peroxidase activity when compared with their control plants, while peroxidase activities for control and infested susceptible plants remained at similar levels or were slightly lower for infested plants. These findings suggest that chinch bug feeding leads to a loss in catalase activity in susceptible buffalograsses. In contrast, resistant buffalograsses may be able to tolerate chinch bug feeding by increasing their peroxidase activity.

Technical Abstract: Modifications in plant protein profiles and alterations in plant oxidative enzyme levels have been reported to be among a plant=s first response to insect herbivory. This research investigated the role of plant proteins in the defense response of buffalograss, Buchloë dactyloides (Nuttall) Engelmann, to Blissus occiduus Barber. The objectives were two-fold: first, to compare protein content and enzyme activities (i.e., peroxidase, catalase, and polyphenol oxidase) of chinch bug resistant and susceptible buffalograsses, and second, to analyze extracted proteins by native and denaturing gel electrophoresis to obtain information about protein profiles of resistant and susceptible buffalograsses. Changes in catalase and peroxidase activity were observed in both resistant and susceptible buffalograsses in response to chinch bug feeding. Susceptible plants were shown to have a lower level of catalase activity when compared to their respective control plants. By contrast, catalase activities of resistant plants were similar between infested and control buffalograsses throughout the study. Resistant plants had higher levels of peroxidase activity when compared with their control plants, while peroxidase activities for control and infested susceptible plants remained at similar levels or were slightly lower for infested plants. These findings suggest that chinch bug feeding leads to a loss in catalase activity in susceptible buffalograsses. In contrast, resistant buffalograsses may be able to tolerate chinch bug feeding by increasing their peroxidase activity. Polyphenol oxidase activities were similar between control and infested plants for the buffalograsses evaluated.

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