TITTLE: MOLECULAR BASIS OF SECONDARY METABOLITES-MEDIATED DEFENSE AGAINST STEM BORERS IN *SORGHUM BICOLOR L.(Moench)* AND *ORYZA SATIVA (Desv.) Steud*

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ABSTRACT

Sorghum (*Sorghum bicolor* (L.) Moench) is the fifth most important crop in the world in terms of production that originated in Africa, but highly susceptible to stem borers. Some sorghum show resistance to stem borer; however, the molecular basis of resistance is not well studied. This study identified two sorghum genotypes with highly contrasting levels of stem damage caused by the caterpillars of Asian stem borer (*Ostrinia furnacalis* Guenée). Recombinant inbred lines (RILs) from genetic cross between resistant (BTx623) and susceptible (NOG) sorghum were used to perform a quantitative trait locus (QTL) analysis in the field. Two major QTLs responsible for higher NOG infestation by stem borer in three independent field seasons were detected on chromosomes 7 and 9, interestingly in positions that overlapped with two major QTLs for plant height. As plant height and stem borer damage were highly correlated, it is proposed that sorghum height-associated morphological or physiological traits could be important for stem borer establishment and/or damage in sorghum.

Acute stress responses include release of defensive volatiles from herbivore-attacked plants. This study used two closely related monocot species, rice as a representative C3 plant, and sorghum as a representative C4 plant, and compared their basal and stress-induced headspace volatile organic compounds (VOCs). Although both plants emitted similar types of

constitutive and induced VOCs, in agreement with the close phylogenetic relationship of the species, several mono- and sesquiterpenes have been significantly less abundant in headspace of sorghum relative to rice. Furthermore, in spite of generally lower VOC levels, some compounds, such as the green leaf volatile (*Z*)-3-hexenyl acetate and homoterpene DMNT, remained relatively high in the sorghum headspace, suggesting that a separate mechanism for dispersal of these compounds may have evolved in this plant. Finally, a variable amount of several VOCs among three sorghum cultivars of different geographical origins suggested that release of VOCs could be used as a valuable resource for the increase of sorghum resistance against herbivores.

Experimental studies were undertaken to ascertain and compare the impact of artificial herbivory oral secretions of *Mythimna loreyi* Duponchel (Lepidoptera: Noctuidae) on quantitative changes of sugar and phenolic constituents in rice (C3) and Sorghum (C4) monocot plants. The phenolic acids and sugars were analyzed using HPLC and quantified with standard samples. The quantity of phenol has been enhanced in WOS treated plants and sugars reduced in WOS as compared to control plants, however sorghum had a high quantity of phenolic compounds in both WOS and control as compared to rice plants. Certain phenolic acids such as P hydroxyl benzoic acid, vanillic acid, syringic acid, cinnamic acid and P-coumaric acid were found in WOS treated sorghum and rice, but more in sorghum as compared to rice. While other compounds such as P-coumaric acid and P- cinnamic acid were not found in control rice, while P-coumaric acid and Chlorobenzoic acid were not found in control sorghum. Results can be useful in integrated pest management.