Synergistic action of opportunistic fungi and sugarcane borer *Diatraea saccharalis* promotes red-rot disease in sugarcane

Flávia P. Franco¹, Maria Fernanda G.V. Peñaflor², Felipe Goulart Gonçalves², José Mauricio S. Bento², Gustavo Henrique Goldman³, Daniel S. Moura⁴, Marcio C. Silva-Filho¹

¹Departamento de Genética, ESALQ, Universidade de São Paulo, Av. Pádua Dias, 11, 13400-918 Piracicaba, SP, Brazil. ²Departamento de Entomologia e Acarologia, ESALQ, Universidade de São Paulo, Av. Pádua Dias, 11, 13400-918 Piracicaba, SP, Brazil. ³Departamento de Ciências Farmacêuticas, Universidade de São Paulo, Ribeirão Preto, SP, 14040-903. ⁴Departamento de Ciências Biológicas, ESALQ, Universidade de São Paulo, Av. Pádua Dias, 11, 13400-918 Piracicaba, SP, Brazil

Colonization of sugarcane stalk by opportunistic fungi, such as *Fusarium verticillioides* and *Colletotrichum falcum*, usually occurs after the attack of *Diatraea saccharalis* (Lepidoptera: Cambridae) caterpillars. SUGARWIN2 (sugarcane wound-inducible protein) is induced in response to *D. saccharalis* damage and pathogen infection. The recombinant protein does not show any effect on larval development, however, it promotes significant morphological and physiological changes on *F. verticillioides* and *C. falcum*, which leads to fungal cell death by apoptosis. In this study we evaluate the infection of *C. falcum* in sugarcane plants with different expression levels of SUGARWIN2. We also evaluate a putative beneficial interaction between the fungi and the insect on plant. The results suggest that SUGARWIN2 has an important role in plant defense against opportunistic pathogens. The sugarcane variety showing higher level of SUGARWIN2 expression had a considerable reduction of *C. falcum* infection. Furthermore, *D. saccharalis* seems to create a favorable environment to *C. falcum* development through a synergistic interaction, since the fungus infection is highly increased when associated to the larvae. In addition, both fungi *C. falcum* and *F. verticillioides* have shown to attract and positively influence *D. saccharalis* feeding. However, the fungus *Aspergillus nidulans*, which usually does not infect sugarcane, has shown no influence on *D. saccharalis* feeding nor attractiveness to the diet. The olfactory choice assay showed that *D. saccharalis* was attracted to volatiles emitted by *C. falcum* and *F. verticillioides*. These observations suggest a close relationship between *C. falcum* and *F. verticillioides* with *D. saccharalis* in sugarcane favoring fungal colonization and disease development.