

INTISARI

Tebu (*Saccharum officinarum* L.) menjadi komoditas utama tanaman penghasil gula di Indonesia. Peningkatan kualitas dan produktivitas tebu terus diupayakan untuk mendukung swasembada tebu tahun 2028. Saat ini sedang dikembangkan tebu hasil produk rekayasa genetik (PRG) overekspresi *sucrose-phosphate synthase* (SPS) yang dapat berkorelasi positif terhadap peningkatan nilai rendemen gula pada tanaman tebu. Salah satu prosedur pelepasan tanaman tebu PRG adalah dengan pengujian ketahanan tanaman terhadap hama dan penyakit. Di mana penyakit utama dalam budidaya tebu adalah penyakit luka api yang disebabkan oleh jamur *Sporisorium scitamineum*. Penelitian ini bertujuan untuk mengetahui respons tanaman tebu PRG terhadap penyakit luka api melalui analisis pola ekspresi gen pertahanan, metabolisme fotosintesis, dan virulensi penyakit. Varietas tebu yang digunakan adalah WT (Bululawang), SP1, SP3, dan Cening. Tebu umur 45 hari setelah tanam (HST) di inokulasi dengan *S. scitamineum* dengan metode modifikasi pelukan dan spray. Analisis ekspresi gen dilakukan dengan ekstraksi RNA setiap varietas tanaman selama 0,1,2,3,4 minggu setelah infeksi. Primer yang digunakan adalah bE2-264 yang mengkode virulensi penyakit, Catalase dan APX sebagai gen antioksidan, RbCs dan SPS-1 yang berperan dalam metabolisme fotosintesis. Selama satu bulan pengamatan, penyakit luka api belum menunjukkan respons morfologi sehingga dilakukan analisis molekuler untuk mengetahui respons fisiologi. Hasil analisis menunjukkan adanya ekspresi gen virulensi penyakit luka api pada semua varietas tanaman. Tidak ada perbedaan pola ekspresi gen antioksidan dan metabolisme fotosintesis pada tanaman tebu SP1 dan SP3 jika dibandingkan dengan varietas WT (Bululawang), sedangkan varietas rentan Cening menunjukkan kecenderungan penurunan ekspresi gen sebagai respons fisiologi pertahanan tanaman.

Kata kunci : ekspresi gen, luka api, overekspresi, *S. scitamineum*, SPS

ABSTRACT

*Sugarcane (*Saccharum officinarum* L.) is one of the important crop as the main source of sugar in Indonesia. Government has an attention to increase sugarcane productivity for supporting self-sufficiency level by 2028. Currently, overexpression sucrose-phosphate synthase (SPS) in sugarcane has been developed, which can potentially increased sugar yield in sugarcane crop. One of the requirements that has to be assessed in GM crop, including sugarcane is to evaluate and ensure the pest and disease resistance in GM sugarcane. According to regulation of Ministry of Agriculture that one of the sugarcane disease that need to be evaluated is smut disease caused by the fungus *Sporisorium scitamineum*. This study aims to determine the response of GM sugarcane to smut disease infection through gene expression analysis. The sugarcane varieties used are WT (Bululawang), SP1, SP3, and Cening. Fourty five days after planting (DAP), the sugarcane was inoculated with *S. scitamineum* using a modified spray method. Gene expression analysis was conducted by extracting RNA from each plant variety at 0, 1, 2, 3, and 4 weeks after infection. The gene encoding catalase, ascorbate peroxidase (APX), sucrose phosphate synthase (SPS), rubisco (RbcS), disease virulence gene (bE2-264) were used in this study. The expression of catalase and APX as antioxidant genes have been increased after 2 weeks after inoculated, while the expression of RbcS and SPS-1 are similar. During one month of observation, smut disease did not show any morphological response, leading to molecular analysis to understand the physiological response. The analysis results indicated there were no differences in the expression patterns of antioxidant and photosynthesis metabolism genes in SP1 and SP3 sugarcane plants compared to the WT (Bululawang) variety, where as the susceptible variety Cening showed a tendency to decrease gene expression as a physiological defense response.*

Keywords: *gene expression, smut, overexpression, *S. scitamineum*, SPS*