Biotic and abiotic factors altogether affect the spread of the vectored emerging disease, Yellow leaf of sugarcane, in Guadeloupe.

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Yellow leaf of sugarcane caused by the *Sugarcane yellow leaf virus* (SCYLV), a *polerovirus*, is an emerging disease in the tropical island of Guadeloupe. It was first detected in 1996 as a possible result of multiple introductions of infected plant material in the germplasm collection of CIRAD, in which three distinct genotypes of the virus have been identified so far. Despite a large distribution of the main vector of SCYLV, the aphid *Melanaphis sacchari*, in Guadeloupe, average field contamination remains relatively low compared to contamination within the germplasm collection, in which incidence of the virus and number of infected accessions increased by 3.5 from 2003 to 2006.

In this study we investigated the impact of diverse environmental factors and genetic diversity of the host and the virus on spread of SCYLV in six distinct geographic locations in Guadeloupe, including 24 fields of plant cane and first ratoon crops planted with five different sugarcane cultivars. Mean values of disease incidence (DI) in all fields were 7.4 and 10.8 (percent of positives samples) in plant cane and first ratoon crops, respectively, as determined by tissue blot immunoassay (TBIA). Two distinct geographical areas were identified in Guadeloupe based on DI values: Marie-Galante, a small island of approximately 61 square miles located 20 miles from Guadeloupe where DI was almost absent (1 positive out of 1700 samples); and the east of the Guadeloupe Basse-Terre, a recent sugarcane growing area, where DI in plant cane crop was significantly higher (18 to 20) comparatively to DI in ancient sugarcane growing areas for the same cultivar (2 to 10). In ancient sugarcane growing areas, DI varied greatly between fields from 2 to 35%. As expected, DI in all fields varied between plant cultivars, revealing differential behaviors of sugarcane genotypes to virus infection.

Interestingly, most of virus samples collected from all fields, using the TBIA positive leaves identified in this study, and analyzed by RT-PCR were of one dominant genotype, and virus diversity was not related to virus incidence. Similarly, virus incidence was not linked to the solely one observation of plant colonization by aphid, as determined by the monitoring of populations of *M. sacchari* during samplings.

However, in ancient sugarcane growing areas disease incidence, was significantly correlated to rainfall in the first weeks following sugarcane plantation in the field. Indeed, rainfall thus explained up to 25% ($P = 0.039$) and 32% ($P = 0.018$) of DI variations observed in plant cane and first ratoon crops, respectively, as determined by multiple coefficient correlation analysis. It is strongly presumed that rainfall affect dynamic of SCYLV vector populations, directly, or, indirectly, affect predator populations of the vector and development of grasses that can modify aphid behavior.

Obviously, spread of a vectored emerging virus disease in a tropical environment is driven by multifactor components that need to be addressed when modeling epidemics.