Xanthomonas albilineans is able to move outside of the sugarcane xylem despite its reduced genome and the absence of a Hrp type III secretion system.

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Xanthomonas albilineans, the causal agent of leaf scald disease of sugarcane, is a pathogen that experienced genome reduction during its speciation. Additionally, this xanthomonad is notably missing the Hrp type III secretion system and the xanthan gene cluster that are commonly found in pathogenic *Xanthomonas* species. *X. albilineans* was up to now considered as limited to the xylem of sugarcane. However, recently published studies suggested that *X. albilineans* was able to invade tissues other than the xylem of sugarcane leaves but the occurrence of *X. albilineans* outside the xylem has not been clearly proven. In this study, we used confocal microscopy and transmission electron microscopy to investigate the localization of this pathogen in diseased leaves and stalks of sugarcane. Three sugarcane cultivars with different levels of resistance to leaf scald were inoculated with the green fluorescent protein labelled *X. albilineans* strains XaFL07-1 (from Florida) and GPE PC73 (from Guadeloupe). Sections of sugarcane leaves and stalks were examined 8-60 days after inoculation in order to localize *X. albilineans* in the different plant tissues. Confocal microscopy observation of symptomatic leaves confirmed the presence of the pathogen in the protoxylem and the metaxylem, however, *X. albilineans* was also observed in the phloem, the parenchyma and the bulliform cells of the leaves. Similarly, the protoxylem and the metaxylem of infected sugarcane stalks were invaded by *X. albilineans*. Surprisingly, the pathogen was also observed in apparently intact storage cells of the stalk and in the intercellular spaces between these cells. Several of these observations made by confocal microscopy have been confirmed by transmission electron microscopy. *X. albilineans* can therefore no longer be considered as a xylem-limited pathogen. To our knowledge, this is the first description of a plant pathogenic bacterium invading apparently intact non-vascular plant tissue and multiplying in parenchyma cells. The mechanisms and virulence factors used by *X. albilineans* to enter and invade different tissues of sugarcane remain to be identified.