

## **TITLE The Sugarcane Microbiome: A Key Element for Its Sustainability**

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Sugarcane (*Saccharum spp.*) is a complex hybrid cultivated in tropical and subtropical regions worldwide, mainly for its sugar, but also for its biomass, given that sugarcane boasts the highest primary productivities for any crop. Under optimal conditions, yields exceeding 150 Tm/Ha have been recorded, and the average for Brazil, the first world producer, exceeds 65 Tm/Ha over the ca. 10 million Ha planted.

Contrary to the situation encountered in many countries, sugarcane cultivated in South-Central Brazil has traditionally required little nitrogen fertilization. This led Döbereiner and collaborators to propose that a significant portion of sugarcane's N budget is provided by diazotrophic microorganisms in close association with sugarcane. Although sugarcane-associated nitrogen fixation has been proven in the field, and although diazotrophs have been isolated from sugarcane, the exact nature of the diazotrophs responsible for sugarcane nitrogen fixation remains elusive.

We have undertaken a thorough characterization of the sugarcane microbiome, across different organs and throughout the growing season. An unexpectedly large and diverse microbiome, made up of bacterial and fungal endophytes and exophytes has been uncovered. The microbiome is dominated by a core microbiome of few, very abundant OTUs. Many of those had not been previously described in sugarcane. A community-based culture collection of the most abundant isolates from the sugarcane microbiome has been established and characterized. This collection contains a large proportion of the OTUS constituting the core sugarcane microbiome, thus opening the way to microbiome reconstruction experiments. Preliminary tests suggest that many of the isolates exhibit desirable plant-growth promoting properties, either individually or in mixtures.

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