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"Solidarity in a competing world — fair use of resources"

The Biocontrol Agent *Fusarium oxysporum* F.sp. *strigae* – Its Impacts on Beneficial Indigenous Prokaryotes in a Maize Rhizosphere

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Abstract

Integrating resistant crop varieties and *Fusarium oxysporum* f.sp. *strigae* (Fos) as biocontrol agents (BCAs) was shown to be effective in controlling the *Striga hermonthica* weed which parasitizes on several tropical cereals. Effects of Fos on beneficial microbial rhizosphere communities has however not been observed so far, although it is a prerequisite for prospective field application. Hence, our objectives were (1) to assess the potential impact of Fos on indigenous nitrifying abundance and proteolytic enzymatic activity prokaryotes in a maize rhizosphere cultivated on two distinct tropical soils (sandy Ferric Alisol versus clayey Humic Nitisol) in a rhizobox study, and (2) to evaluate potential effects of Fos versus those of soil properties (i.e. pH and texture), seasonality and crop growth stage on the abundance and diversity of nitrifying prokaryotes from two contrasting agroecological sites in western Kenya (Homabay and Busia). Fos-BCA "Foxy-2" was applied as model organism via seed coating of a *S. hermonthica* tolerant maize variety to the four soils. Nitrifying prokaryotes and proteolytic enzyme activity in the rhizobox study was followed at 14, 28 and 42 days after experiment start while for the field study nitrifying prokaryotes abundance and community structure was determined at early leaf development (EC30), flowering stage (EC60) and senescence stage (EC90). Two significant influence factors were considered: (1) presence of *S. hermonthica* plants, and (2) application of *Tithonia diversifolia* residues as nitrogen source for "Foxy-2", and the indigenous microbes. The rhizobox study revealed a stimulating effect of "Foxy-2" and *S. hermonthica* on abundance of archaeal nitrifiers, while bacterial counterparts and proteolytic enzyme activity remained unaffected. Proteolytic abundance revealed a transient decline which was compensated by *Tithonia diversifolia* application. The field study demonstrated that soil properties, seasonality and crop growth stages exerted a strong influence on abundance and community structure nitrifying prokaryotes compared to "Foxy-2" inoculation effects. In conclusion, we showed that "Foxy-2" did not pose a negative effect on indigenous nitrifiers and that application of high quality organic input *Tithonia diversifolia* compensates minor "Foxy-2" effects on proteolytic abundance. To strengthen our findings, we recommend plant-microbiome interaction studies to better understand the action mechanisms of "Foxy-2".

Keywords: Biocontrol, Foxy-2, indigenous prokaryotes, rhizosphere

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