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"Bridging the gap between increasing knowledge and decreasing resources"

Response of the Abundance of Nitrifying Prokaryotes to *Fusarium oxysporum* f.sp. *strigae* in a Maize Rhizosphere

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Abstract

The parasitic weed *Striga hermonthica* adversely affects production of several cereals (*e.g.*, maize, sorghum) that are cultivated in sub-Saharan Africa. The integration of resistant crop varieties and *Fusarium oxysporum* f.sp. *strigae* (Foxy-2) strains as biological control agent (BCA) has shown to be an effective control. Most studies have examined the efficacy of the BCA and its interactions with host crops, while overlooking the interplay among key microorganisms in the soil nitrogen (N) cycle. Hence, we postulated that: (i) Foxy-2 poses a threat to the indigenous plant root-associated microbial communities involved in N cycling through competition for nutrients, and (ii) the application of high quality organic residues would compensate these effects. The objective of this study was thus to assess the potential impact of Foxy-2 on indigenous nitrifying prokaryotes in maize rhizosphere cultivated on distinct soils (sandy Alisol versus clay Nitisol, Acrisol and Phaeozom) from central and western Kenya. The soils from central Kenya were used in a rhizobox experiment while field experiments were done in western Kenya. Soils were treated with or without Foxy-2, *Striga* and high quality organic residue (*i.e.*, *Tithonia diversifolia*) as N source. Using quantitative polymerase chain reaction (qPCR), the responses of ammonia-oxidising archaea (AOA) and bacteria (AOB), total bacteria and archaea abundance was recorded at three pre-defined sampling dates. Contrary to our expectations, a distinct stimulative, but no resource competition effect of Foxy-2 on the abundance of AOA, as well as total archaeal and bacterial communities was observed in the sandy soil of the rhizobox experiment. AOB only showed increases in the sandy soil when organic residue was added. Under field conditions, however, preliminary results indicated that Foxy-2 had no negative effect on studied nitrifying prokaryotes abundance. Although we found indications that Foxy-2 influences prokarytotic abundance, it did not become clear which underlying mechanisms were responsible for the stimulative effect. Since it is known that antagonistic *Fusarium* are genetically stable and able to survive over long periods in foreign environments, further research is required to evaluate the effects of external factors including contrasting seasons (long rains versus short rains seasons) and also crop growth stages.

Keywords: Biological control, *Fusarium oxysprorum* f.sp. *strigae*, nitrifying prokaryotes, quantitative PCR, rhizosphere, *Striga hermonthica*

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