Control of the weed *Striga hermonthica* by the fungal biocontrol agent *Fusarium oxysporum* f.sp. *strigae*

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Introduction

Cereals (especially maize and sorghum) are major staple in Sub-Saharan Africa (SSA). Ethiopia produced over 4.3 Million tonnes of sorghum in 2014, thus it is Africa's 3rd and the world's 6th highest producer of sorghum. *Striga hermonthica* infestation has taken up about 30% of the sorghum growing areas in Ethiopia, causing yield loss estimated at US$75 million annually.

Literature review (problems)

High temperatures and poor soils (particularly lower Nitrogen) favour *S. hermonthica* spread, hence its proliferation could be accelerated with the rising effects of climate change. *S. hermonthica* threat could be more severe in Ethiopia than other regions of SSA due to its ubiquitous distribution across farmlands.

The mycoherbicidal efficacy of *Fusarium oxysporum* f.sp. strigae (isolate Foxy-2), against *S. hermonthica* has been largely successful in Western Africa, however field trials from Kenya did not validate Foxy-2 effectiveness, rather another *F. oxysporum* isolate (FK3) proved effective. It is unclear if FK3 success in Eastern Africa results from the fungal isolate mode of action, *Striga* genotype susceptibility pattern or ecology.

Methodology

Assessing the impact of *F. oxysporum* isolates on the physiological attributes in early developmental stages of *S. hermonthica,* through in-vitro examination with fluorogenic reporter and metabolomics technology.

Connecting *S. hermonthica* resistant trait to allelic variations among/within sampled populations via genotyping by PCR and sequencing, and bioinformatic linkage to resistance (phenotypic manifestation).

Investigating the combined *F. oxysporum* and Plant Growth Promoting Rhizobacteria treatment effects on the vegetative physiological development of *S. hermonthica* in-vivo by bioluminescence gene reporter.

Field evaluation of Foxy-2/FK3 potency in contrasting southern Ethiopian agroecologies, based on recommendations from earlier laboratory studies. Then, molecular biological and physicochemical assays of plant/soil samples with biogeographic tests of field data.

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Objectives

(1) To determine the efficacy of *F. oxysporum* isolates (Foxy-2 and FK3) in controlling West and East African *S. hermonthica* populations.
(2) To investigate the allelic size variation among West and East African *S. hermonthica* populations and the linkage to Foxy-2 and FK3 susceptibility.
(3) To assess the impact from combined application of Plant Growth Promoting Rhizobacteria (PGPR) and *F. oxysporum* isolates (Foxy-2 and FK3) in increasing the efficiency of *S. hermonthica* control.
(4) To identify the major soil microbiota and physicochemical properties, and climate associated with southern Ethiopian agroecologies where Foxy-2 and/or FK3 will effectively control *S. hermonthica*.

Sorghum field heavily infested with *S. Hermonthica*
(Photo credit: Taye Tessema, on UC Davis Blog, 2017)

Overall expectation

Clearer understanding of soil biotic and abiotic properties including climatic conditions associated with southern Ethiopian agroecologies where Foxy-2 and/or FK3 will be effective against *S. hermonthica,* as among ways of ensuring food security in the era of climate change.

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