The Summer Undergraduate Research Fellowship (SURF) Symposium
6 August 2015
Purdue University, West Lafayette, Indiana, USA

Use of Intrinsic Volatile Compounds to Create Bird Resistance in Sorghum

Kennedy I. Clark, Roselyn L. Hatch
Department of Agronomy, Purdue University
Clifford Weil
Department of Agronomy, Purdue University

ABSTRACT

The red-billed quelea is the most abundant bird in the world, with 1.5 million breeding pairs. They live in massive flocks in central Africa and cause significant damage to cereal crops, especially sorghum. The chemical compound methyl anthranilate (MA), a volatile produced in the leaves of sorghum, has been proven to be an effective bird repellent. While there are currently commercial MA spray treatments available for sorghum, they have to be applied frequently and are thus not cost effective for smallholder farmers. This work aims to produce a line of sorghum that produces the MA compound in its inflorescence, specifically during early seed development, to decrease bird predation. To produce MA in the seed head of sorghum, we have fused a sorghum anthranilate methyl transferase (AMT) gene (which encodes the enzyme that produces MA) to each of three candidate promoter sequences. Each one of these promoters signals gene expression in different stages of early seed development. Using these promoters, and the isolated AMT, constructs have been created that will be transformed into sorghum. Once these plants are generated, and in the early stages of growth, the concentration of headspace volatiles around the inflorescence will be analyzed by dynamic headspace sampling coupled with gas chromatography-mass spectrometry to determine if the levels of MA are adequate to repel birds. Establishing the optimal MA levels in the plant for bird resistance and deploying this trait can decrease the issues that spray repellents bring for smallholder farmers and reduce sorghum vulnerability to quelea predation.

KEYWORDS

sorghum, methyl anthranilate, inflorescence, quelea