Accepted Manuscript

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PII: S1878-6146(17)30163-0

DOI: 10.1016/j.funbio.2017.11.005

Reference: FUNBIO 871

To appear in: *Fungal Biology*

Received Date: 31 August 2017

Revised Date: 8 November 2017

Accepted Date: 20 November 2017

Please cite this article as: Mitema, A., Okoth, S., Rafudeen, M.S., Vegetative compatibility and phenotypic characterization as a means of determining genetic diversity of *Aspergillus flavus* isolates, *Fungal Biology* (2017), doi: 10.1016/j.funbio.2017.11.005.

Vegetative compatibility and phenotypic characterization as a means of determining genetic diversity of *Aspergillus flavus* isolates

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1. Introduction

Maize (*Zea mays*) is an important staple food in most countries in Africa and is often contaminated by *Aspergillus* fungal species during pre- and post-harvest practices, storage and transportation (Shiferaw *et al.*, 2011). Studies by Horn (2007) showed that *Aspergillus* species are commonly found in the soil, which acts as a source of primary inoculum for infecting developing maize kernels during the growing season. *Aspergillus flavus* (*A. flavus*) is distributed globally with a high frequency of occurrence in warm climates which favour the growth of the fungus (Cotty *et al.*, 1994). The fungus produces aflatoxin, a mycotoxin that is a potent carcinogen that is toxic to both animals and humans and has been implicated in human aflatoxicosis (Lucic *et al.*, 1999).

Of the approximately 200 species of *Aspergillus* that have been identified, 16 produce aflatoxins that are considered to be carcinogenic, hepatotoxic, teratogenic or immunosuppressing agents (Klich, 2007; Rotimi *et al.,* 2016; IARC, 2016). *A. flavus* produces aflatoxins B1 and B2, with aflatoxin B1 classified as a class one carcinogen (IARC, 2016), while *A. parasiticus* produces aflatoxins G1 and G2 in addition to B1 and B2.

A. flavus isolates differ in many characteristics such as the ability to produce aflatoxins, the formation of sclerotia and sporulation (Bayman *et al.,* 1991). Some isolates lack the capability to produce aflatoxins (atoxigenic), while others produce low (<100 ng/g) to very high (>1000 ng/g) aflatoxin concentrations (aflatoxigenic) (Bayman *et al.,* 1991). *A. flavus* can be categorised into L- and S-morphotype strains (Cotty *et al.,* 1994). Cotty *et al.* (1994), observed that, L-morphotypes produce few large sclerotia (Ø>400 µm) with a variable amount of aflatoxins whereas, S-morphotypes produce numerous small sclerotia (Ø<400 µm) with higher amounts of aflatoxin. Moreover, Cotty *et al.* (1999) observed that a taxon (un-named and marked as S_{BG}) which is phylogenetically different from, but morphologically analogous to the *A. flavus* S-type strain, produces small sclerotia and large amounts of both aflatoxins G and B. Some isolates of *A. flavus* also produce the mycotoxin cyclopiazonic acid (CPA), which is a mycotoxin reported to be the cause of the Turkey 'X' disease outbreak in the 1960s (Richard *et al.,* 1986; Richard 2008; Abbas *et al.,* 2011). CPA is not currently regulated by any government