experiment was carried out in 2016/17 and 2017/18 to compare the efficacy of formulations of *C. rosea* strain 016 and *T. atrobrunneum* strain Th908. The collected data included *Fusarium* spore dispersal during the infection period, disease symptoms, mycotoxin content, as well as the incidence of *Fusarium* species and *F. graminearum* DNA in harvested grains. The treatments with *C. rosea* strain 016 resulted in significantly lower FHB symptoms and reduced the deoxynivalenol content in harvested grains by up to 82% in the first and by up to 90% in the second year. Likewise, zearalenone was reduced by up to 80% in the first and by up to 90% in the second year. In conclusion, the results confirm the great potential of *C. rosea* to reduce FHB infections, which will be further investigated in on-farm experiments in the future.

Chasing Fusarium graminearum throughout its entire life cycle using botanicals: an in vitro approach

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Fusarium Head Blight (FHB) is one of the most important cereal diseases worldwide causing significant yield reductions and severe contaminations of harvested products with mycotoxins. Worldwide, *Fusarium graminearum* (FG) is one of the most common FHB causing species in wheat and barley cropping systems. By employing a unique approach, we assessed the control efficacy of different plant-based products (i.e. botanicals) on essential parts of the entire fungal life cycle using three FG strains (i.e. FG0410, FG2113 and FG1145). The botanicals included aqueous extracts from white mustard (*Sinapis alba*) seed flour (Pure Yellow Mustard (PYM) and Tillecur® (Ti)), as well as milled Chinese galls (CG). At 2% concentration (w v^{-1}), PYM and Ti completely inhibited the mycelium growth of all FG strains, while at 1%, CG reduced the growth by 65-83%, depending on the strain. Furthermore, PYM and Ti greatly inhibited the germination of both conidia and ascospores at 2% w v^{-1}, while CG was only effective against conidia germination. Perithecia formation of FG0410, but not of FG2113, was suppressed by all botanicals. Moreover, application of botanicals on mature perithecia led to two- to four-fold lower discharge of ascospores. Using liquid chromatography (LC) with diode array detection, we quantified the principal glucosinolate component sinalbin of PYM and Ti. LC time-of-flight mass spectrometry was used to demonstrate that the bioactive matrix of CG contains different gallotannins as well as gallic and tannic acids. Possible antifungal mechanisms of the botanical matrices will be discussed. The results of this study are promising and suggest that the examined botanicals should be further tested in crop protection programs against FHB, targeting different developmental stages of the fungus.

Zero Aflatoxin – Development and implementation of antifungal strategies to increase food safety in sub-Sahara Africa

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Africa is known as the world's second largest continent with a human population of about 1.2 billion people. Due to its geographical position, Africa has a relatively warm and humid climate. This climatic condition provides fungi such as *Aspergillus flavus* and *A. parasiticus* optimal growth support and can lead to a high load of food and feed with the strong carcinogenic mycotoxin aflatoxin. Since aflatoxin may be a frequent cause of death, especially for children, the elderly and the weakened, the development of sustainable strategies against fungal infestation is of utmost importance. Especially maize is a food that is very popular and commonly consumed in Sub-Saharan-Africa. Irrespective of the decades

of engagement of various initiatives to reduce fungal contamination, the problem still could not be solved. Furthermore, chemically based fungicides are too expensive for most small farmers and could form unwanted residues in the environment. Thus, only biological approaches will ensure a sustainable decrease in contamination of maize with the mycotoxin aflatoxin and thus an increase in food and feed safety. One such strategy is the application of the mycoparasitic fungus *Trichoderma harzianum* which itself is not able to produce harmful mycotoxins but actively attacks mycotoxin producing prey-fungi such as *A. flavus* and *A. parasiticus* which leads to disintegration and degradation of their filaments. This aspect additionally increases the nutritional value of the soil compartment. Another possible strategy is the spray application of an aqueous solution containing coumarin (benzopyrone chemical class). Plant parts containing coumarin concentrations up to 50 ppm are allowed as supplements in food. Coumarin inhibits structural similar benzopyrone-based mycotoxins such as the furano-coumarin, aflatoxin, on a mechanistic action comparable to negative feed-back response without affecting the growth of the fungus itself. These results and additional results gained in the actual research consortium project "AflaZ" together with German and Kenyan partners give hope that one day the aflatoxin contamination could substantially be reduced by researchers.

Fungal diversity and biocontrol of aflatoxins in GM- and non-GM maize cultivars

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GM-maize with either pest or herbicide resistance or both are now commonly grown in many countries, especially in the USA and South America. There is however, very little information on the fungal diversity and potential for control of *Aspergillus flavus* and aflatoxins in such cultivars when compared with their isogenic non-GM cultivars. This study has examined 6 different non-GM and related GM-maize cultivars to quantify the diversity and dominance of different fungi with a focus on toxigenic species. The secondary metabolite profiles in these related groups of cultivars were also compared. Some of the fungal isolates including non-toxigenic *A.flavus* isolates were screened for potential control of aflatoxin production by toxigenic strains *in vitro* and *in situ*. These studies showed that some atoxigenic strains of *A.flavus* regardless of inoculum ratios were able to inhibit aflatoxin production and maize contamination under different water availability x temperature conditions. Subsequent studies examined the relationship between biocontrol and simulated pest damage in related pest resistance GM and the equivalent non-GM cultivars. In addition, potential impacts on resilience of biocontrol under climate change conditions was examined.

Controlling the spoilage of fruit purees by heat-resistant moulds (HRMs): Diversity of HRMs during processing and inhibition of their growth during storage

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Whilst pasteurized high-acid fruit products, such as fruit purees, are generally considered to be microbiologically stable, heat-resistant moulds (HRMs) have been reported to cause spoilage. While several studies have been made to develop appropriate strategies to extend the shelf-life of high-acid fruit products by i.e. inactivating and/or preventing the germination and growth of ascospores of HRMs, the HRMs remain a challenge for fruit producers worldwide. This study was conducted to (i) determine the occurrence and diversity of HRMs throughout fruit purees processing; (ii) investigate the effect of processing on the levels of HRMs and (iii) determine conditions inhibitory for the growth

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