

Biocontrol of Aflatoxins in Maize and Groundnuts with Aflasafe GH01 and Aflasafe GH02, two biopesticides developed for Ghana

Agbetiameh D^{1,2}, Ortega-Beltran A¹, Elzein A¹, Atehnkeng J¹, Awuah RT², Cotty PJ³, Bandyopadhyay R¹

¹International Institute of Tropical Agriculture (IITA–Ibadan, Nigeria)

²Department of Crops & Soil Sciences, Kwame Nkrumah University of Science & Technology (KNUST–Kumasi)

³USDA-ARS, School of Plant Sciences, University of Arizona, Tucson, AZ, USA

Corresponding author email: R.Bandyopadhyay@cgiar.org

Key research activities

- Aflasafe GH01 and aflasafe GH02 were developed by IITA/USDA-ARS/KNUST through extensive examination of fungal communities associated with crops and soils in Ghana.
- Aflatoxin sensitization and training campaigns were held with stakeholders. These included farmers and farmer-based organizations, personnel from MoFA, Ghana Export Promotion Authority, The World Food Program, and SPRING/Ghana.
- Efficacy validation trials of aflasafe GH01 & aflasafe GH02 were conducted in 240 fields in Savelugu, Tolon, Bongo, Kassena-Nankana, Wa West, and Nadowli districts.

Results and main findings

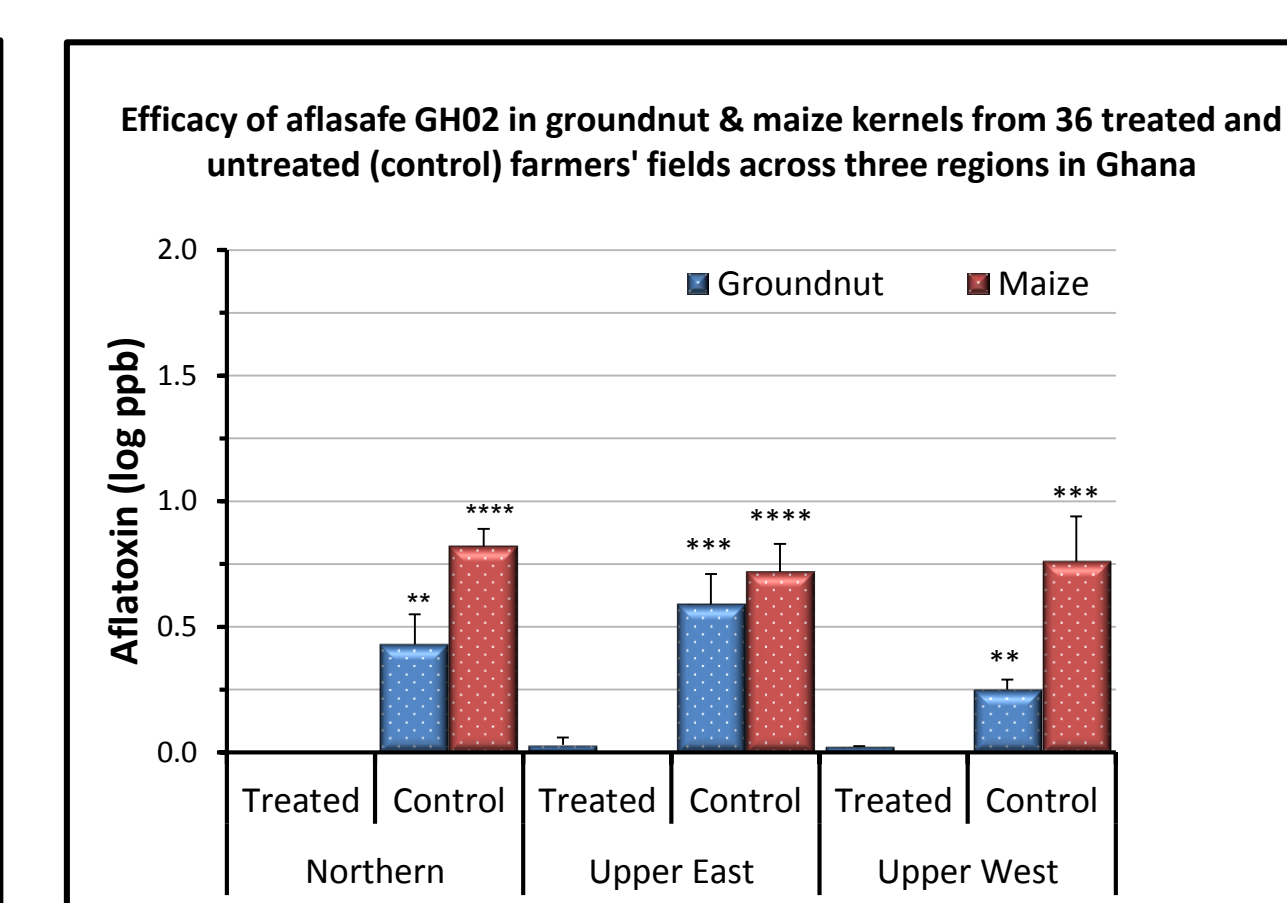
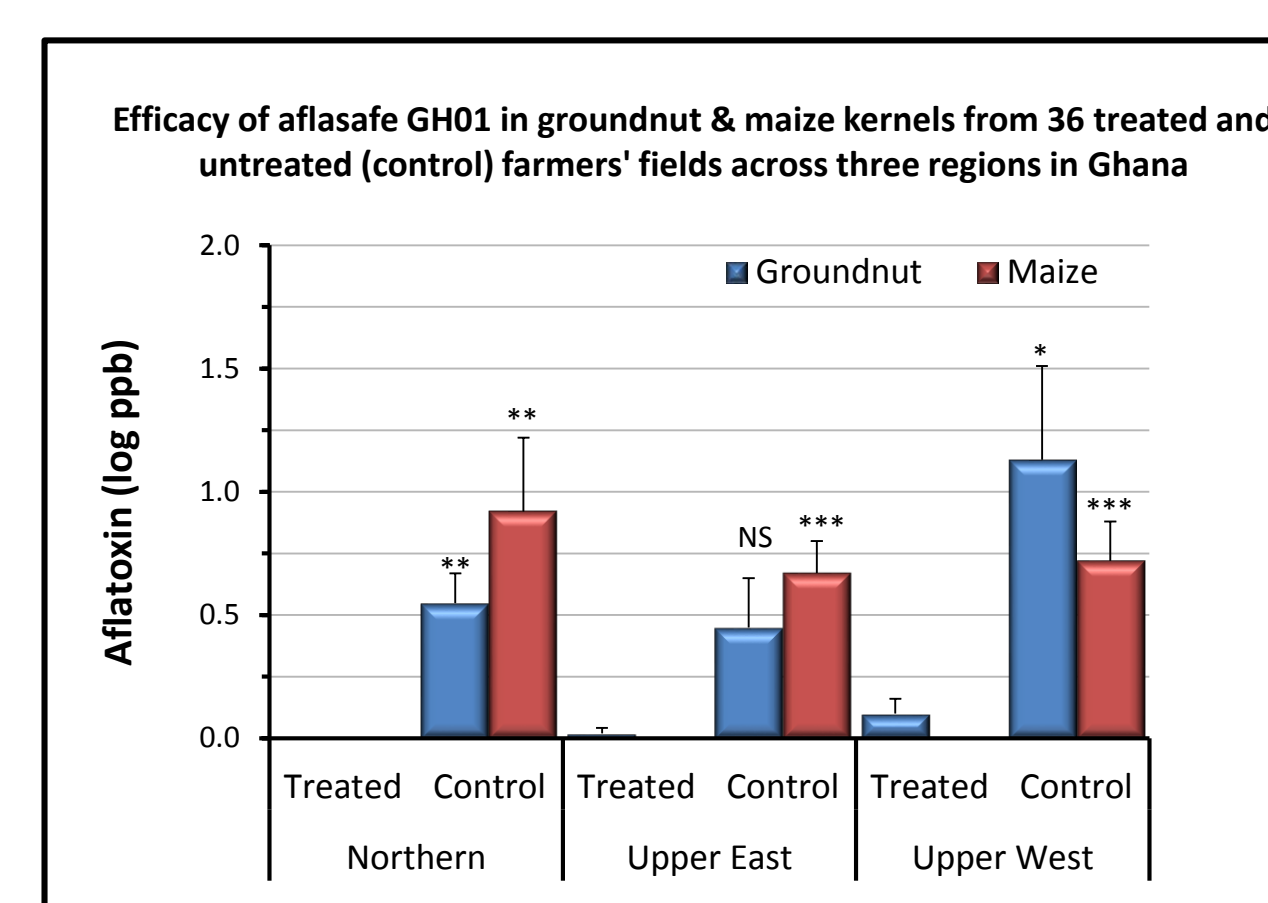
- Two biocontrol products, aflasafe GH01 & aflasafe GH02, were developed. Each is formulated with four atoxigenic *Aspergillus flavus* strains native to Ghana that belong to vegetative compatibility groups (VCGs) widely-distributed and effective in reducing aflatoxin contamination in both maize and groundnut.
- Increased knowledge on aflatoxins and its management of over 300 maize and groundnut value chain participants that included farmers and farmer-based organizations from six districts, 2 each from the Northern, Upper East, and Upper West regions.
- Several thousand tons of maize and groundnut were produced with at least 80% less aflatoxins.

Implications of the research for generating development outcomes

Farmers will produce, consume, and commercialize aflatoxin-safe maize and groundnut by employing an environmentally friendly biocontrol technology effective at reducing aflatoxin contamination. Use of aflasafe will result in i) improved health of millions in Ghana, particularly children and women, who are at greater risk of aflatoxin-related illnesses, and ii) greater trade opportunities as maize and groundnut will meet the stringent aflatoxin standards imposed by local, regional, and international premium markets.

How this work would continue in Africa RISING phase 2

- Large-scale field efficacy validation trials for both aflasafe GH01 & aflasafe GH02 are being conducted to support registration for both biocontrol products in Ghana.
- A long-term carry-over study of aflasafe strains is being conducted to determine frequencies of aflasafe application.
- The aflasafe technology will be scaled-out and promoted through strategic partnerships with SPRING/Ghana and other public and private partners to facilitate future dissemination and commercialization of aflasafe in Ghana.
- Pre-harvest (aflasafe) and post-harvest (drying) technologies will be evaluated to determine the best options to minimize aflatoxin contamination throughout the value chain.
- Socioeconomic and cost-benefit studies will be conducted to assess impacts of aflasafe adoption throughout Ghana.
- The best platform for a partnership/networking for scaling-out and commercialization of both aflasafe and aflatoxin-reduced maize and groundnuts will be determined.



Vertical bars represent standard error of treatment means. Means of the treated and control fields were compared individually in each region for each crop.

NS = Means of aflatoxin values in control and treated fields not significantly different (GLM of SAS, LSMEANS option, $P = 0.05$)

*, **, ***, **** indicate significance at $P < 0.05, 0.01, 0.001, \text{ and } 0.0001$, respectively (GLM of SAS, LSMEANS option).



Upper images: Stakeholders sensitized on aflatoxin and its management; Bottom images: Farmers applying aflasafe on maize and groundnut fields

Current partnerships and future engagements for out scaling

- Collaborations were established with national partners (KNUST, PPRSD, and MoFA) and regulatory authorities (EPA) for supporting awareness creation, movement of aflasafe products across borders, inspection of field efficacy trials, and strengthening national advocacy coalitions to facilitate the process of aflasafe registration.
- Linkages with GIZ (a Ghanaian-German program assisted by the Deutsche Gesellschaft für Internationale Zusammenarbeit) and SPRING Ghana (a USAID funded nutrition project) were established to scale-out use of aflasafe products in more than 1,500 ha of maize and groundnut in 2016.
- Partnership will be established with ADVANCE, ATT, and RING.
- After registration, aflasafe products will be licensed to private or public sector partners for manufacturing, distribution and marketing so that the products are available to millions of Ghanaian farmers for improving health and enhancing trade.