

Biological control of aflatoxins in maize and groundnut through use of aflasafe products developed for Ghana

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Key messages

- **aflasafe** GH01 and **aflasafe** GH02 are safe, cost-effective, environmentally-benign biocontrol products containing beneficial (i.e. non-toxin producing; atoxigenic) fungi native to Ghana. Both products drastically reduce aflatoxin contamination in maize and groundnut before harvest and until crops are consumed.
- One application of **aflasafe** (10 Kg/ha) 2-3 weeks before crop flowering modulates *Aspergillus* community structure resident in the environment in favor of the atoxigenic genotypes used as biocontrol agents.
- Use of **aflasafe** in maize and groundnut farming systems in Ghana has the potential to enhance crop value, and reduce health and economic burdens frequently posed by aflatoxin contamination in these crops.

Objectives and approach

Influences of both **aflasafe** products in mitigating aflatoxin contamination of both maize and groundnut were assessed for a second year under farmer field conditions. Trials included 480 farmers' fields (240 each of maize and groundnut) located in six districts: Savelugu & Tolon (Northern region), Bongo & Kassena-Nankana (Upper East region), Wa West & Nadowli (Upper West region). For each treated field, an adjacent field (>25 m apart) of the same crop served as a non-treated control. **aflasafe** products were applied 35–40 days after planting. Aflatoxin content of crop samples was analyzed at harvest. Microbial analyses are on-going. Other activities included sensitization and training on aflatoxins and its management of >1,000 key actors in the crop value chain. Although not part of this project, both **aflasafe** products were also evaluated in maize and groundnut crops planted in the Middle Belt (Ashanti & Brong Ahafo regions).

Key results

- Application of either **aflasafe** product resulted in significantly ($P < 0.05$) less aflatoxin content (<95%) in grains from treated fields compared to grains from non-treated fields.
- Even though microbial analysis is not complete, preliminary data indicates that aflatoxin reductions are associated with high proportions of the atoxigenic genotypes composing the **aflasafe** products.
- Sensitization and training campaigns resulted in increased knowledge on aflatoxins and its management of >1,000 maize and groundnut value chain participants that included farmers, government officials and private sector representatives.

Significance and scaling potential

Results from efficacy trials will be submitted to Ghana's Environmental Protection Agency for registration of both **aflasafe** products by Dec 2017. Once registered, both **aflasafe** products will be available to maize and groundnut farmers across Ghana. IITA is in the process of identifying key partners for production, commercialization, and use of both **aflasafe** products throughout Ghana at scale as a part of the **aflasafe** Technology Transfer and Commercialization project, funded by USAID and the Bill & Melinda Gates Foundation. Use of **aflasafe** products in other African nations results in production of safe and nutritious crops. In addition, premium markets are accessible to **aflasafe** users. These benefits will be available to Ghanaian farmers, particularly small-scale farmers, and the Ghanaian population in general.

Partners



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A group of stakeholders sensitized on aflatoxin and its management (left; Bolgatanga, Upper East region); farmers being trained prior to **aflasafe** application (right; Kassena-Nankana district).



Farmers applying **aflasafe** on groundnut (left; Bongo district) and maize (right; Tolon district).

Table 1. Efficacy of **aflasafe** GH01 at reducing field aflatoxin contamination in groundnut and maize kernels in Northern Ghana in 2016.

Region	Treatment ^a	Aflatoxin concentration (ppb)			
		Groundnut		Maize	
		Mean	% Reduction ^b	Mean	% Reduction ^b
Northern	Control	199	100	238	100
	Treated	0		0	
Upper East	Control	200	100	122	100
	Treated	0		0	
Upper West	Control	939	100	301	98.0
	Treated	0		6.0	

^a Treated refers to farmer fields to which atoxigenic product **aflasafe** GH01 was applied. Control refers to adjacent fields to which no **aflasafe** product was applied.
^b % Reduction = $\{(\text{mean of control field} - \text{mean of treated field}) / \text{mean of control field}\} * 100$.

Table 2. Efficacy of **aflasafe** GH02 at reducing field aflatoxin contamination in groundnut and maize kernels in Northern Ghana in 2016.

Region	Treatment ^a	Aflatoxin concentration (ppb)			
		Groundnut		Maize	
		Mean	% Reduction ^b	Mean	% Reduction ^b
Northern	Control	50	100	70	99.3
	Treated	0		0.5	
Upper East	Control	8.1	100	238	100
	Treated	0		0	
Upper West	Control	14	100	325	99.5
	Treated	0		1.7	

^a Treated refers to farmer fields to which atoxigenic product **aflasafe** GH02 was applied. Control refers to adjacent fields to which no **aflasafe** product was applied.
^b % Reduction = $\{(\text{mean of control field} - \text{mean of treated field}) / \text{mean of control field}\} * 100$.