Aflatoxins in Nigerian Groundnut: Continuous Threat to Health, Agriculture and Foreign Trade

Policy Brief 35
April 2018

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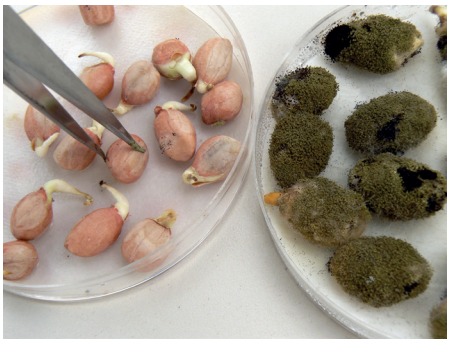

Summary

Groundnut is the most common host of aflatoxin world wide. In Nigeria, this crop is largely grown by resource-limited farmers under rainfed conditions. Most of the groundnut and groundnut-based products grown and/or sold in Nigeria contain varying quantities of aflatoxins. At least 30% of groundnut grains and seeds sold on local markets are contaminated by aflatoxins, with 25-83% of them exceeding permissible levels for many countries, including Nigeria. Aflatoxin contaminations are higher in local groundnut varieties than in improved ones. Similarly, 87-100% of *kuli kuli* consumed in Nigeria is contaminated by aflatoxins; the situation of many other groundnut-based products are not very different from that of *kuli kuli*. This Policy Brief is an integral component of proactive measures being taken to create awareness and sustain on going measures to effectively manage aflatoxin contamination in groundnut and other crops prone to aflatoxin contamination. Other measures include regular use of good agricultural practices, consistent enforcement of pertinent existing, and constant re-assessment and revision of policies, regulations and evolving biological control methods.

1. What are aflatoxins?

Aflatoxins (*Aspergillus flavus* toxins) are poisonous substances produced by some fungi (molds) on crops, foods and feeds. They have worldwide occurrence, usually in tropical and sub-tropical areas (latitudes 35° North and 35° South). Fungi of the Aspergillus group are responsible for secreting these toxins, [mainly *Aspergillus flavus and A. parasiticus].* They live in soils and decayed materials. When their spores are released, they infect crops on farms, produce in stores and processed products.

Aflatoxin: A dangerous mycotoxin

Aflatoxins belong to a larger family of diverse and highly toxic mycotoxins produced by some pathogenic fungi. There are six major forms of Aflatoxins - Aflatoxin B_1, B_2, G_1, and G_2 (*found in plant-based foods and feeds*) and Aflatoxin M_1 and M_2 *(found in milk and milk products)*.

Aflatoxin B_1 (AFB_1) is the most dangerous form due to its direct link with the human liver cancer, immune system suppression and stunted growth in children.

2. Crops prone to Aflatoxins contamination

Aflatoxins contaminate a wide range of crops and their products. The crops mostly affected are groundnut, maize, sorghum, millet, rice, sesame, wheat, cowpea, spices and cassava.

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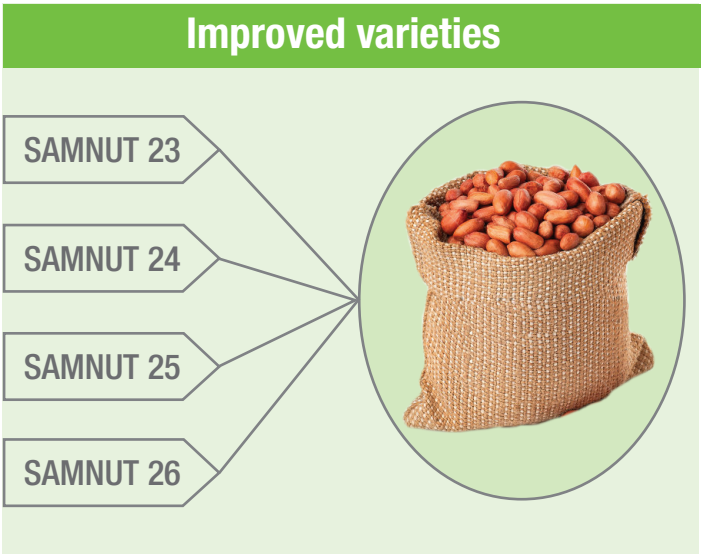
Groundnut is reported to be the most common host of aflatoxin world-wide. This crop is largely grown by resource-limited farmers under rainfed conditions. It is a core component of farming systems, source of employment and cash incomes in the major producing states of the Northwest, Northeast and North-central regions of Nigeria. It can be consumed raw, boiled, roasted, processed and/or incorporated into other foodstuffs. Groundnut cake (*Kuli kuli*) is commonly consumed as a snack, while both the cake and haulms are used as feed to livestock.

3. Outcomes of research on Aflatoxin in groundnut and groundnut products in Nigeria

Over the years, researchers have demonstrated that most of the groundnut and groundnut-based products in Nigeria contain varying quantities of Aflatoxins. At least 30% of the groundnut grains and seeds sold on local markets are contaminated by aflatoxins, with 25-83% of them exceeding permissible levels for countries of the European Union, while 14-25 % are beyond US and Nigerian permissible limits. Average Aflatoxin concentration in fresh local varieties of groundnut was recently found to be 19.6 µg/kg, which is below the Nigerian and US limits (Table 1). Within the framework of a country-led strategy mission, Aflatoxin concentrations in groundnuts meant for consumption have been reported from 9.50 to 534.50 µg/kg.

AFB_1 contaminations are also higher in all local groundnut varieties (10.15 µg/kg-13.74 µg/kg) compared to the **improved varieties (SAMNUT 23, SAMNUT 24, SAMNUT 25 and SAMNUT 26)** released by the Institute for Agricultural Research (6.04 µg/kg-10.49 µg/kg). These varieties are being promoted by development partners of the Nigerian Government. Likewise, groundnut shelled by hand are reported to have lower levels of AFB_1 (39 µg/kg) compared to seeds shelled mechanically (338 µg/kg).



AFB_1 concentrations in *kuli kuli*, a groundnut product widely consumed in different forms by a vast majority of Nigerians, range between 4.10-268.00 µg/kg, which is above the 2 µg/kg limit for Nigeria and 20 µg/kg limit for groundnut. Indeed, 87-100% of *kuli kuli* consumed in Nigeria is contaminated by aflatoxin. The situation of several other groundnut-based products are not very different from that of *kuli kuli*. For example, between 91-96% of roasted groundnut sold at different locations across Nigeria are contaminated by AFB_1 with concentrations ranging between 1-65 µg/kg.

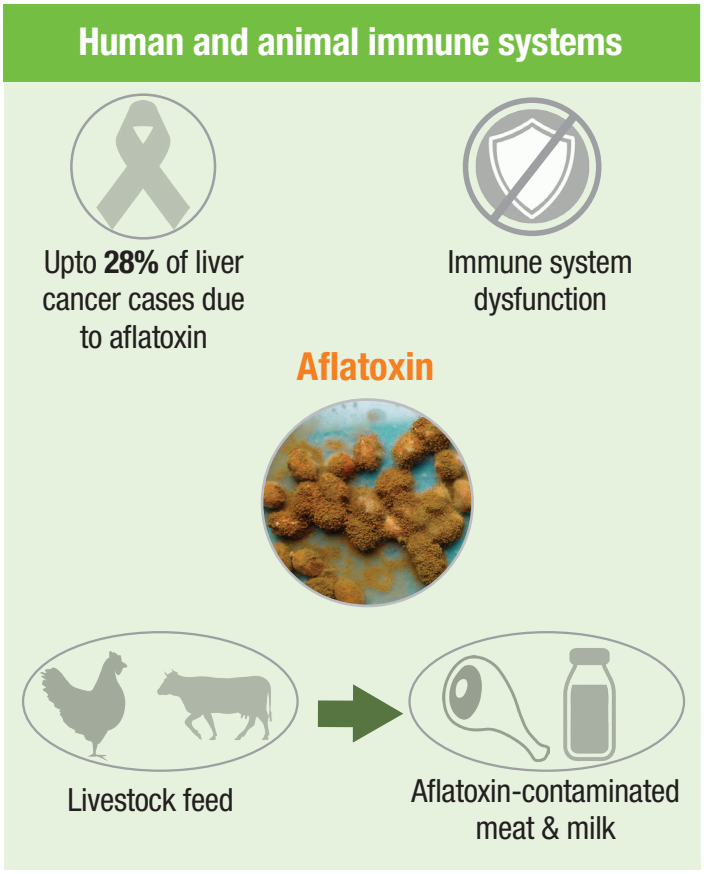
Table 1. Aflatoxin limits for commodities for direct consumption.

Countries	Aflatoxin Limits	Additional information
Nigeria	4 µg/kg	Maize
	20 µg/kg	Groundnut
	4 µg/kg	*Kuli kuli*
	10 µg/kg	Sorghum
European Union	4 µg/kg	Total aflatoxins (B_1, B_2, G_1 and G_2)
	0.05 µg/kg	Aflatoxin M_1 in milk and milk products
	0.025 µg/kg	M_1 for infant foods
United States of America	20 µg/kg	Total aflatoxins in all foods except milk
	0.5 µg/kg	M_1 in milk
Australia and Canada	15 µg/kg	Total aflatoxins in all nuts

4. Impacts of Aflatoxin contamination on human health, agriculture and trade

Continuous exposure to food and feed contaminated by aflatoxins can lead to suppression of human and animal immune systems, increased viral load in those living with HIV and AIDS, infertility in men, liver cancer, and even death. Since its identification, evidence shows that aflatoxins cause liver cancer in humans and are implicated in up to 28% of cases of liver cancer worldwide. Aflatoxin-related cancers are the fifth- and seventh-most common cancers in men and women respectively. In poultry and cattle, egg and milk production can drop with a corresponding decrease in weight gain leading to increased mortalities. Africa loses about 1.5 billion Naira (about US$500 million) annually in export trade due to systematic rejections of export crops and animal products with unacceptable levels of aflatoxins. The EU rejected 24 agricultural commodities from Nigeria, due to contamination with aflatoxins and pesticide residues including groundnuts, which was specifically rejected due to aflatoxins. Also, the EU ban on import of five (5) commodities from Nigeria led to a decline of ₦671.1 billion in import revenue. Consequently, attempts to export crop contaminated by aflatoxins has led to serious loss of trade revenue and diplomatic humiliation to Nigeria.

Aflatoxin contamination was the core reason for export sanctions and notifications by the European Union (EU) to Nigeria in 2016. This ban motivated nation-wide high level advocacy campaigns on agricultural quality control and standardization across all the six geo-political zones of Nigeria. These campaigns recognize the pivotal role of food safety across agricultural sector value chains from production, processing, transportation, consumption to export.



5. Managing Aflatoxin contamination in groundnut and groundnut-based products

Good agricultural practices (GAP) – using the most appropriate seeds, timely planting, ensuring adequate farm sanitation (weeding when required), harvesting when crops are matured, adequate drying of crops after harvest, respecting basic hygienic condition during processing can keep away Aflatoxin contamination. Similarly, emerging bio-control methods could be applied, where feasible, to manage Aflatoxin contamination. While a majority of Nigerian resource-limited farmers are willing and able to implement farm-level measures, an inclusive approach to food safety and quality regulations remains supreme.

6. Conclusions and Policy Implications for Nigeria

Good agricultural practices and consistent enforcement of food safety regulations is a motivation for placing Aflatoxin-free groundnut on both domestic and foreign markets. Nigeria has already engaged on an aggressive export promotion drive on food safety and quality control. Complementary measures should include:

- recurrent awareness creation about the harmful effects of aflatoxins on human health and nutrition;
- development and facilitation of access to aflatoxin-free groundnut varieties and other crops liable to contamination;
- identification and promotion of alternative non-food uses of aflatoxin-contaminated groundnut, such as biofuels in industries;
- resolute enforcement of existing policies and regulations of crops liable to aflatoxin contamination meant for domestic and exports markets;
- acquisition of Aflatoxin testing facilities and the systematic detection of Aflatoxins loads in groundnuts;
- development/implementation of an inclusive Aflatoxin national strategy that goes beyond departmental and institutional mandates;
- enhancement of national capacities on Aflatoxin detection and quantification.

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