

Aflatoxin control in maize through aflatoxin-resistant variety breeding and other aflatoxin management methods

Donor: Nestec Ltd

Timeframe: 2011 - 2014

Background: Aflatoxin is a silent and slow killer in the food system of the most poor and underprivileged people. Aflatoxin-safe food must be viewed as one of the key primary health care components for improving health and productivity of people, and profitability of agriculture. Private sector food enterprises, such as Nestlé, are increasingly sourcing agriculture raw materials from local farmers. Local procurement of maize in Africa has posed a particular challenge due to aflatoxin contamination. Aflatoxins can be minimized with several pre-harvest and post-harvest practices. Use of resistant varieties is considered as one of the most economical and farmer-friendly way to reduce damage by pathogens since the resistance trait is already present in the varieties that farmers grow. Several maize inbred lines with aflatoxin resistance have been identified by IITA and others. However, these inbred lines possess poor grain yields and will not be grown by farmers. In spite of almost three decades of aflatoxin resistance breeding efforts around the world, not a single maize variety labeled as aflatoxin resistant has been released anywhere in the world. Although the likelihood of developing farmer utilizable maize varieties with high levels of aflatoxin resistance is low, it may be possible to develop maize varieties that support low aflatoxin accumulation. Using such varieties along with other aflatoxin management practices can significantly lower aflatoxin risk of maize to levels acceptable by the food industries.



Evaluation for cob rot of cobs of several maize synthetics artificially inoculated with *Aspergillus* in the field (photo by R. Bandyopadhyay)

Project summary: This projects aims to reduce aflatoxin contamination in the maize value chain by developing high-yielding aflatoxin-resistant varieties and hybrids that are acceptable to farmers and the food industry. Such farmer-ready aflatoxin-resistant varieties are bred by crossing tropical adapted maize lines with aflatoxin-resistant inbred lines identified by IITA and partners. Various test-crosses, hybrids and synthetics are evaluated in multilocational trials with large number of replications under artificial inoculation and natural infection conditions in the field, and by using a 'kernel screening assay' in the laboratory. Progenies with high-yield potential and low aflatoxin accumulation are advanced and repeatedly evaluated to ensure that the finally selected lines have stable resistance across locations and years. Promising experimental hybrids and synthetics identified through this rigorous testing process are evaluated for various grain quality parameters to select those genotypes that have traits useful for farmers as well as food industries. A few of the promising hybrids and synthetics are released for general cultivation following appropriate variety release protocols. Varieties with low aflatoxin accumulation are tested with and without various other aflatoxin management methods such as biocontrol, good crop management practices, and good post-harvest practices. The purpose of these studies is to determine the extent to which aflatoxin accumulation in low-aflatoxin maize varieties can be further reduced by other aflatoxin management practices. Aflatoxin management manuals in farmer-friendly language are prepared and used to promote the use of integrated aflatoxin management practices in the maize value chain.

Objectives

- to breed, test, identify and release high-yielding maize varieties that support low aflatoxin accumulation
- to identify low-aflatoxin maize varieties with grain quality parameters preferred by the food industry
- to promote aflatoxin management practices among farmers and other actors in maize value chain

Outputs

- high-yielding maize varieties that support low aflatoxin accumulation available for the benefit of maize value chain with special focus on various sectors of the food industry
- capacity of farmers and other actors in the maize value chain actors to control aflatoxin enhanced through adoption of integrated aflatoxin management practices
- more aflatoxin-safe maize available to farm families and maize industry thus enhancing safety of overall food system

Major partners: Institute of Agriculture Research, International Institute of Tropical Agriculture (IITA), Nestlé, Premier Seeds

Target country: Nigeria

Crop: maize