

## Assessing Purdue Improved Crop Storage (PICS) bags to mitigate fungal growth and aflatoxin contamination

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### Abstract

Insects and fungi are a major challenge for storing grain, especially in regions of the world where farmers are without sufficient drying and storage capacity. In several African countries, the Purdue Improved Crop Storage (PICS) bag system has proven to be a low-cost and effective means of preventing damage caused by storage insects. These bags are nearly impervious to gas, thus biological respiration within the bags causes the build-up of carbon dioxide and a reduction of oxygen, which is inhibitory to the growth of the insects. The goal of the current research is to determine efficacy of the PICS system towards reducing the risks associated with fungal growth and mycotoxin accumulation, which is important for farmers in the humid tropics. In a pilot experiment, PICS bags containing 2.5 kg of maize conditioned at 12, 15, 18 and 21% moisture were stored at 26°C. To follow potential fungal growth, each bag was inoculated with 50 g of maize colonized by a fluorescent-marked strain of *Aspergillus flavus*. After one and two months of storage, we assessed oxygen/carbon dioxide levels, fungal growth, aflatoxin, moisture content, and kernel germination. At both time points, there was no evidence of growth of *A. flavus* or other storage fungi within the PICS bags, and no accumulation of aflatoxin B<sub>1</sub> was detected. Moisture content of the maize in the PICS bags also remained nearly constant over the 2-month experiment. In contrast, maize (18 and 21%) stored in mesh bags under the same conditions exhibited visible molding and aflatoxin B<sub>1</sub> accumulation near 100 ppb. The moisture content of grain in the mesh bags also equilibrated with conditions in the storage chamber. These results indicate that PICS bags can prevent fungal growth and aflatoxin accumulation as well as prevent external environmental conditions from affecting grain moisture.

Keywords: *Aspergillus flavus*, mycotoxins, maize storage, mold growth, PICS bags