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Development of Grain Drying Facilities That Use Superabsorbent Polymers (SAP) to Optimise Drying and Control Aflatoxin Contamination in Kenya

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Abstract

Maize is the most important staple food in Kenya but is highly susceptible to aflatoxin contamination. Chronic exposure to aflatoxins from maize is prevalent in a high percentage of the Kenyan population and fatal outbreaks from acute exposure have also been reported in the past. Aflatoxin producing species are also cause of economic losses by spoilage, reduced prices and the effects on animals fed with contaminated maize. A condition to stall postharvest aflatoxin contamination of maize is to store it with a low enough moisture content. This, however, is seldom possible, especially for small-scale farmers who rely on sun drying for it and are instead faced with rains during harvest. This project aims to address this problem using superabsorbent polymers (SAP) to assist maize drying where fossil fuels or electricity are not available. These materials can adsorb a relatively high amount of water vapour, and preliminary studies on laboratory scale showed that they can be effective for drying and aflatoxin control in maize if present in sufficient proportion. The main objective of the project is to produce forced-convection drying and storage structures that incorporate SAPs and to test their performance in field conditions. Research partners working in the project are the Department of Environmental and Biosystems engineering at the University of Nairobi (Kenya), the Department of Agricultural Engineering at the University of Kassel (Germany), the Food and Soft Materials Laboratory at the ETH Zürich (Switzerland), and the Department of Agricultural and Rural Engineering at the University of Venda (South Africa). First results showing the high water vapour adsorption capacity, the adsorption kinetics, and the regeneration properties of the SAP, as well as the simulation model of the heat and mass transfer in the system are presented and discussed.

Keywords: Aflatoxin, maize, post-harvest

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