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Performance Evaluation of an Inflatable Solar Dryer for Maize and the Effect on Product Quality Compared with Traditional Sun Drying

Janvier Ntwali, Steffen Schock, Sebastian Romuli, Joachim Müller

University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Germany

Abstract

Maize is an important food source in Uganda, where the daily consumption is 52 g per person. Maize is often harvested at a high moisture content not suitable for long-term storage. Therefore, drying is a crucial process to slow down the activity of enzymes, bacteria, yeasts and moulds; and to preserve the quality before storage. Traditionally, maize is dried by spreading the grains on a surface under direct sun. In these conditions the risk of contamination is high and it is difficult to achieve required reduction of moisture content during cloudy weather. In this study, maize was dried using an inflatable solar drier (ISD) and the performance was compared with traditional sun drying in Gombe, Wakiso District in the Central Region of Uganda. The quality of maize, in terms of the contamination level of yeast, moulds and aflatoxins, was evaluated. The target moisture content for safe storage could be achieved in less than one day using both drying methods, whereas no significant difference of drying time was detected at $p \leq 0.05$. The ambient temperature during the field trials varied between 16 and 32°C, while ambient relative humidity was between 40 and 90 %. The maximum temperature inside the ISD could reach up to 68°C, which was around 25°C higher than the ambient. The variation in relative humidity inside the ISD depended on the ambient relative humidity and reached a maximum of 89 %. Aflatoxin contamination was analysed and compared to the EU standard limit of 10 ppb. Some batches showed a contamination lower than the standard limits while in one batch, contamination was manifold higher. In general, the batches dried under ISD showed a slightly lower contamination compared to the sun dried samples. Application of ISD showed a great potential to preserve the quality of maize. A rapid and non-destructive method to determine the quality of maize should be developed for early detection of the contamination along the whole value chain.

Keywords: Drying characteristics, food quality control, food safety, innovative solar drying, mycotoxin, solar bubble dryer

Contact Address: Janvier Ntwali, University of Hohenheim, Inst. of Agricultural Engineering, Tropics and Subtropics Group, Garbenstr. 9, 70599 Stuttgart, Germany, e-mail: janvier.ntwali@uni-hohenheim.de