

Title Post-harvest control strategies: Minimizing mycotoxins in the food chain
Author Naresh Magan and David Aldred
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Abstract

Contamination of cereal commodities by moulds and mycotoxins results in dry matter, quality, and nutritional losses and represents a significant hazard to the food chain. Most grain is harvested, dried and then stored on farm or in silos for medium/long term storage. Cereal quality is influenced by a range of interacting abiotic and biotic factors. In the so-called stored grain ecosystem, factors include grain and contaminant mould respiration, insect pests, rodents and the key environmental factors of temperature, water availability and intergranular gas composition, and preservatives which are added to conserve moist grain for animal feed. Thus knowledge of the key critical control points during harvesting, drying and storage stages in the cereal production chain are essential in developing effective prevention strategies post-harvest. Studies show that very small amounts of dry matter loss due to mould activity can be tolerated. With < 0.5% dry matter loss visible moulding, mycotoxin contamination and downgrading of lots can occur. The key mycotoxigenic moulds in partially dried grain are *Penicillium verrucosum* (ochratoxin) in damp cool climates of Northern Europe, and *Aspergillus flavus* (aflatoxins), *A. ochraceus* (ochratoxin) and some *Fusarium* species (fumonisins, trichothecenes) on temperate and tropical cereals. Studies on the ecology of these species has resulted in modelling of germination, growth and mycotoxin minima and prediction of fungal contamination levels which may lead to mycotoxin contamination above the tolerable legislative limits (e.g. for ochratoxin). The effect of modified atmospheres and fumigation with sulphur dioxide and ammonia have been attempted to try and control mould spoilage in storage. Elevated CO₂ of > 75% are required to ensure that growth of mycotoxigenic moulds does not occur in partially dried grain. Sometimes, preservatives based on aliphatic acids have been used to prevent spoilage and mycotoxin contamination of stored commodities, especially feed. These are predominantly fungistats and attempts have been made to use alternatives such as essential oils and anti-oxidants to prevent growth and mycotoxin accumulation in partially dried grain. Interactions between spoilage and mycotoxigenic fungi and insect pests inevitably occurs in stored grain ecosystems and this can further influence contamination with mycotoxins. Effective post-harvest management of stored commodities requires clear monitoring criteria and effective implementation in relation to abiotic and biotic factors, hygiene and monitoring to ensure that mycotoxin contamination is minimised and that stored grain can proceed through the food chain for processing.