

Food security, climate change and mycotoxins

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Food security issues have become important as prices of staple grains have soared in the last few years. Climate change is expected to increase pressure on food supply/quality/sustainability worldwide. Changes in rainfall patterns, drought, temperature and CO₂ all impact on staple food production systems. It has been suggested that there will be "hotspots" in different regions of the world where the temperature may increase by +2–4 °C, where rainfall patterns and drought events may increase, resulting in more rapid desertification and significantly impacting on staple food crop yields. Thus, for staple cereals a doubling of CO₂ (350 to 700 µl/l) and an increase in temperature will have a penalty on yield and nutritional quality, while for rice this could increase crop biomass, although effects on yield and quality are less clear. Plant stress inevitably leads to increased susceptibility to fungal infection, pre- and post-harvest, and potential for increased contamination by mycotoxins (Magan *et al.*, 2011; Wu *et al.*, 2011). We have previously demonstrated that mycotoxicogenic fungal activity can lead to small changes in dry matter losses in climate change type conditions, which would still exceed the legislative limits, certainly in Europe. It is thus important to consider the potential for increased contamination of cereals by *Aspergillus flavus* and aflatoxins and *Fusarium verticillioides* and fumonisins in maize; *Fusarium* species and trichothecenes A and B, such as T-2 and HT-2 toxins, zearalenone and deoxyniva-

lenol in small grain cereals. We have harnessed our published ecological data on the marginal conditions for growth and mycotoxin production in relation to temperature and water availability for a range of *Fusarium*, *Aspergillus* and *Penicillium* species and tried to integrate this with other types of data including mould growth and molecular data to develop models which could be used to predict mycotoxin contamination and the relative risk in cereals under different climate change scenarios. Based on climate change scenarios there are expected to be hot spots of increased temperature and flooding in northern parts of India with southern parts being subjected to increased drought episodes with increased temperatures and irrigation becoming essential. This could have profound impacts on cereal production, yield and grain quality in northern parts of India. This could impact on food security and availability in some parts of the Indian sub-continent.

Keywords

climate change; mycotoxins; temperature; drought stress; water availability; CO₂; risk analysis; food insecurity.

References

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