Investigate the impact of agronomic practices on mycotoxin levels in oats and analysis of the implications of modifying agronomic practices

Area of research interest: Chemical hazards in food and feed
Study duration: 2008-01-01
Project code: FS231004 (C03059)
Conducted by: Harper Adams University

Background

The results from a previous FSA funded project 'Investigation of fusarium mycotoxins in UK barley and oat production' identified high concentrations of T-2 and HT-2 toxin in unprocessed oats. The investigation of agronomic factors identified crop rotation and cultivation as important restrictions, but due to the lack of positive samples showing increased levels of T-2 and HT-2 toxin, the role of these factors could not be accurately measured.

Research Approach

Field experiments were performed at two sites which represent major oat growing regions of the UK (East of Scotland and West of England) each year for two years. Trials of winter (cultivar Gerald) and spring (cultivar Firth) oats were designed as factorial experiments to test the importance of previous crop (wheat and oil seed rape) and cultivation (ploughing and minimum tillage) as a two-dimensional strip plot design (4x4 blocks of 2x2 plots, total of 64 plots per trial). The experiments required replicated strips of alternate wheat and oil seed rape (12m wide) to be grown one year in advance for each trial. The land was cultivated in replicated strips of ploughed and minimum tillage (12m wide), perpendicular to the strips of previous crops. Oats were drilled across the whole trial area and managed using standard farm agronomy. At harvest the following components were quantified from each 12m x 12 m plot:

- • yield
- • kernel content
- • specific weight
- • screenings (% • T-2 and HT-2 toxin content

Results

The results from this project and a review of other data on the impact of agronomic factors on T-2 and HT-2 toxin concentration in harvested oats identified two key factors that appear to provide consistent and worthwhile reductions in T-2 and HT-2 toxin in harvested oats.

The first of these was variety, with consistently lower T-2 and HT-2 toxin occurring in spring oat varieties.

The second factor was the frequency of cereals grown, as farms would want to produce a number of harvests each year. Farms that grow oats only tend to use the crops for personal consumption or as animal feed. This is due to the economics of cereal production in the UK, i.e. the high value of wheat, it is unfeasible to grow oats within a rotation with low cereal intensity for most farm enterprises.

Based on these results a risk-based analysis was conducted to identify the implications for the oat industry of a switch from winter sown oat varieties to spring sown varieties. The direct benefit of such a change is a four-fold reduction in the average number of oat consignments entering the human food chain that exceed 1000 ?g/kg T-2 and HT-2 toxin from 16 % to 4%. However, a change in oat varieties would increase the industry's costs.

Research report

England, Northern Ireland and Wales

PDF
View Investigate the impact of agronomic practices on mycotoxin levels in oats - final report as PDF(Open in a new window) (1.34 MB)

England, Northern Ireland and Wales

EXCEL
View Mycotoxin data as Excel(Open in a new window) (950.09 KB)

England, Northern Ireland and Wales

EXCEL
View Quality data as Excel(Open in a new window) (491.04 KB)

England, Northern Ireland and Wales

EXCEL
View Yield data as Excel(Open in a new window) (498.5 KB)