Analysis of the genetic and environmental factors influencing grain quality in oats to meet end-user requirements and increase grower returns

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Introduction
Developing oat varieties with high milling quality is constrained by a lack of detailed information on how genetic differences and environmental factors impact on grain quality. Focussing on key grain quality parameters, i.e. kernel content, hullability, specific weight, thousand grain weight, grain size and shape parameters and chemical composition, four winter oat varieties, Gerald, Mascani, Tardis and Balado, were grown in replicated field trials in a range of geographical locations over four field seasons. The aim is to understand the role of genotype and environment on grain quality parameters. The results obtained will be used to develop new varieties to meet quality parameters for the milling industry.

Results

Figure 1. Correlation by variety between thousand grain weight (g) and width (mm) of the grain (p-value 0.05).

Figure 2. Mean oil, protein and β-glucan content (%) for all field seasons.

Figure 3. Mean kernel content (%) by variety and site.

Conclusions
High correlations between grain width and thousand grain weight for all varieties and field seasons. Hullability, kernel content and specific weight correlations with grain size and shape parameters, were variable depending on site and variety.

Comparisons between average kernel content at each location and kernel content for each variety at each site suggest higher influence of variety than environment. Further analysis will include heritability calculations for each quality parameter.

Analysis of variance suggested statistical significant differences and effects of both genetic and environmental factors for all quality parameters under study (p<0.001). Statistically significant interactions between environment and genetic factors were found.

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