Effect of grain development and nitrogen fertiliser on grain quality parameters

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To enhance the competitiveness of the oat crop

Grain Quality

Physical
- Area
- Width
- Length
- Roundness

Chemical
- Specific Weight
- Kernel Content
- Thousand Grain Weight
- Hullability
- Low Screenings
- β-Glucan
- Oil Content
- Protein Content
Nitrogen Trials

ADAS 2014
Six levels of Fertiliser
Four Winter Oat Varieties
Balado
Gerald
Mascani
Tardis

IBERS 2014
Five levels of Fertiliser
Four Winter Oat Varieties
Balado
Gerald
Mascani
Tardis

Grain size and shape, and quality parameters assessed after harvest
Effect of N on Grain Quality Parameters

- Specific Weight (kg/hl)
  - Balado
  - Gerald
  - Mascani
  - Tardis

- Kernel Content (%)
  - Balado
  - Gerald
  - Mascani
  - Tardis

Graphs showing the effect of applied N (kg N/ha) on specific weight and kernel content for different varieties.
Effect of N on Grain Quality Parameters

- **Thousand Grain Weight (g)**
  - Balado
  - Gerald
  - Mascani
  - Tardis

- **Hullability (%)**
  - Applied N (kg N/ha)

The graphs show the effect of N on the thousand grain weight and hullability of different rice varieties. The data is represented across different levels of applied N (kg N/ha). Each variety has a distinct trend line indicating the change in grain quality parameters with increasing N application.
Effect of N on Grain Size and Shape

- Width (mm)
- Area (mm$^2$)
- Length (mm)

Applied N (kg N/ha): 0, 50, 100, 150, 200

Species: Balado, Gerald, Mascani, Tardis
Effect of Grain Size and Shape on Grain Quality Parameters
Effect of N application on range of grain size

Tardis

Balado
Summary

• Statistical significant differences (p-value<0.001), between all nitrogen levels and varieties at both sites, ADAS 2014 and IBERS 2014.

• Higher levels of nitrogen fertilisation had a positive response in all grain quality parameters except specific weight, and on grain size and shape except on width.

• Loss in bimodality and increased number of grains for all varieties at both sites, with increasing levels of nitrogen.
Grain Development Experiment

- Three Varieties
  - Mascani
  - Buffalo
  - Tardis
- Five Growth Stages (GS)
  - Early Milk
  - Late Milk
  - Soft Dough
  - Hard Dough
  - Ripening
- Three Replicates for each GS and variety
- Grain Size and Shape parameters determined by whorls and type of grain
Grain Development Experiment

Buffalo Average Area ($\text{mm}^2$)

Mascani Average Area ($\text{mm}^2$)

Tardis Average Area ($\text{mm}^2$)
Grain Development Experiment

Primary Grain. Rest Mascani

Early Milk
- Length 15.0 mm
- Length 15.0 mm

Late Milk
- Length 14.5 mm
- Length 8.8 mm

Soft Dough
- Length 14.9 mm
- Length 9.4 mm

Hard Dough
- Length 15.8 mm
- Length 15.8 mm

Ripening
- Length 14.7 mm
- Length 9.3 mm
Next

• Complete chemical analysis on N trials samples, 2014.
• Analysis of N trial 2015.
• Combine all the results from both years.

• Metabolomics analysis on grain development experiment 2015.
• Analysis on the different types of grain and groat.
• More complete experiment next summer 2016.
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