Essential Tools to Manage Grain and Flour Quality - Standards and Proficiency Rating Programs

Anne Bridges, Ph.D.  
Technical Director  
IAOM Bangalore, December 7th 2018
Wheat Supply Chain - Delivery of Product Quality
Wheat Sources Vary - Location and Year

- Government requirements
- Domestic supplies
- Market opportunities - new products
- International sourcing
  
  e.g. Australia 22.9 Mt, exports 2018 15.5 Mt
  
  Lowest level in 9 years
Wheat Sources Vary - Location and Year

India

- 2017: UKR, AUS, RUS
- 2013: AUS

Sri Lanka

- 2017: CAN, RUS, AUS, USA
- 2013: CAN, RUS, AUS

Bangladesh

- 2015: CAN, RUS, UKR, IND
- 2013: CAN, RUS, UKR

Standards for Grain - Specific to Commodity

Based on a range of factors that include (but not limited to):

* Customer contract
  • Importing country Government regulations for quality
* Relevant food safety laws
  • Requirement to improve quality of grain supplies
* Competitor grades and quality
  • Available quality of grain given restrictions of varieties, growing and harvesting conditions, pest and disease resistance of crop
  • International protocols such as Cartagena and Codex Alimentarius
  • Ability of the storage system to segregate or commingle grain
  • Land protection and quarantine laws
What is a Standard?

A published specification that establishes a common language, and contains a technical specification or other precise criteria and is designed to be used consistently, as a rule, a guideline, or a definition.
What is a Standard?

Standards can be set by
• governments
• regional and intergovernmental agencies
• standards development organizations
• trade organizations
• learned societies with input from industry and end-users
Relevant Food Safety Standards - Laws

International Standards Organisations
• Codex Alimentarius
• Scientific Organizations
• Many Interactions
  • Government
  • Academia
  • Industry
  • NGOs

Protecting Health, facilitating trade
DON Occurrence in Grains: A North American Perspective


### Relevant Food Safety Standards - Laws

**International Standards Organisations - CXS 193**

**DEOXYNIVALENOL (DON)**

<table>
<thead>
<tr>
<th>Commodity/Product Name</th>
<th>Maximum Level (ML) µg/kg</th>
<th>Portion of the Commodity/Product to which the ML applies</th>
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<tbody>
<tr>
<td>Cereal-based foods for infants and young children</td>
<td>200</td>
<td>ML applies to the commodity on a dry matter basis.</td>
</tr>
<tr>
<td>Flour, meal, semolina and flakes derived from wheat, maize or barley</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Cereal grains (wheat, maize and barley) destined for further processing</td>
<td>2000</td>
<td>&quot;Destined for further processing&quot; means intended to undergo an additional processing/treatment that has proven to reduce levels of DON before being used as an ingredient in foodstuffs, otherwise processed or offered for human consumption. Codex members may define the processes that have been shown to reduce levels</td>
</tr>
</tbody>
</table>

Reference to JECFA: 56 (2001), 72 (2010)
Toxicological guidance value: Group PMTDI 0.001 mg/kg bw (2010, for DON and its acetylated derivatives)
Group ARID 0.008 mg/kg bw (2010, for DON and its acetylated derivatives)
Contaminant definition: Deoxynivalenol
Synonyms: Vomitoxin; Abbreviation, DON
## Relevant Food Safety Standards - Laws

### International Standards Organisations - CXS 193

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**Infants young children**

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Grain Quality = Food Quality

Tools to Manage
• Standards - Approved Methods
• Check Samples
• Proficiency Rating Programs
<table>
<thead>
<tr>
<th>Grain</th>
<th>Flour</th>
<th>Dough</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Weight</td>
<td>Flour Extraction</td>
<td>Farinograph</td>
</tr>
<tr>
<td>Thousand Kernel Weight</td>
<td>Protein</td>
<td>Extensigraph</td>
</tr>
<tr>
<td>Grain Hardness</td>
<td>Diastatic Activity and/or Starch Damage</td>
<td>RVA</td>
</tr>
<tr>
<td>Protein</td>
<td>Flour Purity (Color grade and Ash)</td>
<td>Alveograph</td>
</tr>
<tr>
<td>Ash</td>
<td>Yellowness</td>
<td>Amylograph</td>
</tr>
<tr>
<td>Falling Number</td>
<td>Brightness</td>
<td></td>
</tr>
<tr>
<td>Screenings</td>
<td>Flour Pasting</td>
<td></td>
</tr>
<tr>
<td>LMA Laboratory Screening</td>
<td></td>
<td></td>
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Elements of Quality Program

- Maintaining Performance
- Food Safety
- GLPs
- Training
- Data Analysis Management
- SOPs
- Proficiency Rating Program
- Check Samples
- Standard Methods
GLP: Good Laboratory Practice

- GLP a set of principles that provide a framework within which laboratory analyses are planned performed, monitored, reported and archived.
- GLP is sometimes confused with the standards of laboratory safety like wearing safety goggles.

ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories
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ISO/IEC 17025: 2017, General requirements for the competence of testing and calibration laboratories
ISO/IEC 17025:2017

• Use most recent version of all standards
• Sampling included - designed to find and correct problems
• Risk assessment - results being wrong (to laboratory, customers etc.)
• Resourcing, Process (flow in laboratory), Laboratory and Management Quality Control
• Account for digital management - records, equipment operation

ISO/IEC 17025:2017, General requirements for the competence of testing and calibration laboratories
Elements of Quality Program

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Who Approves Method Standards?

Method Harmonization through International Scientific Organizations

• AACC Intl
• AOAC
• AOCS
• ISO

Produce Official Methods - National, Regional and International
Who Uses Method Standards?

- Governments
- Industry
- Universities
- Trade
Approved Methods

AACC International

Approved Methods of Analysis • 11th Edition

Methods Home
All Methods
Methods eXtras
Propose a Method
Cite a Method
Technical Committees
Archived Methods
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Suppliers Guide
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Check Samples and Proficiency Rating Program

AACC Series - Focus on Grains / Cereal Products

- Subscribers
- Homogenous Sample
- Fixed Analytes
- Regular Participation
- Training
- New Products - reference samples
Check Samples and Proficiency Rating Program

AACC Series - Focus on Grains / Cereal Products

- Flour - hard, soft, semolina
- Food and Feed Safety - Microbiology, Mycotoxins
- Food and Feed Labeling - sugars, fats, GF, DF, vitamins and minerals
- Physical Testing - Rheology
## Check Samples and Proficiency Rating Program

201 AACC Wheat Flour - HW1

### Laboratory Test Result Summary

#### Summary of Z-Scores 2018

201 AACC Wh

<table>
<thead>
<tr>
<th>Analyst</th>
<th>Moisture % Method Codes</th>
<th>Protein (N x 5.7) % Method Codes</th>
<th>Moisture %</th>
<th>Protein (N x 5.7) %</th>
<th>Ash %</th>
<th>Falling Number sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>13.97 C7</td>
<td>12.79 C7</td>
<td>0.008</td>
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<tr>
<td>96</td>
<td>13.86 A1</td>
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<tr>
<td>659</td>
<td>13.52 A2</td>
<td>12.91 B3</td>
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<td>0.305</td>
<td>1.144</td>
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<tr>
<td>768</td>
<td>14.20 A2</td>
<td>13.04 B3</td>
<td>1.040</td>
<td>1.030</td>
<td>1.227</td>
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</tr>
<tr>
<td>839</td>
<td>14.12 A1</td>
<td>12.93 B3</td>
<td>0.661</td>
<td>0.416</td>
<td>0.272</td>
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<tr>
<td>936</td>
<td>14.18 A1</td>
<td>12.86 B7</td>
<td>0.950</td>
<td>0.025</td>
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<tr>
<td>1131</td>
<td>13.92 A3</td>
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<tr>
<td>1233</td>
<td>13.30 A1</td>
<td>12.95 B3</td>
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<td>0.528</td>
<td>-3.181</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-0.620</td>
<td>0.249</td>
<td>0.081</td>
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</tr>
</tbody>
</table>

**ISO 13528:2015(en)**

- Results reviewed
- Managed in test lab
- Comparison other labs
- Problem resolution
Questions?
annebridges001@earthlink.net

Educational Opportunities - publications, journals
Annual Meeting, webinars, workshops, and more ....

Analytical Resources
- Approved Methods of Analysis - recognized international standards
- Moisture, dietary fiber, gluten-free, shelf-life, non-gmo ..... 
- Laboratory Quality Tools
- Check Samples and Proficiency Rating Programs
- Technical Committees

aaccnet.org