FAO-EBRD Seminar on Grain Inspection, Sampling and Fumigation:
Best Practices
Wheat Quality Determination Methods (contractual)
# Egypt Milling Wheat Specification (example)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Specifications</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test weight</td>
<td>Min 78 kg/hl</td>
<td>ISO 7971-3</td>
</tr>
<tr>
<td>Moisture</td>
<td>Max 13.5%</td>
<td>ISO 712</td>
</tr>
<tr>
<td>Protein on dry basis (N x 5.7)</td>
<td>Min 11.5%</td>
<td>ISO 20483</td>
</tr>
<tr>
<td>Wet gluten</td>
<td>Min 23.0%</td>
<td>ISO 21415-2</td>
</tr>
<tr>
<td>Falling number</td>
<td>Min 230 sec.</td>
<td>ISO 3093</td>
</tr>
<tr>
<td>W (Alveograph)</td>
<td>Min 160 x 10^-4J</td>
<td>ISO 27971</td>
</tr>
<tr>
<td>Foreign matter</td>
<td>Max 2.0%</td>
<td>EN 15587</td>
</tr>
<tr>
<td>Bug damage</td>
<td>Max 1.0 / 1.5%</td>
<td>EN 15587</td>
</tr>
<tr>
<td>Ergot</td>
<td>Max 0.05%</td>
<td>EN 15587</td>
</tr>
<tr>
<td>Ambrosia</td>
<td>Max 50 ppm</td>
<td>visual check</td>
</tr>
<tr>
<td>Mycotoxins, Pesticides, Heavy metals</td>
<td>Within the international limits</td>
<td>HPLC/RE or ELISA</td>
</tr>
</tbody>
</table>

Above mentioned parameter spec are doable fro RU and UA wheat
## Additional testing as per Egyptian Measurement Standard № 1601 for milling wheat

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<thead>
<tr>
<th>Parameters</th>
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<tbody>
<tr>
<td>Harmful seed</td>
<td>Max 0.5%</td>
<td>ES 1601</td>
</tr>
<tr>
<td>Toxic seed</td>
<td>Max 0.05%</td>
<td>ES 1601</td>
</tr>
<tr>
<td>Ergot</td>
<td>Max 0.05%</td>
<td>ES 1601</td>
</tr>
<tr>
<td>Bunted grains</td>
<td>Max 0.5%</td>
<td>ES 1601</td>
</tr>
<tr>
<td>Grass seeds - Lolium temulentum, Convolvulus arvensis, Avena fatua (sativa, sterilis)</td>
<td>25 (un. per 1 kg)</td>
<td>visual check</td>
</tr>
<tr>
<td>Grains attacked by pests</td>
<td>32 (un. per 100 gr)</td>
<td>visual check</td>
</tr>
<tr>
<td>Cotton seeds</td>
<td>0 (un. per 1 kg)</td>
<td>visual check</td>
</tr>
<tr>
<td>Parts of straw, dead insects, parts of insects, filth</td>
<td>0.1%</td>
<td>visual check</td>
</tr>
</tbody>
</table>

Above mentioned parameter spec are doable fro RU and UA wheat
The initial methods of grain quality assessment

**Smell**
Olfactory method

**Color**
Visual method

**Live Pests**
Sieving and Visual check
The main physical and chemical indicators of grain quality

<table>
<thead>
<tr>
<th>Test Weight</th>
<th>Moisture Content</th>
<th>Crude protein content</th>
</tr>
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- **Test Weight**
- **Moisture Content**
- **Crude protein content**
Moisture content

Drying

At a certain temperature for a certain time

GOST 13586.5-93 < % Cereals EN ISO 712:2009 = % Cereals GAFTA 2:2
Crude protein content

Kjeldahl method
- Common to most standards
- Differences in calculation

\[
\begin{align*}
\% & \quad \text{GOST} \\
& 10846-91 \\
& \quad \text{(dry)}
\end{align*}
\]

\[
\begin{align*}
\% & \quad \text{ISO} \\
& 20483:2013 \\
& \quad \text{(dry)}
\end{align*}
\]

\[
\begin{align*}
\% & \quad \text{AACC} \\
& 46-12.01 - 2014 \\
& \quad \text{(moisture 12 \%)}
\end{align*}
\]

\[
\begin{align*}
\% & \quad \text{GAFTA} \\
& 4:1 \\
& \quad \text{(as is)}
\end{align*}
\]
The main physical and chemical indicators of grain quality

<table>
<thead>
<tr>
<th>Gluten content</th>
<th>Falling number</th>
</tr>
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<tbody>
<tr>
<td>Manual method</td>
<td>Mechanical method</td>
</tr>
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</table>

- Gluten content
- Falling number

- Manual method
- Mechanical method

Table showing the main physical and chemical indicators of grain quality.
Wet Gluten Content

Manual method
ISO 21415-1
GAFTA 26:1

Mechanical method
ISO 21415-2
GAFTA 26:2, ICC155

+ 1,5 - 2,0 %
Wet Gluten Content
Mechanical Methods in comparison with GOST

ISO 21415-2;
AACC 38-12A;
GAFTA 26:2

+ 1,0 - 1,5 %

GOST 13586.1
Falling number (Hagberg-Perten method)

**Falling Number, FN** - time in seconds required to activate the viscometric agitator and fall down from a predetermined height through the aqueous suspension.

Á-amylase activity is evaluated by the presence of the starch in the substrate sample. The definition is based on an aqueous suspension of flour ability to quickly turn into jelly in the boiling water bath and measuring the starch present in the sample dilution á-amylase.
Effect of wet gluten and falling number on the bread making quality of flour

Gluten quantity

20%, 30%, 40%

Falling number quantity

- Falling Number 62
- Falling Number 250
- Falling Number 400
Determination of rheological properties of flour Alveograph (W, P/L, G, I)
Deformation energy $W$

The standard curve

The average value of the maximum pressure $P$

$4 \text{ cm}$

$G \text{ ou } L$
Quality Parameters Correlation (simplified scheme)

Impurities content:
- Broken grains
- Damaged by heat and insects
- Sprouted grains
- Diseased, Moldy grains

Acidity
- Moisture
- Test Weight

Deformation Energy
- W

Gluten Content

Protein Falling Number
Common Parameters Correlation in the Grain
Picture for Visual impression of all links in the wheat grain

- Dextrin content
- Degree of grinding
- Weed content
- Time length
- Specific surface of flour
- Protein content
- Liquefying dough
- Sedimentation
- Vitreousness
- Infection of the head, ergot
- Starch content
- Bulk bread output
- Falling Number
- Gas-forming ability of flour
- Nature
- Contamination with heavy metals
- Moisture absorption capacity of flour
- Amylase activity
- Gas-forming ability of flour
- Protein content
- Proteinase activity
- Sugar-forming ability of flour
- Quantity and quality of gluten

- Weight of 1000 grains
- Specific volume of bread
- Porosity
- Formability
- Valometric estimation
- Ash
- Weed content
- Specific surface of flour
- Protein content
- Liquefying dough
- Sedimentation
- Vitreousness
- Infection of the head, ergot
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- Quantity and quality of gluten

- Content of damaged grains
- Particle size index
- Strength of Flour

- Size
- Alignment
- Moisture
- Volume of grain
- Stability of the dough
- Microbiological contamination
- Ability to darken
- Ash
- Weed content
- Specific surface of flour
- Protein content
- Liquefying dough
- Sedimentation
- Vitreousness
- Infection of the head, ergot
- Starch content
- Bulk bread output
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Questions?

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