Sorghum Composition

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Sorghum Composition
Sorghum Breeding
Sorghum Seed

• Texas is the source of approximately 85% of the world’s annual sorghum seed supply
• Grain sorghum planting seed - 30,000 acres (12,000 ha) grown annually in Texas
• 20%-35% of grain sorghum seed grown in Texas is exported to 30 countries
• 10-15% of grain sorghum seed is certified annually and most of that is exported
Sorghum Seed
Sorghum Seed

• Forage sorghum seed is grown on 8000 acres (3200 ha) annually in Texas
• Very little forage sorghum seed is certified
• Sorghum/Sudan hybrid seed grown on 25,000 acres (10,000 ha) in Texas annually
• 15%-20% of sorghum/Sudan hybrid seed is certified and is exported worldwide
Sorghum Seed

• Majority of Texas-produced sorghum seed is grown on a relatively small area of the High Plains with ideal climatic conditions
• Sorghum hybrid seed crops rely heavily on supplemental irrigation water
• As sorghum crop acres increase on the Texas High Plains it becomes more difficult to find the required isolation for seed production
Sorghum Seed

• The Texas Seed Trade Association and its members work very closely with underground water conservation districts to ensure adequate irrigation water is available for sorghum seed production

• We feel confident that we will be producing the best sorghum seed in the world far into the future
What About Germplasm?

• Double haploid technology allows for faster breeding times and quicker introductions of new traits

• Wild type sorghums are being indexed, converted, and made available for breeding purposes at a high rate – 144 in 2014

• Multi-seed genetics has been made available for public and private breeding programs resulting in as much as 3-fold seed increase
Wild Type Sorghum Nursery
What About Germplasm?

- Food grade sorghums are on the increase due to gluten-free popularity, increasing direct human consumption of sorghum, non-GM, relatively low glycemic index
- Forage sorghum for alternative fuels receiving significant investments
- Possible GM forage sorghum for direct production of biofuels
Food Grade Sorghum
Showing Variance in Seed Size
What About Germplasm?

- Genetic mapping program of public and private sorghum germplasm by Texas A&M University
- Public Sorghum breeding programs:
Chemical Composition

- Sorghum seed is made up of three distinct parts, the pericarp (outer layer), the germ (embryo) and the endosperm (storage tissue).
- The relative proportion of each varies by hybrid and environment (larger proportion of embryo to endosperm if the seed develops under stress).
## Chemical Composition

<table>
<thead>
<tr>
<th>Component</th>
<th>Whole Grain</th>
<th>Endosperm</th>
<th>Germ</th>
<th>Pericarp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Seed</td>
<td>100%</td>
<td>84%</td>
<td>9.5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Protein</td>
<td>12.3%</td>
<td>10.5%</td>
<td>18.5%</td>
<td>6%</td>
</tr>
<tr>
<td>Fat</td>
<td>3.6%</td>
<td>0.5%</td>
<td>28%</td>
<td>5%</td>
</tr>
<tr>
<td>Starch</td>
<td>74%</td>
<td>82%</td>
<td>13.5%</td>
<td>35%</td>
</tr>
<tr>
<td>Ash</td>
<td>1.5%</td>
<td>0.5%</td>
<td>10.5%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Standards-Color

• Genetics of pericarp color, pericarp thickness, presence or absence of a testa, and testa color and thickness influence grain color
• Pericarp thickness influences seed color and may range from white to pink, orange, red, and brown
• Some hybrids have very thin pericarp and may appear translucent
Standards-Color

• A few hybrids with thick pericarp have a testa containing tannin
• Less than 2% of sorghum hybrids are high tannin – sometimes called bird resistant
• Tannins have a negative impact on non-ruminant animal weight gain & performance
• Tannin effects on ruminant animals is not so pronounced
Class-Color & Tannin

• Class 1. Sorghum – Sorghum low in tannin, contains less than 98% white sorghum and not more than 3% tannin sorghum

• Class 2. Tannin Sorghum – Sorghum high in tannin containing no more than 10% non-tannin sorghum – usually brown pericarp
Class-Color & Tannin

- Class 3. White Sorghum – Sorghum low in tannin due to absence of testa, contains no more than 2% sorghum of other classes.

- Class 4. Mixed Sorghum – Sorghum that does not meet the criteria of Class 1, 2, or 3.
Sorghum Grades

• Major factors for grading commercial sorghum grain are:
  • Test weight
  • Percentage of damaged seeds/kernels
  • Amount of broken seeds/kernels
  • Foreign material
  • Non-sorghum seeds
## Sorghum Grades

<table>
<thead>
<tr>
<th>Minimum Test Weight</th>
<th>Grade 1. 57 lb/bu</th>
<th>Grade 2. 55 lb/bu</th>
<th>Grade 3. 53 lb/bu</th>
<th>Grade 4. 51 lb/bu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limits on Damaged Kernels</td>
<td>2.0%</td>
<td>5.0%</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Broken Kernels &amp; Foreign Matter</td>
<td>1.5%</td>
<td>2.5%</td>
<td>3.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Non-Sorghum Seeds &amp; Unknown</td>
<td>13 Count per probe</td>
<td>13 Count per probe</td>
<td>13 Count per probe</td>
<td>13 Count per probe</td>
</tr>
</tbody>
</table>
Feeding Sorghum
Feeding Sorghum

• 35 years of studies indicate sorghum has shown the nutritional value of sorghum is 95-100% that of corn

• Vitamin content of corn and sorghum are similar but sorghum has slightly higher concentrations of most minerals
Feeding Sorghum

• Factors that DO NOT influence feeding value:
  • Color *except as it relates to tannins*
  • The color of the outer layer of the sorghum kernel (red, bronze, yellow, cream, or white) has little to no correlation with nutritional value
  • Grain color not associated with feed value in 98% of the sorghum grown in the U.S.
Feeding Sorghum

• Factors that DO influence feeding value:
• Starch & protein digestibility – processing by grinding or steam flaking overcome this problem
• Presence of tannins - has a negative effect on animal weight gain and performance
• Test weight – lower test weights result in lower weight gain of non-ruminant animals
Feeding Sorghum

• Factors that DO influence feeding value:

• Processing methods – processing enhances the nutritional value of sorghum whether by grinding, rolling, steam flaking, or extrusion
Feeding Sorghum
Feeding Sorghum

• Following extended periods of drought or a series of frosts prussic acid may be found in hazardous amounts in forage sorghums, Sudan sorghum hybrids, and grain sorghum foliage

• Prussic acid levels generally go down as a sorghum crop matures and sorghum grain is unlikely to have elevated prussic acid levels
Thank You!

First The Seed

SORGHUM CHECKOFF