Grain Sorghum 101

Sorghum Partners
Important decisions a producer makes

• Hybrid selection
• Planting date/Maturity
• Soil Fertility
• Water Supply
• Weed control
• Pest Management
• Seeding rate
Hybrid selection is biggest decision

• First consideration is planting date
  • Do not be afraid to push maturities.
    • Longer season hybrids have higher yield potential
    • Tendency is to drift to early hybrids, especially after periods of drought.

• Select a maturity that will keep plant from flowering during the warmest and driest periods
  • April plantings in West Texas or OK use a shorter hybrid than in the traditional planting periods
    • This allows plant to flower before the warm dry period

• Soil temperatures
  • 58 - 65°F utilize red or bronze
  • Above 65°F any color will work
Hybrid selection continued

- **Irrigated Sorghum**
  - Medium to Medium Full hybrids should be used depending on latitude and water supply.
  - Plant the longest maturity hybrid for your conditions; longer maturity hybrids in general have a higher yield potential.

- **Double Crop Sorghum (after wheat)**
  - Medium Early hybrids perform the best.
    - Want flowering complete one month before expected frost.
  - Select SCA tolerant hybrids as insects will be present during early stages of growth.
## Grain Sorghum Seed Treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaucho</td>
<td>115.5</td>
<td>99.5</td>
<td>107.5</td>
</tr>
<tr>
<td>Cruiser</td>
<td>117.5</td>
<td>99.0</td>
<td>108.3</td>
</tr>
<tr>
<td>No Trt</td>
<td>111.0</td>
<td>94.5</td>
<td>102.8</td>
</tr>
<tr>
<td>LSD</td>
<td>2.4</td>
<td>3.3</td>
<td></td>
</tr>
</tbody>
</table>

Wilde, KSU  
5 Locations and 2 Hybrids each Year
Planting Date Considerations

- Be 80 to 90% complete with planting when your optimum date occurs.
  - Later planting often affects yields worse than early planting.
- Keep late planting date yield reductions in mind when evaluating stands.
SOIL FERTILITY

• Fertility and rainfall will impact yield
• Soil pH is first consideration, because it effects availability of many nutrients
  • Desired range is 5.5 to 7.5
    • Below 5.5 stand is reduced and can have micronutrient deficiencies
    • Above 7.5 micronutrient deficiencies are observed most notably Fe and Zn
Nitrogen fertility

• Nitrogen (N) is the building block of plants
  • N builds amino acids, which build proteins, which in turn build biomass

• Generally is the one nutrient producers generally don’t apply enough of

• Nitrogen requirement is based on yield goal
  • 1.2 lbs./bushel of yield goal
  • 2.0 lbs./100 lbs. of yield goal
  • 40 lbs./ton of yield goal

• Credits for previous crop and residual N should be considered.
Phosphorus and Potassium

• Phosphorus is used in complex energy transformations (energy source of plant)
  • Unless animal waste has been continuously applied is generally insufficient
  • Banding and Starter fertilizer are most efficient ways to apply

• Potassium is generally only required in areas with rainfall over 25 to 30 inches
  • Broadcast is best application method
P&K Sorghum Sufficiency Recs.

Recommendations for building soil test P and K levels are available in source: Kansas State Univ. MF2586: Soil Test Interpretation and Fertilizer Recommendations.
Starter fertilizer

In-Row Starter
- Keep salt index below 7 lbs./ac
- Recommendation of 5 gals/ac 10-34-0 equals 5.5 lbs. of N = 5.5 lbs. of salt

2X2 Starter
- Higher N rates can be used.
- N = 30 lbs/acre + P\textsubscript{2}O\textsubscript{5} = 30 lbs/acre resulted in optimum response.

2x2 Starter
NC KS Exp. Stn.

![Sorghum Yield Graph]

- Hybrid M and MF resulted in the highest sorghum yield with starter.
- Hybrid ME resulted in the lowest sorghum yield without starter.
- Across all hybrids, the mean yield with starter is higher than without starter.
Micronutrients

- In general if soil pH is between 6.0 and 7.2 that is considered perfect
  - Example P is most available between 6 and 7
- When above 7.5 Fe, Zn, Mn deficiency will start to appear
- Low pH soils can be amended by liming to try to raise to minimum of 6.0
- For high pH soils there is no economical way to lower pH
Sulfur and Chloride in Sorghum

- Sorghum responses to Cl applications are possible in areas where KCl is not regularly applied. Cl recommendations can be based from a soil test.

- Sorghum response to S is highest in no-till systems where cool spring soils mineralize soil OM at a slower rate.

<table>
<thead>
<tr>
<th>Chloride</th>
<th>Wheat, Corn and Sorghum</th>
<th>Chloride Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ppm</td>
<td>Lb/A</td>
<td>Lb Cl/A</td>
</tr>
<tr>
<td>&lt; 4</td>
<td>&lt; 30</td>
<td>20</td>
</tr>
<tr>
<td>4 - 6</td>
<td>30 - 45</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 6</td>
<td>&gt; 45</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil OM (%)</th>
<th>Yield Goal (bu/acre)</th>
<th>Lbs of S/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>80</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>120</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>160</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>200</td>
<td>38</td>
<td>36</td>
</tr>
</tbody>
</table>
Water Supply – Irrigation or expected rainfall

- Water supply is based on soil moisture at planting, rainfall, and/or irrigation.
- Time planting date to utilize rainfall at critical growth stages.
- With irrigation, planting time is not as critical as it is for dryland.
Grain yield from total water supply

Source: modern grain sorghum production and 16 years of Oklahoma State University trial results
When is moisture most critical (30-60-90)

- At 30 – 35 days after emergence (when yield potential is determined)
  - Plant is going from vegetative to reproductive
  - Head size and number of kernels is determined
- At 55 – 70 days (depending upon maturity of hybrid)
  **BOOT STAGE**
  - Panicle exertion is water driven
  - Maintains kernels/head
- Approximately 90 days after emergence
  - Maintains test weight
  - Maintains plant health (standability)
  - Reduces instances of lodging
Sorghum Growth, Development, and Yield

- Total Leaf Area
- 60% D.M & 70% N
- Maximum Root Depth
- Panicle Differentiation
- Potential Seed Number Determined

- Plant Emerge
- Panicle Initiation
- Boot Stage
- Anthesis
- Seed Set

- GSII
- Final Seed Number Set
- Phys Mat.

- GSIII
- Harv

- Total Leaf Number
- 1/3 Leaf Area
- 1/5 Total Wt.
- ~8 Leaf Stage

- Total Dry Wt.
- Total Grain Wt.
- Loss of Leaf Area

Yield potential is determined
Weed control

• **DO NOT RELY ON POST ONLY TREATMENTS**

• Pre-emergent herbicides are the easiest and best grassy weed control option in grain sorghum (*requires concept treated seed*)
  - Recommend a grass control pre (chloracetamide) + broadleaf (atrazine)
  - If there are resistance broadleaves, a third mode of action may be needed
    - Lumax EZ (dual + atrazine + callisto)
    - Chloracetamide + atrazine + sharpen
    - Or pre followed by post (Huskie + atrazine + AMS)

• **Know rotation restrictions for herbicides used on previous crops**
# Pre-Plant or Pre-emergence Herbicides

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Commercial Name(s)</th>
<th>Barnyard, Crabgrass, Fall panicum, Foxtail, Witchgrass</th>
<th>Pigweed</th>
<th>Other Annual broadleaf weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrazine</td>
<td>Atrazine</td>
<td>F</td>
<td>G-E</td>
<td>F</td>
</tr>
<tr>
<td>Metolachlor + Atrazine</td>
<td>Bicep II Magnum</td>
<td>G-E</td>
<td>G-E</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>Bicep II Lite Magnum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetochlor + Atrazine</td>
<td>Degree Xtra, Fultime NXT</td>
<td>E</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>Metolachlor</td>
<td>Dual II Magnum and other S-metolachlor</td>
<td>G-E</td>
<td>G</td>
<td>--</td>
</tr>
<tr>
<td>Mesotrione+Metolachlor + Atrazine</td>
<td>Lumax EZ, Lexar EZ</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Mesotrione+Metolachlor + Atrazine</td>
<td>Mesotrione</td>
<td>G-E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Dimethenamid-P</td>
<td>Outlook, Slider</td>
<td>G-E</td>
<td>G</td>
<td>G-E</td>
</tr>
<tr>
<td>Saflufenacil</td>
<td>Sharpen</td>
<td>--</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Saflufenacil + Dimethenamid-P</td>
<td>Verdict</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
</tbody>
</table>
How do pre-emergent herbicides work

- After application rainfall or irrigation is required for activation (movement into soil)
  - Generally requires 0.5 inch to activate
  - Large rainfall events in short periods will reduce effectiveness (which may require a post treatment)
  - Once in the soil, weeds begin to germinate and herbicide is taken up and weed growth is stopped
- Chloroacetamide's control grass and small seeded broadleaf weeds
- Atrazine, Callisto, and Sharpen will control broadleaf
## Postemergence Herbicides (Slide 1)

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Commercial Name(s)</th>
<th>Barnyard, Crabgrass, Fall panicum, Foxtail, Witchgrass</th>
<th>Pigweed</th>
<th>Other Annual broadleaf weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carfentrazone</td>
<td>Aim</td>
<td>-</td>
<td>G</td>
<td>F</td>
</tr>
<tr>
<td>Atrazine</td>
<td>Atrazine</td>
<td>-</td>
<td>E</td>
<td>G</td>
</tr>
<tr>
<td>Dicamba + Atrazine</td>
<td>Banvel K + Atrazine</td>
<td>-</td>
<td>G</td>
<td>G-E</td>
</tr>
<tr>
<td>Bromoxynil</td>
<td>Broclean, Buctril, Moxy, Bromox</td>
<td>-</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>Bromoxynil + Atrazine</td>
<td>Brozine, Buctril + Atrazine</td>
<td>-</td>
<td>G</td>
<td>G-E</td>
</tr>
<tr>
<td>Dicamba</td>
<td>Dicamba</td>
<td>-</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Quinclorac</td>
<td>Facet L, Quinstar 4L, Quinstar GT</td>
<td>-</td>
<td>—</td>
<td>F</td>
</tr>
<tr>
<td>Pyrasulfotole + Bromoxynil</td>
<td>Huskie</td>
<td>-</td>
<td>G-E</td>
<td>G-E</td>
</tr>
<tr>
<td>Prosulfuron</td>
<td>Peak</td>
<td>-</td>
<td>G</td>
<td>E</td>
</tr>
</tbody>
</table>
# Postemergence Herbicides (Slide 2)

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Commercial Name(s)</th>
<th>Barnyard, Crabgrass, Fall panicum, Foxtail, Witchgrass</th>
<th>Pigweed</th>
<th>Other Annual broadleaf weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluroxypyr + Bromoxynil + 2,4-D</td>
<td>Kochiavore</td>
<td>-</td>
<td>G-E</td>
<td>G-E</td>
</tr>
<tr>
<td>Halosulfuron</td>
<td>Permit</td>
<td>-</td>
<td>F</td>
<td>G-E</td>
</tr>
<tr>
<td>Dicamba + 2,4-D</td>
<td>RangeStar, Brash, WeedMaster, Outlaw, Latigo</td>
<td>-</td>
<td>G</td>
<td>G-E</td>
</tr>
<tr>
<td>Fluroxypyr + Bromoxynil</td>
<td>Starane NXT</td>
<td>-</td>
<td>F</td>
<td>G-E</td>
</tr>
<tr>
<td>Fluroxypyr</td>
<td>Starane Ultra</td>
<td>-</td>
<td>P</td>
<td>G</td>
</tr>
<tr>
<td>Halosulfuron + Dicamba</td>
<td>Yukon</td>
<td>-</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>2,4-D</td>
<td>2,4-D</td>
<td>-</td>
<td>G</td>
<td>G</td>
</tr>
</tbody>
</table>
Post emergent weed control

• Select post emerge herbicides based on weeds present.
  • Generally if pre-emergent is applied and activated, weed free fields until harvest is possible
  • Many post emerge broadleaf weed control options are available
  • Be careful when using growth regulators (2,4-D and dicamba) as some hybrids are sensitive to these herbicides and can rob yield even when no symptoms appear.
  • Apply post emerge herbicides to small weeds to improve weed control
Huskie injury usually no yield loss
Problems from 2,4-D applied to late

- Buggy whip
- Fused brace roots
- Laid over
Herbicide carryover examples

Reflex carryover in North Carolina

Finesse carryover in Kansas
Pest management

• The best defense is tolerant hybrids and seed treatments

• Tolerance and/or resistance
  • Examples:
    • East coast - anthracnose and SCA
    • South Texas - SCA and charcoal rot
    • Great plains - SCA and charcoal rot

• Cruiser will provide control of
  • Wireworms, 25 days for chinch bugs, 30 – 40 days for SCA, and 60 – 70 days for greenbugs

• Utilize other insecticides and fungicides when necessary
Seeding rate?

• One of most discussed but least important decisions
• Grain sorghum is a adaptive crop
  • Due to its ability to tiller, sorghum it will maintain yields across a wide range of seeding rates
  • Some producers like tillers and plant at the lower end of range
  • Some producers do not like tillers and plant at the higher end of range
  • Tillers decrease as planting date is delayed and night temperatures increase, plant higher seeding rates as planting is delayed or in double crop situation to account for lower tiller production.

• Plant enough to avoid replanting, late planting reduces yields much more than “high” populations.
In nearly all trials, middle to upper seeding rates resulted in maximum yields. Think twice before lowering seeding rates.
Planting Date effects tiller contributions
Seeding rates based upon rainfall

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Seeding rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less 20 inches</td>
<td>25 – 35,000</td>
</tr>
<tr>
<td>20 to 30 inches</td>
<td>40 – 55,000</td>
</tr>
<tr>
<td>Above 30 inches</td>
<td>55 – 70,000</td>
</tr>
<tr>
<td>Irrigated</td>
<td>80 – 120,000</td>
</tr>
</tbody>
</table>

Note: if planting in 20 inch rows or less always use the higher rates.
Seeding rates based up yield goal

<table>
<thead>
<tr>
<th>Yield Goal</th>
<th>Seeding rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>bu/acre or lbs/acre</td>
<td>Seed/acre</td>
</tr>
<tr>
<td>≤80 or 4,500</td>
<td>25 – 35,000</td>
</tr>
<tr>
<td>80 -125 or 4,000 -5,600</td>
<td>40 – 55,000</td>
</tr>
<tr>
<td>125+ or 7,000+</td>
<td>55 – 70,000</td>
</tr>
<tr>
<td>Irrigated</td>
<td>80 – 120,000</td>
</tr>
</tbody>
</table>

- if planting in 20 inch rows or less always use the higher rates
- Increase seeding rate by 20% if planting is delayed significantly to account for lower tillering rates.
Questions