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# 2009–2011 Performance of Sorghum Hybrids in the Virginia-Carolina Region

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## Introduction

Based on data from the U.S. Grain Council (www.grains.org), grain sorghum is the third most important cereal crop grown in the United States and the fifth most important cereal crop grown in the world. The United States, with approximately 9.7 million acres harvested in the 2009-10 cropping season, is the world's largest producer of grain sorghum, followed by India and Nigeria. Sorghum production in the U.S. is concentrated in the central and southern plains of five states — Kansas, Texas, Nebraska, Oklahoma, and Missouri — representing approximately 89 percent of total production.

In many parts of the world, sorghum has traditionally been used for food. In the United States, sorghum is primarily used for animal feed, but also for food and industry derivatives such as wallboard and biodegradable packaging materials. Recently, sweet sorghums have been considered for bioenergy feedstock production.

Sorghum is one of the most drought-tolerant cereal crops currently under cultivation. It offers farmers the ability to reduce costs on irrigation and other production expenses. The International Water Management Institute warns that by the year 2025, 25 percent of the world's population will experience severe water scarcity. However, water productivity in both irrigated and rain-fed acres can be increased through the use of more water-use-efficient crops, such as sorghum.

This and other economic concerns influenced Murphy-Brown — one of the largest feed operations in the country — to push for increased sorghum production in Virginia and the Carolinas. For the 2013 Murphy-Brown Sorghum Program, the cash price for grain sorghum will be 95 percent of the harvest price for corn at selected elevators, one of which is in Waverly, Va.

Before Murphy-Brown became interested in sorghum production in the Virginia-Carolina region, researchers at Virginia Cooperative Extension's Tidewater Agricultural Research and Extension Center (AREC) in Suffolk, Va., recognized the potential benefits of a drought-tolerant, lower-input-demanding cereal to replace corn, which is considered a water-inefficient crop.

With funds provided by the United Sorghum Checkoff Program, a hybrid testing program began at the Tidewater AREC in 2009. Each year since, 10 to 18 sorghum hybrids have been planted in approximately 240-square-foot plots at up to six locations in Virginia and North Carolina. Plots were replicated four times in a randomized complete block design at all locations.

Data collected on grain yield and grain moisture at harvest of hybrids tested during 2009-2011 in this program are presented here.

Figure 1. Planting sorghum with a NG Plus 3 Monosem two-row precision vacuum planter in plots of two 40-foot rows on 36-inch centers.

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Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University, 2013

# 2009

## 2009 Cultural Practices

**Table 1. Cultural practices used in sorghum test at the Tidewater AREC, Suffolk, Va., in 2009.**

| **Activity** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Planting date | 5/20 | | | | | | |
| Harvest date | 9/30 | | | | | | |
| Soil type | Emporia and Nansemond (fine sandy loam soil) | | | | | | |
| Seeds per acre | 120,000 | | | | | | |
| Soil test results | **pH** | **P** lb/ac | **K** lb/ac | **Ca** lb/ac | **Mg** lb/ac | **Zn** ppm | **Mn** ppm |
| | 6.82 | 70 | 61 | 328 | 64 | 0.7 | 3.1 |
| Land Preparation | Field cultivation (5/15) | | | | | | |
| Cultivation | 6/18 | | | | | | |
| Irrigation (rate per acre) | 2 inches (6/29); 1 inch (7/15) | | | | | | |
| Fertility (rate per acre) | Broadcast 330 lb 6-16-39 N-P-K (4/16) | | | | | | |
| Nitrogen (rate per acre) | 30% urea @ 60 pounds N (5/21 and 6/15) | | | | | | |
| Weed management (rate per acre) | Starfire 1 qt (4/17)<br>Dual 1.25 pt (5/21)<br>Attrex 1 qt (6/4) | | | | | | |
| Pest Control (rate per acre) | Temik 7 lb (5/20)<br>Intrepid 4 oz (7/15)<br>Baythroid 2 oz (7/15)<br>Baythroid 3 oz (8/19) | | | | | | |

## 2009 Weather Conditions

**Table 2. Air temperature, soil temperature (4-inch depth), light (reported as photosynthetic active radiation or PAR), relative humidity (RH), and precipitation recorded at the Tidewater AREC, Suffolk Va., in 2009.**

| | **Air temp** (°F) | | | **Soil temp** (°F) | **PAR*** (µmol $m^{-2}$ $s^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|
| **Month** | **Avg** | **Max** | **Min** | **Avg** | **Avg** | **Max** | **RH** (%) | **Rainfall** (inches) |
| May | 71 | 80 | 64 | 69 | 574 | 2,188 | 78 | 1.77 |
| June | 80 | 90 | 73 | 75 | 575 | 2,248 | 78 | 3.38 |
| July | 81 | 91 | 73 | 76 | 587 | 2,172 | 77 | 6.02 |
| August | 83 | 92 | 75 | 78 | 500 | 2,062 | 85 | 5.86 |
| September | 73 | 81 | 66 | 69 | 394 | 1,733 | 86 | 5.54 |
| October | 69 | 79 | 62 | 67 | 268 | 1,267 | 74 | 0.16 |
| **Mean** | 76 | 86 | 69 | 72 | 483 | 1,945 | 80 | 22.73 |

***** Light is important for plant growth and development. On a fully sunny day, maximum photosynthetic active radiation approaches 2,500 µmol $m^{-2}$ $s^{-1}$ and average PAR (average from sunrise to sunset) is approximately 600 µmol $m^{-2}$ $s^{-1}$. If these numbers are lower, it denotes cloudy days when plants grow at a slower rate.

## 2009 Results

**Table 3. Stand count, grain moisture, and grain yield for sorghum hybrids tested at the Tidewater AREC, Suffolk, Va., in 2009.**

| Company | Hybrid | Stand count* (plants/ac) | Grain moisture* (%) | Grain yield at 14% moisture* (bu/ac) |
|---|---|---|---|---|
| TAMU | ATx399xRTx430 | 101,670 a | 15.0 d | 75 a |
| Monsanto | A 571 | 47,204 cd | 16.2 b-d | 74 a |
| Pioneer | P 84G62 | 74,800 a-d | 16.0 cd | 74 a |
| Monsanto | DKS 53-67 | 45,752 cd | 18.5 a | 67 ab |
| Pioneer | P 83G66 | 78,431 a-c | 17.3 a-c | 64 ab |
| Pioneer | P 85G46 | 83,515 ab | 17.9 ab | 64 ab |
| Monsanto | DKS 52 | 71,169 a-d | 16.0 ab | 60 ab |
| Pioneer | P 8925 | 56,645 b-d | 18.0 ab | 58 ab |
| TAMU | ATx642xRTx439 | 90,777 ab | 15.9 d | 55 ab |
| Monsanto | DKS 44-20 | 39,942 d | 16.7 b | 49 b |
| **Mean** | | **68,991** | **16.7** | **64** |

** Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

## Discussion

The most productive hybrids in 2009 were ATx399xRTx430, A 571, and P 84G62, with yields of 10 bushels per acre more than the average of all hybrids. The least productive was DKS 44-20, but it also had the poorest emergence.

Severe reduction of crop stand in 2009 was likely due to seed not being treated with an herbicide "safener." Metolachlor and S-metolachlor herbicides — for example, Dual — can have adverse effects on germinating seed of sorghum if seed is not treated with a safener such as Concep or CSI Safener 500 FS. The severity of the damage is dependent on the hybrid, which is clearly shown by our stand counts in 2009.

Therefore, grain yield data from 2009 are not representative for the actual yield potential of the hybrids but rather show the importance of the seed treatment in sorghum. In addition to Concep, seed treatments with Maxim XL (a combination of Maxim 4FS and Apron XL), Raxil 2.6F, and Dynasty provide good protection for seed- and soil-borne fungi, Rhizoctonia, Phytium, and Fusarium.

Insect protection at early seedling stages is efficiently controlled by seed insecticides such as Cruiser, Poncho, and Concur. All these pesticides are labeled for sorghum, and their rates and tank mixes should be followed as indicated on their labels.

# 2010

## 2010 Cultural Practices

**Table 4. Cultural practices used in sorghum tests at five locations in 2010.**

| Activity | Product | Tidewater AREC Suffolk, Va. | Southampton Co., Va. | Martin Co., N.C. | Accomack Co., Va. | Orange Co., Va. |
|---|---|---|---|---|---|---|
| Planting date | | 5/27 | 5/26 | 6/6 | 5/25 | 5/10 |
| Harvest date | | 9/30 | 10/6 | 10/11 | 9/30 | 10/8 |
| Seeds per acre | | 120,000 | 120,000 | 120,000 | 120,000 | 120,000 |
| Soil type | | Emporia & Uchee fine sandy loam | Emporia fine, sandy loam | Norfolk loamy fine sand | Bojack sandy loam | Star silty clay loam |
| Land preparation | | Field cultivation (5/25) | | | | |
| Irrigation (rate per acre) | | total 3 inches (6/24, 7/8, and 7/21) | total 4 inches (6/28 and 7/19) | None | None | None |
| Weed management (rate per acre) | Gramoxone | 1 pt (4/6) | | | | |
| | Roundup (WM) | 22 oz (5/1) | | | | |
| | Attrex 4L | 1 qt (5/27) | 1 qt (5/28) | 1 qt (5/29) | | |
| | Intro | 2 qt (5/27) | 2 qt (5/28) | 2 qt (5/29) | | |
| | Dual | | | | 1 pt | 1 pt |
| | Atrazine 4L | | | | 1 qt | 1.6 qt |
| Pest control (rate per acre) | Baythroid | 2 oz and 3 oz (6/20, 6/30, and 8/6) | 3 oz (7/1 and 8/14) | 3 oz (7/2 and 7/15) | | |
| | Steward | 5 oz (8/6) | | | | |
| | Lannate SP | 0.5 lb (8/11 and 8/31) | | 0.5 lb (8/12) | | |
| Disease control | | | | | | |
| Nutrient management (rate per acre) | Broadcast | 300 lb 8-15-36 N-P-K (4/6) | | | 100 lb N (5/25) | 300 lb 8-15-36 N-P-K (5/6) |
| | 30% urea | 60 lb N (5/27 and 6/22) | 60 lb N (5/27 and 6/1) | 60 lb N (6/2 and 7/2) | | |

## 2010 Weather Conditions

**Table 5. Weather and irrigation information by location in 2010.**

| | | Temperature (°F) | | Rainfall | Irrigation |
|---|---|---|---|---|---|
| **Location** | **Month** | Max | Min | (inches) | |
| Suffolk, Va. | April | 76 | 47 | 1.26 | |
| | May | 83 | 59 | 6.57 | |
| | June | 93 | 70 | 1.53 | 1 |
| | July | 96 | 69 | 1.85 | 2 |
| | August | 92 | 69 | 5.60 | |
| | September | 88 | 60 | 17.14 | |
| | October | 76 | 50 | 1.91 | |
| Southampton Co., Va. | April | 78 | 47 | 0.99 | |
| | May | 83 | 59 | 3.32 | |
| | June | 93 | 69 | 0.83 | 2 |
| | July | 95 | 69 | 3.22 | 2 |
| | August | 92 | 69 | 3.18 | |
| | September | 90 | 60 | 12.00 | |
| | October | 75 | 48 | 1.22 | |
| Martin Co., N.C. | April | 76 | 50 | 2.20 | |
| | May | 81 | 60 | 4.42 | |
| | June | 91 | 71 | 1.90 | |
| | July | 91 | 70 | 2.56 | |
| | August | 90 | 70 | 4.80 | |
| | September | 86 | 62 | 14.17 | |
| | October | 75 | 52 | 7.81 | |
| Orange Co., Va. | April | 73 | 46 | 1.61 | |
| | May | 77 | 57 | 3.07 | |
| | June | 88 | 66 | 2.45 | |
| | July | 91 | 68 | 1.45 | |
| | August | 87 | 68 | 2.59 | |
| | September | 85 | 59 | 0.12 | |
| | October | 73 | 50 | 0 | |
| Accomack Co., Va. | April | 72 | 49 | 0.85 | |
| | May | 80 | 59 | 2.94 | |
| | June | 90 | 71 | 1.68 | |
| | July | 92 | 72 | 1.33 | |
| | August | 88 | 70 | 4.62 | |
| | September | 84 | 64 | 4.00 | |

## 2010 Results

**Table 6. Grain moisture and grain yield for sorghum hybrids tested at the Tidewater AREC, Suffolk, Va., in 2010.**

| Company | Hybrid | Grain moisture* (%) | Grain yield at 14% moisture* (bushels/acre) |
|---|---|---|---|
| Monsanto | DKS 49-45 | 15.3 b | 112 a |
| Monsanto | DKS 54-03 | 15.3 b | 112 a |
| Monsanto | DKS 54-00 | 17.1 ab | 111 ab |
| Monsanto | DKS 44-20 | 15.0 b | 110 ab |
| Advanta | 21222 | 15.9 ab | 108 a-c |
| Monsanto | DKS 53-67 | 15.6 b | 104 a-d |
| Advanta | 99547 | 15.2 b | 103 a-d |
| Pioneer | 84G62 | 14.5 b | 99 a-c |
| Advanta | 28219 | 14.8 b | 96 a-c |
| Sorghum Partners | NK 6638/09008 | 15.0 b | 95 a-e |
| Monsanto | DKS 52 | 15.1 b | 83 a-e |
| Advanta | 26056 | 16.5 ab | 77 a-e |
| TAMU | ATx399xRTx430 | 16.7 ab | 73 a-e |
| Kansas State University | KS 735/99030 | 16.7 ab | 73 a-e |
| Pioneer | 85G46 | 15.7 ab | 69 b-e |
| Pioneer | 83G66 | 16.3 ab | 67 c-e |
| Monsanto | DKS 36-06 | 20.3 a | 63 de |
| Monsanto | DKS 37-07 | 16.3 ab | 59 e |
| **Mean** | | **16.0** | **90** |

** Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

**Table 7. Grain yield and harvest moisture for sorghum hybrids tested at Southampton County, Va., in 2010.**

| Company | Hybrid | Grain moisture* (%) | Grain yield at 14% moisture* (bushels/ acre) |
|---|---|---|---|
| Sorghum Partners | NK 6638/09008 | 15.5 e | 89 a |
| Monsanto | DKS 53-67 | 16.9 a-e | 79 ab |
| Monsanto | DKS 44-20 | 15.5 de | 77 ab |
| Monsanto | DKS 52 | 16.3 b-e | 74 ab |
| Kansas State University | KS 735/99030 | 15.8 c-e | 72 ab |
| Monsanto | DKS 37-07 | 16.0 b-e | 72 ab |
| Pioneer | 85G46 | 17.8 a-c | 69 ab |
| Monsanto | DKS 49-45 | 16.8 a-e | 68 ab |
| Advanta | 21222 | 17.0 a-e | 62 ab |
| Pioneer | 84G62 | 17.0 a-e | 60 ab |
| Monsanto | DKS 54-03 | 17.6 a-d | 60 ab |
| Advanta | 26056 | 18.5 a | 59 ab |
| Pioneer | 83G66 | 18.7 a | 57 ab |
| TAMU | ATx399xRTx430 | 15.5 de | 55 ab |
| Monsanto | DKS 36-06 | 18.5 a | 53 ab |
| Monsanto | DKS 54-00 | 18.0 ab | 52 b |
| Advanta | 28219 | 17.8 a-c | 49 b |
| Advanta | 99547 | 17.9 a-c | 46 b |
| Mean | | 17.1 | 64 |

** Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

**Table 8. Harvest moisture and grain yield for sorghum hybrids tested at Martin County, N.C., in 2010.**

| Company | Hybrid | Grain moisture* (%) | Grain yield at 14% moisture* (bushels/acre) |
|---|---|---|---|
| Monsanto | DKS 54-00 | 14.8 bc | 65 a |
| Monsanto | DKS 53-67 | 14.9 bc | 53 ab |
| Advanta | 99547 | 14.5 bc | 46 a-c |
| Monsanto | DKS 49-45 | 14.8 bc | 46 a-c |
| Monsanto | DKS 54-03 | 13.0c | 46 a-c |
| TAMU | ATx399xRTx430 | 15.6 bc | 39 a-c |
| Pioneer | 85G46 | 19.8 a-c | 38 a-c |
| Sorghum Partners | NK 6638/09008 | 17.4 a-c | 37 a-c |
| Monsanto | DKS 52 | 16.4 a-c | 35 a-c |
| Kansas State University | KS 735/99030 | 18.6 a-c | 32 a-c |
| Advanta | 21222 | 16.0 bc | 31 a-c |
| Advanta | 28219 | 21.2 ab | 28 bc |
| Pioneer | 83G66 | 20.3 a-c | 28 bc |
| Advanta | 26056 | 19.0 a-c | 27 bc |
| Monsanto | DKS 44-20 | 19.1 a-c | 26 bc |
| Monsanto | DKS 37-07 | 18.1 a-c | 25 bc |
| Pioneer | 84G62 | 19.8 a-c | 23 bc |
| Monsanto | DKS 36-06 | 23.5 a | 16 c |
| **Mean** | | **17.6** | **36** |

** Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

**Table 9. Grain yield and harvest moisture for sorghum hybrids tested at Accomack County, Va., in 2010.**

| Company | Hybrid | Grain moisture* (%) | Grain yield at 14% moisture* (bushels/acre) |
|---|---|---|---|
| Monsanto | DKS 53-67 | 23.05 a | 56 a |
| Pioneer | 84G62 | 17.8 b | 54 a |
| Advanta | 21222 | 17.7 b | 49 a |
| Monsanto | DKS 54-00 | 17.2 b | 45 a |
| TAMU | ATx399xRTx430 | 16.8 b | 40 a |
| Monsanto | DKS 49-45 | 16.8 b | 37 a |
| Advanta | 26056 | 16.7 b | 37 a |
| Monsanto | DKS 54-03 | 16.3 b | 36 a |
| Monsanto | DKS 44-20 | 15.7 b | 34 a |
| Monsanto | DKS 37-07 | 15.4 b | 34 a |
| Advanta | 99547 | 15.3 b | 32 a |
| Sorghum Partners | NK 6638/09008 | 14.8 b | 31 a |
| Pioneer | 83G66 | 14.8 b | 28 a |
| Kansas State University | KS 735/99030 | 14.4 b | 27 a |
| Monsanto | DKS 36-06 | 14.2 b | 27 a |
| Advanta | 28219 | 14.1 b | 20 a |
| Pioneer | 85G46 | 14.0 b | 19 a |
| Monsanto | DKS 52 | 13.7 b | 16 a |
| **Mean** | | **16.0** | **34** |

** Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

**Table 10. Harvest moisture and grain yield for sorghum hybrids tested at Orange County, Va., in 2010.**

| Company | Hybrid | Grain moisture* (%) | Grain yield at 14% moisture* (bushels/acre) |
|---|---|---|---|
| Monsanto | DKS 44-20 | 13.8 b-d | 67 a |
| Pioneer | 85G46 | 14.1 a-d | 63 ab |
| Sorghum Partners | NK 6638/09008 | 13.1 cd | 58 ab |
| Pioneer | 84G62 | 14.5 a-c | 58 ab |
| Monsanto | DKS 54-03 | 13.5 b-d | 55 a-c |
| Pioneer | 83G66 | 15.8 a | 55 a-c |
| Advanta | 21222 | 14.7 ab | 54 a-c |
| Advanta | 26056 | 15.0 ab | 54 a-c |
| Monsanto | DKS 36-06 | 14.5 a-d | 52 a-c |
| Monsanto | DKS 52 | 13.9 b-d | 52 a-c |
| Monsanto | DKS 37-07 | 13.8 b-d | 50 a-c |
| Monsanto | DKS 49-45 | 14.1 a-d | 50 a-c |
| Advanta | 28219 | 14.9 ab | 48 a-c |
| Monsanto | DKS 53-67 | 14.5 a-d | 46 a-c |
| Kansas State University | KS 735/99030 | 13.4 b-d | 44 a-c |
| TAMU | ATx399xRTx430 | 12.8 d | 44 a-c |
| Monsanto | DKS 54-00 | 15.0 ab | 36 bc |
| Advanta | 99547 | 13.0 cd | 28 c |
| **Mean** | | **14.1** | **51** |

* *Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

**Table 11. Relative yield of sorghum at all test locations in 2010. Relative yield was calculated as the hybrid yield at a location divided by the average yield for a location.**

| Company | Hybrid | Tidewater AREC, Suffolk, Va. | South-ampton Co., Va. | Martin Co., N.C. | Accomack Co, Va. | Orange Co., Va. |
|---|---|---|---|---|---|---|
| | | (%) | | | | |
| Monsanto | DKS 54-03 | 124 | 94 | 128 | 106 | 108 |
| Monsanto | DKS 49-45 | 124 | 106 | 128 | 109 | 98 |
| Monsanto | DKS 54-00 | 123 | 81 | 181 | 132 | 71 |
| Monsanto | DKS 44-20 | 122 | 120 | 72 | 100 | 131 |
| Advanta | 21222 | 120 | 97 | 86 | 144 | 106 |
| Monsanto | DKS 53-67 | 116 | 123 | 147 | 165 | 90 |
| Advanta | 99547 | 114 | 72 | 128 | 94 | 55 |
| Pioneer | 84G62 | 110 | 94 | 64 | 159 | 114 |
| Advanta | 28219 | 107 | 77 | 78 | 59 | 94 |
| Sorghum Partners | NK 6638/09008 | 106 | 139 | 103 | 91 | 114 |
| Monsanto | DKS 52 | 92 | 116 | 97 | 47 | 102 |
| Advanta | 26056 | 86 | 92 | 75 | 109 | 106 |
| Kansas State University | KS 735/99030 | 81 | 113 | 89 | 79 | 86 |
| TAMU | ATx399xRTx430 | 81 | 86 | 108 | 118 | 86 |
| Pioneer | 85G46 | 77 | 108 | 106 | 56 | 124 |
| Pioneer | 83G66 | 74 | 89 | 78 | 82 | 108 |
| Monsanto | DKS 36-06 | 70 | 83 | 44 | 79 | 102 |
| Monsanto | DKS 37-07 | 66 | 113 | 69 | 100 | 98 |

## Discussion

In 2010, location and hybrid had significant effects on yield, and the location × hybrid interaction was significant. This means that the best hybrids at some locations were not as good at other locations and vice versa. Because of this, hybrids must be tested at multiple locations.

At Suffolk, Va., yields ranged from 112 to 59 bushes per acre; at Southampton County, Va., from 89 to 46; at Martin County, N.C., from 65 to 16; at Accomack County, Va., from 56 to 16; and at Orange County, Va., from 67 to 28.

Hybrids that produced yields consistently above or close to the average of all hybrids at all locations were: DKS 54-03, DKS 49-45, DKS 54-00, DKS 44-20, 21222, DKS 53-67, NK 6638/09008, and 84G62 (table 11).

# 2011

## 2011 Cultural Practices

**Table 12. Cultural practices used in sorghum tests in 2011.**

| Activity | Product | Tidewater AREC, Suffolk, Va. | Isle of Wight Co., Va. | Accomack Co., Va. | Martin Co., N.C. |
|---|---|---|---|---|---|
| Planting date | | 5/20 | 5/23 | 5/26 | 5/19 |
| Harvest date | | 10/5 | 10/10 | 10/5 | 10/44 |
| Seeds per acre | | 120,000 | 120,000 | 120,000 | 120,000 |
| Soil type | | Emporia sandy loam | Emporia sandy loam | Bojack sandy loam | Norfolk loamy fine sand |
| Land preparation | Rip-strip till (4/14) | | | | |
| Irrigation (rate per acre) | | 1 in (7/22) | | | |
| Weed management (rate per acre) | Gramoxone | 22 oz (5/22) | 22 oz (5/23) | | 22 oz (5/19) |
| | Atrazine | 1 qt (5/20) | 1 qt (5/23) | | 1 qt (5/19) |
| | Intro | 1 qt (5.20) | 1 qt (5/23) | | 1 qt (5/19) |
| | Dual | | | 1.25 pt (5/26) | |
| | Attrex L | 1 qt (5/20) | | 1 qt (5/26) | |
| | Round-up | 1 qt (3/29) | | | |
| Pest control (rate per acre) | Bathyroid | 2.8 oz (7/14) | 2.8 oz (7/15) | | |
| | Lannate | 1.5 pt (8/15) | 1.5 pt (8/9) | | |
| Disease control | | | | | |
| Nutrient management (rate per acre) | Broadcast | 300 lb 8-15-36 N-P-K (4/6) | 300 lb 8-15-36 N-P-K (5/1) | 100 lb N (5/26) | 300 lb 8-15-36 N-P-K (4/28) |
| | Nitrogen (30% urea) | 60 lb N (5/20 and 6/13) | 60 lb N (5/23 and 6/21) | | 60 lb N (5/19 and 6/22) |

## 2011 Weather Conditions

**Table 13. Weather and irrigation information by location in 2011.**

| | | Temperature (°F) | | Rainfall | Irrigation |
|---|---|---|---|---|---|
| **Location** | **Month** | **Max** | **Min** | (inches) | |
| Tidewater AREC, Suffolk, Va. | May | 84 | 56 | 2.36 | |
| | June | 91 | 65 | 3.53 | |
| | July | 96 | 70 | 6.84 | 1 |
| | August | 90 | 67 | 18.08 | |
| | September | 84 | 64 | 8.79 | |
| | October | 72 | 48 | 2.53 | |
| Isle of Wight Co., Va. | May | – | – | – | |
| | June | – | – | – | |
| | July | 88 | 70 | 3.58 | |
| | August | 87 | 68 | 10.22 | |
| | September | 82 | 67 | 7.56 | |
| | October | 72 | 49 | 3.93 | |
| Accomack Co., Va. | May | 78 | 59 | 3.41 | |
| | June | 87 | 67 | 10.28 | |
| | July | 90 | 72 | 3.63 | |
| | August | 87 | 69 | 8.01 | |
| | September | 80 | 65 | 3.71 | |
| | October | 70 | 51 | 3.17 | |
| Martin Co., N.C. | May | 81 | 58 | 2.41 | |
| | June | 89 | 67 | 1.90 | |
| | July | 92 | 71 | 4.36 | |
| | August | 88 | 69 | 15.66 | |
| | September | 82 | 64 | 7.14 | |
| | October | 72 | 50 | 1.14 | |

## 2011 Results

**Table 14. Grain yield for sorghum hybrids tested at three locations in Virginia in 2011.**

| | | Tidewater AREC, Suffolk, Va.* | Isle of Wight Co., Va.* | Accomack Co., Va.* |
|---|---|---|---|---|
| **Company** | **Hybrid** | Yield corrected at 14% moisture (bushels/acre) | | |
| Pioneer | P 83P17 | 89 a | 23 f | 25 de |
| Pioneer | P 84G62 | 88 a | 44 ab | 41 a-d |
| Dyna-Gro | DG 766B | 87 a | 30 ef | 33 b-e |
| Pioneer | P 84P80 | 86 a | 38 b-e | 37 a-d |
| Monsanto | DKS 54-00 | 86 a | 36 b-e | 35 be |
| Monsanto | DKS 53-67 | 85 a | 52 a | 46 ab |
| Dyna-Gro | DG GX08365 | 85 a | 28 ef | 42 a-c |
| Monsanto | DKS 44-20 | 82 a | 44 a-c | 53 a |
| Dyna-Gro | DG 751B | 81 a | 24 f | 20 e |
| Pioneer | P 83G66 | 81 a | 33 c-f | 28 c-e |
| Dyna-Gro | DG 771B | 80 a | 32 d-f | 32 b-e |
| Monsanto | DKS 49-45 | 79 a | 42 a-d | 30 b-e |
| Pioneer | P 84G77 | 78 a | 32 d-f | 39 a-d |
| Monsanto | DKS 54-03 | 78 a | 38 b-e | 36 b-e |
| Dyna-Gro | DG 764B | 71 a | 42 a-d | 53 a |
| **Mean** | | **82** | **36** | **37** |

* *Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

**Table 15. Harvest moisture for sorghum hybrids tested at three locations in Virginia in 2011.**

| | | Tidewater AREC, Suffolk, Va.* | Isle of Wight Co., Va.* | Accomack Co., Va.* |
|---|---|---|---|---|
| **Company** | **Hybrid** | | Grain moisture (%) | |
| Monsanto | DKS 54-03 | 17.9 a | 15.6 cd | 16.5 cd |
| Dyna-Gro | DG GX08365 | 17.7 a | 18.8 ab | 16.9 cd |
| Dyna-Gro | DG 766B | 16.6 a | 18.4 a-c | 16.7 cd |
| Pioneer | P 84G77 | 16.3 a | 18.7 ab | 19.7 bc |
| Pioneer | P 84G62 | 16.0 a | 16.3 b-d | 16.6 cd |
| Monsanto | DKS 44-20 | 15.8 a | 14.6 d | 15.8 d |
| Monsanto | DKS 54-00 | 15.7 a | 17.4 a-d | 19.2 b-d |
| Dyna-Gro | DG 764B | 15.6 a | 17.2 a-d | 17.5 cd |
| Dyna-Gro | DG 751B | 15.6 a | 20.1 a | 19.6 bc |
| Monsanto | DKS 49-45 | 15.5 a | 16.8 b-d | 18.5 cd |
| Dyna-Gro | DG 771B | 15.5 a | 17.5 a-d | 18.4 cd |
| Pioneer | P 83G66 | 15.1 a | 17.9 a-c | 22.4 ab |
| Pioneer | P 84P80 | 15.0 a | 16.8 b-d | 16.5 cd |
| Monsanto | DKS 53-67 | 14.9 a | 17.3 a-d | 19.8 a-c |
| Pioneer | P 83P17 | 14.8 a | 18.8 ab | 23.3 a |
| **Mean** | | **15.9** | **17.5** | **18.5** |

** Within each column, means followed by the same letter(s) are not statistically different based on Tukey's HSD test (p = 0.05).*

**Table 16. Relative yield of sorghum at three test locations in 2011. Relative yield was calculated as the hybrid yield at a location divided by the average yield for a location.**

| | | Tidewater AREC Suffolk, Va. | Isle of Wight Co., Va. | Accomack Co., Va. |
|---|---|---|---|---|
| Company | Hybrid | | (%) | |
| Pioneer | P 83P17 | 109 | 64 | 68 |
| Pioneer | P 84G62 | 107 | 122 | 111 |
| Dyna-Gro | DG 766B | 106 | 83 | 89 |
| Pioneer | P 84P80 | 105 | 106 | 100 |
| Monsanto | DKS 54-00 | 105 | 100 | 95 |
| Monsanto | DKS 53-67 | 104 | 144 | 124 |
| Dyna-Gro | DG GX08365 | 104 | 78 | 114 |
| Monsanto | DKS 44-20 | 100 | 122 | 143 |
| Dyna-Gro | DG 751B | 99 | 67 | 54 |
| Pioneer | P 83G66 | 99 | 92 | 76 |
| Dyna-Gro | DG 771B | 98 | 89 | 86 |
| Monsanto | DKS 49-45 | 96 | 117 | 81 |
| Pioneer | P 84G77 | 95 | 89 | 105 |
| Monsanto | DKS 54-03 | 95 | 106 | 97 |
| Dyna-Gro | DG 764B | 87 | 117 | 143 |

In 2011 at the Tidewater AREC, DKS 52 was planted as six border rows by a 240-foot length for the hybrid trial on May 20 and cut to the ground on July 21. It regrew and produced 33 bushels per acre in late November.

At Martin County, N.C., Hurricane Irene destroyed the crop (fig. 2). Observations on lodging and seed retention were made using a visual score, and this information is presented in table 17. Similarly at Accomack County, Va., visual lodging observations were recorded (table 18).

Figure 2. Sorghum plots at Martin County, N.C., before (left) and after Hurricane Irene.

At Orange County, Va., plots were in good shape at the beginning of October (fig. 3). However, bird damage coupled with head blight mold due to a very wet season was observed after that, for which yield data were not taken.

Figure 3. Sorghum plots at Orange County, Va., on Oct. 1, 2011.

**Table 17. Lodging ratings and grain retention for sorghum hybrids tested at Martin County, N.C., in 2011.**

| Company | Hybrid | Lodging ratings[a,b] | Retention ratings[b,c] |
|---|---|---|---|
| Pioneer | P83G66 | 4.38 a | 2.88 bc |
| Dyna-Gro | DG766B | 4.13 ab | 3.13 ab |
| Pioneer | P84P80 | 4.13 ab | 3.38 ab |
| Monsanto | DKS49-45 | 4.00 ab | 3.00 bc |
| Monsanto | DKS53-67 | 4.00 ab | 2.63 bc |
| Monsanto | DKS54-03 | 3.88 ab | 3.13 ab |
| Dyna-Gro | DG771B | 3.75 ab | 3.25 ab |
| Pioneer | P83P17 | 3.13 a-c | 4.13 a |
| Pioneer | P84G77 | 3.13 a-c | 3.13 ab |
| Monsanto | DKS44-20 | 2.88 b-d | 2.63 bc |
| Pioneer | P84G62 | 2.88 b-d | 3.25 ab |
| Dyna-Gro | DG751B | 2.13 c-e | 2.75 bc |
| Dyna-Gro | DGGX08365 | 1.75 c-e | 3.13 ab |
| Monsanto | DKS54-00 | 1.50 de | 2.00 c |
| Dyna-Gro | DG764B | 1.25 e | 3.13 ab |
| Mean | | 3.13 | 3.03 |
| $LSD_{0.05}$ [d] | | 1.48 | 1.07 |

*[a]Lodging ratings ranged from 1 to 5. Lodging ratings: 1 = all plants erect, 2 = either all plants leaning slightly or a few down, 3 = either all plants leaning moderately (45° angle) or 25-50% down, 4 = either all plants leaning considerably or 50-80% down, and 5 = all plants down.*

*[b]Means sharing the same letter(s) are not statistically different at p = 0.05 based on the Fisher's protected least significant difference (LSD) test.*

*[c]Grain retention ranges from 1 (all kept) to 5 (all shattered).*

*[d]Fisher's LSD at p = 0.05.*

**Table 18. Lodging ratings for sorghum hybrids tested at Accomack County, Va., in 2011.**

| Company | Hybrid | Lodging ratings[a,b] |
|---|---|---|
| Pioneer | P 84G62 | 4.13 a |
| Pioneer | P 84P80 | 4.00 a |
| Dyna-Gro | DG 766B | 3.63 ab |
| Monsanto | DKS 54-03 | 3.50 a-c |
| Dyna-Gro | DG 771B | 3.00 b-d |
| Pioneer | P 83P17 | 3.00 b-d |
| Dyna-Gro | DG 751B | 2.88 b-e |
| Monsanto | DKS 49-45 | 2.75 b-e |
| Dyna-Gro | DG GX08365 | 2.63 c-e |
| Pioneer | P 83G66 | 2.63 c-e |
| Dyna-Gro | DG 764B | 2.25 d-f |
| Pioneer | P 84G77 | 2.25 d-f |
| Monsanto | DKS 53-67 | 2.00 ef |
| Monsanto | DKS 54-00 | 2.00 ef |
| Monsanto | DKS 44-20 | 1.63 f |
| Mean | | 2.82 |
| $LSD_{0.05}$[c] | | 0.97 |

[a]*Lodging ratings ranged from 1 to 5. Lodging ratings: 1 = all plants erect, 2 = either all plants leaning slightly or a few down, 3 = either all plants leaning moderately (45° angle) or 25-50% down, 4 = either all plants leaning considerably or 50-80% down, and 5 = all plants down.*

[b]*Means sharing the same letter(s) are not statistically different at p = 0.05 based on the Fisher's protected least significant difference (LSD) test.*

[c]*Fisher's LSD at p = 0.05.*

**Table 19. Lodging ratings for sorghum hybrids averaged across two locations — Martin County, N.C., and Accomack County, Va. — in 2011.**

| Company | Hybrid | Lodging ratings[a,b] |
|---|---|---|
| Pioneer | P 84P80 | 4.06 a |
| Dyna-Gro | DG 766B | 3.88 ab |
| Monsanto | DKS 54-03 | 3.69 ab |
| Pioneer | P 84G62 | 3.50 a-c |
| Pioneer | P 83G66 | 3.50 a-c |
| Monsanto | DKS 49-45 | 3.38 a-d |
| Dyna-Gro | DG 771B | 3.38 a-d |
| Pioneer | P 83P17 | 3.06 b-e |
| Monsanto | DKS 53-67 | 3.00 b-e |
| Pioneer | P 84G77 | 2.69 c-f |
| Dyna-Gro | DG 751B | 2.50 d-f |
| Monsanto | DKS 44-20 | 2.25 ef |
| Dyna-Gro | DG GX08365 | 2.19 ef |
| Monsanto | DKS 54-00 | 1.75 f |
| Dyna-Gro | DG 764B | 1.75 f |
| Mean | | 2.97 |
| $LSD_{0.05}$[c] | | 0.98 |

[a]*Lodging ratings ranged from 1 to 5. Lodging ratings: 1 = all plants erect, 2 = either all plants leaning slightly or a few down, 3 = either all plants leaning moderately (45° angle) or 25-50% down, 4 = either all plants leaning considerably or 50-80% down, and 5 = all plants down.*

[b]*Means sharing the same letter(s) are not statistically different at p = 0.05 based on the Fisher's protected least significant difference (LSD) test.*

[c]*Fisher's LSD at p = 0.05.*

## Discussion

The best-performing hybrids in 2011 were P 84G62, 84P80, DKS 54-00, DKS 53-67, and DKS 44-20. Other hybrids that performed relatively well in 2011 were GX08365 and 764B. The best performing hybrids in both years included DKS 54-00, DKS 53-67, DKS 44-20, and P 84G62. These hybrids are medium-to-late maturing with 70 to 72 days to flower. For these hybrids, yield ranged from 33 to 112 bushels per acre depending on year and location, but yield was almost always more than the average of all hybrids.

Other hybrids, such as A 21222, P 83P17, and P 84P80, also performed well but they were tested for only one year. Additional years of testing will be necessary to draw accurate conclusions on their productivity in this region. Hybrids DKS 49-45 and DKS 54-03 were tested in 2010 and 2011. They showed somewhat contradictory results with yields significantly greater in 2010 than in 2011. This could have been due to their tendency to lodge and poor seed retention, which was expressed in 2011 during Tropical Storm Irene. This assumption is based on their high lodging score and seed loss at Martin County, N.C., and Accomack County, Va.

No disease was observed during either year. The most serious pest problem was corn earworm [*Helicoverpa zea* (Boddie)], which caused damage every year at Suffolk, Va., Martin County, N.C., Southampton County, Va., and Isle of Wight County, Va. Several treatments with Baythroid, Intrepid, and — depending on severity — Lannate and Steward corrected the problem.

Each year, seed moisture ranged from 13 to 20 percent with only a few seed samples more than 20 percent. This seems to be a positive characteristic because artificial drying is required if the value is more than 22 percent, increasing production costs. We speculate that low seed moisture was due to good aeration between the rows because they were 36 inches apart.

Table 20 includes main characteristics of the sorghum hybrids tested during 2009-2011. Figure 4 presents the sorghum growth stages and the approximate dates when they occur if planting on May 15.

**Table 20. Grain sorghum characteristics chart.**

| Management | | | Plant Description | | | | | | Growth | | | Har-vest | Diseases | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Company | Variety | Maturity group | Total plant height (in) | Panicle type | Seeds per pound (000) | Grain color | Days to flower – Texas and South East | Days to harvest – Texas and South East | Seedling vigor | Root lodging | Pre-flower stress tolerance | Post-flower stress tolerance | Test weight | Charcoal rot resistance[a] | Downy mildew resistance[a] | Head smut resistance[a] | MDMV "A" resistance[b] | Greenbug resistance[c] |
| DEKALB | DKS36-06 | Medium/early | 42-53 | Semi-open | 12-14 | Bronze | 61 | 104 | 3 | 4 | 2 | 4 | 2 | 5 | 4 | 3 | 4 | |
| DEKALB | DKS37-07 | Medium/early | 40-49 | Semi-open | 14-16 | Bronze | 62 | 105 | 3 | 3 | 3 | 2 | 2 | 4 | 4 | 3 | 4 | |
| DEKALB | DKS44-20 | Medium | 42-52 | Semi-open | 14-15 | Bronze | 70 | 112 | 2 | 2 | 3 | 2 | 2 | 3 | 4 | 2 | 3 | |
| DEKALB | DKS49-45 | Medium | 41-53 | Semi-open | 13-15 | Bronze | 71 | 114 | 3 | 2 | 3 | 4 | 2 | 4 | 5 | 2 | 3 | |
| DEKALB | DKS53-67 | Medium/late | 41-51 | Semi-compact | 14-16 | Bronze | 72 | 114 | 3 | 3 | 4 | 2 | 1 | 2 | 4 | 5 | 3 | |
| DEKALB | DKS54-00 | Medium/late | 42-54 | Semi-compact | 15-16 | Bronze | 72 | 116 | 2 | 3 | 3 | 4 | 3 | 5 | 7 | 2 | 3 | |
| DEKALB | DKS54-03 | Medium/late | 42-53 | Semi-open | 13-15 | Bronze | 72 | 116 | 3 | 3 | 4 | 3 | 4 | 4 | 1 | 1 | 2 | |
| DEKALB | DKS52 | No longer sold in this area. | | | | | | | | | | | | | | | | |
| ASGROW | A571 | No longer sold in this area. | | | | | | | | | | | | | | | | |
| Advanta | 28219 | Medium/late | 48-52 | Semi-compact | 13-16 | Red | 72 | | 2 | 3 | 3 | 3 | 2 | 3 | 4 | 3 | 2 | C |
| Advanta | 26056 | Medium | 42-48 | Semi-open | 12-14 | Red | 66 | | 3 | 2 | 3 | 3 | 3 | 2 | 5 | 3 | 3 | C |
| Advanta | 21222 | Medium | 48-52 | Semi-open | 14-16 | Bronze | 68 | | 3 | 6 | 2 | 2 | 2 | 2 | 7 | 8 | 4 | C & E |
| Advanta | 99547 | Late | 46-50 | Semi-open | 12-14 | Bronze | 73 | | 3 | 4 | 3 | 5 | 3 | 4 | 3 | 4 | 2 | none |
| Dyna-Gro | 751B | Medium | Medium | Semi-compact | 10-13 | Red | 69 | | 2 | | | | | 5 | 2 | 2 | | C & E |
| Dyna-Gro | 764B | Medium/early | Medium | Semi-open | 13-15 | Bronze | 64 | | 2 | | | | | 3 | 3 | 3 | | C, D, E |

**Table 20. Grain sorghum characteristics chart (cont.).**

| Management | | | Plant Description | | | | | | Growth | | | | Harvest | Diseases | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Company | Variety | Maturity group | Total plant height (in) | Panicle type | Seeds per pound (000) | Grain color | Days to flower – Texas and South East | Days to harvest – Texas and South East | Seedling vigor | Root lodging | Pre-flower stress tolerance | Post-flower stress tolerance | Test weight | Charcoal rot resistance[a] | Downy mildew resistance[a] | Head smut resistance[a] | MDMV "A" resistance[b] | Greenbug resistance[c] |
| Dyna-Gro | 766B | Medium/early | Tall | Semi-open | 16-17 | Bronze | 65 | | 3 | | | | | 5 | 5 | 7 | | C, D, E |
| Dyna-Gro | 771B | Medium/late | Tall | Semi-open | 14-16 | Bronze | 70 | | 3 | | | | | 3 | 2 | 3 | | None |
| Dyna-Gro | GX08365 | Experimental hybrid; it was released in 2012 because it outperformed DG 751B and DG 771B. | | | | | | | | | | | | | | | | |
| Pioneer | 8925 | Very old hybrid; no longer in production. | | | | | | | | | | | | | | | | |
| Pioneer | 84G62 | Medium/late | 36 | | | Bronze | 72 | | | | | | | | | | | |
| Pioneer | 83G66 | Medium/late | | | | | 72 | | | | | | | | | | | |
| Pioneer | 85G46 | Medium | | | | | 69 | | | | | | | | | | | |
| Texas AgriLife | ATx399 xRTx430 | Medium/late | 34 | | | Bronze | | | | | | | | | | | | |

*Note: The characteristics in this chart were provided by the respective seed companies.*

[a]*Rating scale: 1-2 = excellent, 3-4 = very good, 5-6 = good, 7-8 = fair, 9 = poor.*

[b]*MDMV = Maize dwarf mosaic virus. The ratings are approximate and should not be considered absolute.*

[c]*Greenbug resistance: C = biotype C, D = biotype D, E = biotype E.*

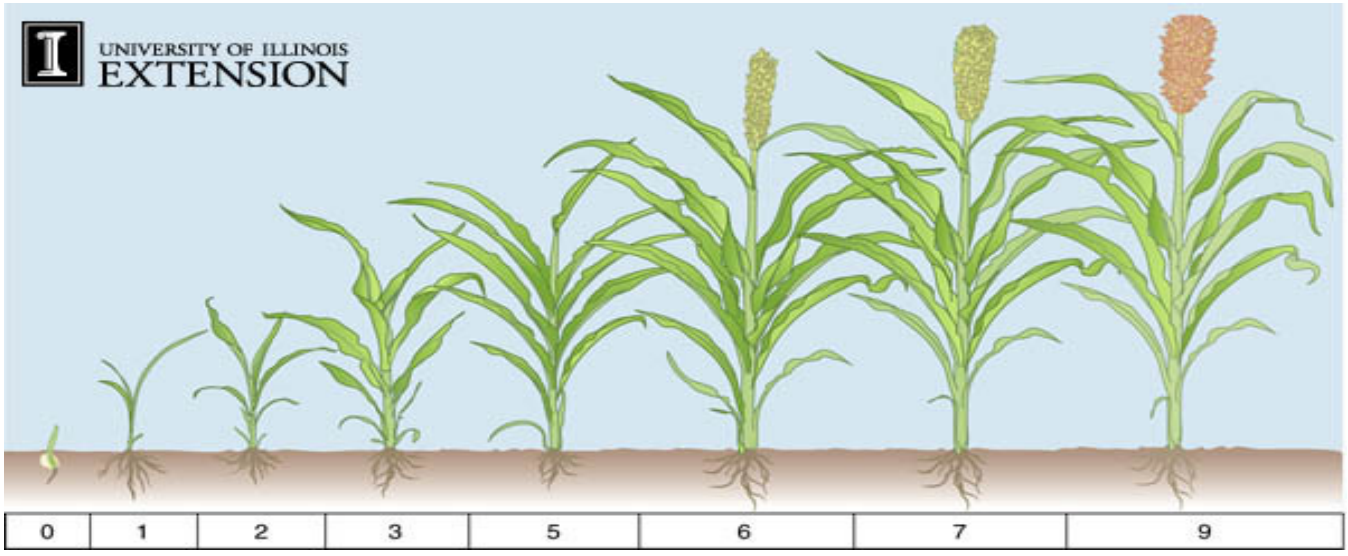


Figure 4. Sorghum growth stages and the approximate dates when they occur if planting is on May 15. Figure courtesy of University of Illinois Extension.

| |
|---|
| Planting date May 15 |
| Emergence (3-10 DFP) May 25 |
| 3-leaf stage (10 DAE), good weed control, June 5 |
| 5-leaf stage (20 DAE), roots develop fast, June 15 |
| Growing point differentiation and stem elongation (30 DAE), June 25 |
| Stage 4 – All except 3-4 leaves not yet expanded (40 DAE), July 5<br>Stage 5 – Boot stage (50 DAE), head is fully sized, rapid growth, July 15 |
| Half boom (60 DAE), flowering takes 4-9 days, July 25 |
| Soft dough (70 DAE), Aug. 5 |
| Stage 8 – Hard dough (80 DAE), Aug. 15<br>Stage 9 – Physiological maturity (90 DAE), Aug. 25 |

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