Increasing Sorghum Yield and Profitability in Kansas:2025 season results and overview

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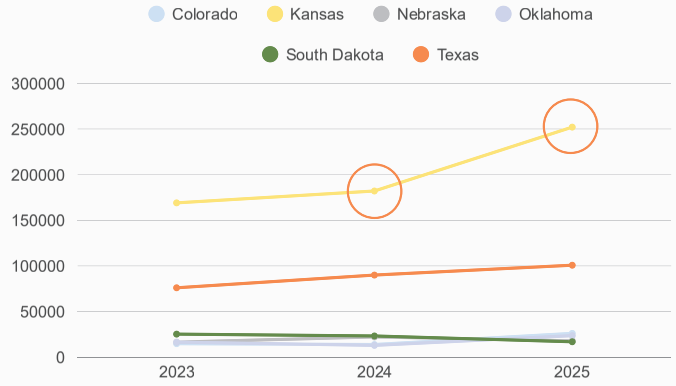
US Sorghum Production Trends



The **total area** harvested in Kansas in 2024 and 2025 **was the same** 2,8 million acres; however, the grain production had **an increase of 38.46%**.

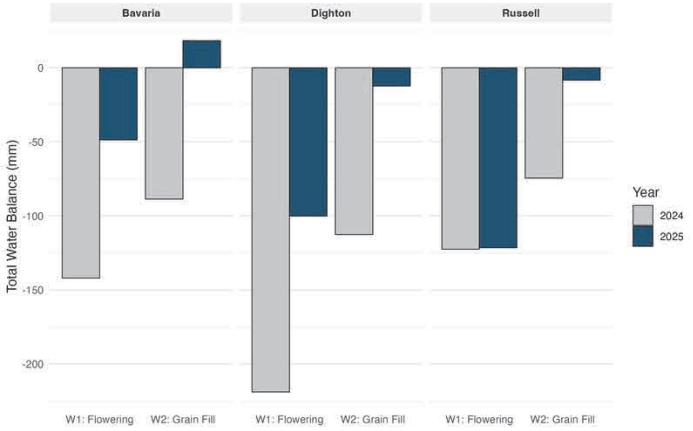


Figure 4: Total water balance (mm) during Flowering (W1) and Grain Fill (W2) across three Kansas locations (Bavaria, Dighton, and Russell) during the 2024 and 2025 growing seasons. Negative values indicate a water deficit, representing drought stress conditions.

Under stress, the plant moves sugars from the stalk to the grain:

- Stalk cells to senesce early
- Pathogens then invade the weakened structural tissue

The hidden threat in sorghum fields

By the time symptoms become visible the disease has already compromised the plant's **internal structure**

*By the time you see it, the **damage is done***

So, what exactly is stalk rot?

Sorghum stalk rots are late-season, stress-related diseases.

Internal stalk damage

Lodging

Yield losses

So, what exactly is stalk rot?

Stalk rots can act as **silent yield robbers** by:

- Reducing panicle size and poor grain filling
- Early head lodging
- Decreasing chlorophyll index

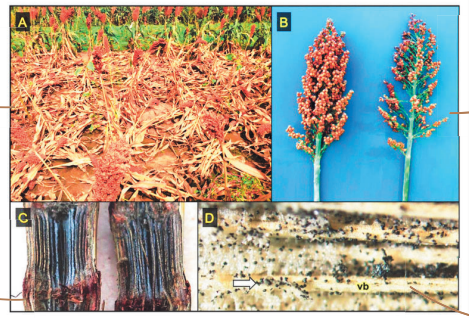
- Post-flowering Stresses
- Environmental Stresses (Drought, Hail)
- Foliar Diseases, and High Plant Population

Charcoal rot

Macrophomina phaseolina

Extensive field lodging

Reduced seed weight and fewer seeds per panicle



Black-pigmented lesions in the infected areas and disintegration of stalk tissue

Black microsclerotia can remain viable in soil and crop residues for up to 15 years

Causes disease in >500 host plants.

Fusarium stalk rot

The symptoms of Fusarium stalk rot and charcoal rot are similar: premature plant death, stalk discoloration (pink, red, tan or purple), head/grain reduction, a shredded vascular system (although not to the same extent as charcoal rot), and lodging.

Plants affected by Fusarium stalk rot are often randomly dispersed in the field

INTRODUCTION

Why is stalk rot a problem?

Hard to predict: the interaction between the **environment and the host** plays a crucial role in determining the **development and outbreaks** of stalk rot

Limited management options: Choosing **hybrids** with good stalk strength and stay green characteristics, **avoiding high plant populations**, and timely harvest

INTRODUCTION

Question #1

During which growth stage does water stress most significantly increase the risk of stalk rot development?

a) Early Vegetative Growth
b)Flowering and Grain Fill
c) Seedling emergence

SORGHUM CONNECTION

Efficacy of fungicide application for stalk rot diseases management

BACKGROUND

Fungicide application as management strategy

Stay-green benefit provided by some fungicides, specifically those in the DMI (FRAC group 3) class:

Can delay senescence by 15–30% (Craven et al., 2017)

METHODOLOGY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Mitigating sorghum stalk rot yield loss through foliar and at-planting fungicide applications

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PDF TOOLS

Abstract

Sorghum stalk rot is a worldwide threat to sorghum production. Current management is limited to pre-planting strategies such as hybrid selection and low planting populations. Experiments were conducted at one location in 2023 and three locations in 2024 in Kansas. Treatments included: At-planting, Xyway™ LFR® was applied as a banded dribbled 5.08 cm off-center bellow the row (2x2), a dribbled over the row (0x0), or a dribbled 5.08 cm off the row (0x2) placement. At flowering, Topguard® EQ and Adastrio™ were applied as foliar sprays. A combination treatment of Xyway™ LFR® at planting 2x2, followed by Topguard EQ at flowering was included. Panicle size, lodging, and yield were evaluated. Stalk rot incidence and severity were assessed prior to harvest. Fungicide had no significant effect on protein content, panicle size, disease severity, or disease incidence. Both hybrid type and fungicide application significantly affected grain yield. Overall, applying Xyway™ LFR® at planting 0x0, and using Topguard® EQ and Adastrio™ at the start of flowering, increased yield by 465.98, 484.53, and 505.00 kg ha^{-1}, respectively, compared to the control ($p = 0.0003$). Foliar application of fungicide at flowering resulted in a greater yield than

METHODOLOGY

Experimental sites and overview

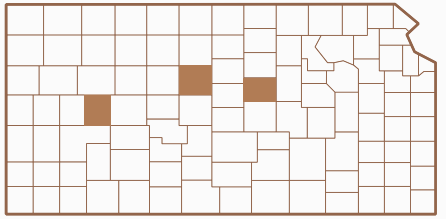
Planting dates and seeding rate:

31 May, 2023: Russell - 45K plants/ha

29 May, 2024: Bavaria - 55K plants/ha

27 May, 2024: Dighton - 32K plants/ha

26 May, 2024: Russell - 45K plants/ha



Experiments were planted following sorghum in fields that have been previously identified as having stalk rot disease issues

METHODOLOGY

Experimental Sites and overview

Experiments followed a randomized complete block design with six replications and two hybrids (**Pioneer *85P44* and Pioneer *84P72***)

No artificial inoculation was performed.

Harvest dates: 10/24/24 (Bavaria), 10/26/24 (Dighton), 10/25/24 (Russell) and 10/20/23 (Russell)

METHODOLOGY

What are we testing?

At planting

TRT	Fungicide	Spraying technology
T2	Xyway (Flutriafol) 15.2 fl oz/A	2x2
T3	Xyway (Flutriafol) 15.2 fl oz/A	0x0
T4	Xyway (Flutriafol) 15.2 fl oz/A	0x2

TRT	Fungicide	Spraying technology
T5	Xyway (Flutriafol) 10.5 fl oz/a	2x2
	Topguard (Flutriafol + Azoxystrobin) 5 fl oz/A	Foliar application

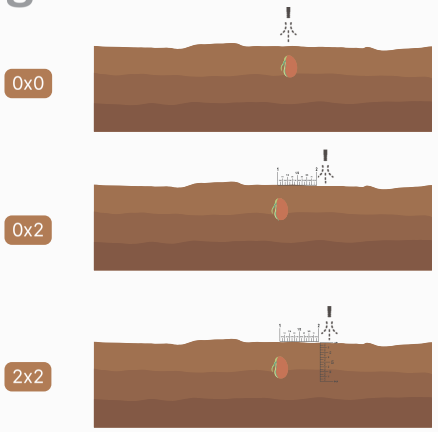
At the beginning of the flowering

TRT	Fungicide	Spraying technology
T6	Topguard (Flutriafol + Azoxystrobin) 5 fl oz/A	Foliar application
T7	Adastrio (Azoxystrobin + Fluindapyr + Flutriafol) 5 fl oz/A	Foliar application

METHODOLOGY

What are we testing?

At planting fungicide application



METHODOLOGY

What did we measure?

Stalks collection

Splitting stalks

Panicle size

Protein content

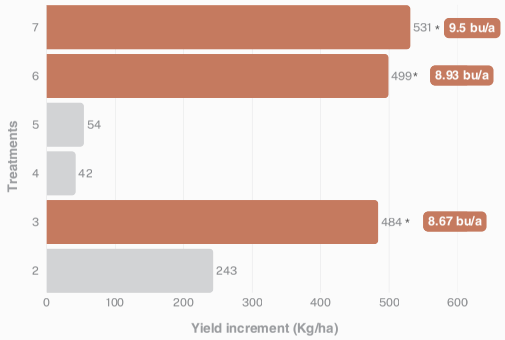
RESULTS

Yield improved with fungicide application

Xyway applied at planting by dribbling over the top of the row (T3), and Topguard EQ (T6) and Adastrio (T7) at the beginning of flowering resulted in a significant increase in grain yield **compared to the control treatment**

Treatment response was not consistent across locations, (fungicide application x location *P* = 0.0219)

Similar results were observed by Fromme et al. (2017)

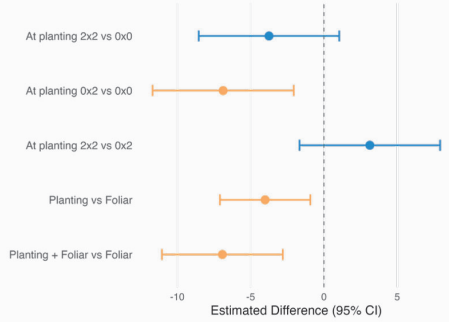


* Significant difference according to Dunnett HSU test = 0.05.

RESULTS

Yield improved with fungicide application

Foliar fungicide at flowering produced the greatest yield increase, more than planting-time or combined applications.



Overall, At-planting and foliar fungicide applications did not reduce stalk rot severity and incidence.

INTRODUCTION

Question #2

Is this a characteristic symptom of Fusarium stalk rot or charcoal rot?

Influence of agronomic practices on sorghum stalk rot diseases

INTRODUCTION

Why is stalk rot a problem?

Hard to predict: the interaction between the **environment and the host** plays a crucial role in determining the **development and outbreaks** of stalk rot in a field

Limited management options: Choosing **hybrids** with good stalk strength and stay green characteristics, **avoiding high plant populations**, and timely harvest

METHODOLOGY

What are we testing?

Hybrids: Pioneer 85P75 and Pioneer 84P72

Row Spacing & Plant Population:

- 15-inch rows
- 30-inch rows

Locations: Bavaria, Russell and Dighton

Season: 2024 and 2025

RESULTS

Grain yield response

Yield was consistently **higher with wider row spacing**, with higher yields observed in Bavaria, followed by Russell and Dighton. Additionally, a **positive linear relationship** between **final stand** and yield was observed.

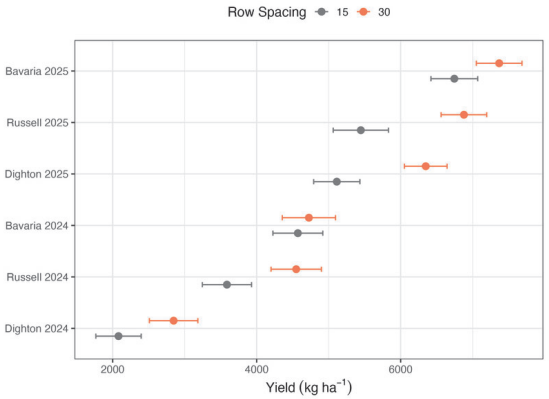


Figure 1: Estimated marginal means (95% CI) of sorghum grain yield (kg ha^{-1}) as influenced by row spacing (15-inch vs. 30-inch) across all site-years.

RESULTS

Panicle size response

Water/Stress Year: 30-inch row spacing produced significantly longer panicles than narrow rows.

High Yield Year: no significant difference across row spacings

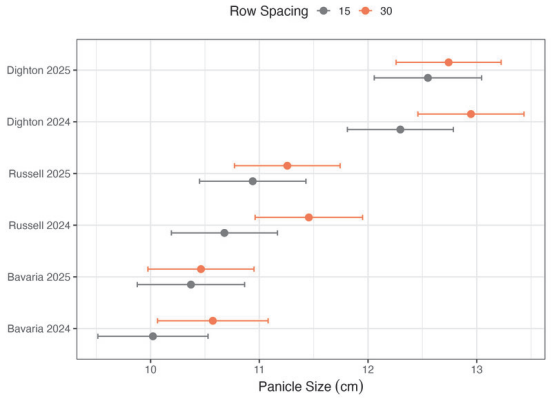


Figure 2: Estimated marginal means (95% CI) of sorghum panicle size (cm) as influenced by row spacing (15-inch vs. 30-inch) across all site-years.

RESULTS

Protein response

The impact of row spacing on protein content is highly variable and depends on the specific year and location.

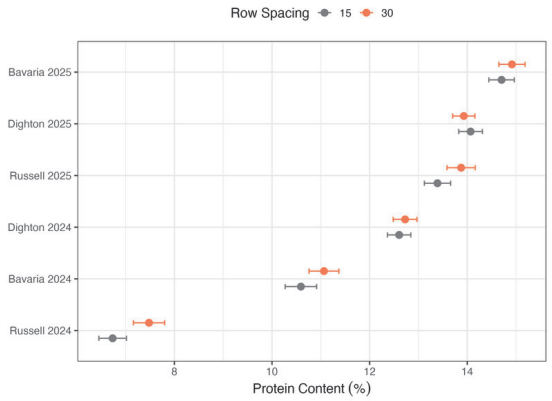
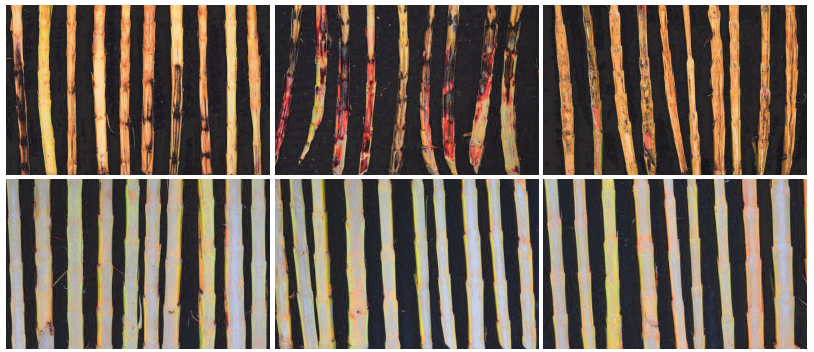


Figure 3: Estimated marginal means (95% CI) of sorghum grain protein content (%) as influenced by row spacing (15-inch vs. 30-inch) across all site-years.

RESULTS

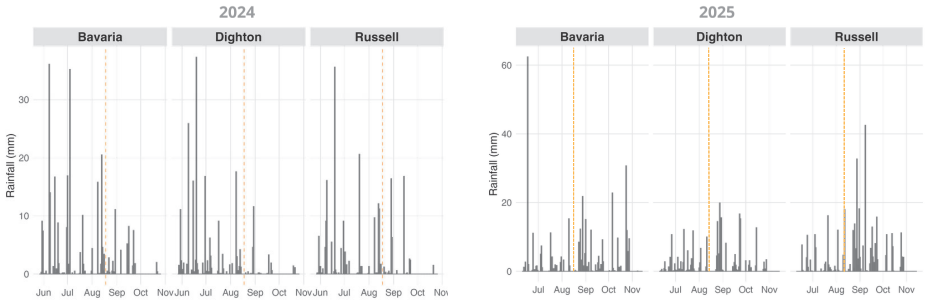
Environment Influences Stalk Rot



2025 season had significantly lower disease pressure compared to 2024 ($p < 0.02$) across all locations

RESULTS

Environment Influences Stalk Rot



Location	Rain before flowering (in)	Rain post-flowering (in)
Bavaria	9.04	1.98
Russell	7.28	1.02
Dighton	6.50	1.94

Location	Rain before flowering (in)	Rain post-flowering (in)
Bavaria	5.72	8.09
Russell	4.27	5.80
Dighton	3.76	10.15

RESULTS

Environment Influences Stalk Rot

Drought stress during grain filling is the **key factor initiating processes** that result in plant lodging (Mughogho and Pande 1984).

>30%
Lodging before harvest

Lodging before harvest was observed **only in Dighton**

Severe lodging in Dighton, KS sorghum field.

RESULTS

Environment Influences Stalk Rot

Lower drought stress during the flowering period and higher plant density significantly increased the probability of observing no stalk rot. **On infected plants, higher plant densities and reduced drought stress during the grain filling significantly reduced disease severity**.

Stalk rot severity

RESULTS

Environment Influences Lodging in Dighton

In cases where lodging occurred in the field, higher plant densities and wider row-spacing significantly reduced lodging severity, while higher stalk rot severity directly resulted in a higher proportion of lodged plants.

Lodging

Questions?

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Collaborating Farmers:
Andy Hineman
Alex Bacon

Ag agents:
Craig Dinkel
Jay Wisbey

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