How Late is Too Late to Correct Potassium Deficiency in Corn?

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DIVISION OF AGRICULTURE
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University of Arkansas System

FRST
FERTILIZER RECOMMENDATION SUPPORT TOOL

SOIL FERTILITY

Corn Production and Nutrient Management

Arkansas K Recommendation for Corn:

K_2O Recommendation

Yield Goal (bu/ac)	-----Soil Test K (ppm)-----				
	<61	61-90	91-130	131-175	>175
	----- lbs of K_2O per acre -----				
125	100	80	60	0	0
150	120	100	60	0	0
175	150	110	60	0	0
≥ 200	160	120	70	50	0

(Kelley & Capps, 2025)

- **Arkansas Soil-Test Summary for Samples Collected in 2023 (DeLong et al., 2024)**
  - 70% of corn acreage has below-optimum STK.
- There is a need for additional research to fine-tune soil-test-based fertilizer-K rate recommendations to maximize corn yield and farming profitability **(Drescher et al., 2021; Oliver et al., 2022).**
- There has been no research to define the window of opportunity to correct K-deficient corn and maintain yield potential.

Effectiveness of In-Season Fertilization

K: 20 and 44 DAR1 **(Slaton et al., 2020).**

N: From V6 up to tasseling **(Abendroth et al., 2011; Slaton et al., 2013).**

N: Midseason to late boot **(Roberts et al., 2016).**

N and K

LOADING.....

P and K

Effectiveness of In-season Fertilization

How Late is Too Late to Correct K Deficiency in Corn?

Objective: To determine how K fertilization timing affects corn tissue-K concentrations, yield components, and grain yield.

(Slaton et al., 2020).

(Slaton et al., 2013).

P and K

Research Approach

Sites	Year	Location	Hybrids	Soil Test K Category	M3K (ppm)
1	2024	SAREC	DKC65-93	Optimum	154
2	2024	NERREC	P1511VYHR	Very Low	41
3	2024	$PTRS_{-F6}$	P1718VYHR	Low	77
4	2025	$LMCRS_{-G14H}$	DKC66-06	Very Low	58
5	2025	NERREC	P1377	Very Low	30
6	2025	$PTRS_{-D12}$	DKC66-06	Low	82
7	2025	$PTRS_{-F6E}$	P17677v5hk	Medium	97

Fertilizer-K rate (muriate of potash: 0-0-60): 0 and 120 lb K_2O/ac
K fertilization timings: preplant, V6, V10, V12, VT, and R2
Planting dates: 04/17 to 05/16
Harvesting dates: 08/28 to 09/27

Research Approach

Experimental Design

- Randomized complete block design; 4 replicates
- 4-rows wide (36- to -38-in. raised beds) and 30 ft long
- 34,000 seeds/ac

Soil Sampling (pH, Mehlich-3, SOM)

- Composite samples (0- to -6-in.)/replicate

Tissue Samples (Before and 2 Weeks After Fertilizer-K Application)

control | preplant | V6 | V10 | V12 | V14 | VT | R2

- Samples were analyzed for tissue-K concentrations by ICP–AES

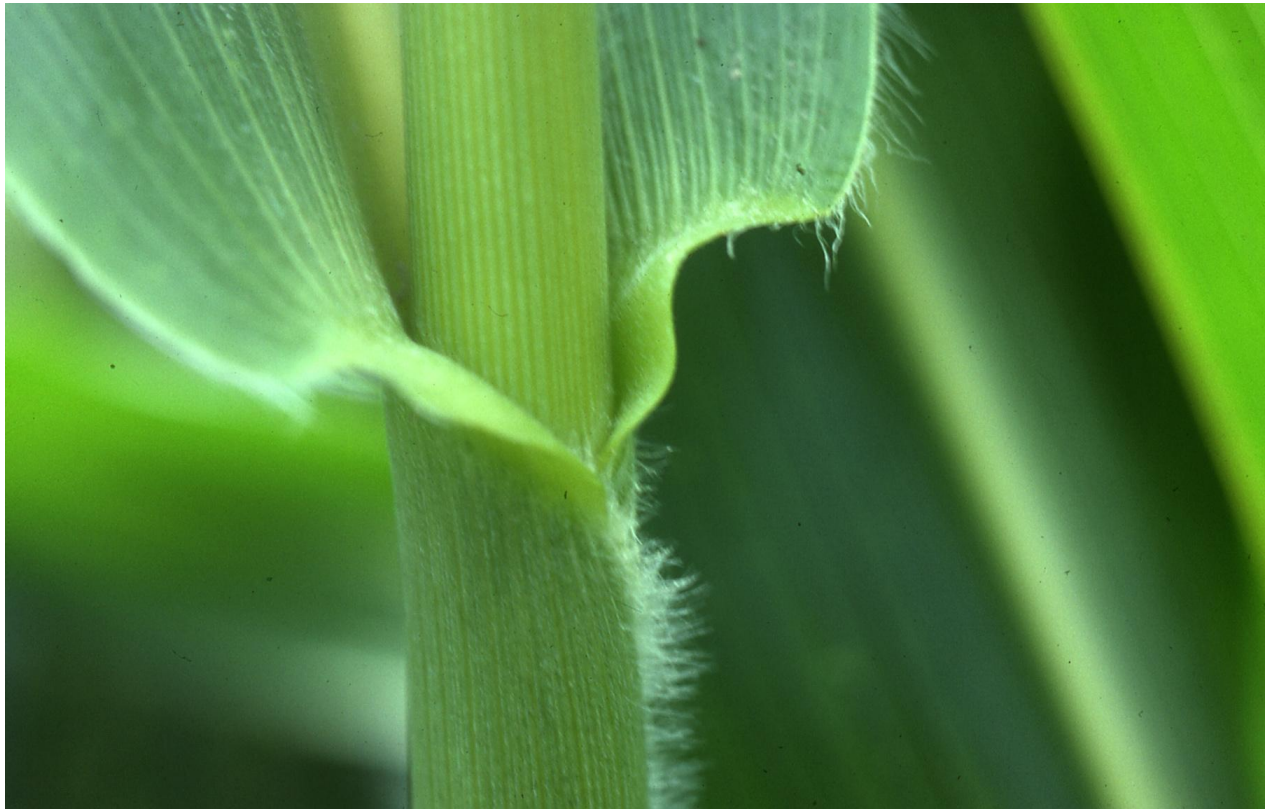
Research Approach

- control
- preplant
- V6
- V10
- V12
- V14
- VT
- R2

Whole-plant samples at V6 growth stage

Research Approach

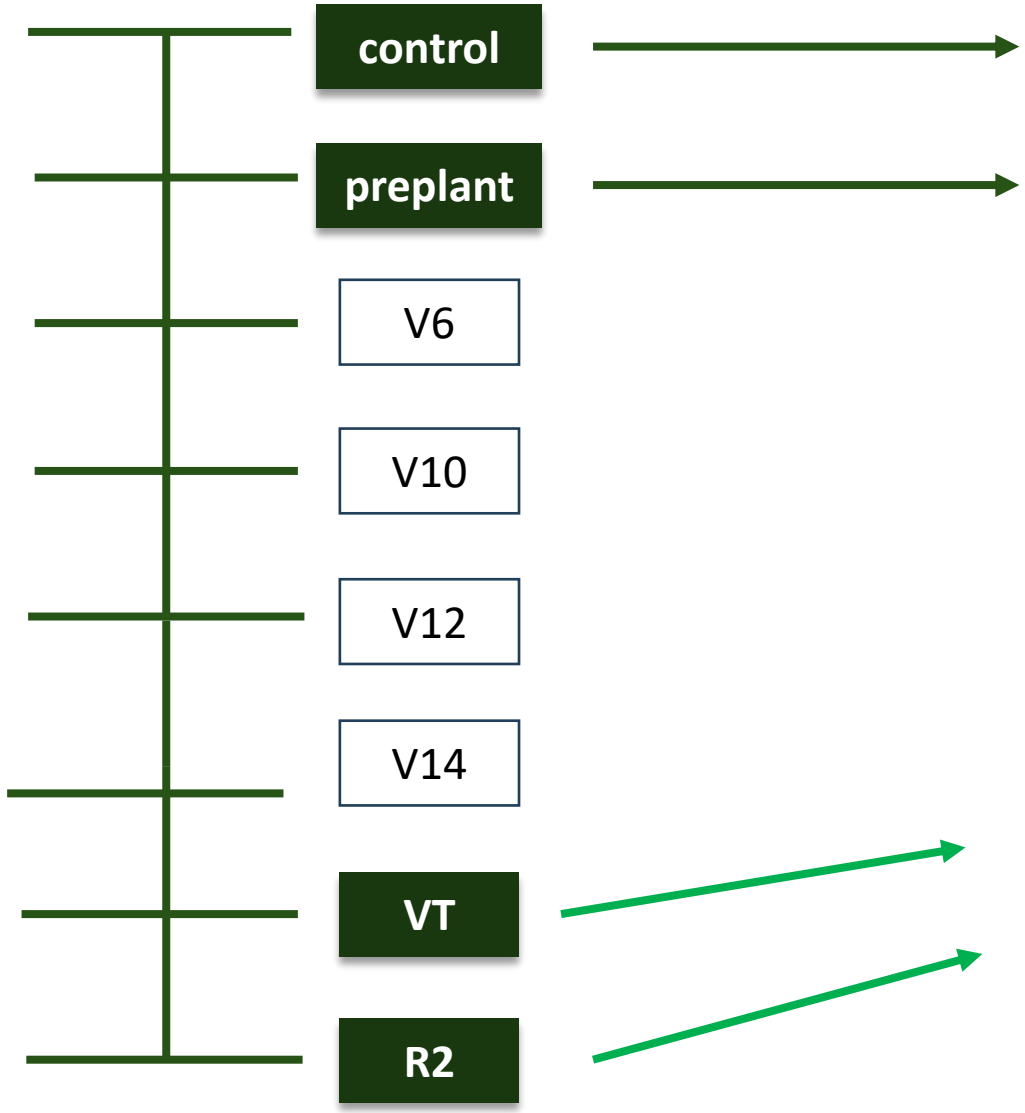
- control
- preplant
- V6
- V10
- V12
- V14
- VT
- R2



Uppermost mature leaf

(Source: Darby, H., and J. Lauer. 2000)

Research Approach



Ear leaf

(leaf immediately subtending the ear)

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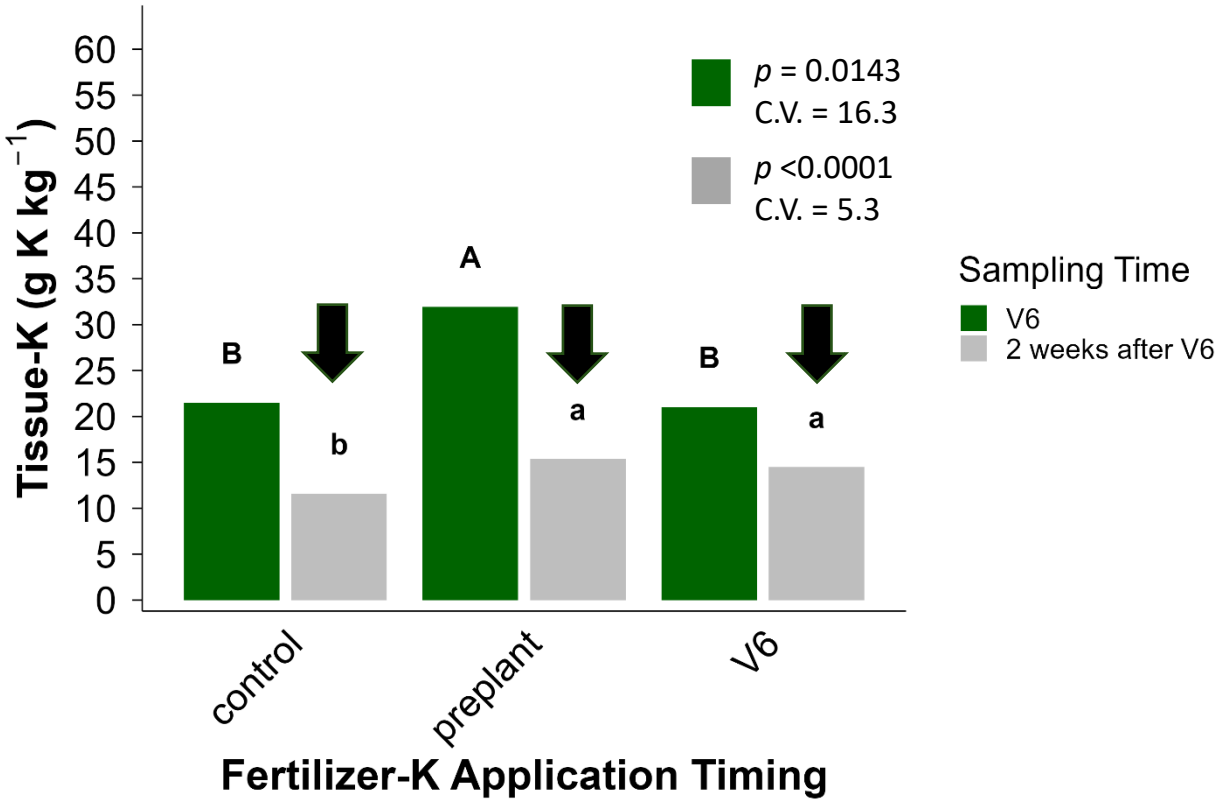
Corn Yield Components & Yield

- Ears from 5 representative plants were sampled per plot at maturity
  - Rows/Ear; Kernels/Row; 1000-Seed Weight
- Harvest: 2 center rows in each plot

Effects of K Fertilization Timing on Corn Tissue-K Concentration

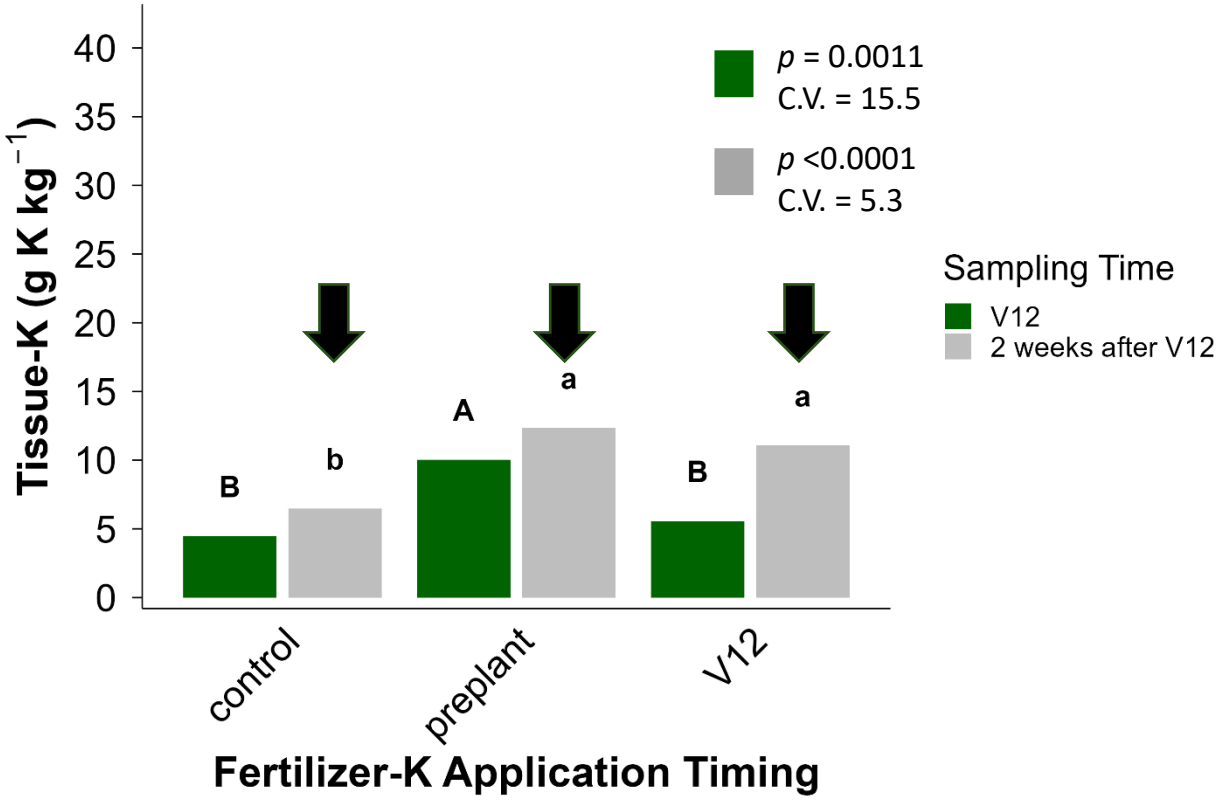
V6

2024 PTRS$_{-F6:}$ Low STK (77 ppm)



V12

2025 NERREC: Very Low STK (30 ppm)

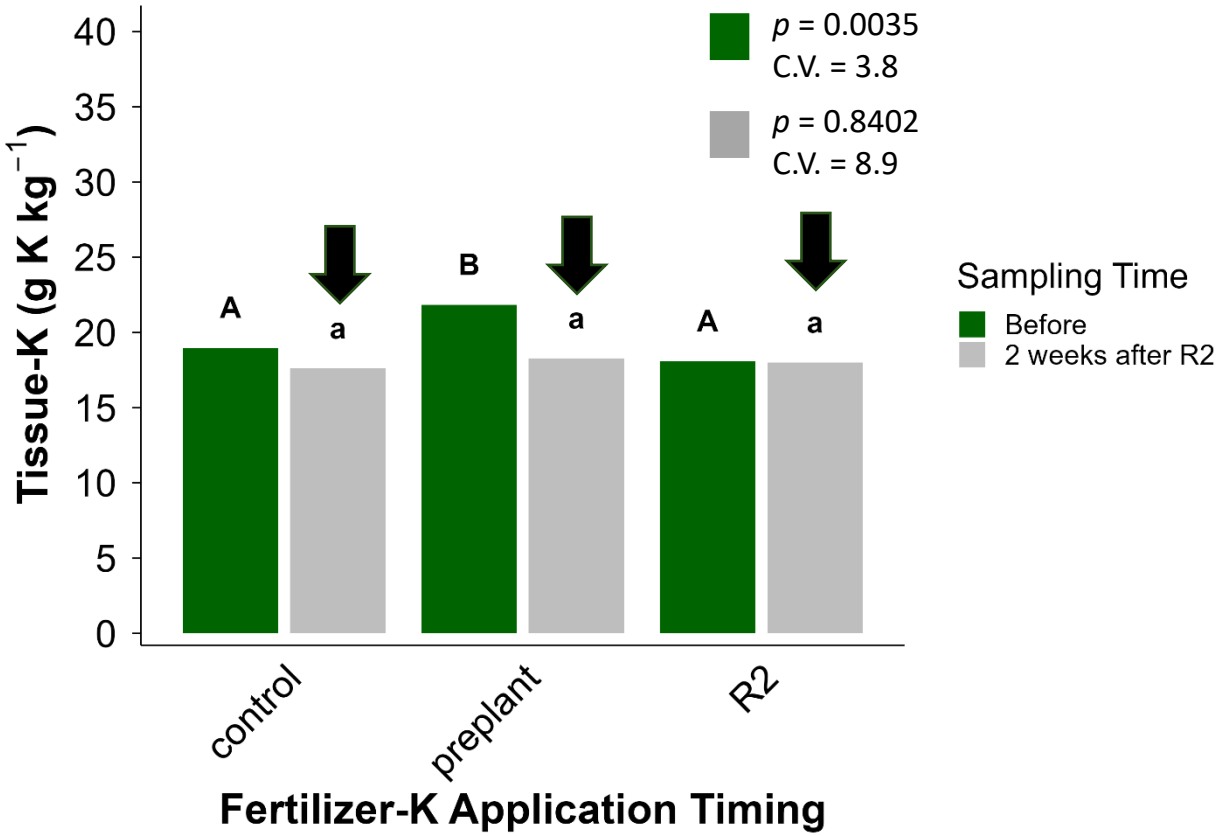


In-season K fertilization effectively corrected K deficiency, reaching tissue-K concentrations similar to preplant treatments.

Effects of K Fertilization Timing on Corn Tissue-K Concentration

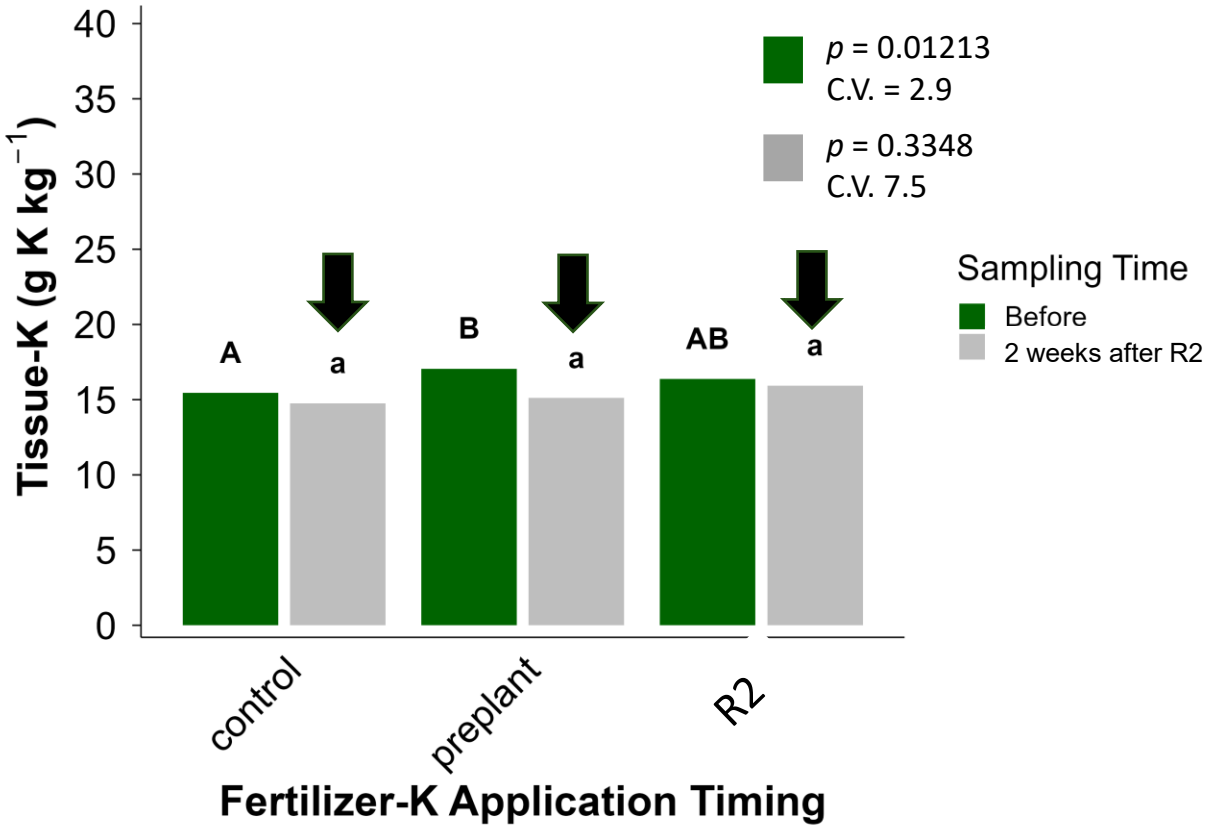
R2

2024 SAREC: Optimum STK (154 ppm)



VT ≈ R2

2025 PTRS-F6E: Medium STK (97 ppm)



In Medium and Optimum STK levels, tissue-K concentrations were not affected by in-season K fertilization.

Effects of K Fertilization Timing on Corn Yield Components

2024 PTRS$_{-F6:}$ Low STK (77 ppm)

K Fertilization Timing	Kernels/Row	Rows/Ear	1000-Seed Weight (g)
No-K Control	39	15	356
Preplant	39	14	385
V6	41	15	387
V10	39	15	375
V12	40	14	378
V14	37	14	386
VT	37	14	362
R2	40	14	377
***P*-value**	0.3909	0.4508	0.3038

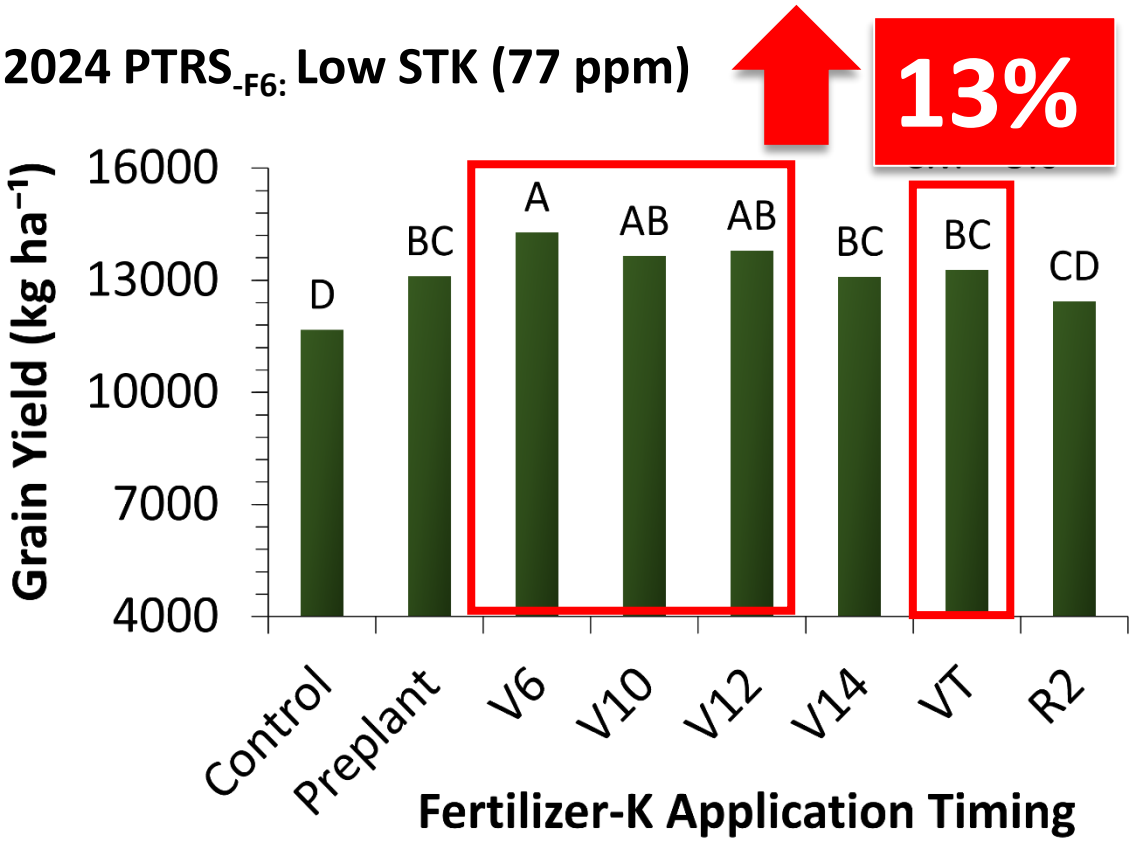
6%

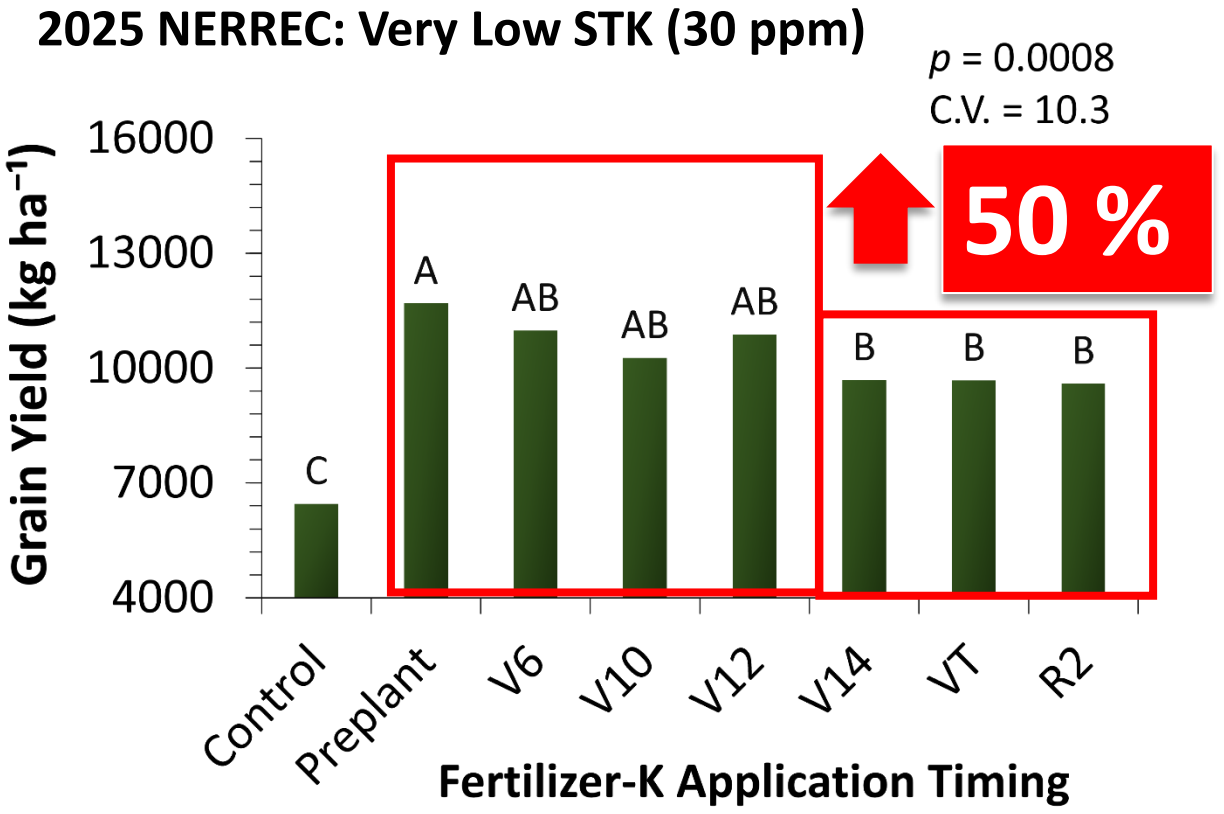
2025 NERREC: Very Low STK (30 ppm)

K Fertilization Timing	Kernels/Row	Rows/Ear	1000-Seed Weight (g)
No-K Control	36	16	247 d
Preplant	38	16	300 ab
V6	39	16	291 abc
V10	38	16	282 bc
V12	38	17	282 bc
V14	40	17	274 c
VT	40	16	287 abc
R2	38	16	303 a
***P*-value**	0.4273	0.0659	0.0005

17%

Corn Yield Response to K Fertilization Timing



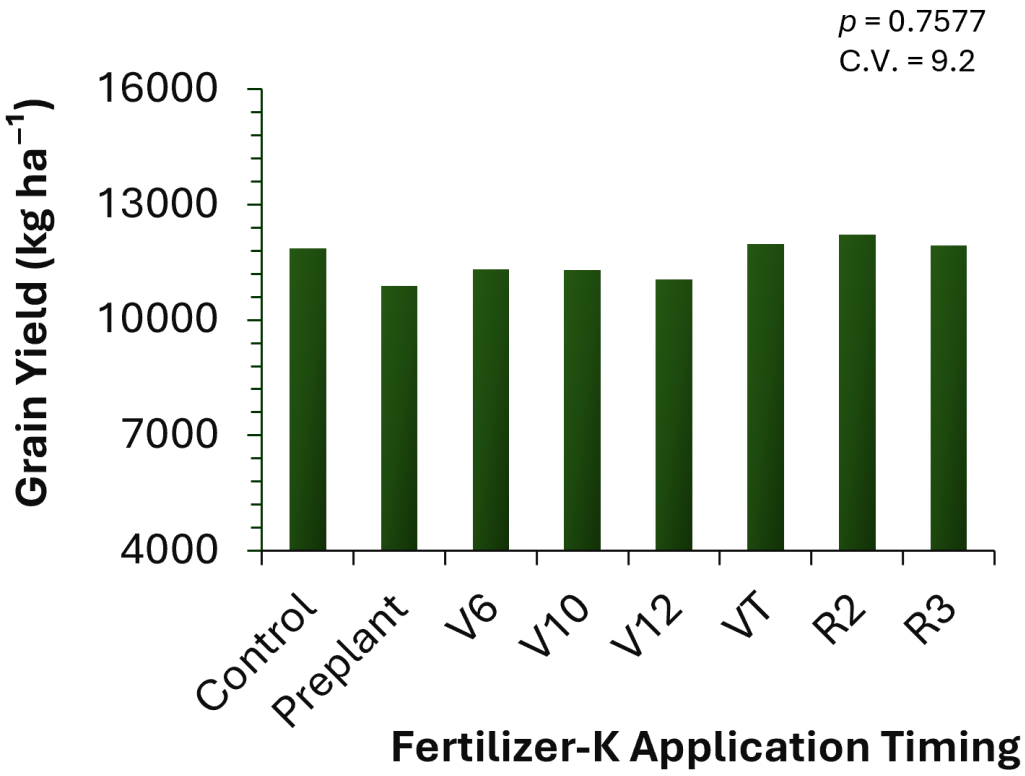


Early-season K applications (*e.g.*, V6–V12) resulted in comparable yields to preplant fertilization.

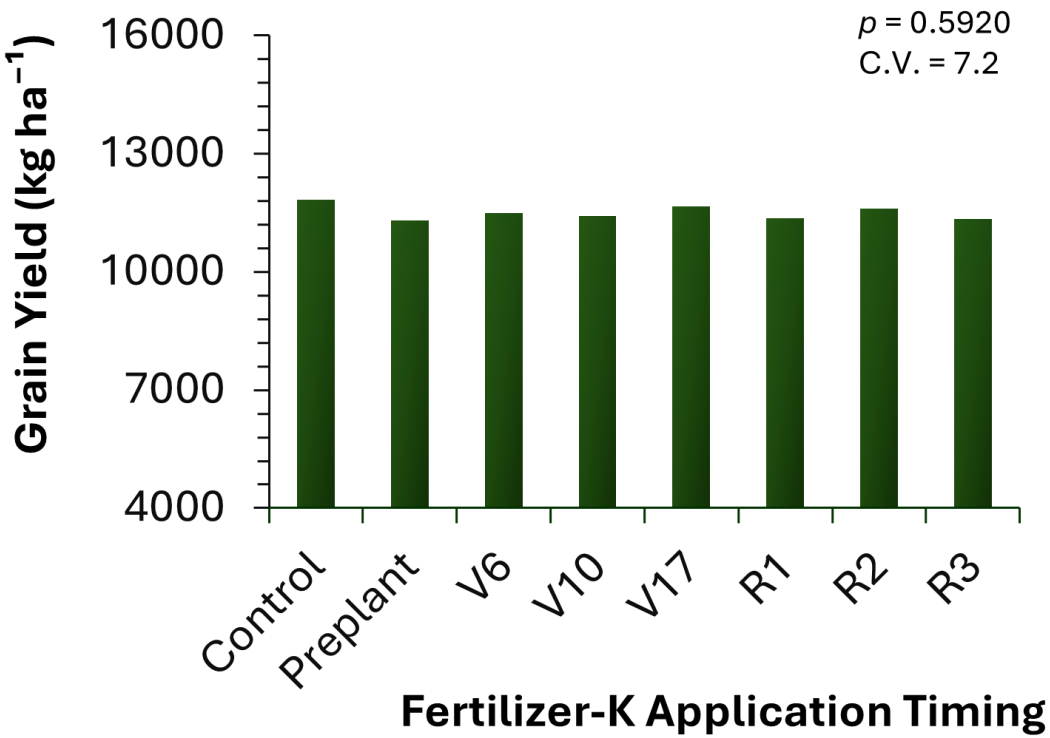
The effective window to rescue K-deficient corn remains open through VT.

Corn Yield Response to K Fertilization Timing

2024 SAREC: Optimum STK (154 ppm)



2025 PTRS$_{-F6E}$: Medium STK (97 ppm)



In Medium and Optimum STK levels, in-season K fertilization did not significantly increase grain yield.

Summary

Practical Applications:

- More flexibility for K management in corn;
- Enhance decision-making for farmers.

Future Research:

- Calibrate fertilizer-K rates;
- Fine-tune fertilizer-K rate recommendations;
- Evaluate the profitability of in-season K fertilization for corn.

Thank you!
Questions?

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