

Effect of KNO_3 (PN) Applications on Rice Stalk Strength, Lodging, and Grain Yields

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About this Presentation

- Dr David Dunn – scientist at the Delta Ag Center in Qulin, Missouri, USA - held this presentation at the 34th Rice Technical Working Group Meeting in Hot Springs, Arkansas on February 29, 2012.



Research Sponsor

- This research has been made possible by a gift from the Potassium Nitrate Association (PNA).

Potassium

- Yellowing of leaf tips, beginning with oldest leaves.
- Decreased disease resistance.
- Increased lodging.
- Decreased yields.



- Missouri Rice Research Farm, Qulin, MO.
- Crowley silt loam soil: fine, montmorillonitic, thermic Typic Albaqualf.
- Soil Test Values:

Soil Test	2010	2011
P (mg/kg)	45	55
K (mg/kg)	46	115
pH	6.2	5.8

- Randomized complete block with 6 replicates.
- Treatments:
 - Preplant KCl at 0, 50, 75, and 100% of recommended rate (68 kg KCl/ha).
 - Foliar PN at 0 or 5.15 kg K/ha (11 kg PN/ha).
- Applied at pre flood, internode elongation and 10% heading.

- Lodging ratings.
- Grain yield.
- Milling quality.
- Stalk breaking strength.
- Data analyzed using GenStat 14th ed.

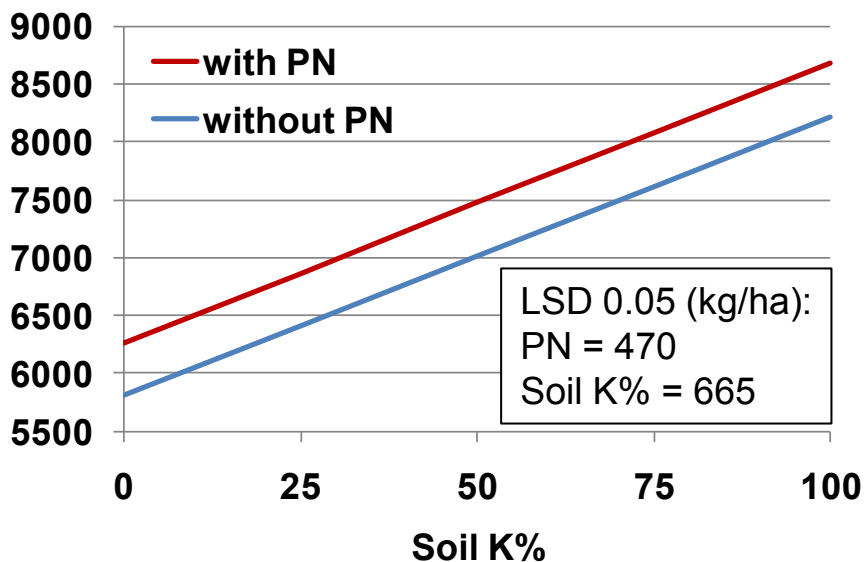
- 1999-2001
 - Midseason K study.
- 2008-2009
 - Commercial foliar products.
- 2010-2011
 - Foliar KNO_3 study.

ANOVA for Yield

Effect	F (prob)	
	2010	2011
Foliar PN	0.057	0.013
Soil K%	<0.001	<0.001
Foliar PN*soilK%	0.29	0.798

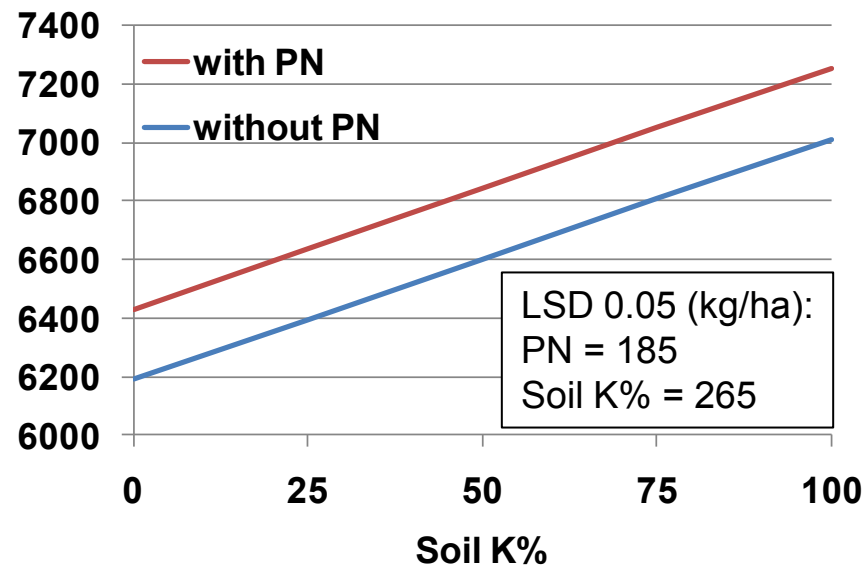
Yield (kg/ha) Regression Analysis

Rice grain yield (kg/ha) - 2010



$$Y = 5812 + 455 * \text{foliar PN} + 24.1 * \text{soilK\%}$$

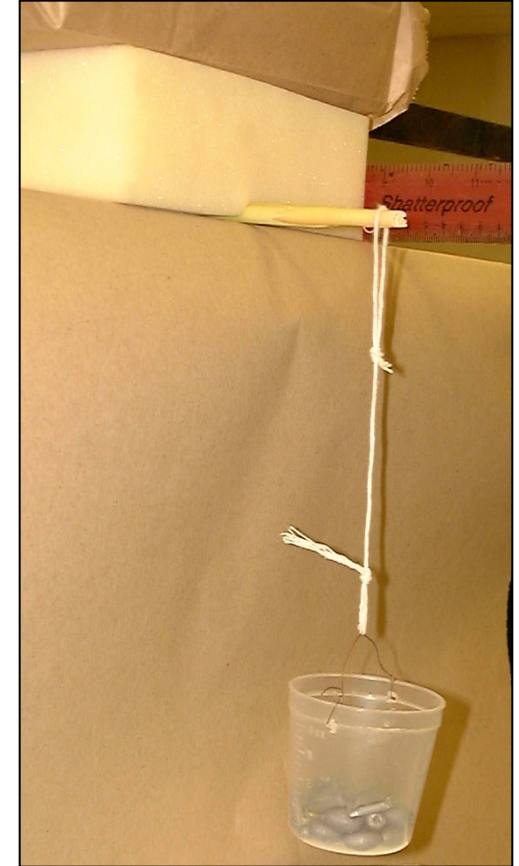
Rice grain yield (kg/ha) - 2011



$$Y = 6190 + 242 * \text{foliar PN} + 8.2 * \text{soilK\%}$$

Measuring Stalk Strength

- Lower 12 inches of stalk collected at harvest.
- Stalk placed with 3' of base exposed at table edge. Held in place with padded book.
- Cup suspended by string from exposed end.
- Weights progressively added until stalk failed, weight recorded, reported in gram/sample.

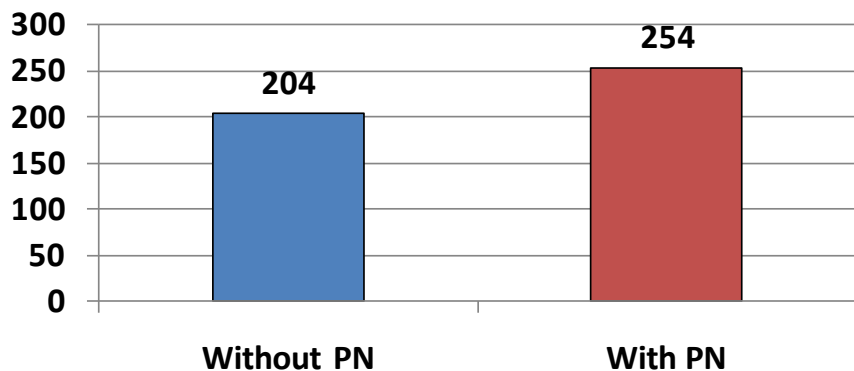


ANOVA for Stalk Breaking Strength

Effect	F (prob)	
	2010	2011
Foliar PN	0.018	<0.001
Soil K%	0.808	<0.001
Foliar PN*soilK%	0.191	0.057

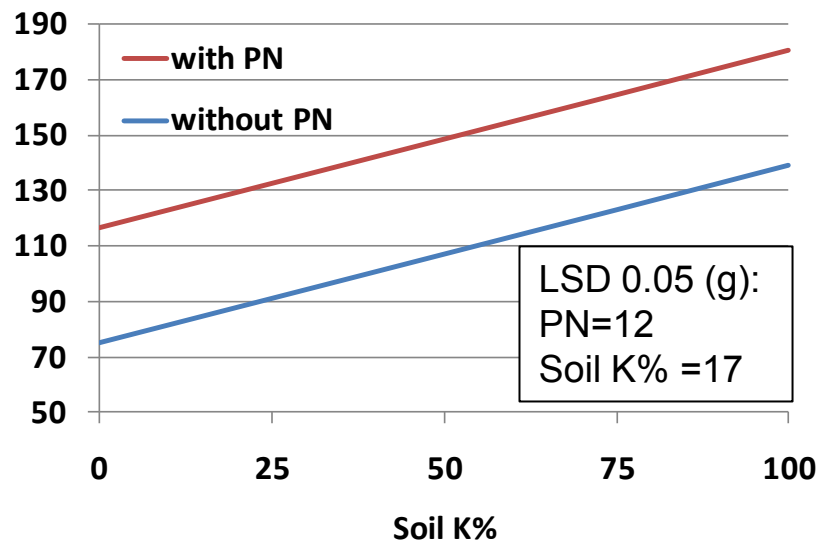
Stalk Breaking Strength (g) ANOVA/Regression Analysis

Stalk Breaking Strength (g) - 2010



LSD 0.05=41.4 g

Stalk Breaking Strength (g) - 2011

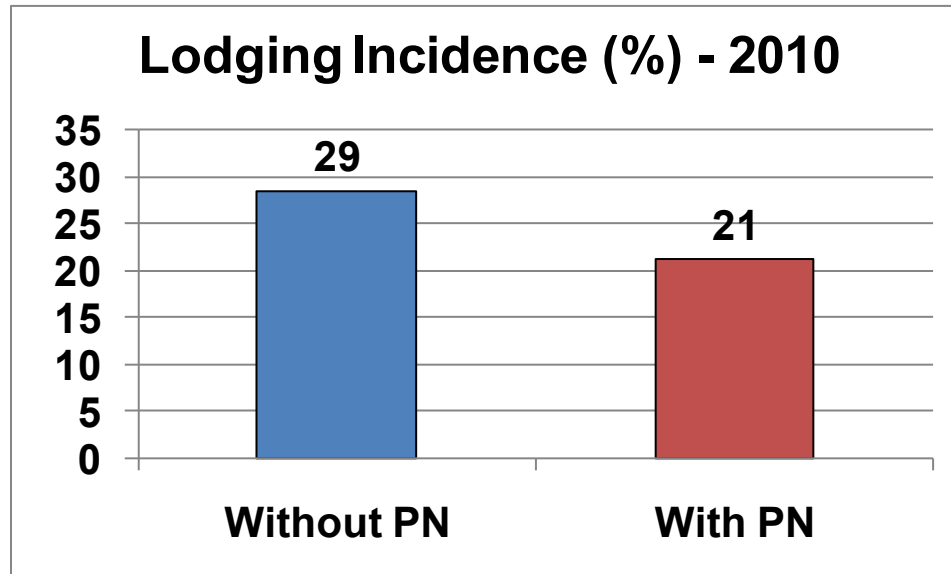


$$Y = 74.89 + 41.58 * PN + 0.643 * \text{soilK}\%$$

ANOVA for Lodging%

Effect	F (prob)	
	2010	2011
Foliar PN	0.046	No lodging occurred
Soil K%	0.596	
Foliar PN*soilK%	0.168	

Lodging%



LSD 0.05=7.15%

ANOVA for Milling: Head Grain%

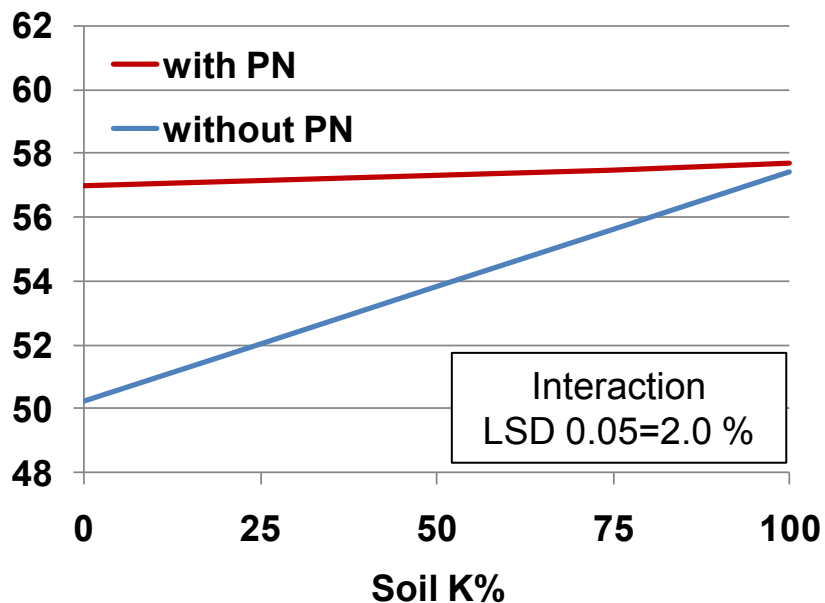
Effect	F (prob)	
	2010	2011
Foliar PN	0.081	0.053
Soil K%	0.417	0.152
Foliar PN*soilK%	0.777	0.197

ANOVA for Milling: Whole Grain%

Effect	F (prob)	
	2010	2011
Foliar PN	<0.001	0.011
Soil K%	<0.001	<0.001
Foliar PN*soilK%	<0.001	<0.001

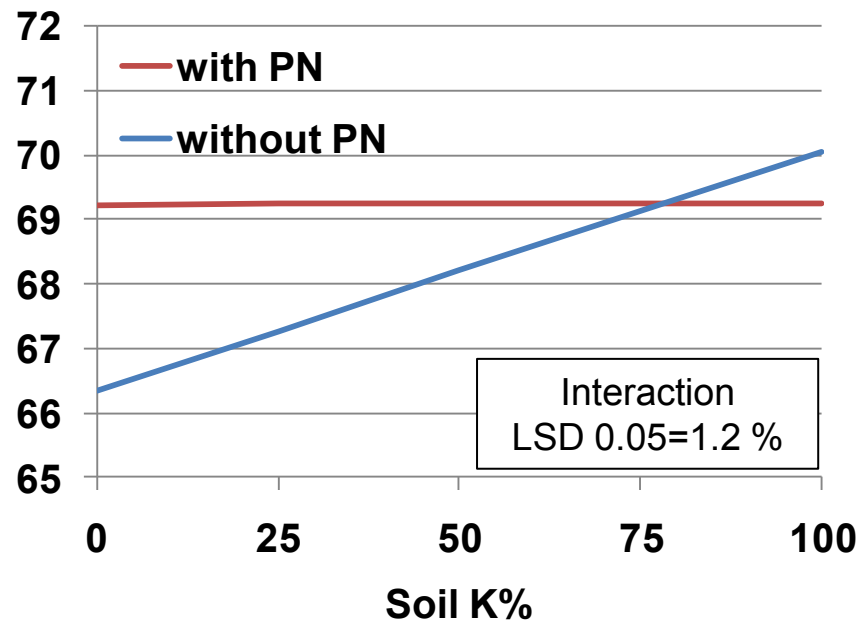
Milling Whole Grain (%) Regression Analysis

Milling Whole Grain (%) - 2010



$$Y = 50.252 + 6.748 * \text{foliar PN} + 0.07181 * \text{soilK}\% - 0.0651 \text{PN} * \text{soilK}\%$$

Milling Whole Grain (%) - 2011



$$Y = 66.35 + 2.879 * \text{foliar PN} + 0.03712 * \text{soilK}\% - 0.03683 \text{PN} * \text{soilK}\%$$

- Foliar PN may be used when soil K is limiting.
- May also have value with adequate soil K.
- Value of K in rice production not limited to yield. Positive effect for:
 - Lodging/stalk strength.
 - Milling quality.
- More study is needed
 - Look at combining KNO_3 with plant protection products.