WHERE DO FLUIDS FIT IN A DRY-AMMONIA PROGRAM?

Larry Murphy
Murphy Agro

FFF IS EMPHASIZING….

- Good nutrition
- Higher yields
- Maintenance of soil test levels
- Lower production costs/bushel, ton, pound
- Higher profitability

FFF WORKS CLOSELY TO COORDINATE INDUSTRY SUPPORT OF APPLIED RESEARCH

WE DON'T HAVE ALL THE ANSWERS:

- Research is continuing
- We have to work with what we know

SOME FACTORS TO CONSIDER

- How fluids, drys and anhydrous fit together
- Idea here is not to replace heavy rates of P and K but to look at how systems complement each other
- Recognize push toward reduced tillage
- Growth of fluid starters in reduced tillage
- Emphasis on efficiency
- Split N applications

LET'S ALSO THINK ABOUT…

- Nutritional interaction with genetics, important in evaluation of new practices
- New or improved chemistry for fertilizer use efficiency
- New tools, re-evaluating methods of application, nutrient timing
- Revisiting starter formulations
- Value of uniformity in a band
- Nutrient interactions
- Nutrient uptake patterns

LET'S ALSO THINK ABOUT…

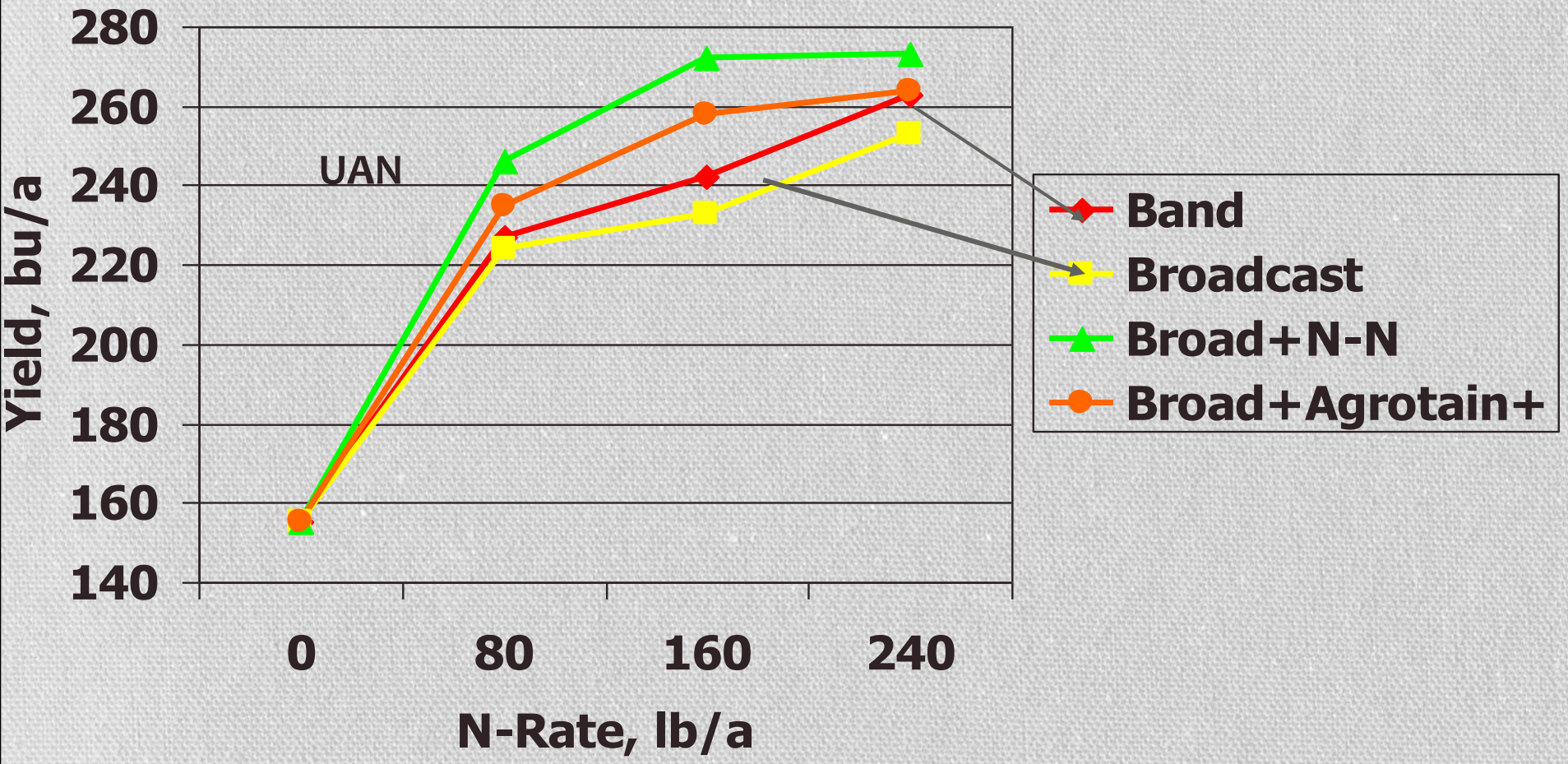
- Environmental pressure---N, P, others?
- Common sense! Environmental and agronomic benefits go hand in hand.
- N and P losses cost money! We have the tools and we are using them! Can never stop losses completely but we can continue to fine tune nutrient supply systems.

FLUIDS AND NITROGEN MANAGEMENT

FLEXIBILITY

- High N starters
- Fertigation – Split N…genetic requirement for late season N; environmental benefits?
- **Dribble** as tool to manage N availability, control N losses via volatilization

N-Rate and Method of Application Effects on Corn Grain Yield -- Kansas



GENETICS AND N RESPONSES

Genetics Affect Corn Response to N and N Efficiency Products

Bu/A

	DKC 64-69	Pioneer 1745HR	Stine VT3PRO	Triumph 7514S
UTC (0 N/A)	77	62	55	58
Urea 184 N/A	177	158	146	142
Urea +Agrotain 184 N/A	180	171	151	150
Urea + N-N 184 N/A	182	170	160	162

Location, Jackson Co. Arkansas
Dr. Ronnie Helms, G&H Associates

LATE SEASON N RESPONSES

- Genetic demands for ammonium N greater with high yield hybrids
- A benefit of fertigation?
- Energy storage benefits, less energy for nitrate-N reduction
- Nitrification suppression

THE IMPORTANCE OF MAINTAINING ADEQUATE SOIL P AND K

SUBSOIL K DEPLETION


SUBSOIL K DEPLETION
Dr.. George Rehm, Univ. of Minnesota

The need for supplemental potassium is not always predictable by soil test.

MANY FACTORS INFLUENCE CROP RESPONSES TO STARTERS BESIDES SOIL TEST VALUES

Large amounts of residues

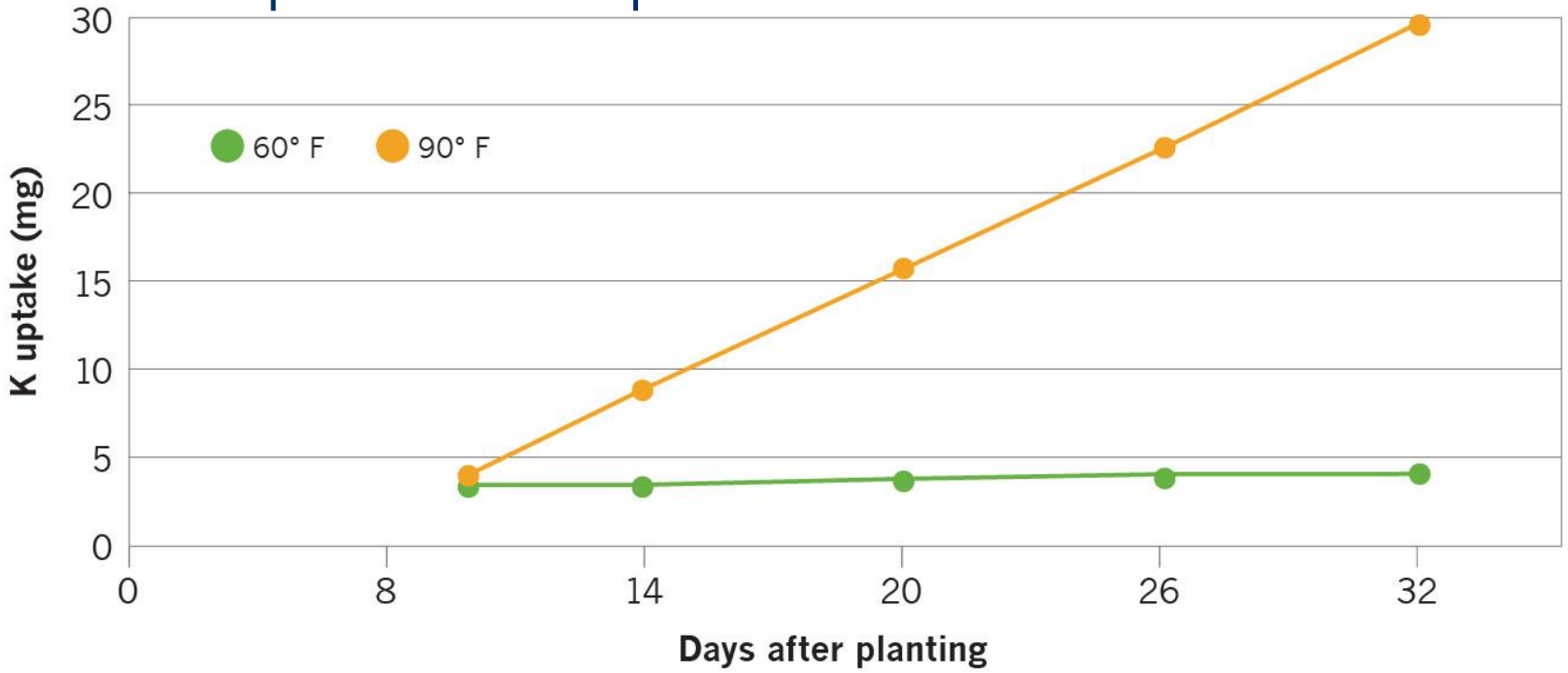
Cold soils

Compaction

Genetics

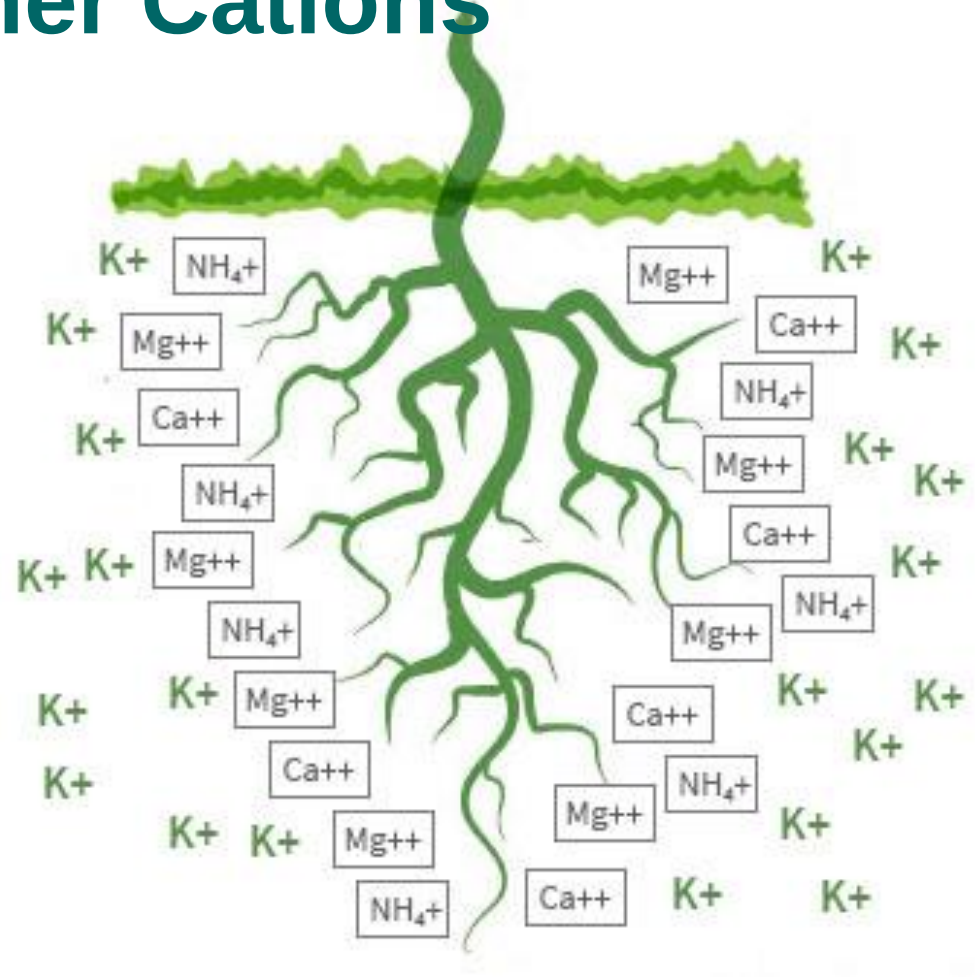
Effects of Low Soil Temperature on K Uptake

- Slows diffusion of K to the root
- Restrict root growth and activity
- Reduce plant nutrient uptake



Minnesota

Uptake Affected by Interactions with Other Cations



IF THESE CONDITIONS EXIST, STARTER K CAN BENEFIT THE CROP

WHAT ABOUT K IN STARTERS FOR REDUCED TILLAGE?

- Current wisdom--don't need K on high K soils
- How wise is the wisdom?
- STRESS…STRESS…STRESS in early season
- Low temperature stress; compaction stress; maybe excessive soil moisture stress
- Soluble K can help overcome this stress
- Include some K in starter for reduced tillage NO MATTER WHAT THE SOIL TEST LEVEL IS!

STARTER FERTILIZER EFFECTS ON RIDGE-TILLED CORN

(Soil Test K=420 ppm)

Treatment	V-6 Dry Weight	V-6 K	Days from Emergence	Yield
	---------- lb/acre----------		Days	bu/acre
0-0-0-0	**210**	**6.2**	**79**	**162**
15-30-5	**382**	**10.9**	**71**	**185**
30-15-5	**355**	**15.2**	**71**	**173**
30-30-0	**395**	**11.2**	**71**	**184**
30-30-5	**460**	**15.2**	**67**	**195**
LSD(0.05)	**28**	**1.5**	**2**	**10**

Dr. Barney Gordon, Kansas State

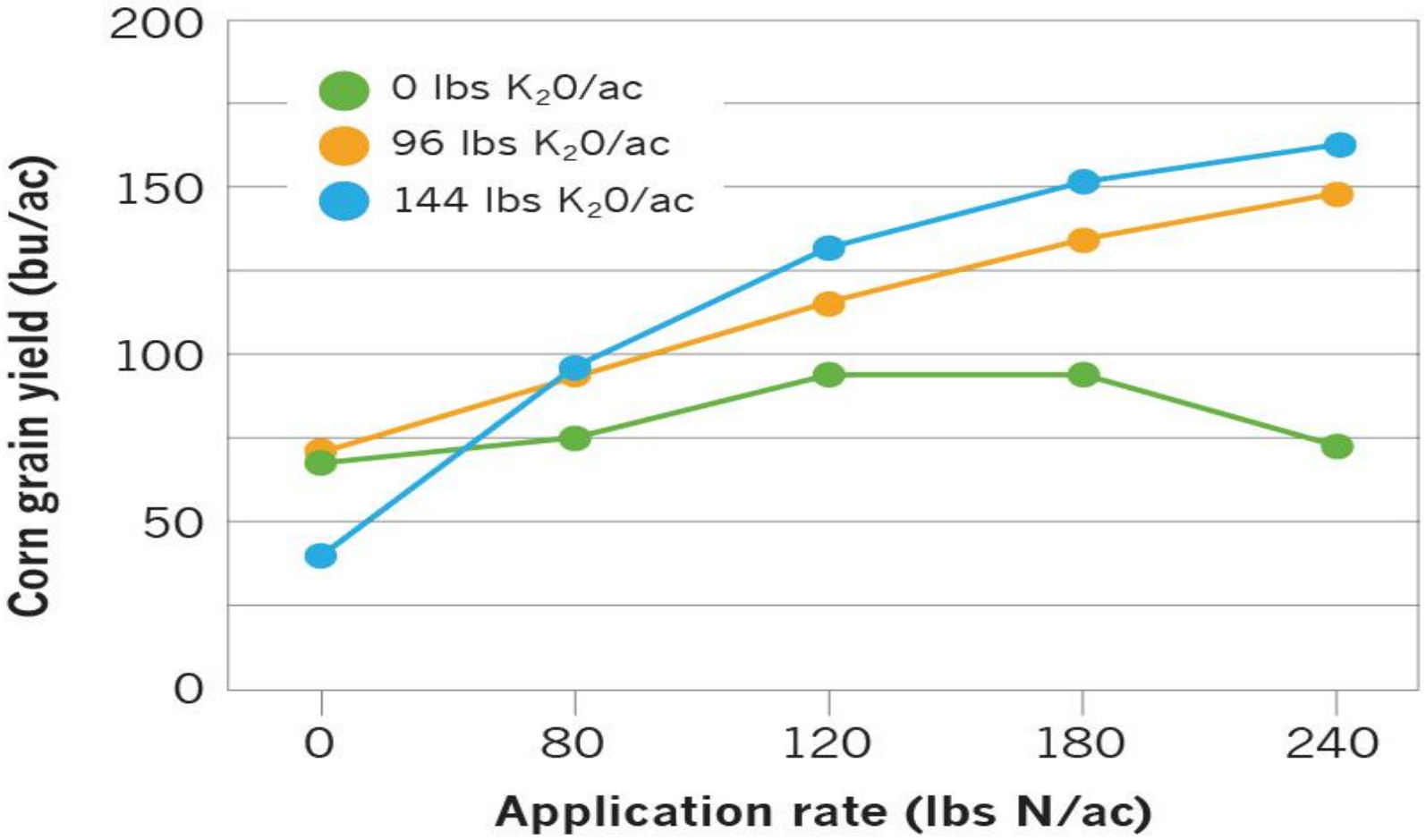
10-34-0 ALONE DOESN'T DO THE TRICK

- NPKSZn formulations—Branded complete options
- May not need a lot of K
- Can't get in a lot of K with high N formulations
- 5-10 lb K_2O/A may be enough in starter

WE ALL KNOW THIS:

THE AVAILABILITY AND UPTAKE OF ONE NUTRIENT AFFECTS USE EFFICIENCY OF OTHERS

Potassium and N Use Efficiency



Dr. Jay Johnson, Ohio State Univ.

LATE SEASON FLUID K

Fertigation, high clearance sidedress?

Bob Miller – CSU

Reduced tillage – New emphasis on starters

Higher Soil Bulk Density Can Lead to Diminished P Uptake by Corn

Soil Texture	Bulk Density g/cm^3	P in Shoots %	P Uptake mg/pot
Loamy sand	1.30	0.59	63.7
	1.60	0.44	47.5
	1.90	0.33	12.2
Silt loam	1.10	0.41	– –
	1.35	0.35	– –
	1.60	0.28	– –
Silty clay	1.10	0.55	78.1
	1.35	0.41	48.4
	1.50	0.34	29.6

Guelph (Canada)

Effects of Soil Temperature

When soil temperature was reduced from 70 to 58 degrees Fahrenheit:

- Corn root growth decreased 5-fold
- P uptake by corn roots decreased 4-fold

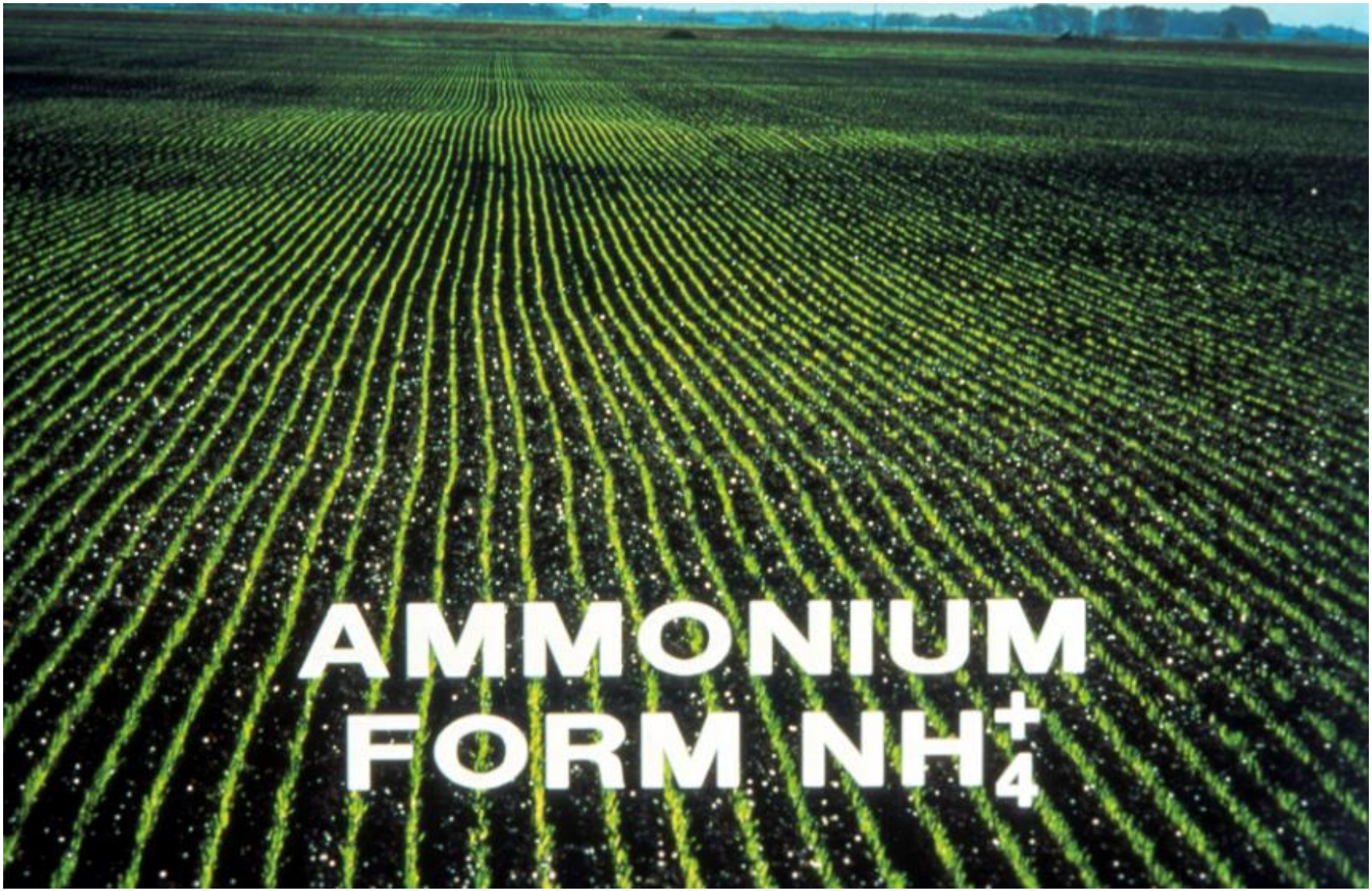
(Mackay and Barber, 1984 Purdue)

IN HIGH RESIDUE SYSTEMS, USE OF STARTER SHOULD BE A MANAGEMENT DECISION, UP FRONT, REGARDLESS OF SOIL TEST VALUES

MICROENVIRONMENTAL CONDITIONS HAVE SUBSTANTIAL EFFECTS ON NUTRIENT AVAILABILITY

MODIFICATION OF MICROENVIRONMENTS CAN ENHANCE NUTRIENT USE EFFICIENCY

Phosphate Fertilizer Enhancer


AMMONIUM
FORM NH_4^+

THE MICROENVIRONMENT OF N-P BANDS

N Stimulation of P Absorption by Plants

- Decrease in the rhizosphere pH and increased solubility of soil phosphates.
- Increased root length.
- Increased physiological capacity of the root to adsorb P. N treatment of corn roots resulted in higher P uptake than a 10-fold increase in P concentration.

(Kamprath, 1987)

HIGH N STARTERS

THE IMPORTANCE OF ADEQUATE AVAILABLE N CLOSE TO THE PLANT IN THE FIRST 30 DAYS OF GROWTH

High N Starter Effects on Corn (bu/A) 3-year Avg (Kansas)

Starter	In-furrow	2x2	Dribble	Row Band
5-15-5	172	194	190	179
15-15-5	177	197	198	180
30-15-5	174	216	212	192
45-15-5	171	215	213	195
60-15-5	163	214	213	201
Average	*171*	*207*	*205*	*189*

Dr. Barney Gordon, Kansas State

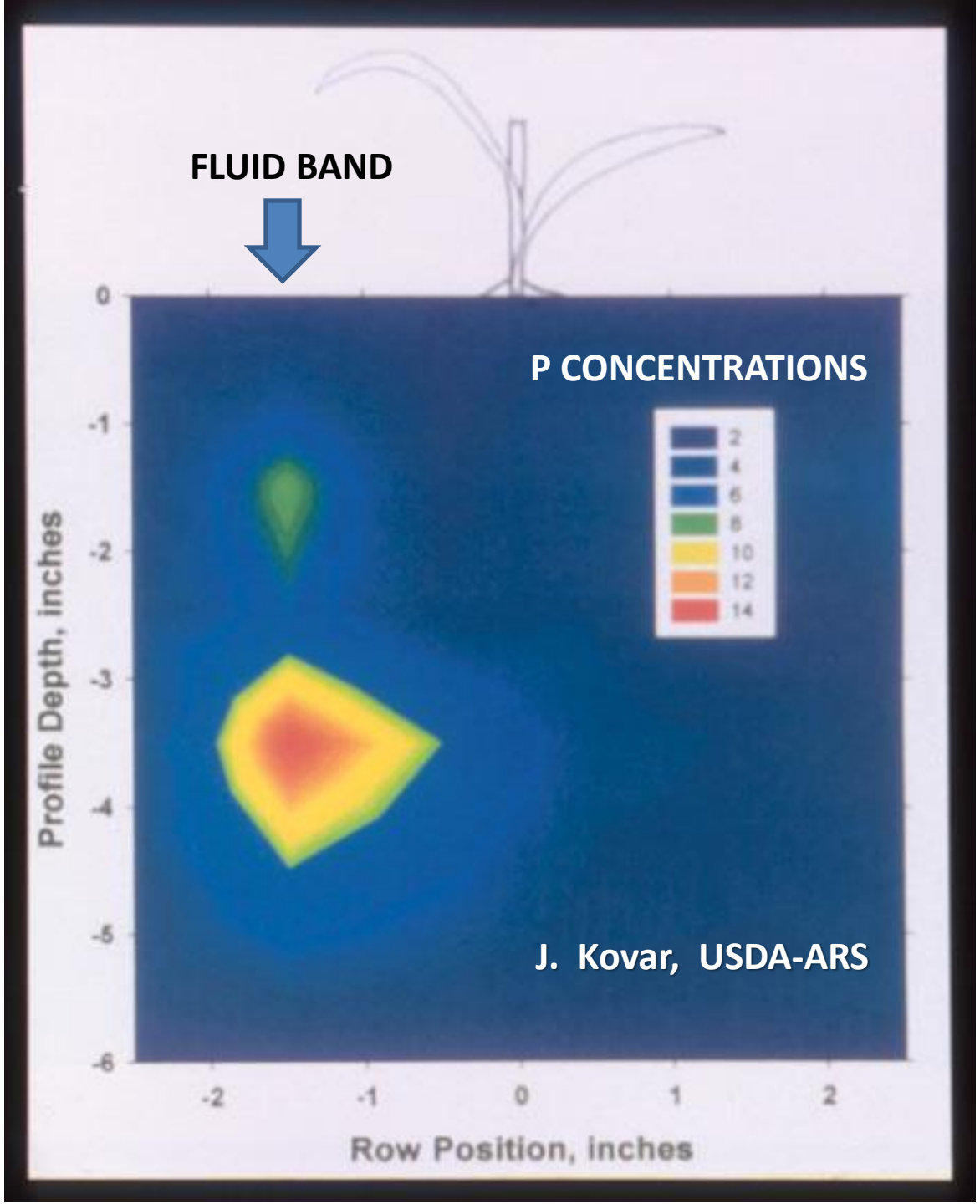
HIGHER STARTER N --A LOGISTICAL PROBLEM BUT ALSO BIG REWARDS!

- ***WILL EARLY BROADCAST UREA OR FERTIGATED UAN DO THE SAME THING?***

NOT CLOSE TO THE ROW!

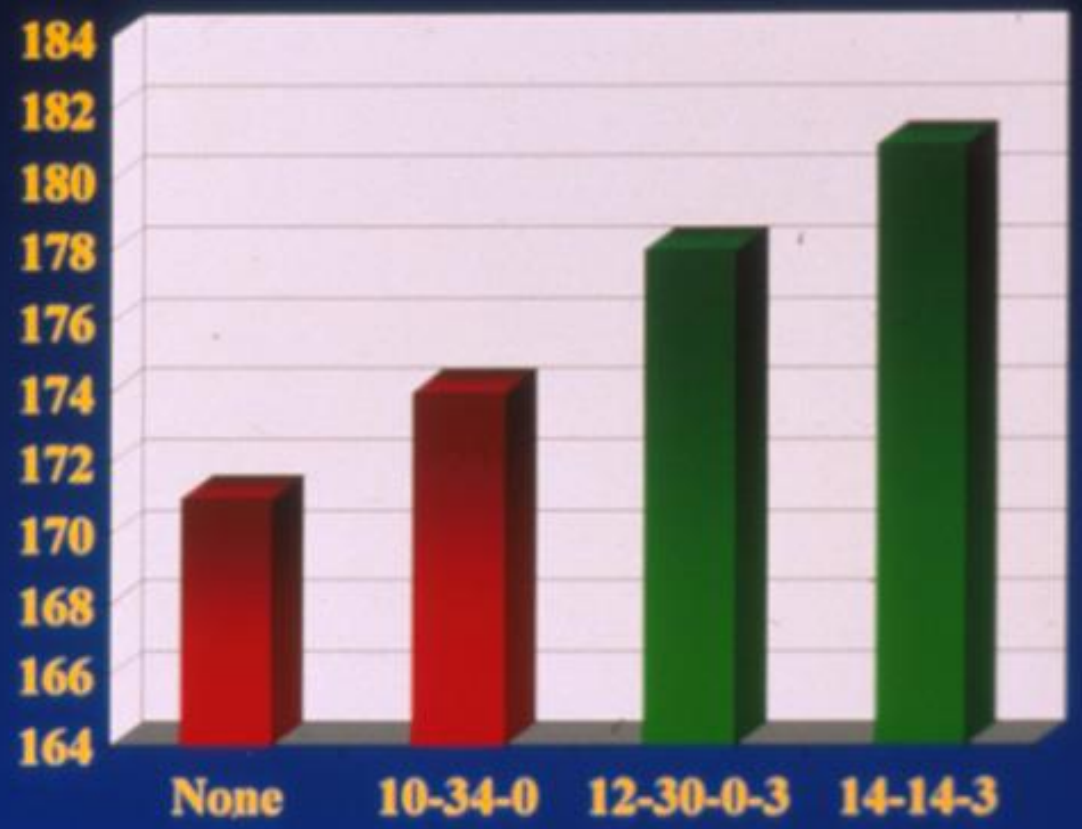

STARTER N
0
30
SIDEDRESS N
200
50

HIGH CONCENTRATIONS OF AMMONIUM N MAY INCREASE SOIL P MOVEMENT


FLUID BAND
P CONCENTRATIONS
2
4
6
8
10
12
14
0
-1
-2
-3
-4
-5
-6
Profile Depth, inches
-2
-1
0
1
2
Row Position, inches
J. Kovar, USDA-ARS

Corn yield response to different starter fertilizers

- There is a starter formulation better than 10-34-0



Ron Heiniger, NCSU


FERTILIZING HIGH YIELD BEANS

WHAT ABOUT SUPPLEMENTAL NITROGEN?

N FOR HIGH YIELD SOYBEANS

Ammonium-N

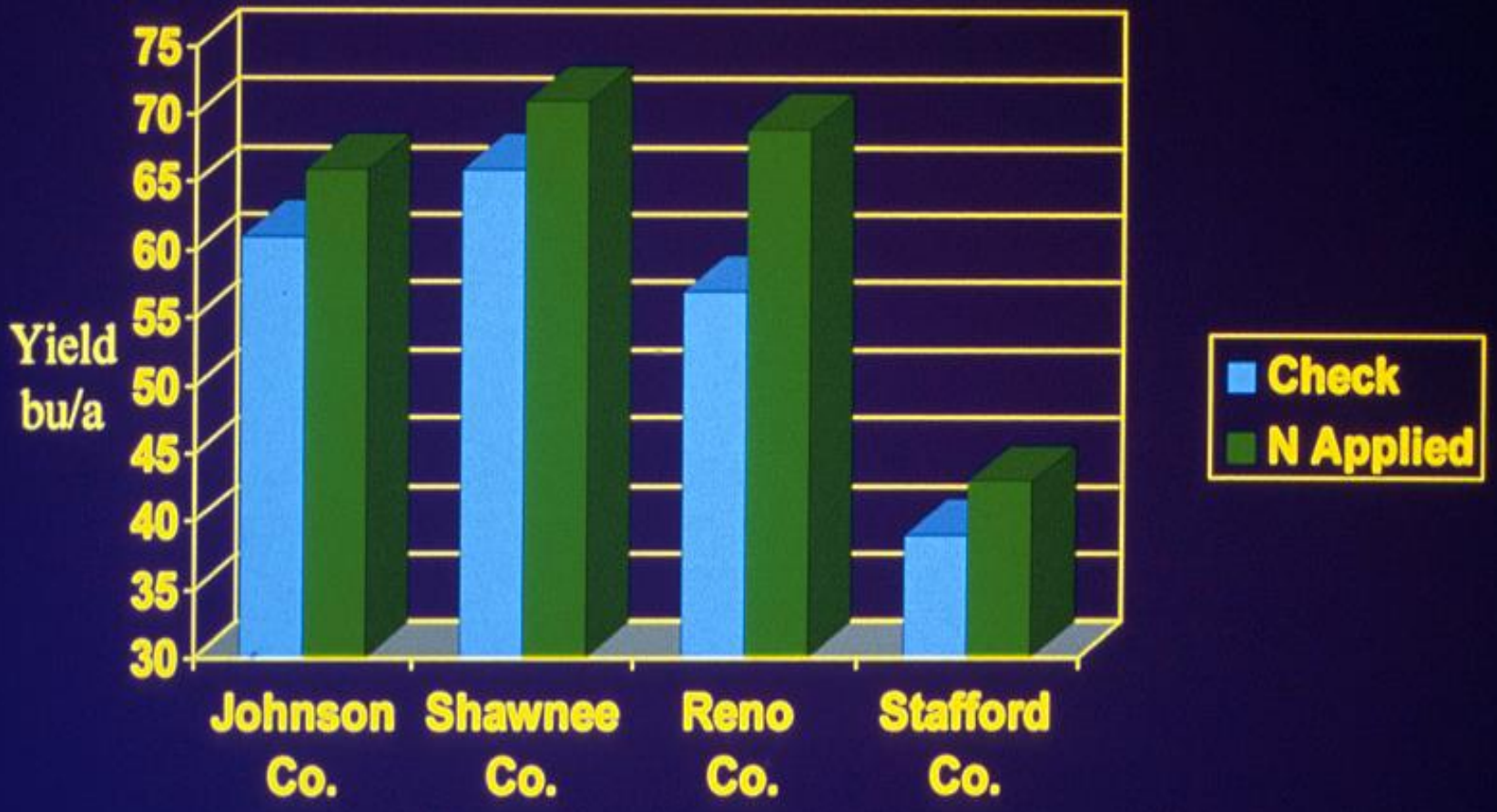
Irrigation

Fertigation

SOYBEANS LIKE AMMONIUM N

- **Nitrate-N seems to be harder on nodulation**
- **Remember that S is essential for N fixation by Rhizobia**

Effect of Late-Season N on Soybean Yield



Each location averaged over two sites

LATE-SEASON SUPPLEMENTAL N FERTILIZATION

- Positive yield responses more consistent, particularly in high-yield environments
- Responses obtained with 20-50 lb N/ac
- Responses often economic
- Easier to do with fertigation

WHAT ABOUT FLUID STARTERS FOR BEANS?

STARTERS?

Never have done that!
Does it work?
What to watch for?

HIGH SENSITIVITY TO SOLUBLE SALTS

Be Careful!
Precision Placement of Fluids
Pop-Up Can Be a Problem
2x2 Placement Safer

STARTER P FOR IRRIGATED SOYBEANS
Kansas

Treatments lb P_2O_5/A	Year 1 Yield bu/A	Year 2 Yield bu/A
Control	52d	32d
30 MAP	62c	41c
30 MAP + Avail	70b	57a
60 MAP	62c	47b
60 MAP + Avail	73a	58a

Duncan's multiple range test, 5%. Gordon, Kansas State Univ.
P banded beside row. Soil test P: 38 ppm Bray 1. Soil pH: 6.8.

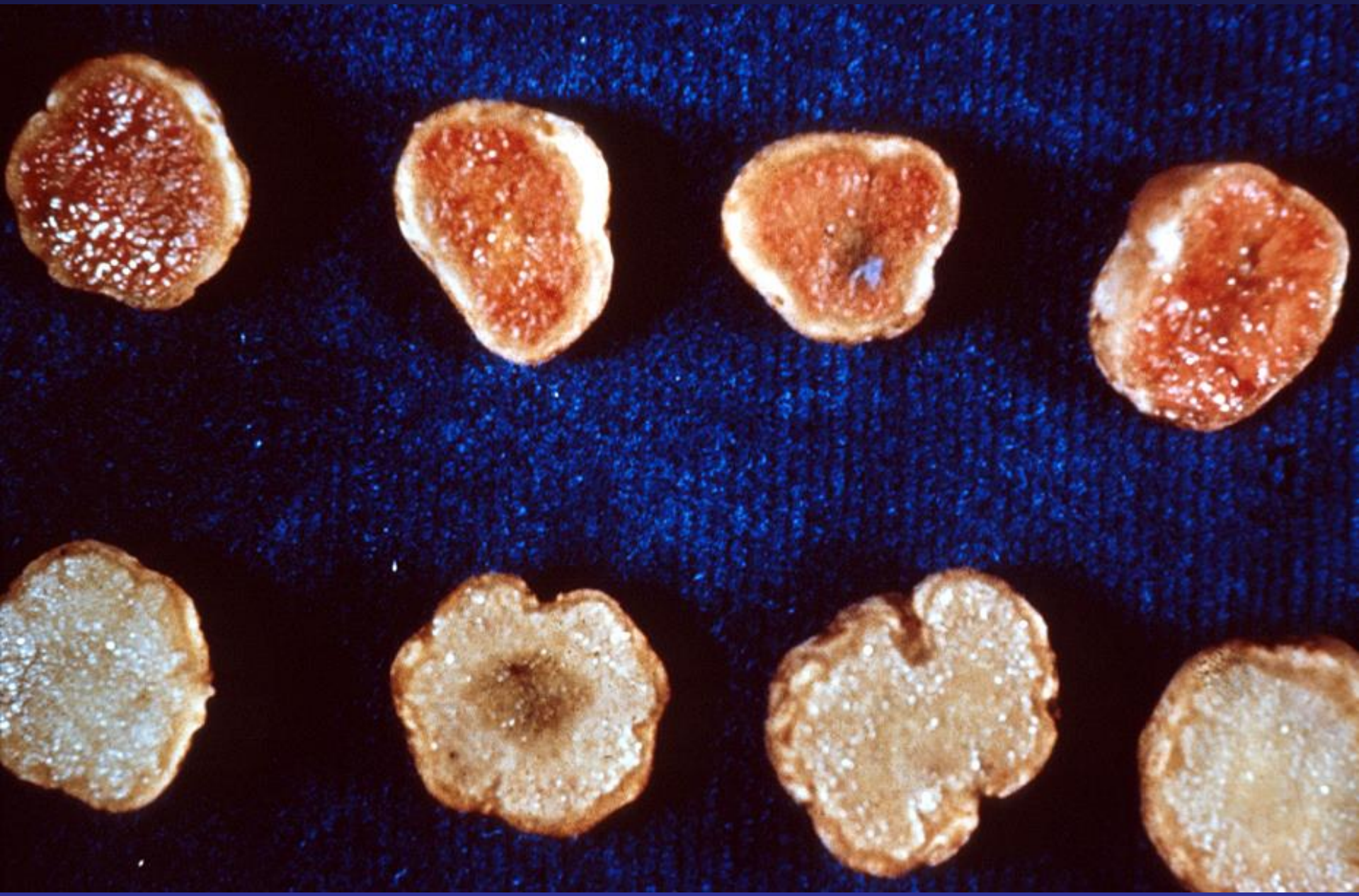

K


80 P_2O_5
0 K_2O

Effect of Residual K on Soybean Yield

L. F. Welch (Illinois)

SULFUR: ESSENTIAL FOR N FIXATION IN LEGUMES



DON’T FORGET MICRONUTRIENTS FOR HIGH YIELD BEANS !!

SOYBEAN RESPONSE TO ZINC CAN BE HIGHLY PROFITABLE

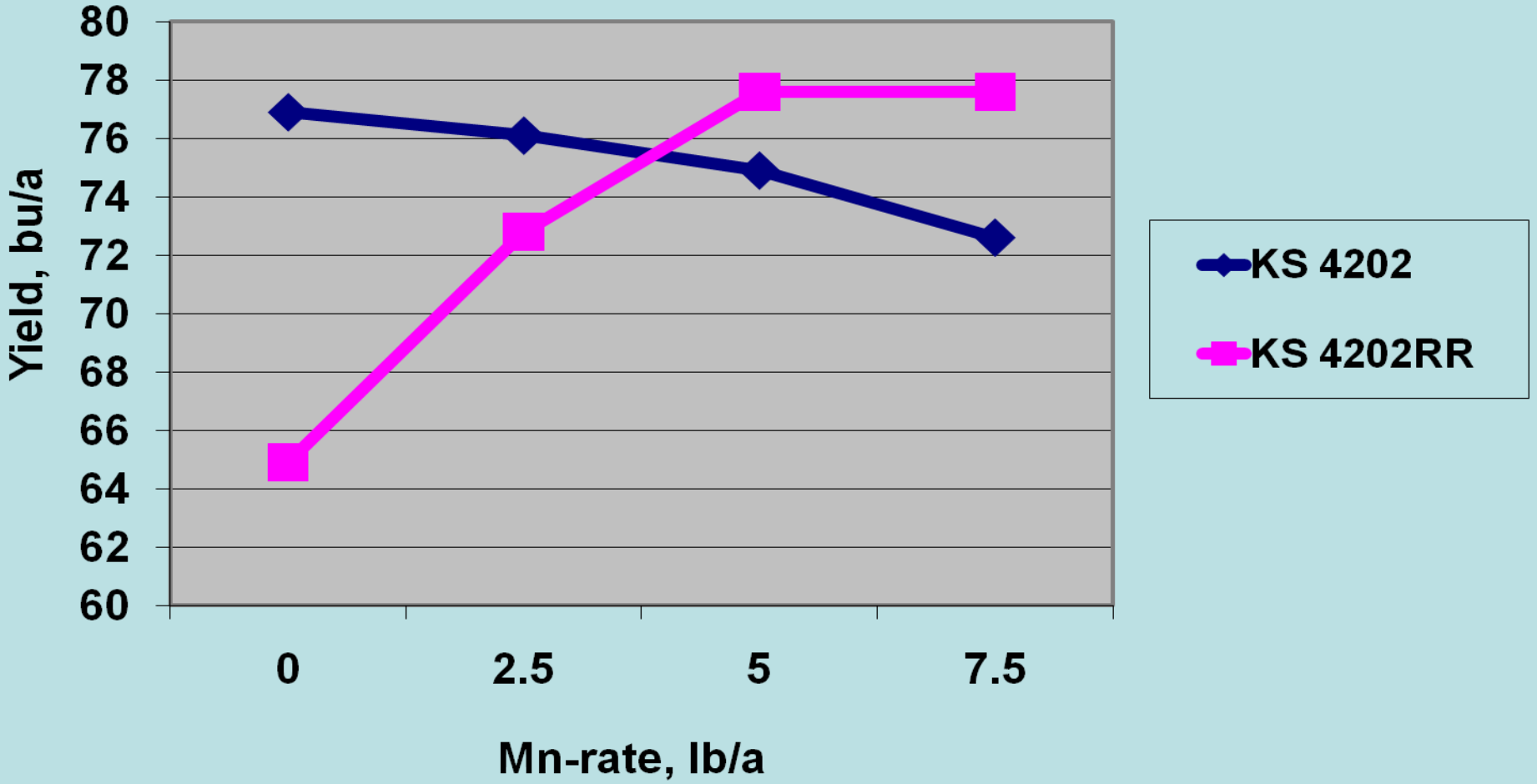
Treatments	Yield	Leaf Composition		Net Return
lb Zn/A	bu/A	%P	ppm Zn	from Zn
0	30	0.260	17.9	----
2	46	0.165	24.9	$172/A
4	50	0.177	28.9	$220/A

Beans $11/bu; Zn $2.00/lb. Zn soil test: Low

Zn broadcast preplant Pawnee Co., KS

GLYPHOSATE RESISTANT BEANS

Mn Response in Glyphosate Resistant Soybeans---Kansas



Fluid Starter Manganese Effects on Soybean Yield

Stage of Growth	Yield, bu/acre
Untreated check	**66**
Starter (.3 lb)	**66**
Starter (.6 lb)	**70**
Starter (.3 lb) + V4	**74**
V4	**66**
V4+V8	**72**
V4+V8+R2	**74**
LSD (0.05)	3

Gly+Mn (sequestered Mn)

FOLIAR Mn FOR GLYPHOSATE RESISTANT BEANS

Stage of Growth	Yield bu/A
Control	62
V-4	68
V-4 + V-8	72
V-4 + V-8 + R-2	80
LSD .05	3

0.3 lb Mn as Mn polymer/appln

IN CLOSING:

- Lots of opportunities for profitable use of fluids in dry-ammonia programs

  Precision and flexibility are big pluses for fluids
- Precision placement of starters
- Manipulation of starter formulations
- Micronutrients in starters of foliars
- Fertigation, split N
- And the list goes on…….