

Effect of Tillage and K Fertilization on Soybean Yield

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Today's discussion topics

- Review soybean K fertility
- Fertilizer recs. for soybean
- Summarize 3 year tillage x K fertility study on soybean



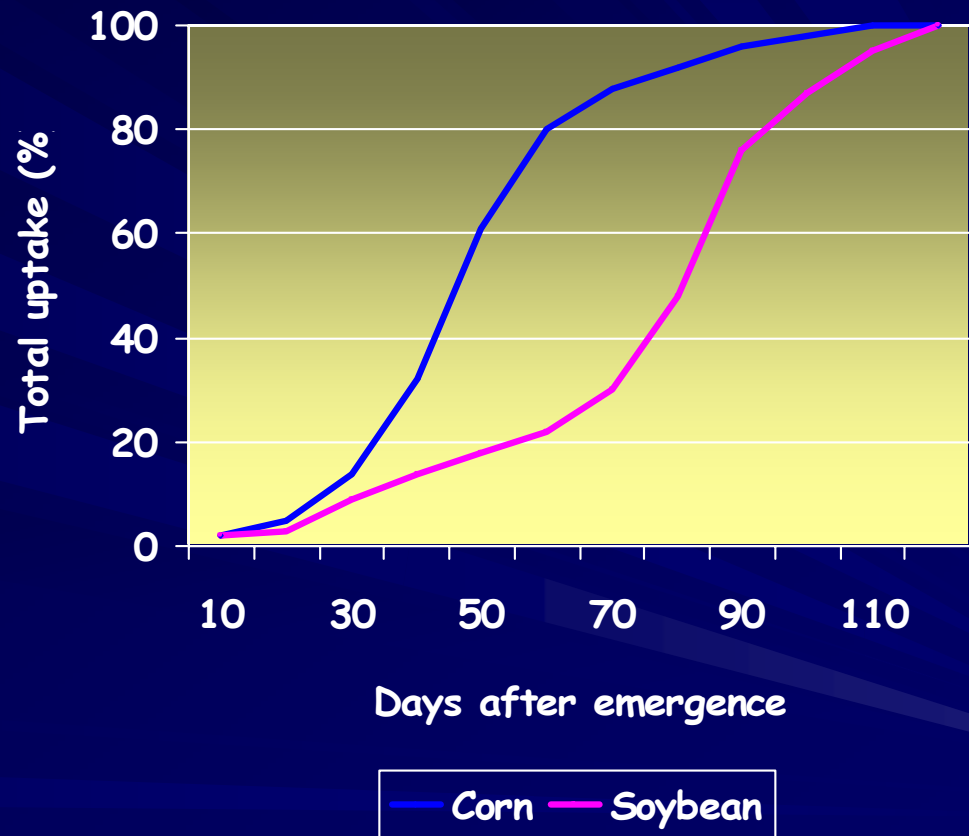
Comparison of basic P and K fertility requirements of corn and soybean

Crop	Component	Yield	P ₂ O ₅		K ₂ O	
			per bu	total	per bu	total
Corn	Grain	150	0.37	56	0.27	41
	Total Crop Need		0.57	86	1.33	200
Soybean	Grain	50	0.80	40	1.40	70
	Total Crop Need		1.07	54	2.37	119

Source: Purdue Corn and Soybean Field Guide, 2005

Soybean K uptake rate is different than corn

- Soybean accumulates K at a slower rate
- Soybean can absorb K at lower soil solution concentrations
- Seed concentrations vary less than plant tissue



UW soil test recs. reflect soybean K physiology

Crop	Subsoil Group	Soil Test Category				
		VL	L	O	H	EH
Corn	B	<70	70-90	91-110	111-150	>150
Soybean	B	<50	50-80	81-100	101-120	>140
Corn	C	<60	60-70	71-100	101-140	>140
Soybean	C	<40	40-70	71-90	91-110	>130
Corn	E	<45	45-65	66-90	91-130	>130
Soybean	E	--	<60	60-80	81-100	>120

Source: UWEX, A2809

Note: VH category for soybean not shown

Effect of soil test on soybean K accumulation by crop component

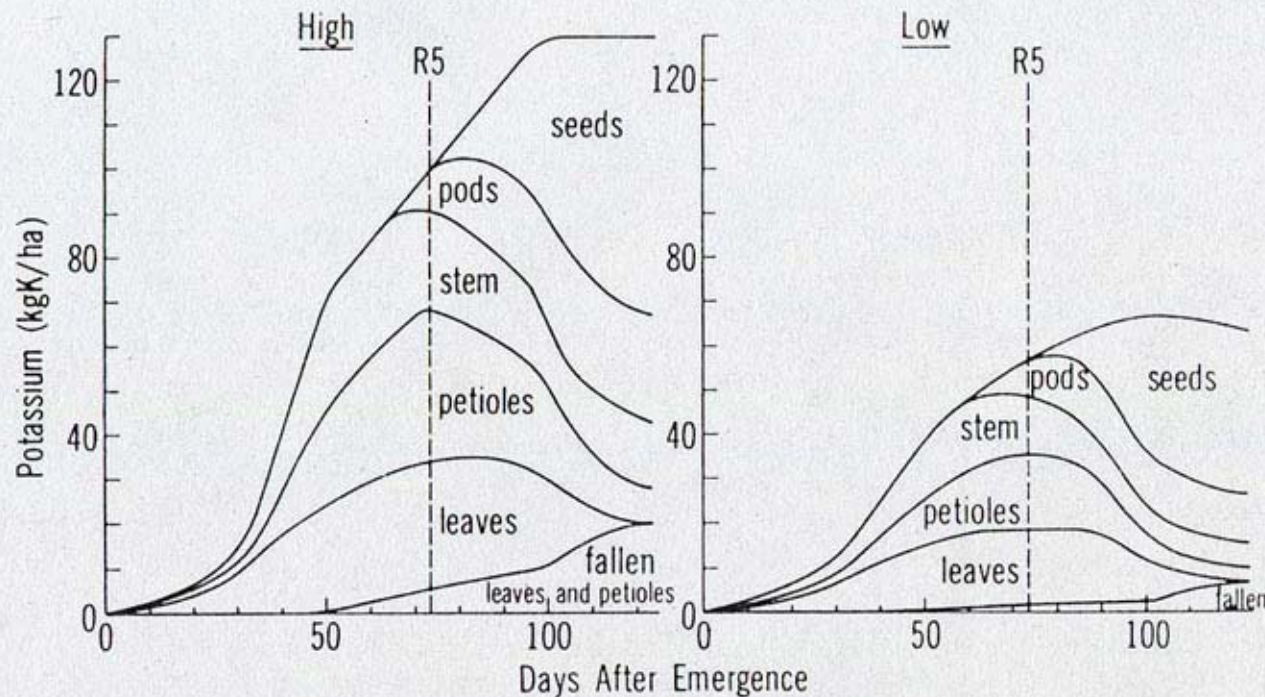


Fig. 32-3. Accumulation of K in soybean plants during the growing season at high and low levels of K^+ availability (Dunphy, 1972; Loberg, 1979).

Source: Potassium in Agriculture, Am. Soc. Agron., 1985

Soybean K concentration in various crop components

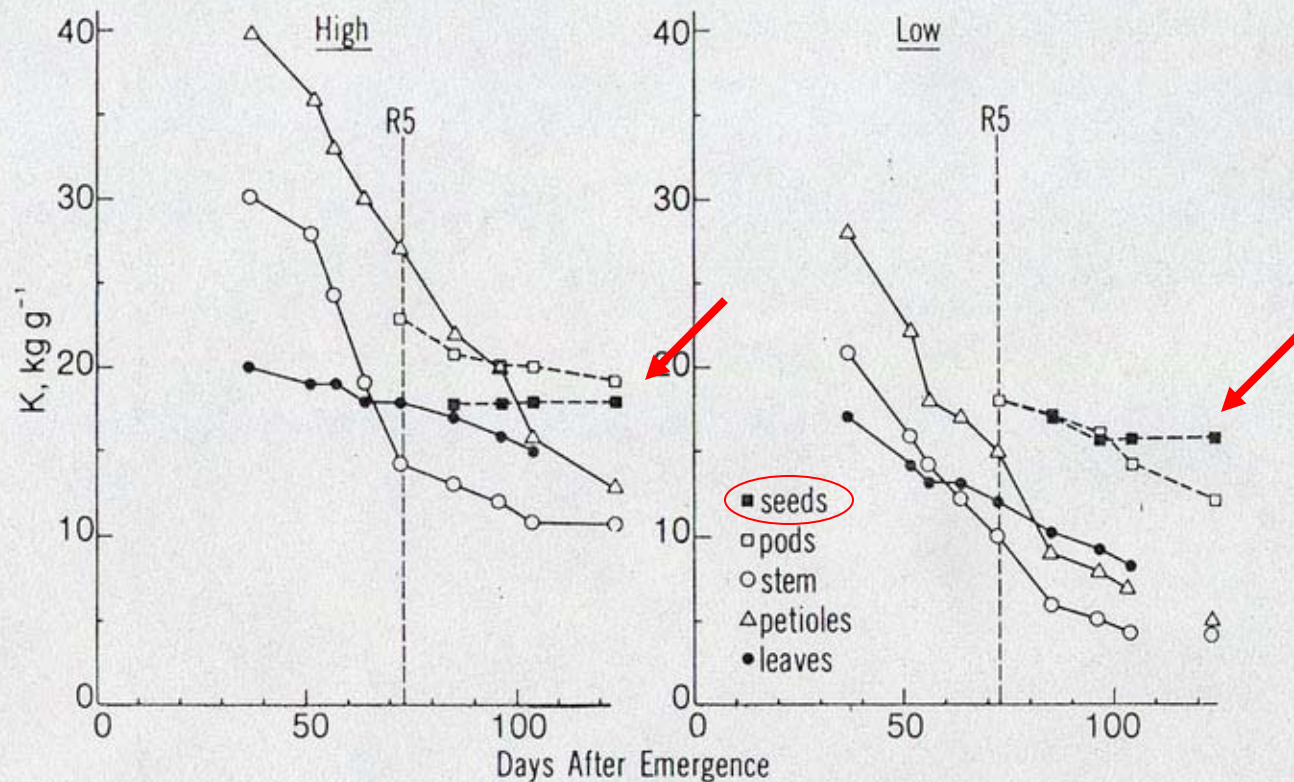


Fig. 32-4. Concentrations of K⁺ in different soybean plant parts during the growing season at high and low levels of K⁺ availability (Dunphy, 1972; Loberg, 1979).

Arlington long-term rotation-tillage-fertilization study

- ROTATION AND TILLAGE TREATMENT SINCE 1997
 - Fertilizer treatments installed 2001
- ROTATION
 - Cont. corn, soybean/corn, **corn/soybean**
- TILLAGE
 - Chisel/field cultivator, strip-till, no-till
- FERTILIZER PLACEMENT
 - None, fall broadcast, 2 x 2, deep (strip-till only)
 - 18+46+60
- MEASURE STAND, GROWTH, K REMOVAL, YIELD

Strip-till treatment

Note: Pictures taken at Lancaster



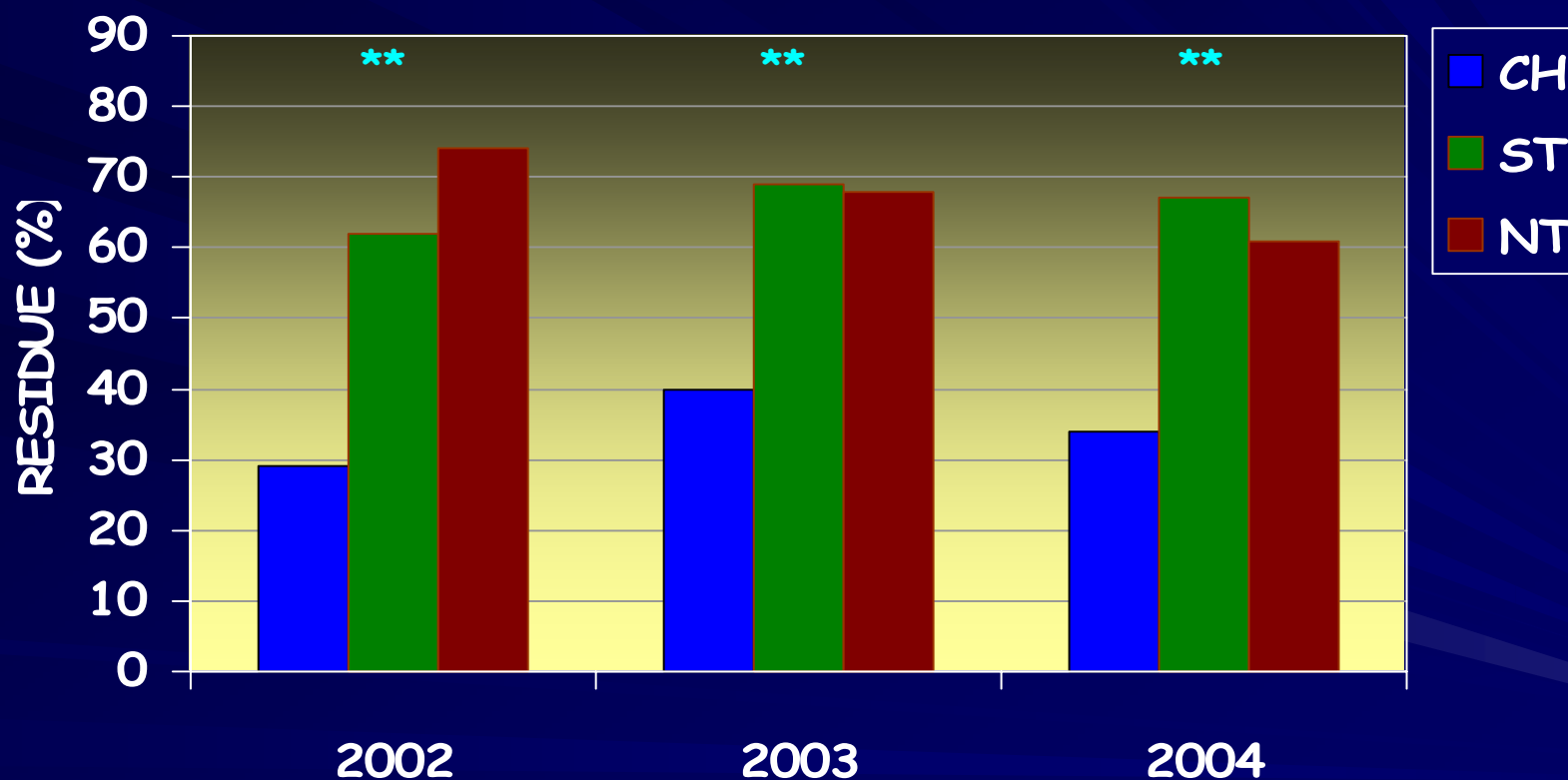
Remlinger Strip-till tool



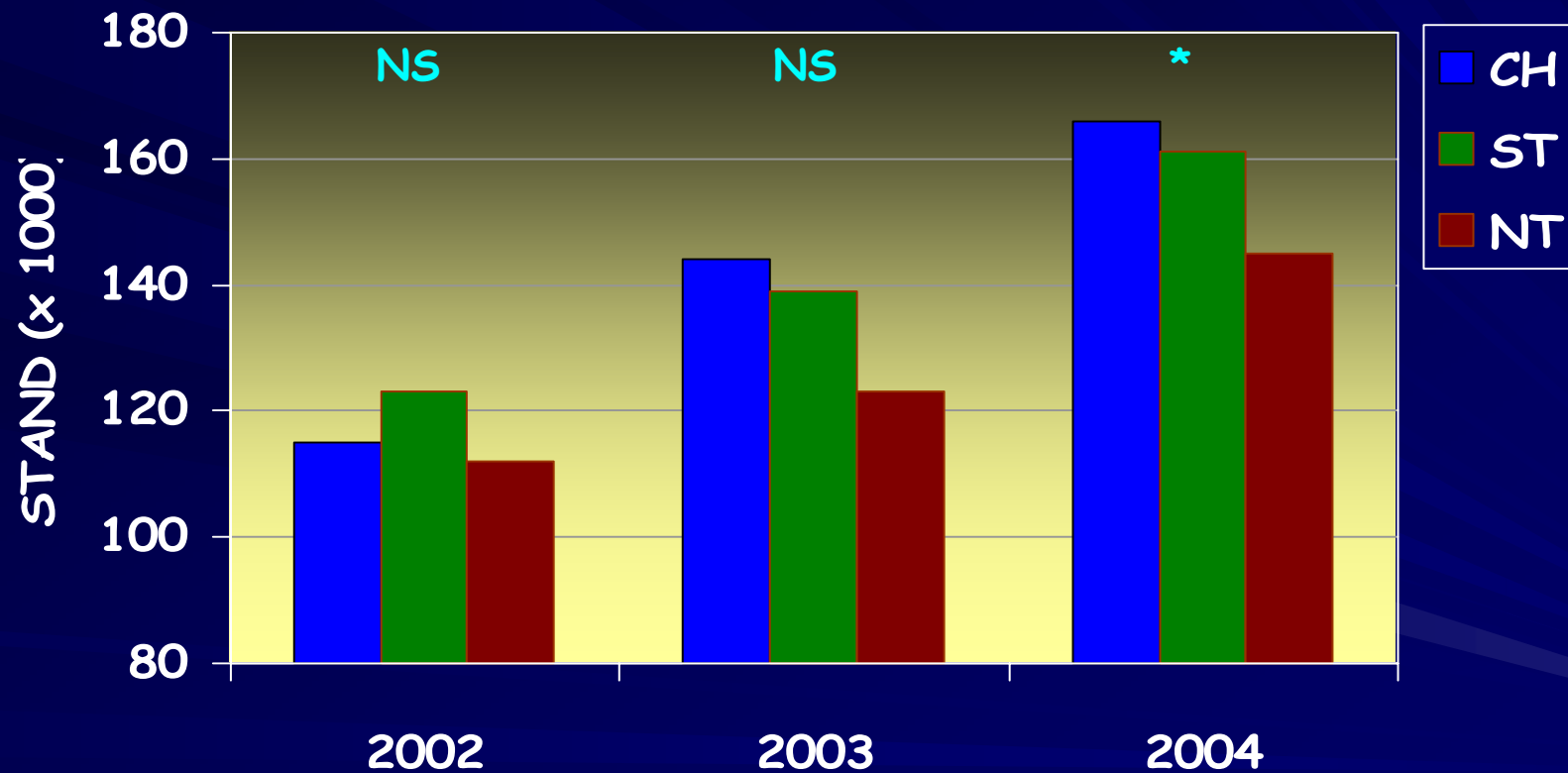
Kinze planter - Pete Wakeman

Note: Soybean planted in 30" rows

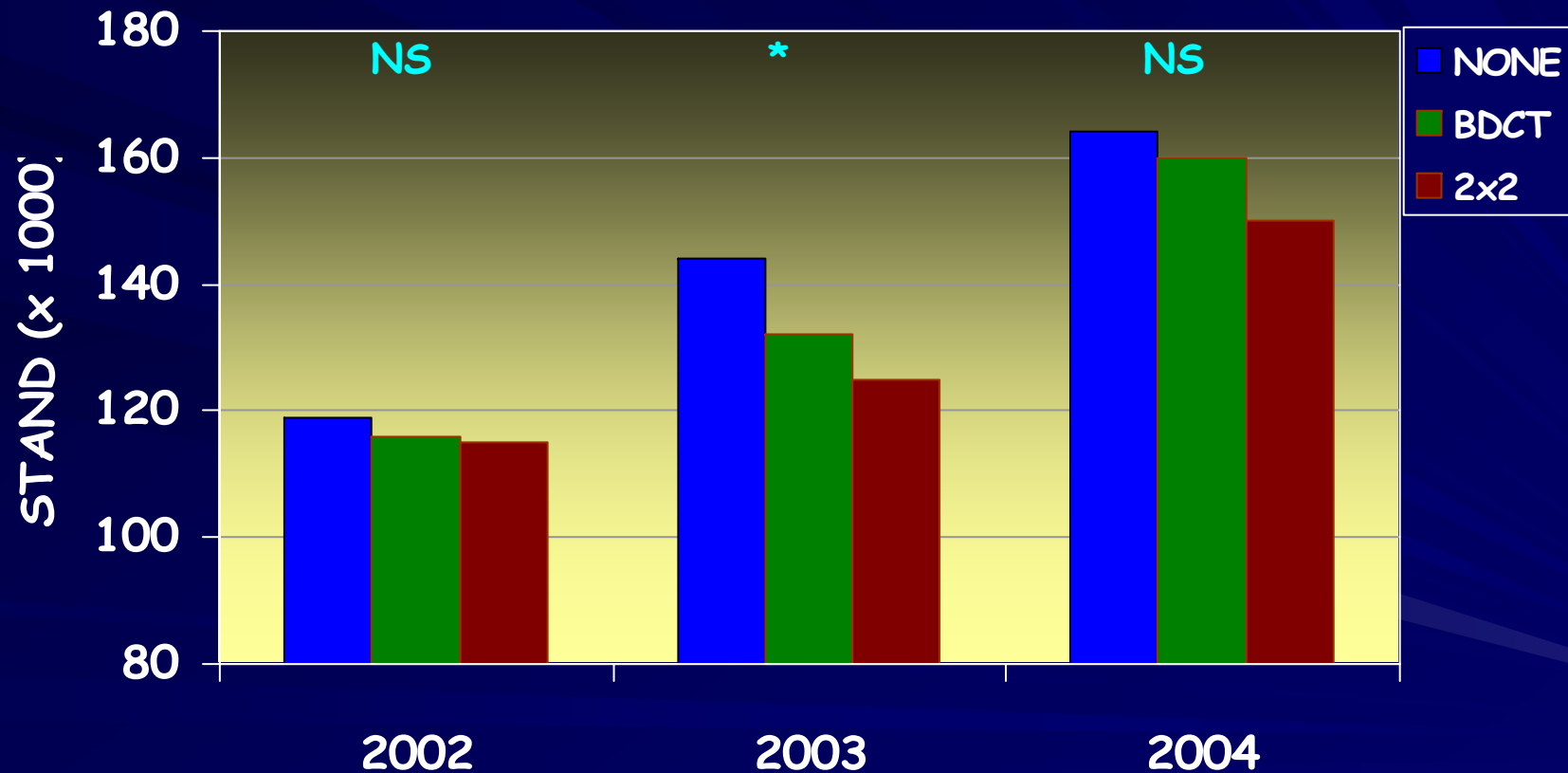
Main effect of tillage on crop residue in soybean following corn, Arlington, Wis.



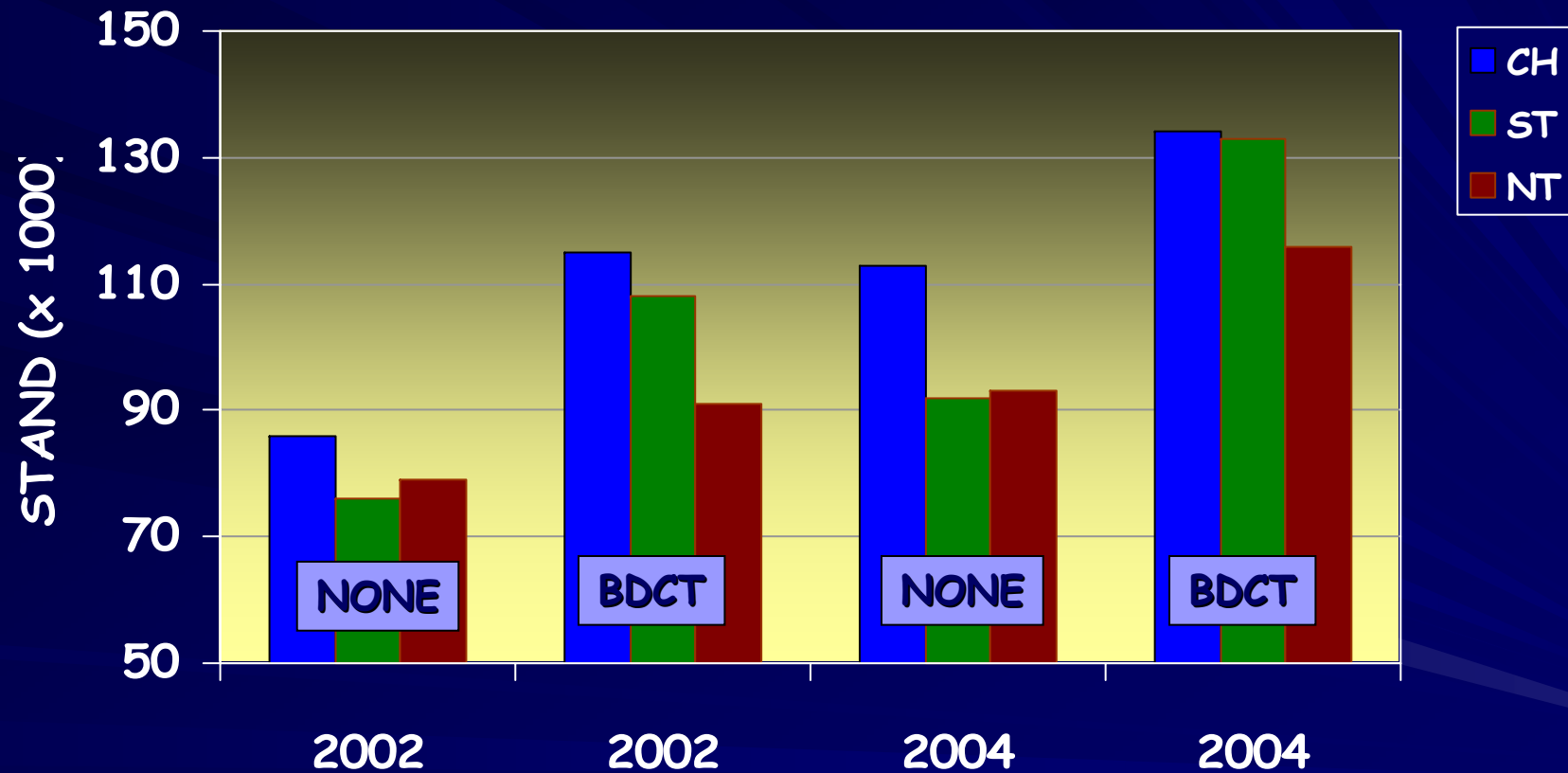
Main effect of tillage on soybean population, Arlington, Wis.



Main effect of fertilizer placement on soybean population, Arlington, Wis.

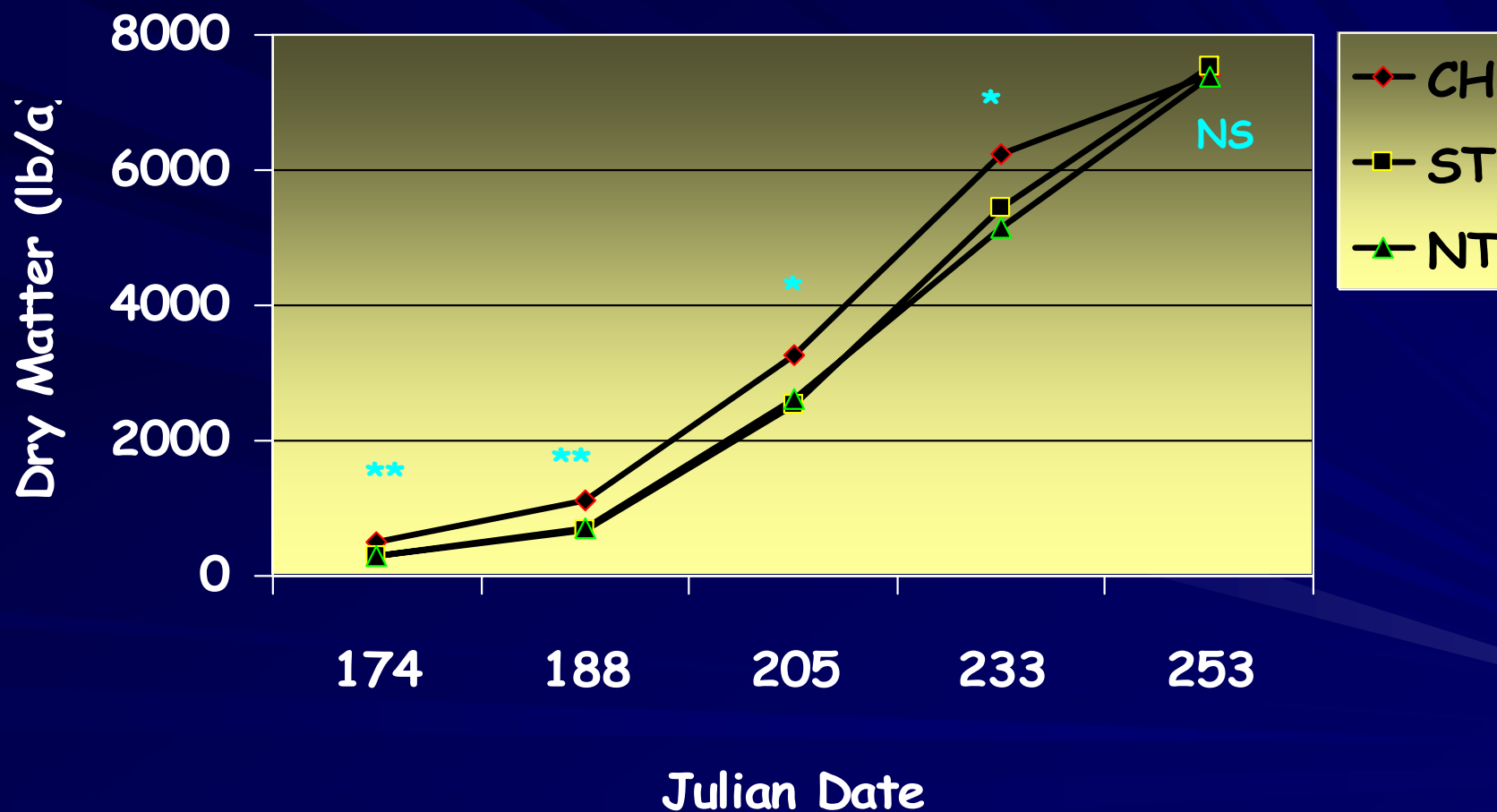


Effect of tillage and fertilizer placement on soil test K, Arlington, Wis.

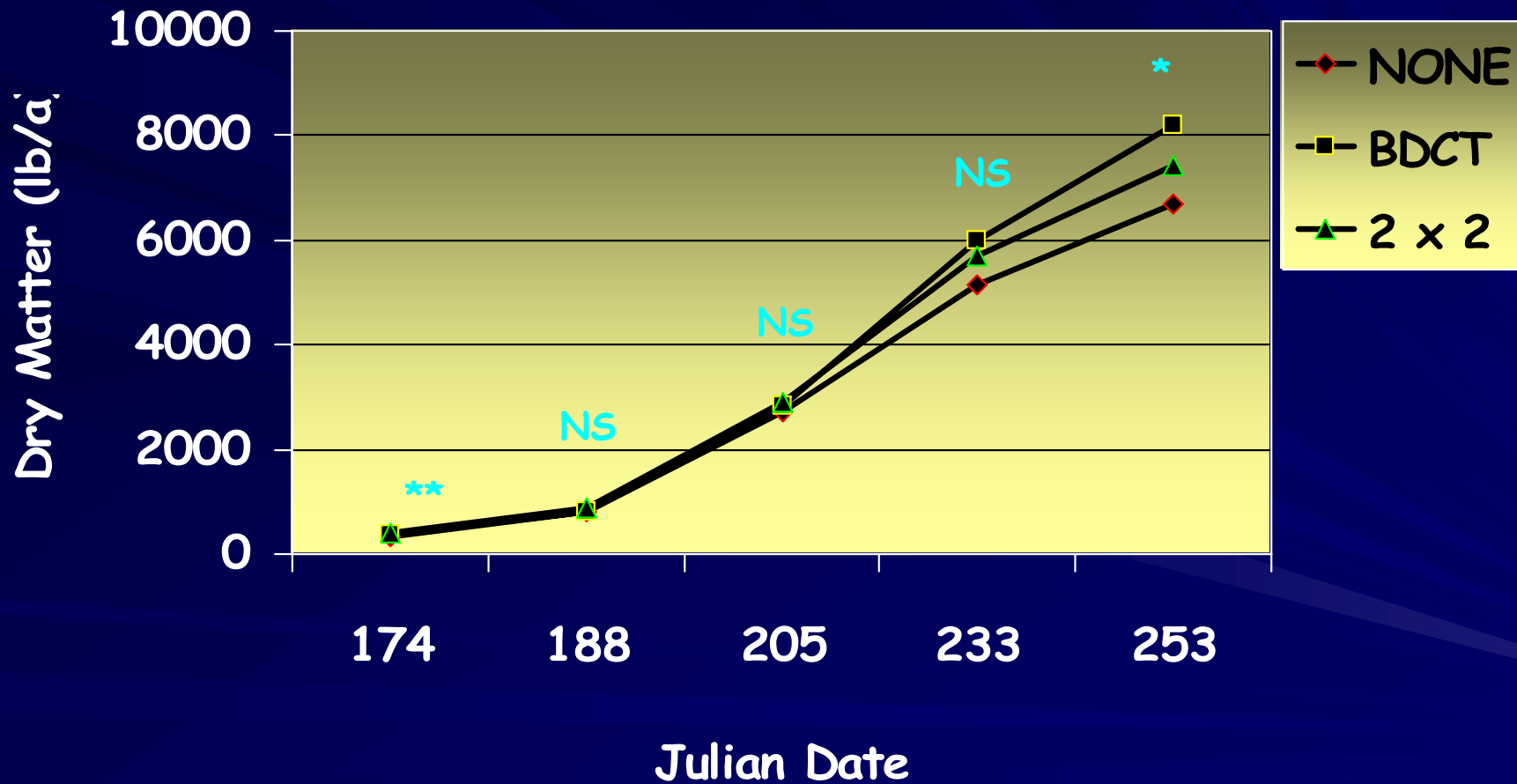


BDCT = 18+46+60/YR

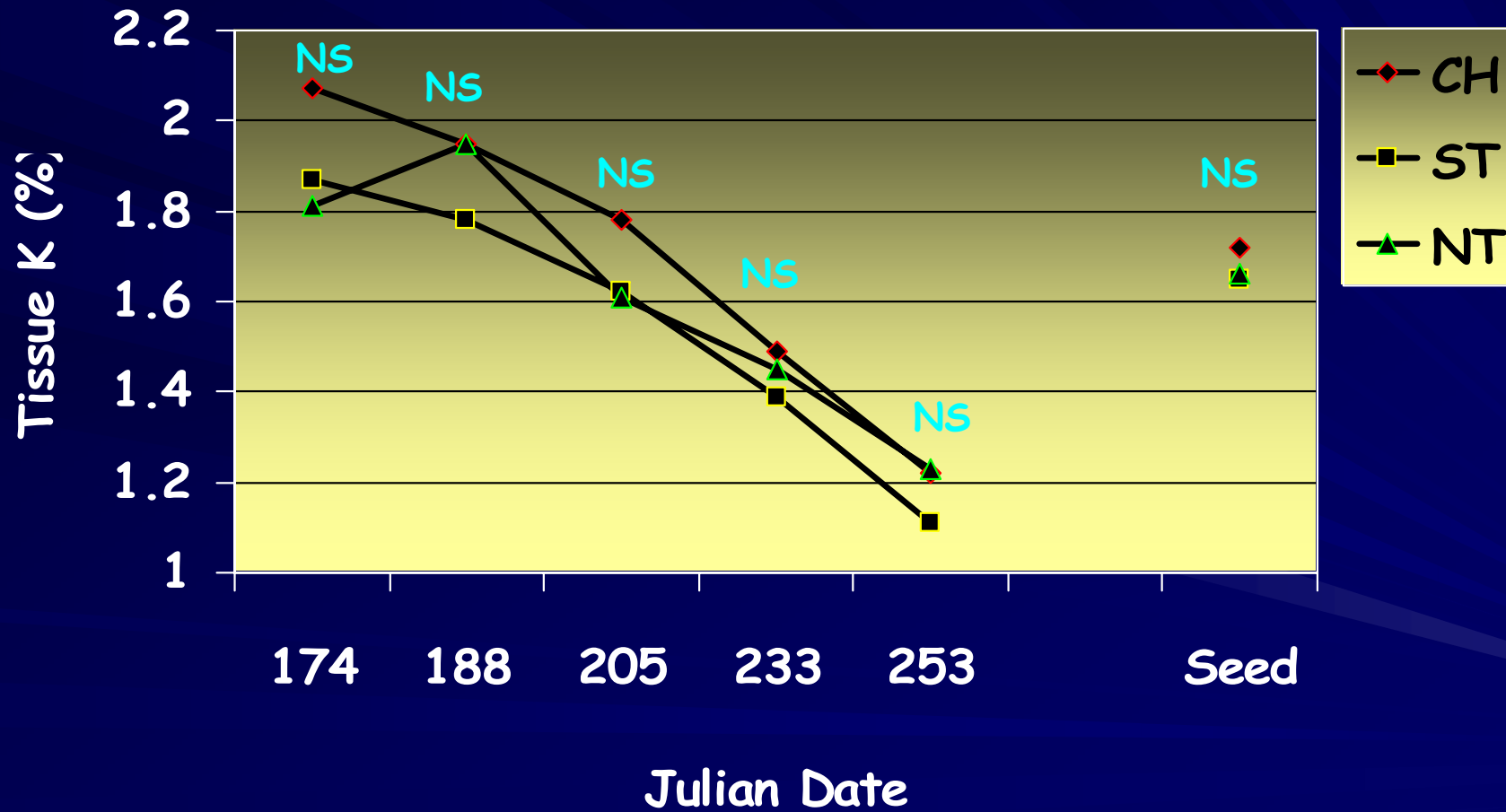
Main effect of tillage on the dry matter accumulation of soybean, Arlington, Wis., 2003



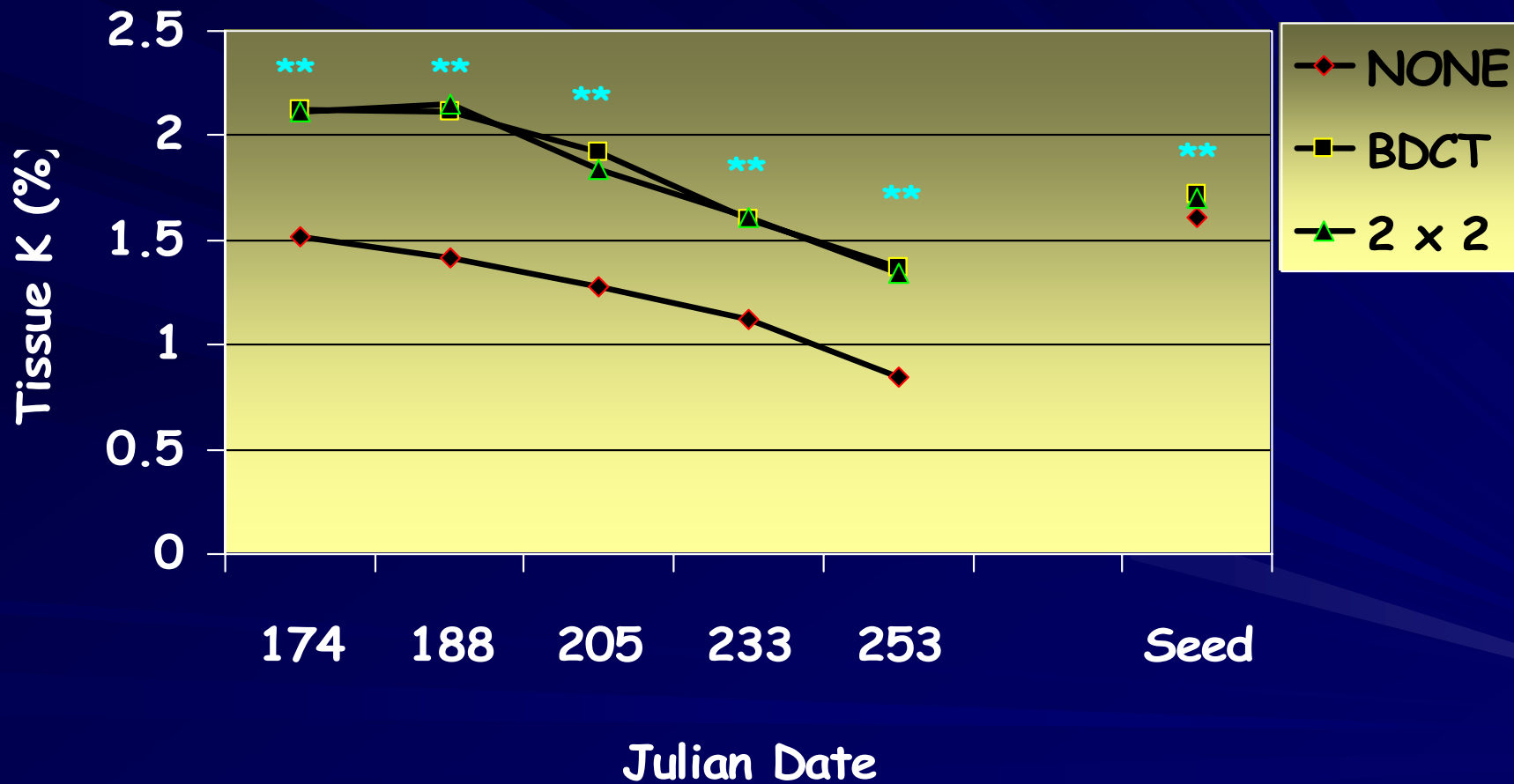
Main effect of fertilizer placement on the dry matter accumulation of soybean, Arlington, Wis., 2003



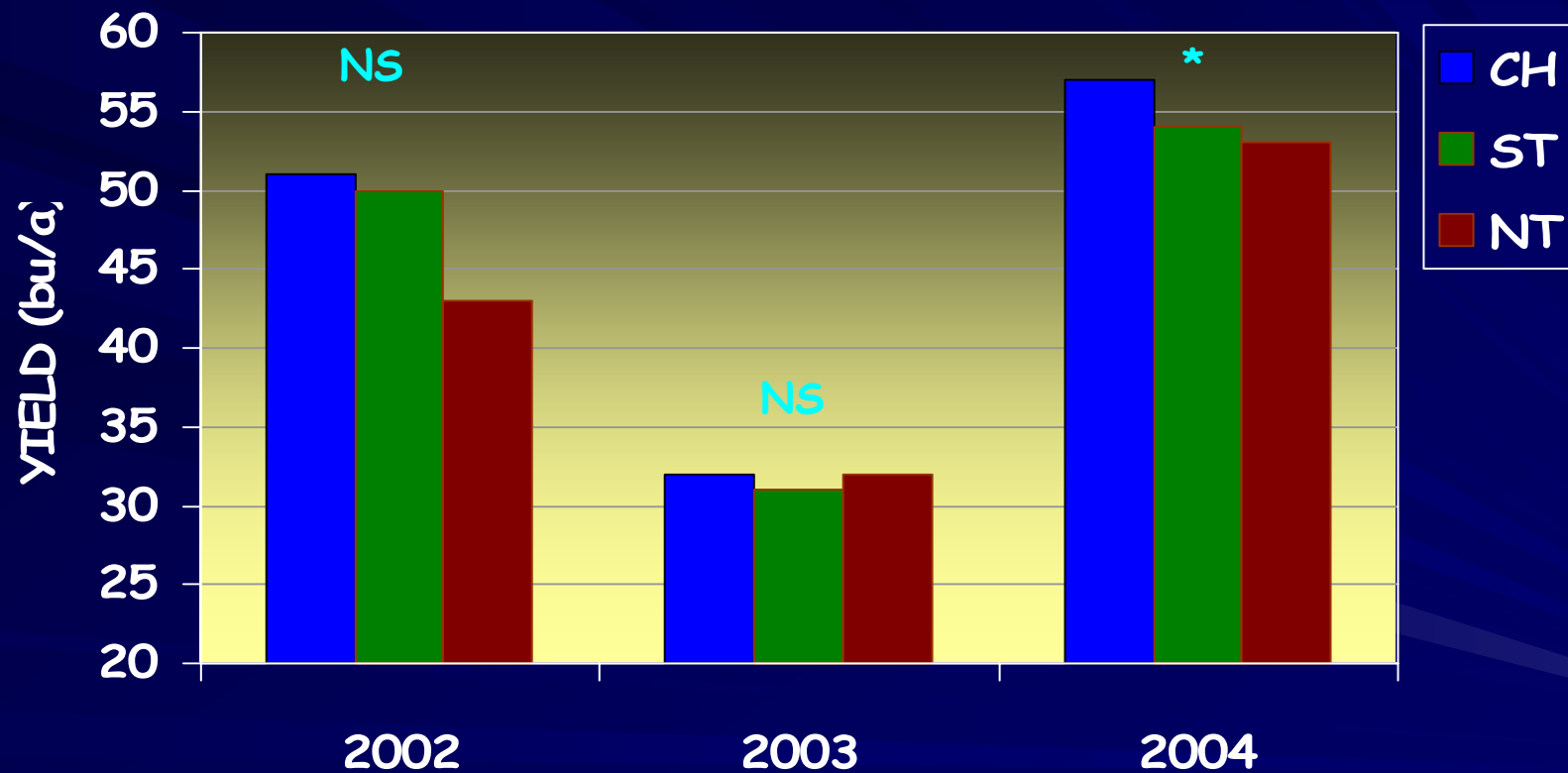
Main effect of tillage on the K concentration of soybean, Arlington, Wis., 2003



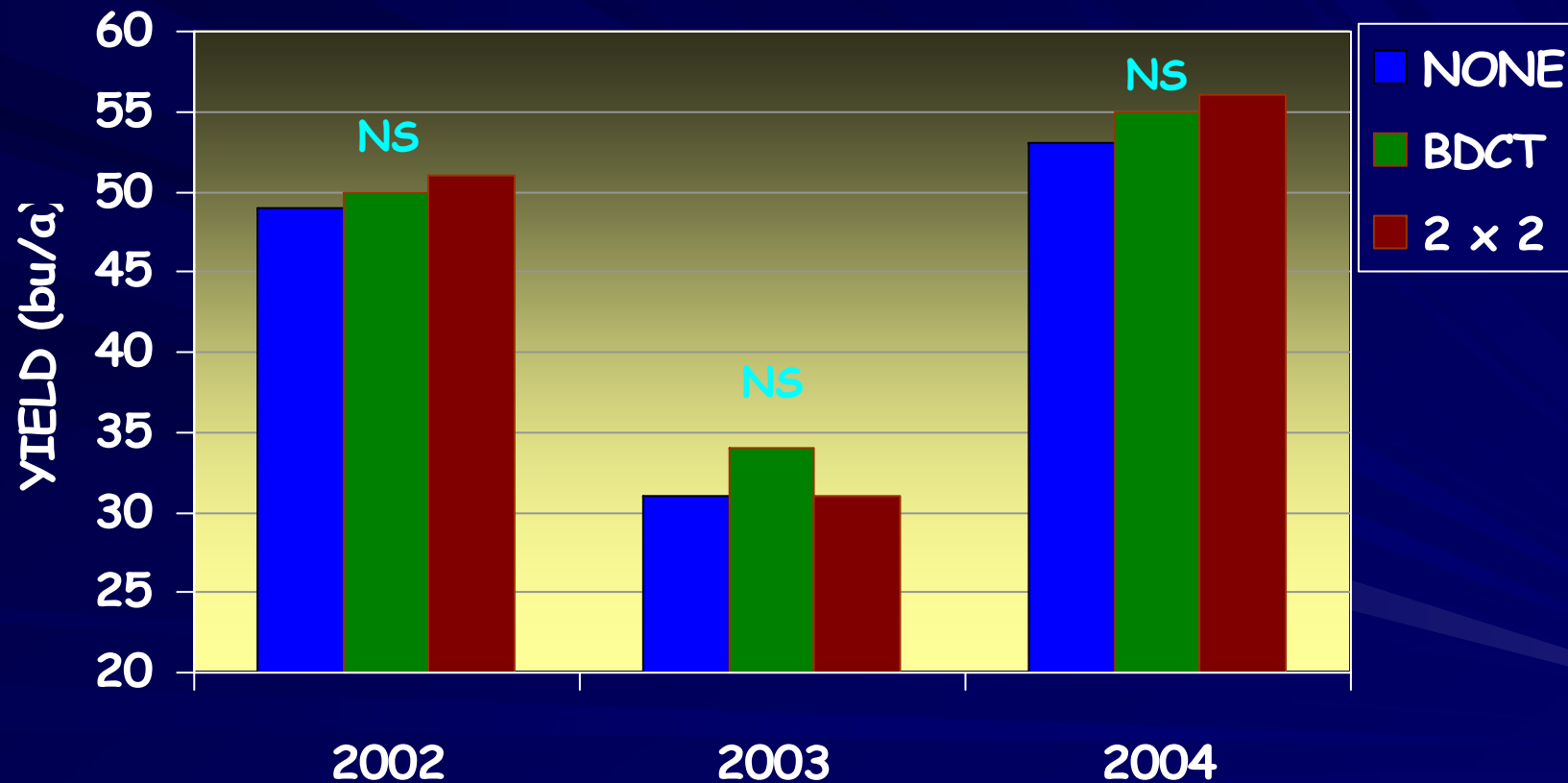
Main effect of fertilizer placement on the K concentration of soybean, Arlington, Wis., 2003



Main effect of tillage on soybean yield, Arlington, Wis.



Main effect of fertilizer placement on soybean yield, Arlington, Wis.



Summary

- Soybean has the ability to extract K more effectively at low soil test
- Sensitivity to fertilizer application even when fall applied
- Slower growth in high residue, but similar by the end of the season
- Tillage did not affect tissue K
- Fertilization substantially increased vegetative K concentration, but seed similar
- Tillage had a minimal effect on yield
- Slight benefit to annual (recommended) fertilization, with no difference between broadcast and 2 x 2