Dark Tobacco Response to Potassium Rate and Application Timing

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Potassium in Tobacco

- Tobacco known to be a luxury consumer of K^+
- Total K^+ uptake is highest of all mineral elements
- Application rates often 2-3 times what is needed for maximum yield
- K^+ involved in leaf color, texture, combustion, and water holding properties

UK Potassium Recommendations for Tobacco

AGR-1: UK Lime and Nutrient Recommendations

- Based on potassium levels in soil sample
- Based on crop removal from harvested portion of plant
  - Burley: 7.5 lbs K_2O/100 lbs leaf yield
  - Dark: 6.0 lbs K_2O/100 lbs leaf yield

Burley		Dark	
Soil Test K	K_2O Needed (lbs/A)	Soil Test K	K_2O Needed (lbs/A)
Very High (>450)	0	Very High (>450)	0
High (450-304)	30-190	High (450-296)	30-100
Medium (303-206)	200-290	Medium (295-206)	110-190
Low (205-96)	300-390	Low (205-96)	200-290
Very Low (<96)	400	Very Low (<96)	300

UK Potassium Recommendations for Tobacco

- No potassium recommended in approximately 30% of Kentucky tobacco fields sampled
- When soil test potassium is below 225, broadcast is more effective than banding.
- If banding is used to apply potassium after transplanting, the recommended rate can be reduced by 30%.
- Most previous potassium research was done with burley and needs to be evaluated more in dark tobacco

Objective

- Determine dark tobacco response to applied potassium in low K soils
  - Take soil test recommendation for site and evaluate response to K_2O rates above and below recommendation
  - Compare broadcast applications made before transplanting to banded applications made after transplanting

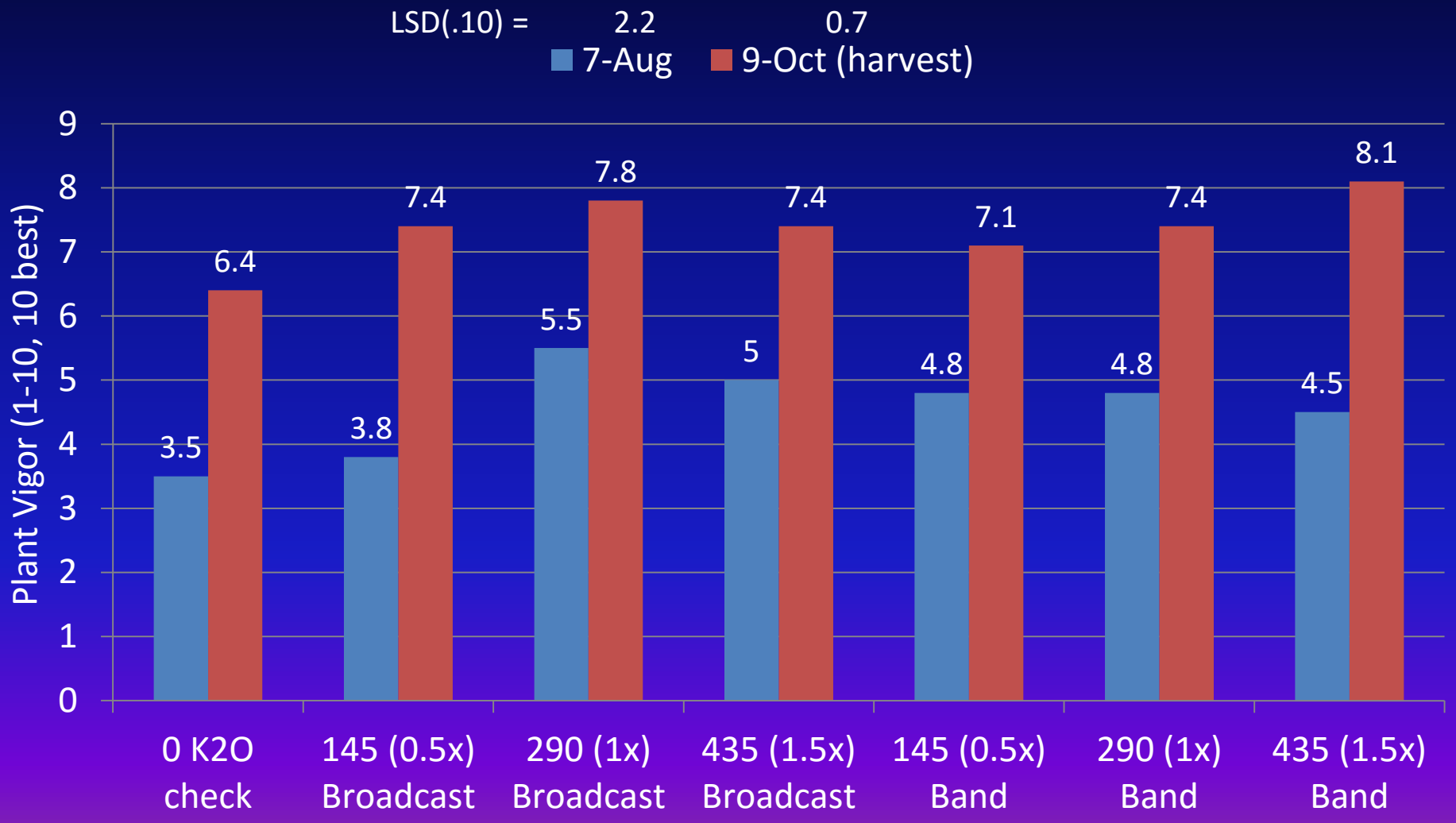
Dark Tobacco Response to Potassium
MSU West Farm - 2012

- Grenada silt loam soil (mod. well drained)
- Soil Test K index = 102 (low)
- 290 lbs K_2O/A recommended
- Trial was randomized complete block with 4 replications.
  - Plots 4 rows, 40 ft. long.
- Extreme drought, plots drip irrigated
- Tobacco harvested October 9
- Fire-cured

Treatment	Lbs K_2O/A (% of UK Rec.)	Application Method
1	0	-
2	145 (50%)	Broadcast
3	290 (100%)	Broadcast
4	435 (150%)	Broadcast
5	145 (50%)	Band
6	290 (100%)	Band
7	435 (150%)	Band

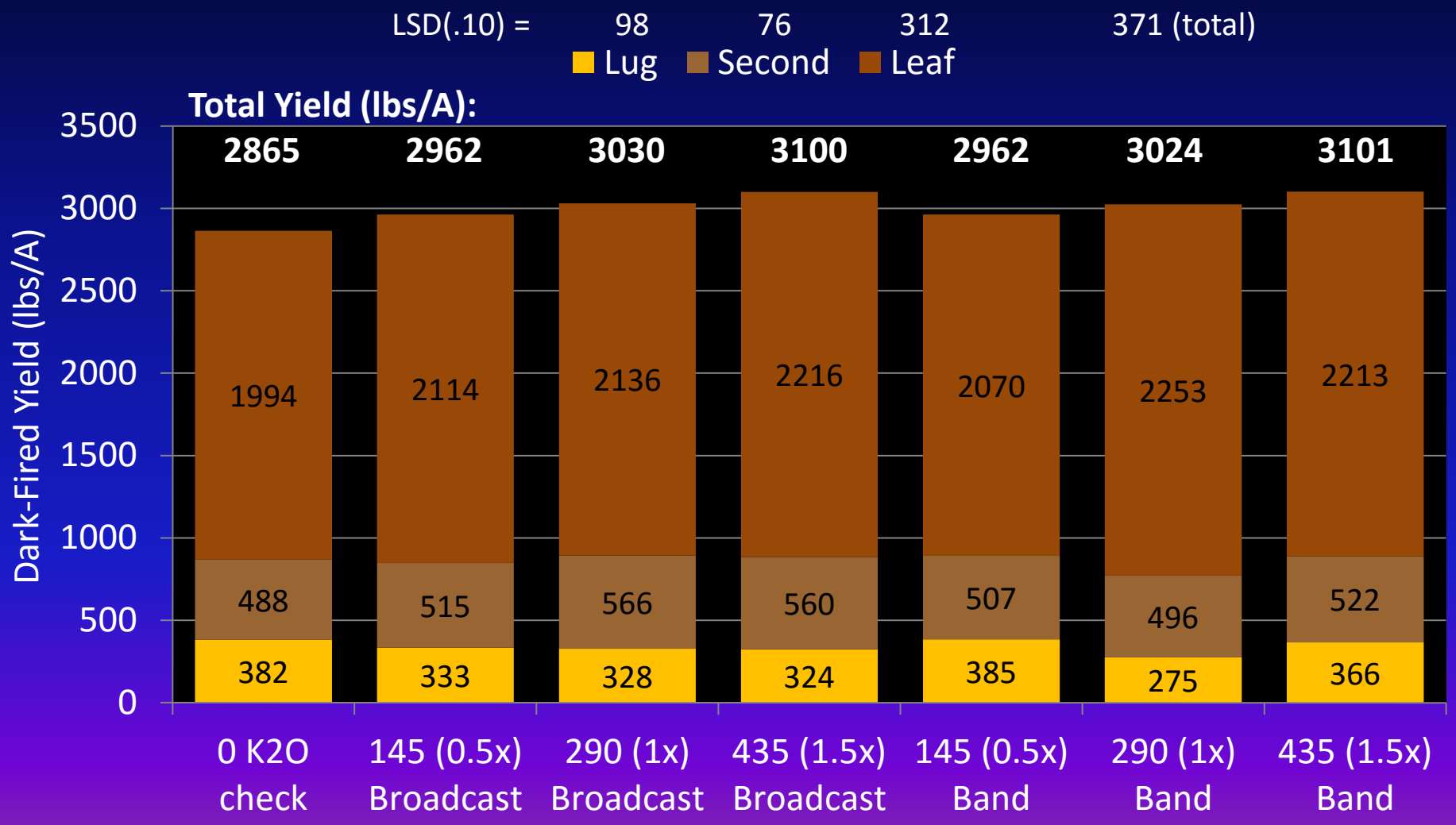
*Broadcast applications made June 8 and incorporated with Roterra.
*PD7309 set June 12-13 on 41" rows and 32" plant spacing (4781 plants/A)
*Banded applications applied to both sides of each row on June 18 and cultivated in.

Dark Tobacco Response to Potassium
MSU West Farm – 2012 – Late Season Plant Vigor



Dark Tobacco Response to Potassium

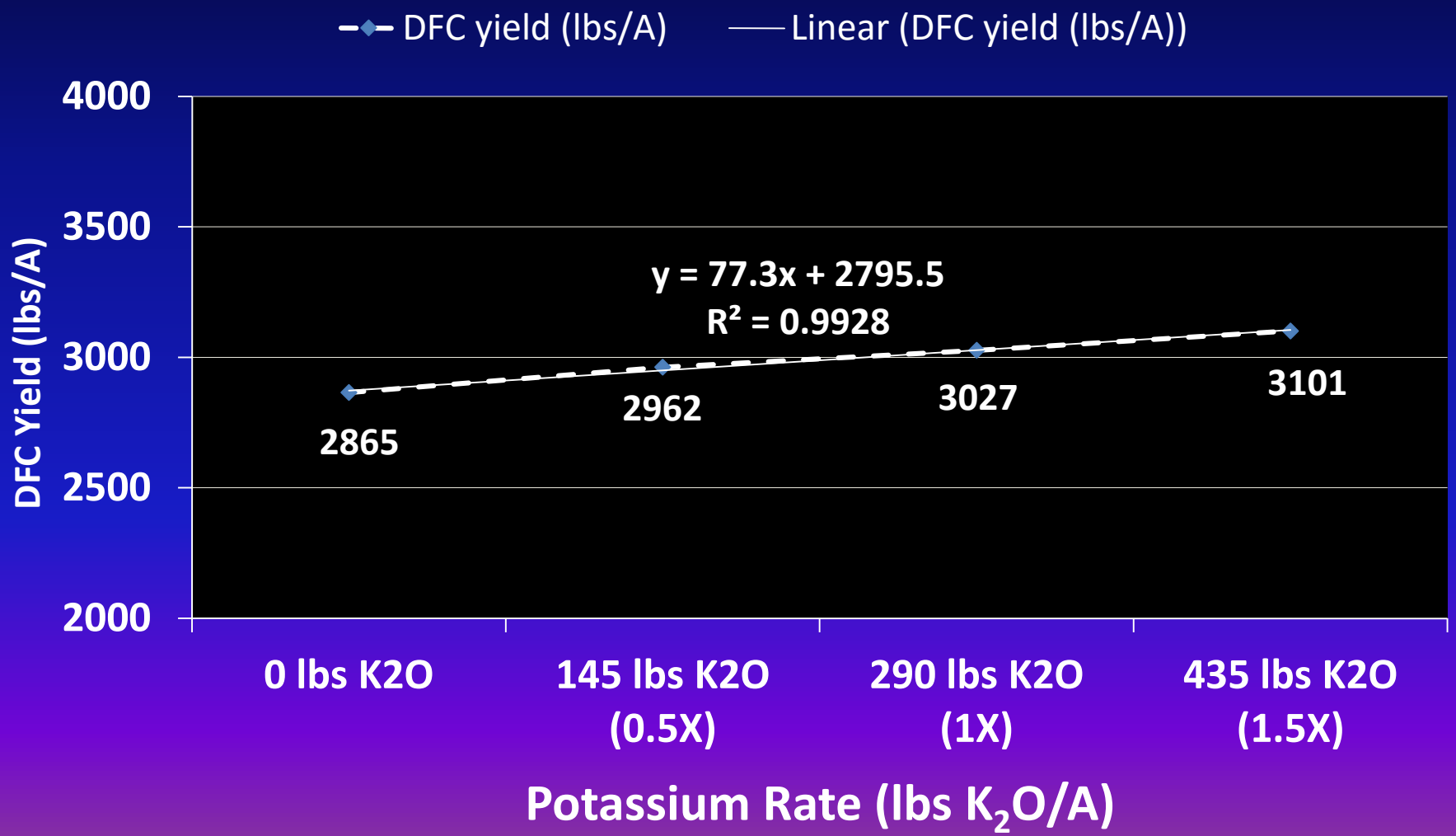
MSU West Farm – 2012 – Dark Fired Yield



Dark-Fired Tobacco Response to Potassium Rate

2012 - MSU West Farm – Murray KY

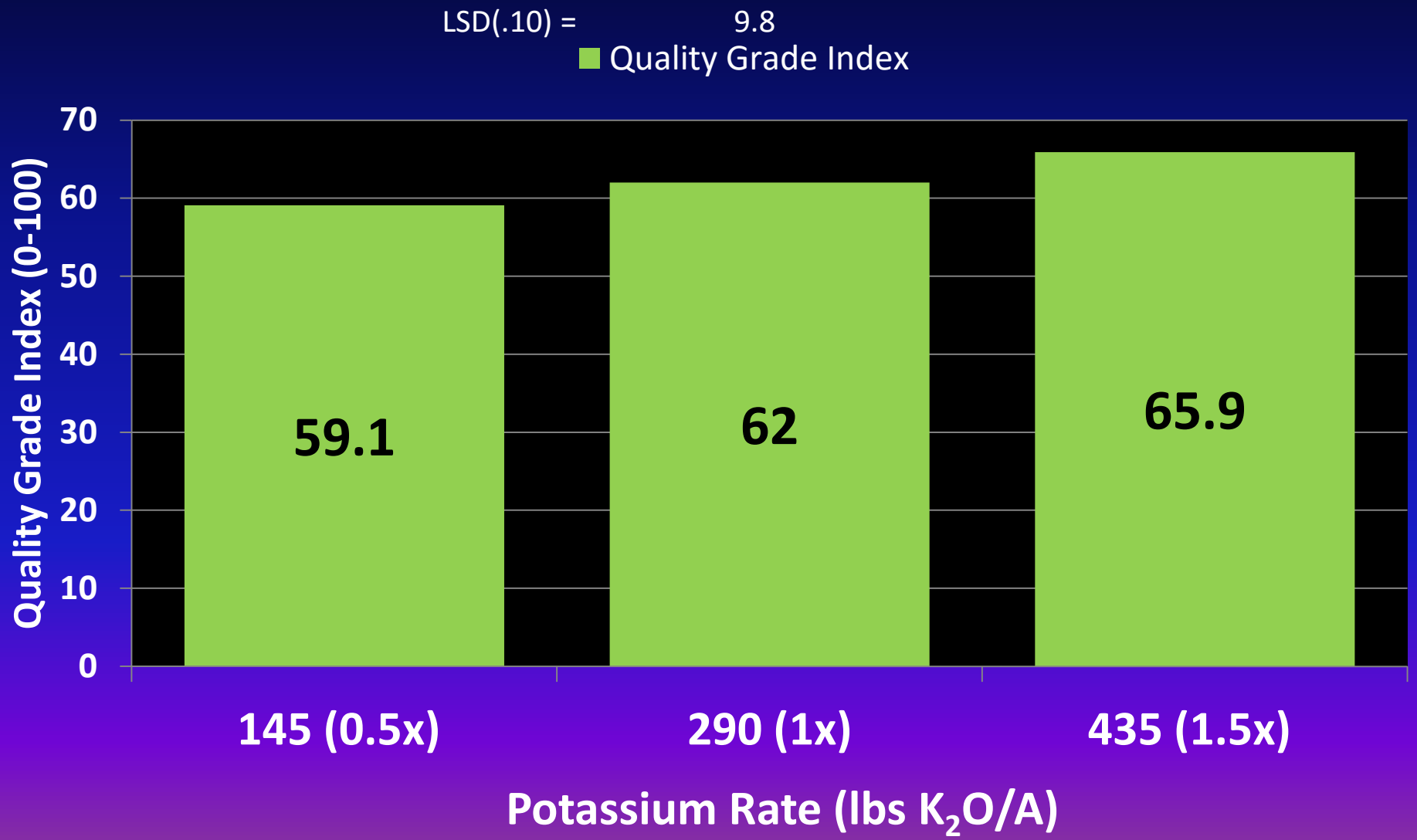
Main Effect of Potassium Rate (averaged over timing)



Dark Tobacco Response to Potassium Rate

MSU West Farm – 2012 – Dark Fired Quality Grade Index

Main Effect of Potassium Rate (averaged over timing)



Dark Tobacco Response to Potassium
MSU West Farm - 2013

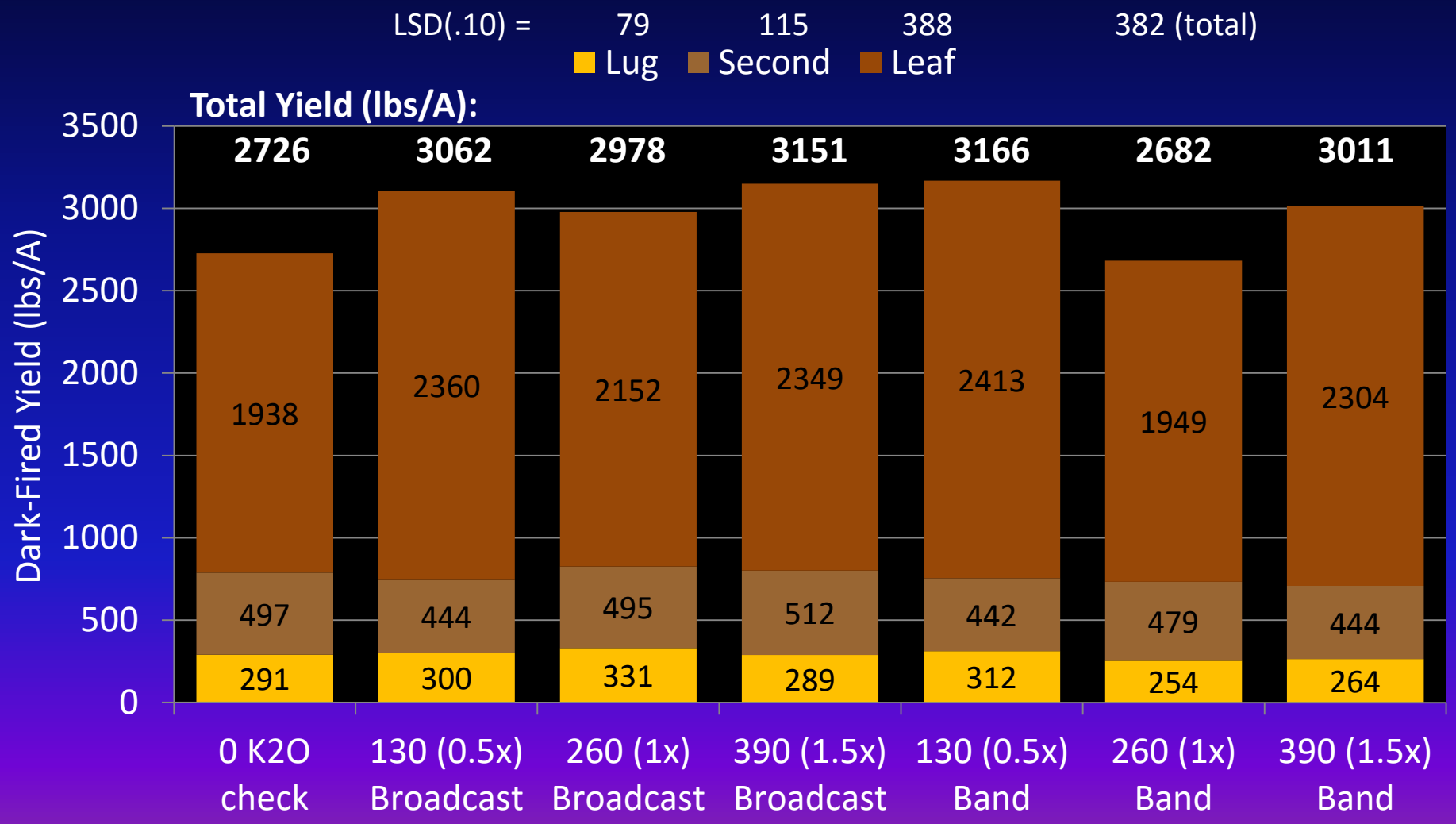
- Soil Test K index = 136 (low)
- 260 lbs K_2O/A recommended
- Wet season, no irrigation needed
- Tobacco harvested October 4
- Fire-cured

Treatment	Lbs K_2O/A	Application Method
1	0	-
2	130 (50%)	Broadcast
3	260 (100%)	Broadcast
4	390 (150%)	Broadcast
5	130 (50%)	Band
6	260 (100%)	Band
7	390 (150%)	Band

*Broadcast applications made June 19 and incorporated with Roterra.
*PD7309 set June 20 on 40” rows and 32” plant spacing (4900 plants/A)
*Banded applications applied to both sides of each row on June 28 and cultivated in.

Dark Tobacco Response to Potassium

MSU West Farm – 2013 – Dark Fired Yield



Dark Tobacco Response to Potassium

2014 – MSU West Farm, Murray KY

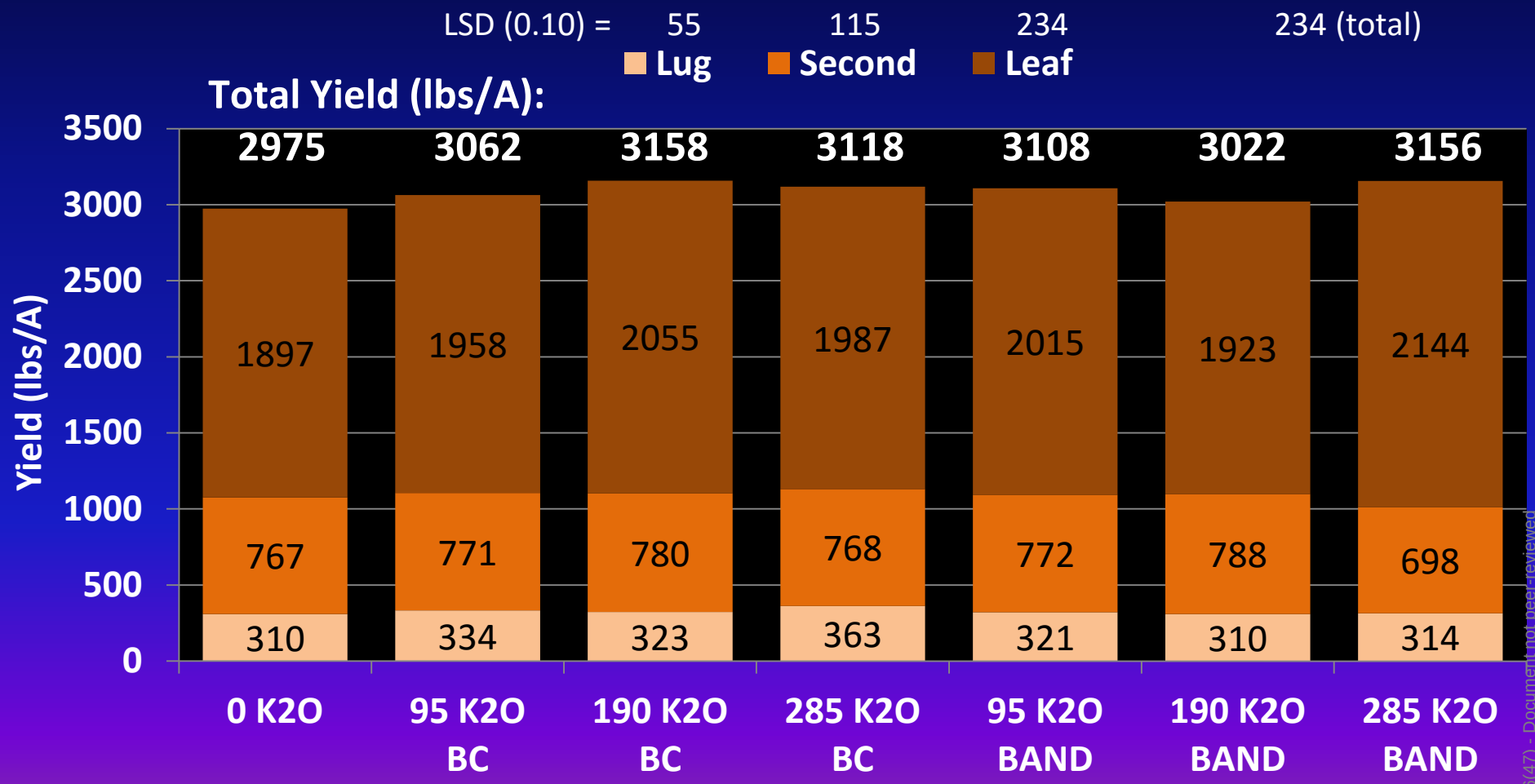
- Soil sample taken March 2014
- Soil test K = 212 (medium-low)
- 190 lbs K_2O/A recommended
- PD7309LC set June 19
  - 40” x 32” = 4900 plants/A
- Plots 4-rows, 40 ft. long
- 4 replications
- Broadcast applications made prior to transplanting on June 18
- Band applications made after transplanting on June 27
  - 2 bands per row, 6-8” from row
- Tobacco harvested late September
- Fire-cured

Trt	K_2O timing	K_2O rate (lbs/A)
1 untreated (no K_2O)	0	0
2	Broadcast	95
3	Broadcast	190
4	Broadcast	285
5	Band	95
6	Band	190
7	Band	285

N and P_2O_5 applied to all plots according to soil test:
275 lbs N/A (150 urea pretransplant,
125 UAN sidedress)
100 lbs P_2O_5 pretransplant

Dark Tobacco Response to Potassium

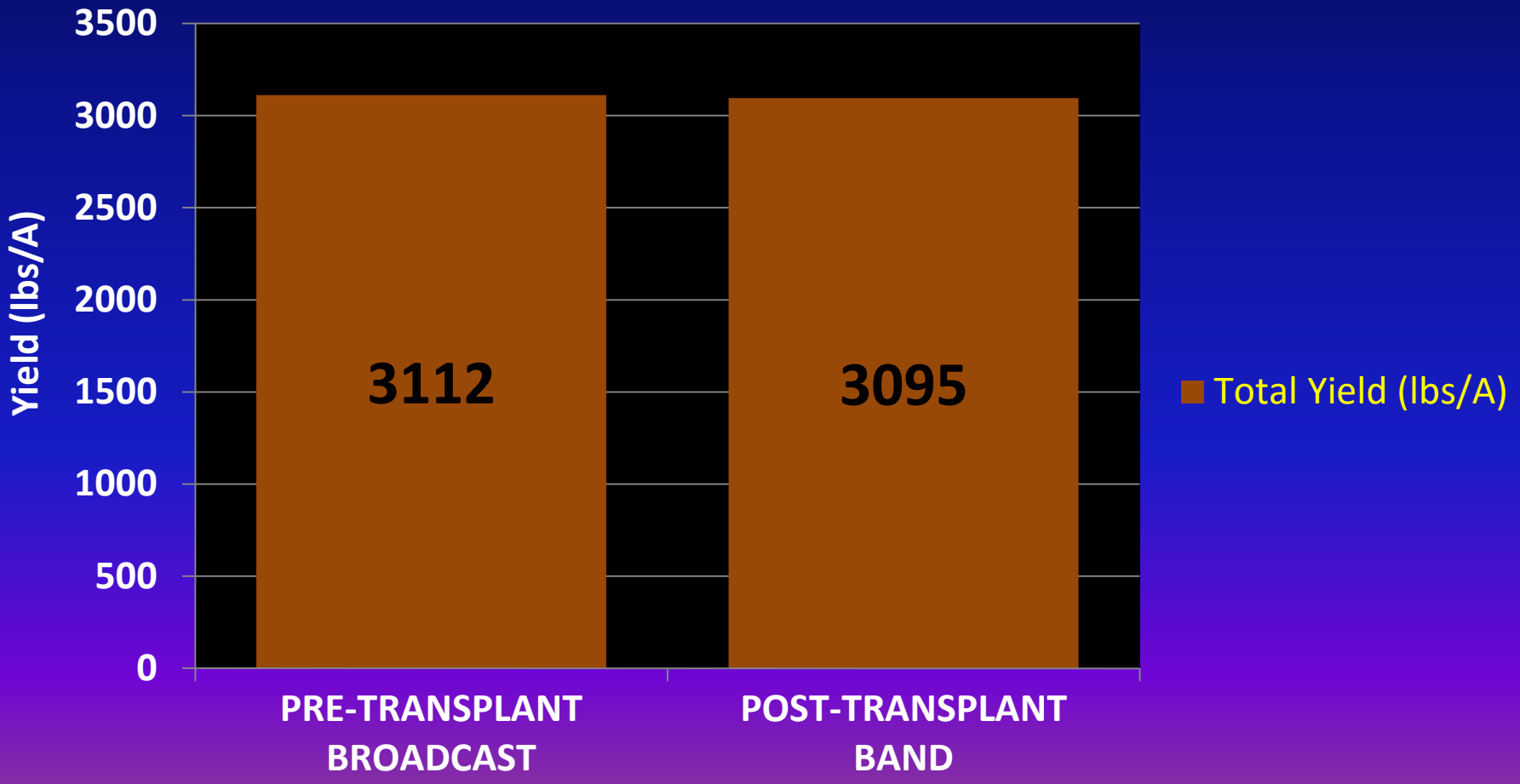
2014 – MSU West Farm, Murray KY - Yield



Dark Tobacco Response to Potassium

2014 – MSU West Farm, Murray KY

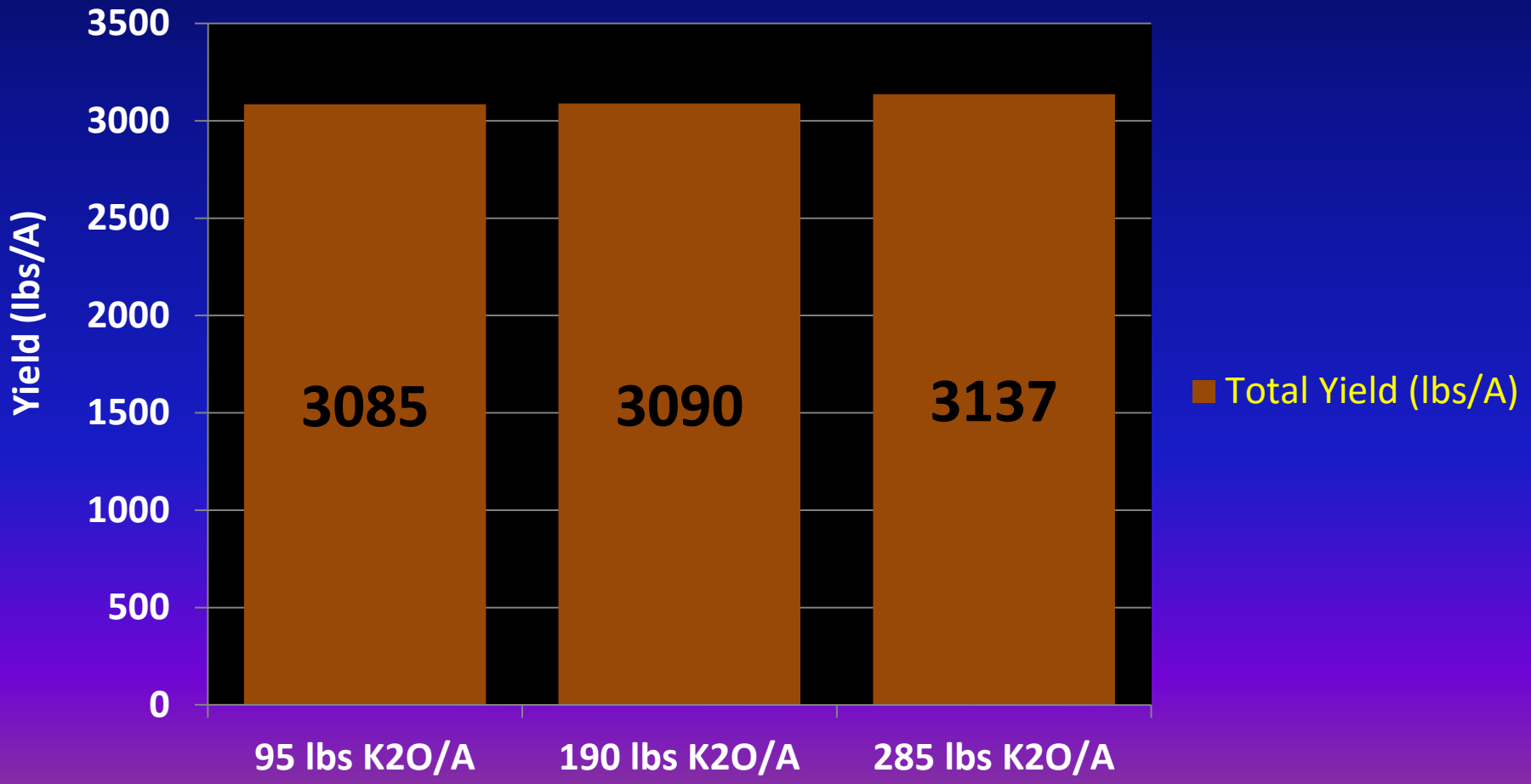
Main Effect of K application timing on total yield (averaged over K rate)



Dark Tobacco Response to Potassium

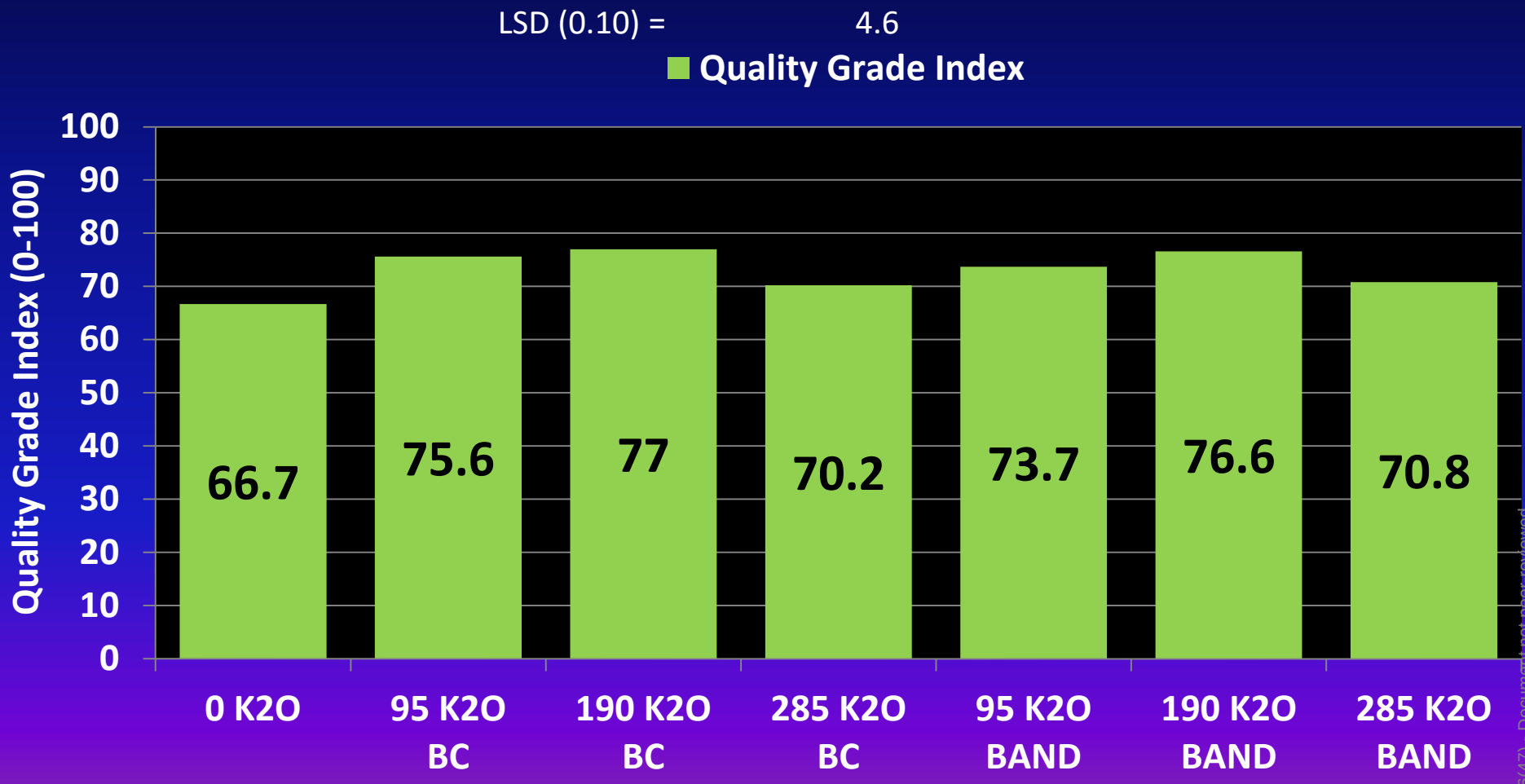
2014 – MSU West Farm, Murray KY

Main Effect of K application rate on total yield (averaged over K timing)



Dark Tobacco Response to Potassium

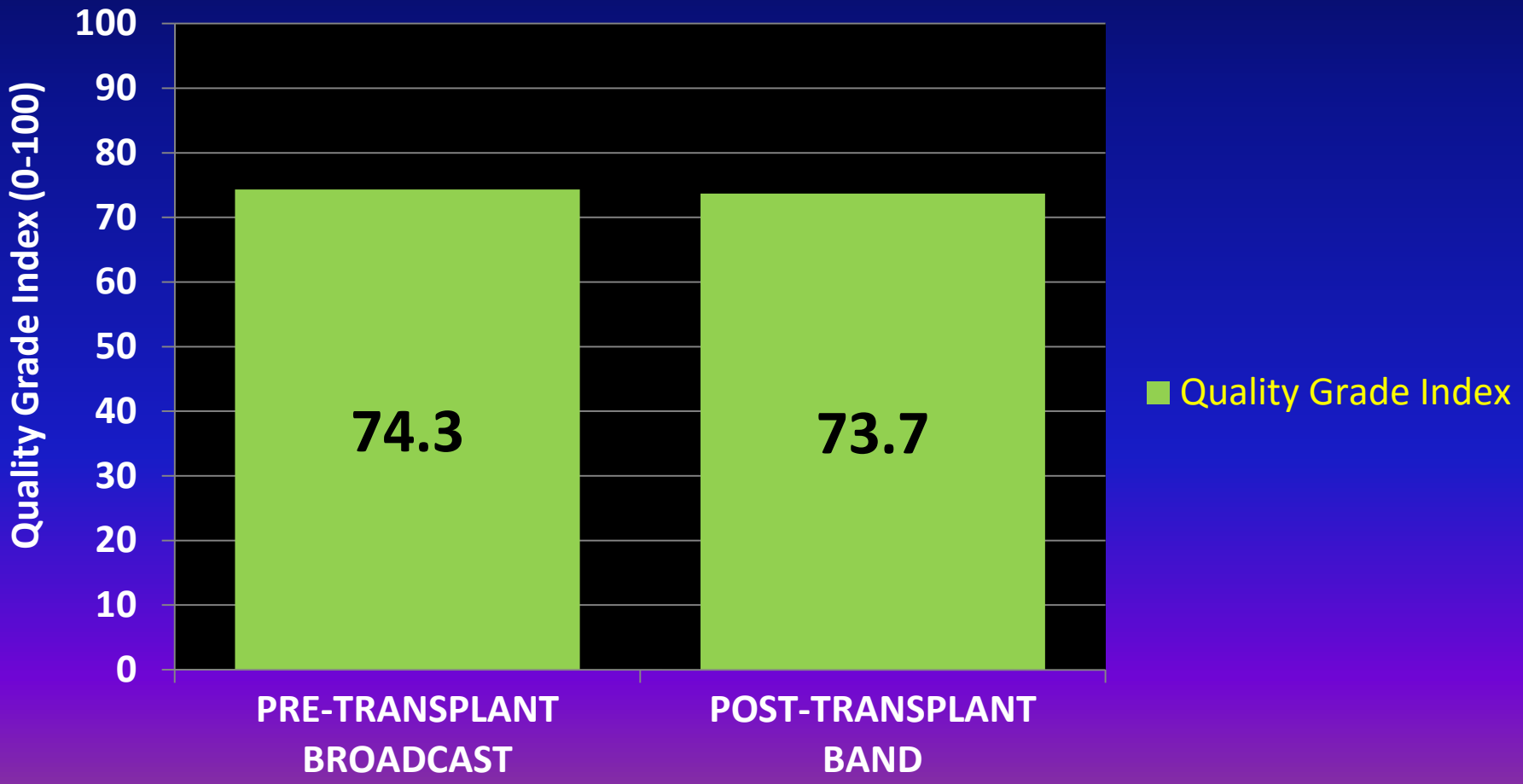
2014 – MSU West Farm, Murray KY – Quality Grade Index



Dark Tobacco Response to Potassium

2014 – MSU West Farm, Murray KY

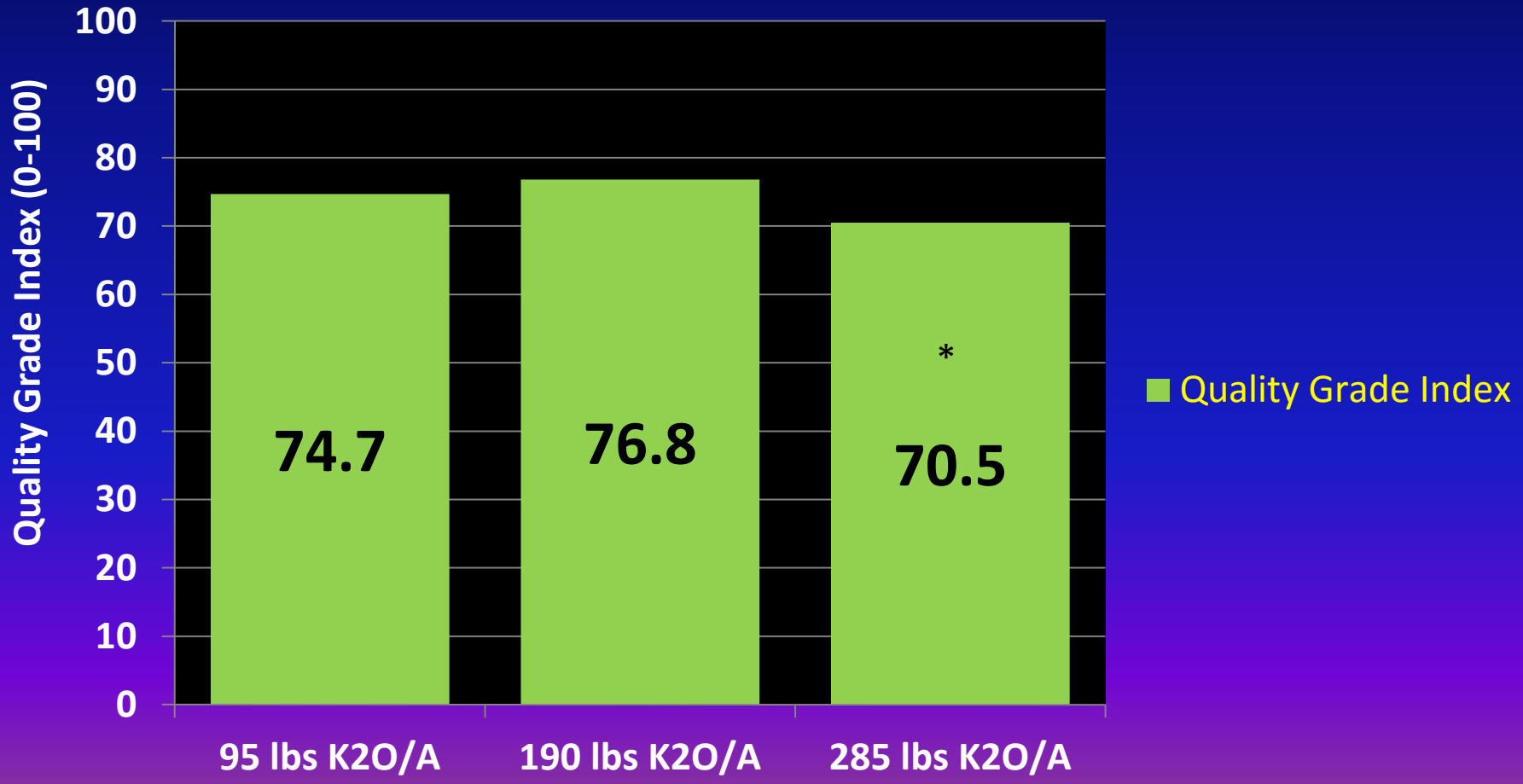
Main Effect of K application timing on quality (averaged over K rate)



Dark Tobacco Response to Potassium

2014 – MSU West Farm, Murray KY

Main Effect of K application rate on quality (averaged over K timing)

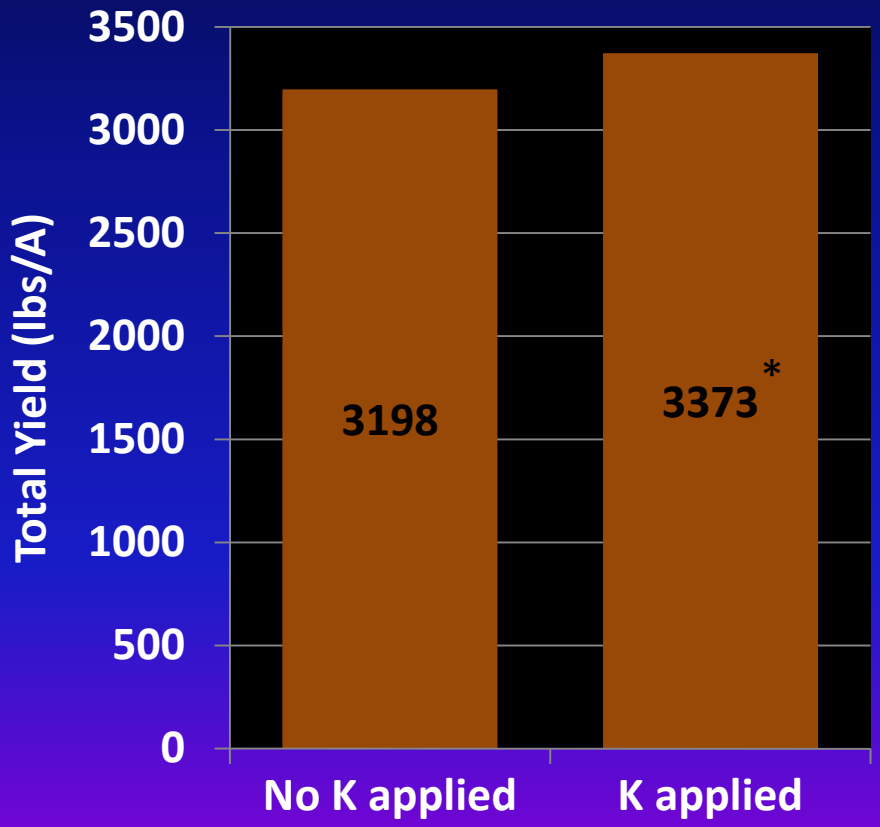


Dark Tobacco Response to Potassium

O Potassium controls vs. all Potassium treatments

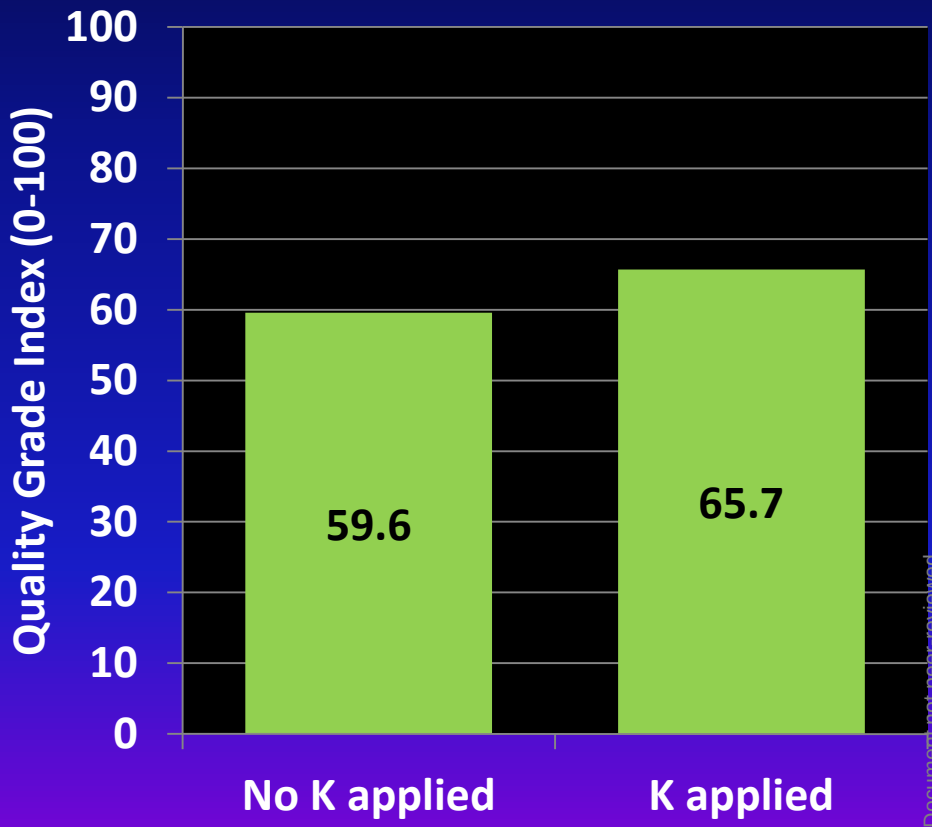
2012-2014

Total Yield Benefit of K



*Average yield benefit of applying K when soil test K is between 102 and 212 = 175 lbs/A

Quality Grade Index Benefit of K



Average 6.1 point increase in grade index

Summary

Year	Soil Type	Soil Test K	lbs K_2O/A recommend	Rainfall* (April-Sept)	Crop Response
2012	Moderately well drained Grenada	102 (Low)	290	Dry (17.98”)	Small
2013	Moderately well drained Grenada	136 (Low)	260	Very Wet (38.58”)	None
2014	Moderately well drained Grenada	212 (Med-Low)	190	Wet (29.25”)	None

*Historical average rainfall from April to September is approximately 23.75 inches.

Summary

- Grenada soil at Murray classified as moderately well-drained
  - More prone to water damage to tobacco root systems in wet years
  - Likely increased variability in 2013
- Grenada soil series and other soils found in the Purchase area of west Kentucky contain more montmorillonite clay than in other areas of Kentucky
  - Can hold large amounts of exchangeable potassium that may be below 6-inch depth where soil samples are taken
- These data suggest there is no difference in dark tobacco response to broadcast or banded applications under these conditions and there are opportunities to reduce K_2O rates without reducing yield or quality of dark-fired tobacco.

Questions?