



Agronomic Decisions for High-Yield Corn

**Southern Research & Outreach Center Winter Crops Days
Arlington, Lake Crystal, Kasson, Waseca & Wykoff, MN
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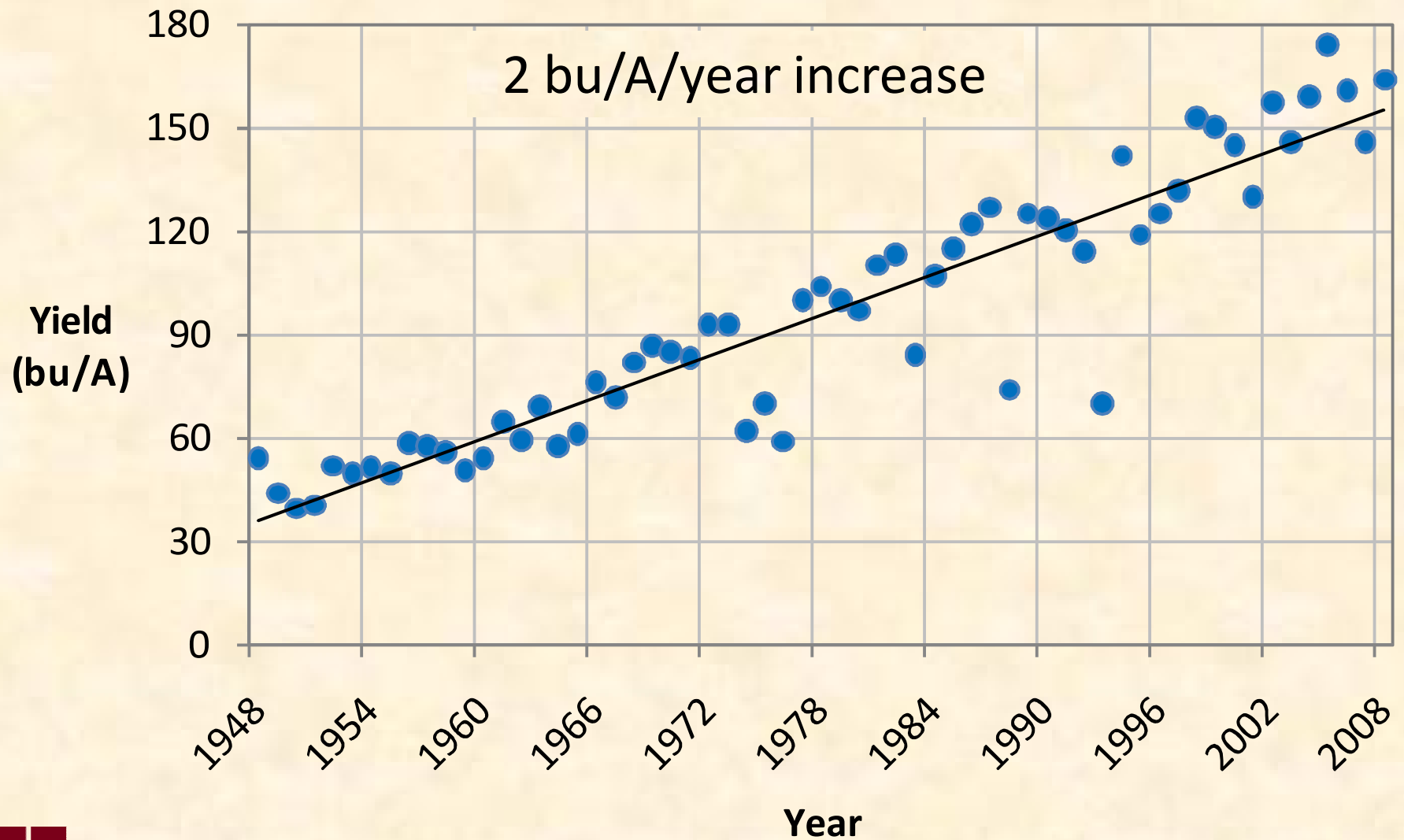
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Future Yield Improvement in Corn

- Corn has limited ability to take advantage of increased water & nutrients under sub-optimal plant populations.
- Future yield improvement will likely be related to greater stress tolerance.
 - = Increased yield with higher plant populations



Minnesota Average Corn Yield



Corn Yield is Limited by Agronomic Management & Growing Conditions

- Yields reported by Minnesota growers in NCGA yield contest:
 - 2009: 268 bu/acre (Sleepy Eye)
 - 2008: 272 bu/acre (St. Cloud - Irrigated)
 - Yields obtained with readily available hybrids



Components of Corn Yield

1) Kernels per acre

– Dependent upon...

- Plant population
- Ear size determination prior to tasseling
- Pollination & kernel abortion (moisture & temp.)

2) Kernel weight

– Dependent upon...

- Rate & duration of grain fill (moisture & temp.)



Components of Corn Yield

1) Kernels per acre

– Dependent upon...

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- Pollination & kernel abortion (moisture & temp.)

2) Kernel weight

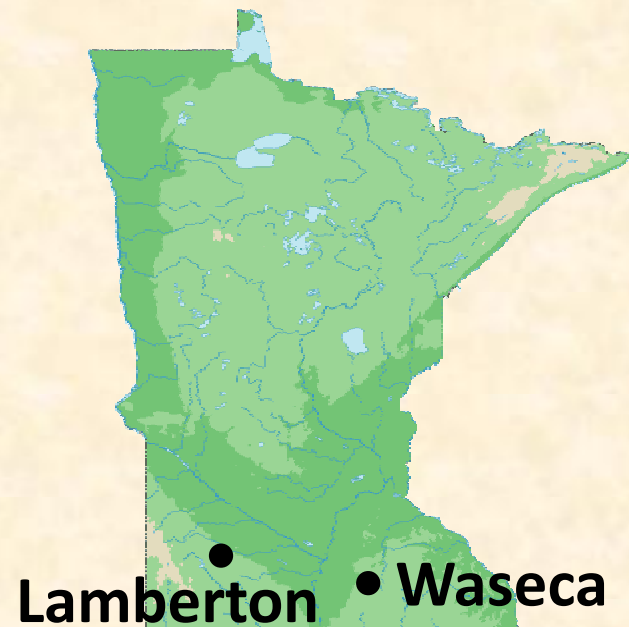
– Dependent upon...

- Rate & duration of grain fill (moisture & temp.)



“High-Yield” Corn Mgt. Study

- 2008 & 2009 - following soybean
- Nicollet-Clarion-Webster clay loam
- DKC52-59 (102-day RM)
- 3 planting dates:
 - Avg: April 30, May 14, & May 28
- 6 plant populations
- Fungicide vs. none at VT:
 - Headline - 6 oz/A
 - Only on 3 populations



Lamberton, 2009 - 32,500 plants/A



April 24 May 8 May 21

Planting Date



Lamberton, 2009 - 43,500 plants/A

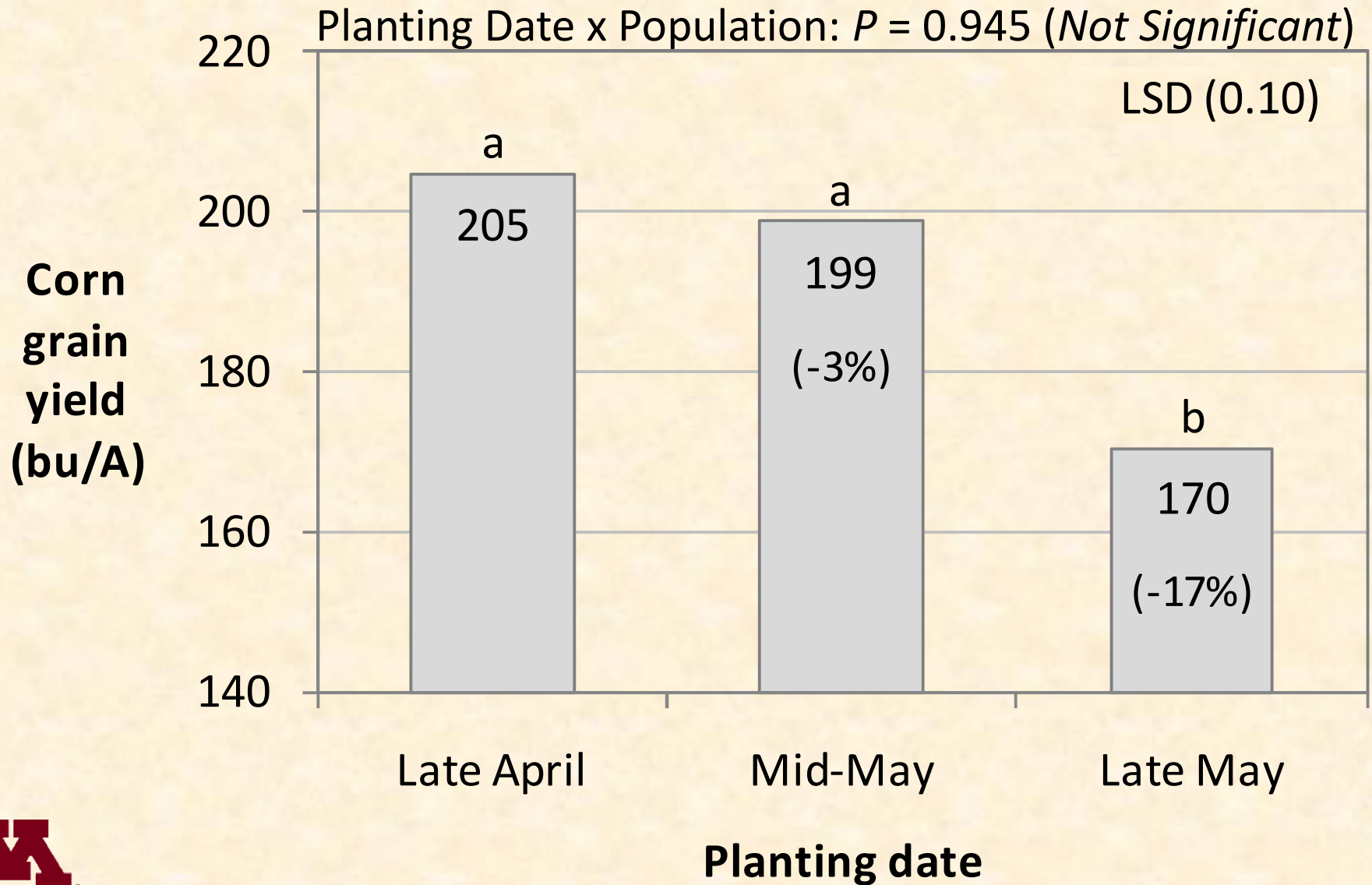


April 24 May 8 May 21

Planting Date



Lamberton & Waseca, 2008 & 2009 (Averaged Over 6 Populations)



Lamberton, 2009 – planted April 24



16

21.5

27

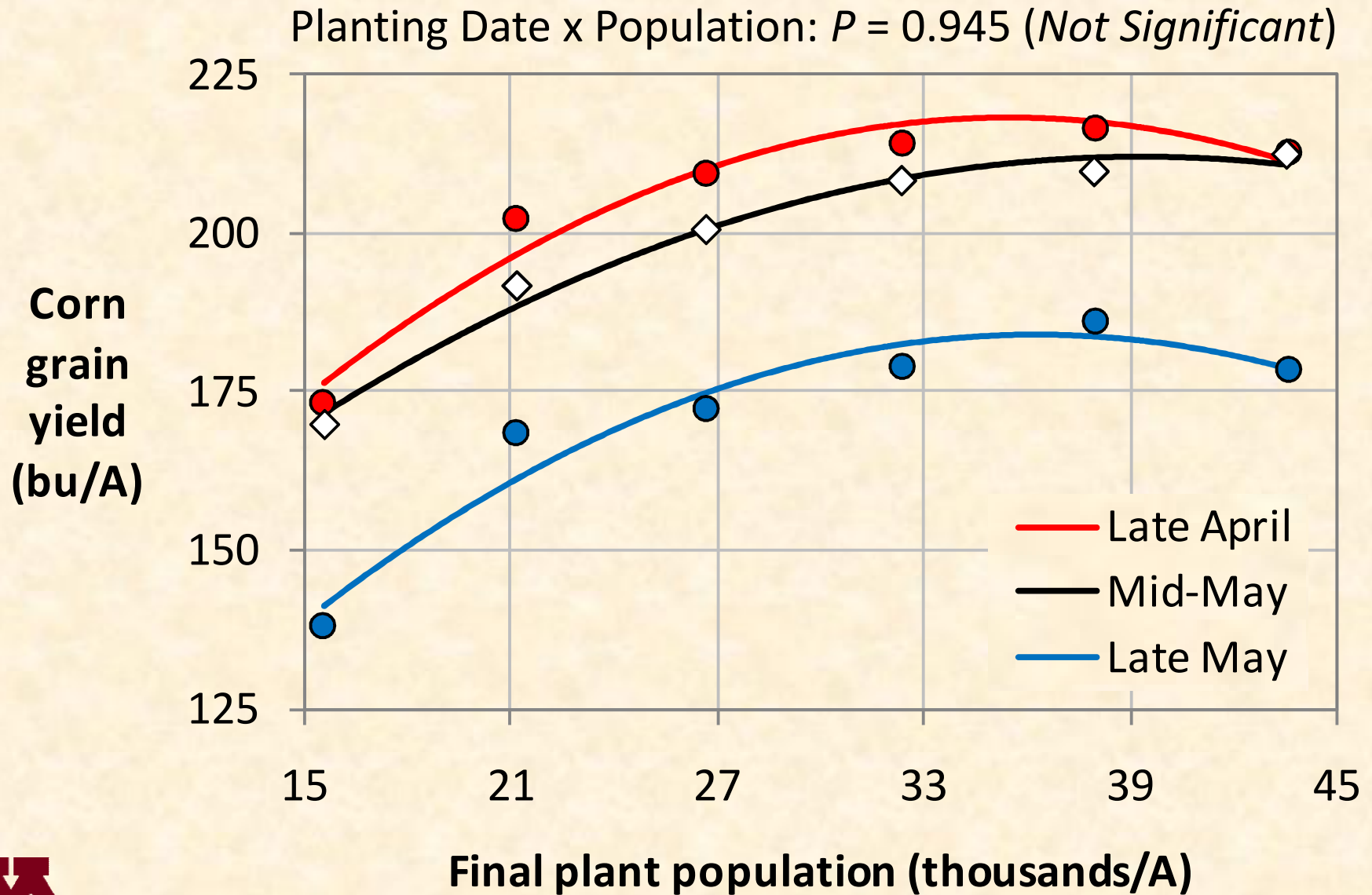
32.5

38

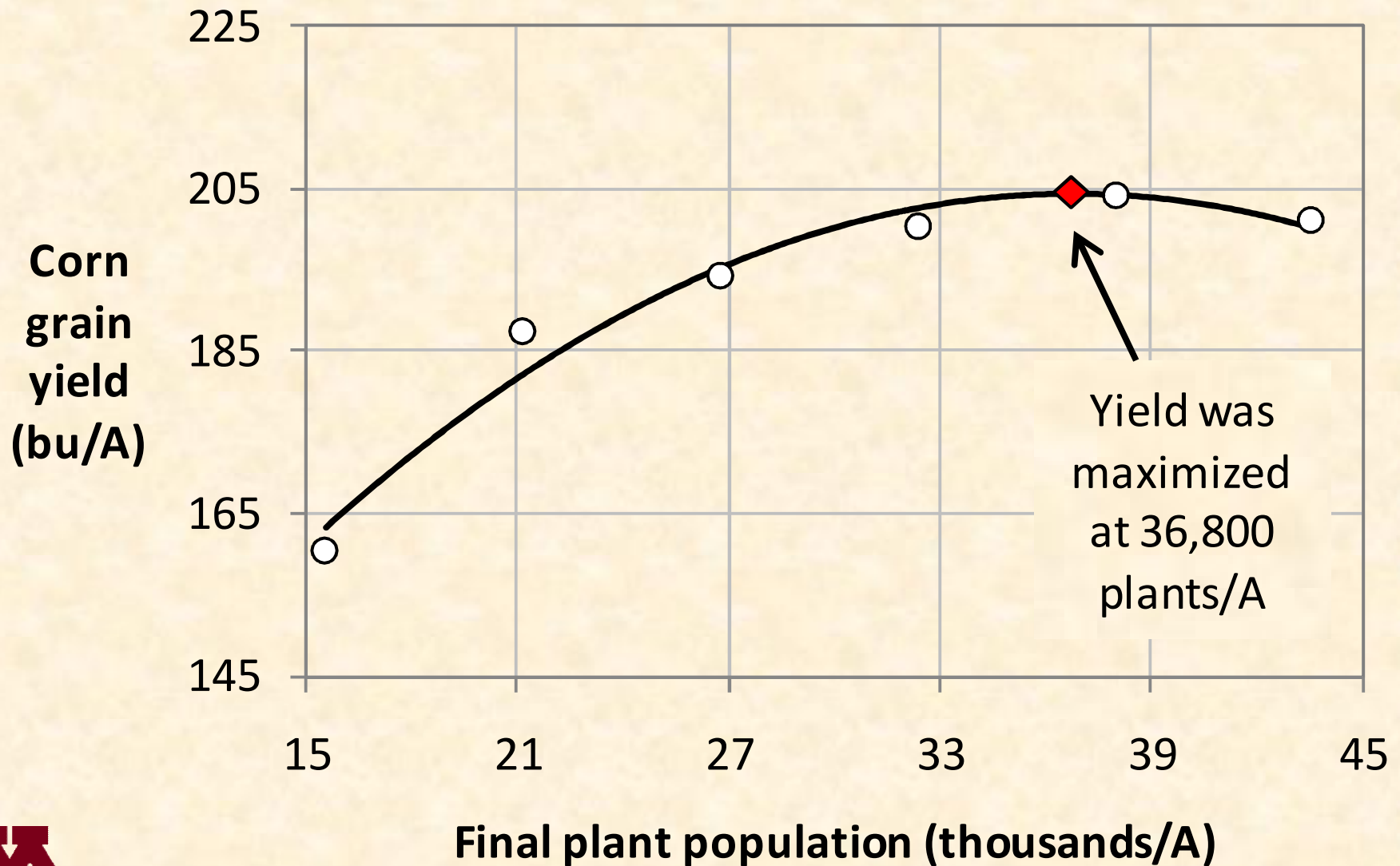
43.5

Final plant population (thousands/A)

Lamberton & Waseca, 2008 & 2009



Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Planting Dates)



Optimum Seeding Rates*

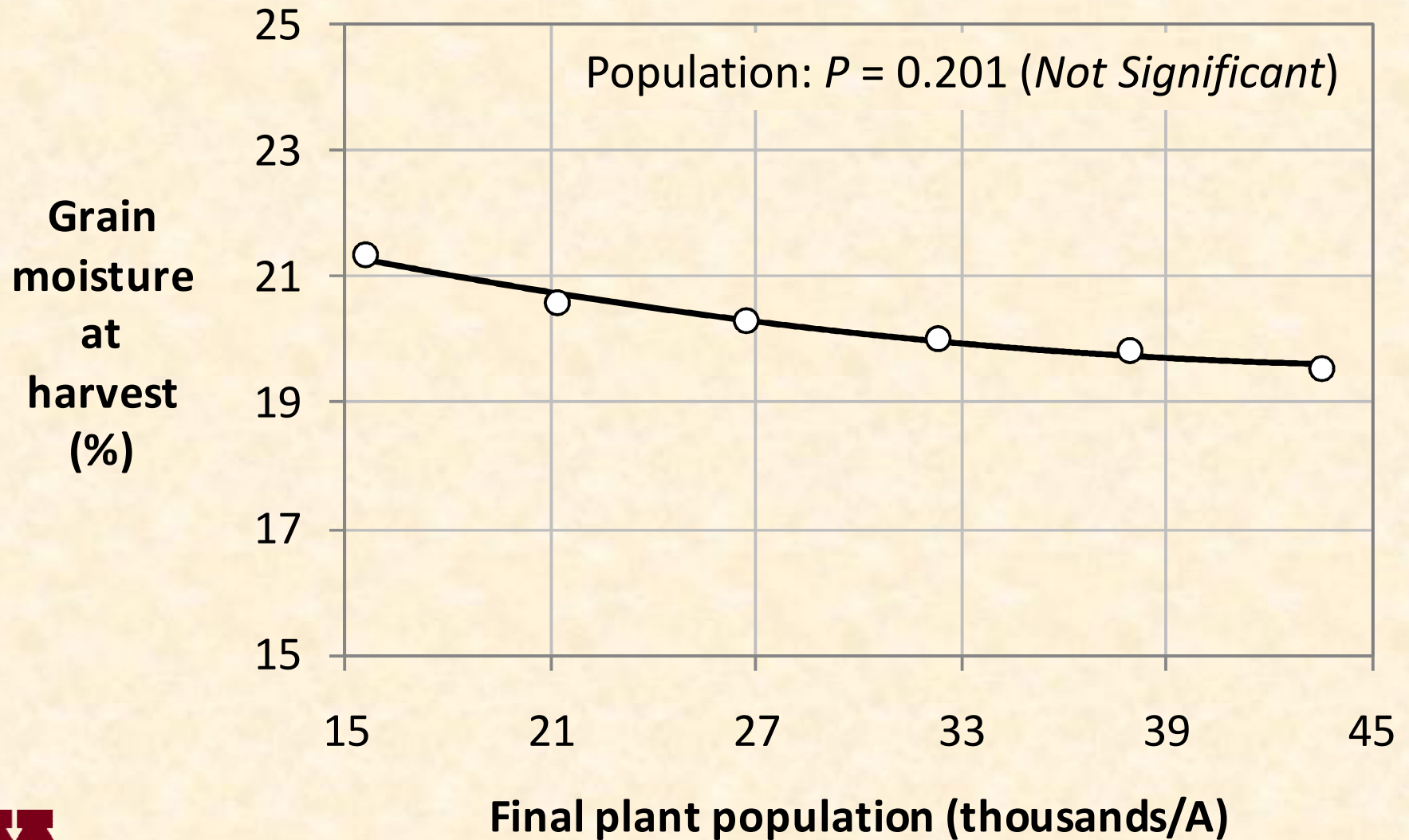
(over 2 years, 2 locations, & 3 planting dates)

Seed cost (\$/bag)	Corn price (\$/bushel)				
	2.75	3.25	3.75	4.25	4.75
175	33,900	34,600	35,100	35,600	35,900
200	33,100	34,000	34,600	35,000	35,400
225	32,500	33,500	34,100	34,600	35,000
250	31,800	32,800	33,600	34,200	34,600
275	31,100	32,300	33,100	33,800	34,300
300	30,400	31,100	32,600	33,300	33,900

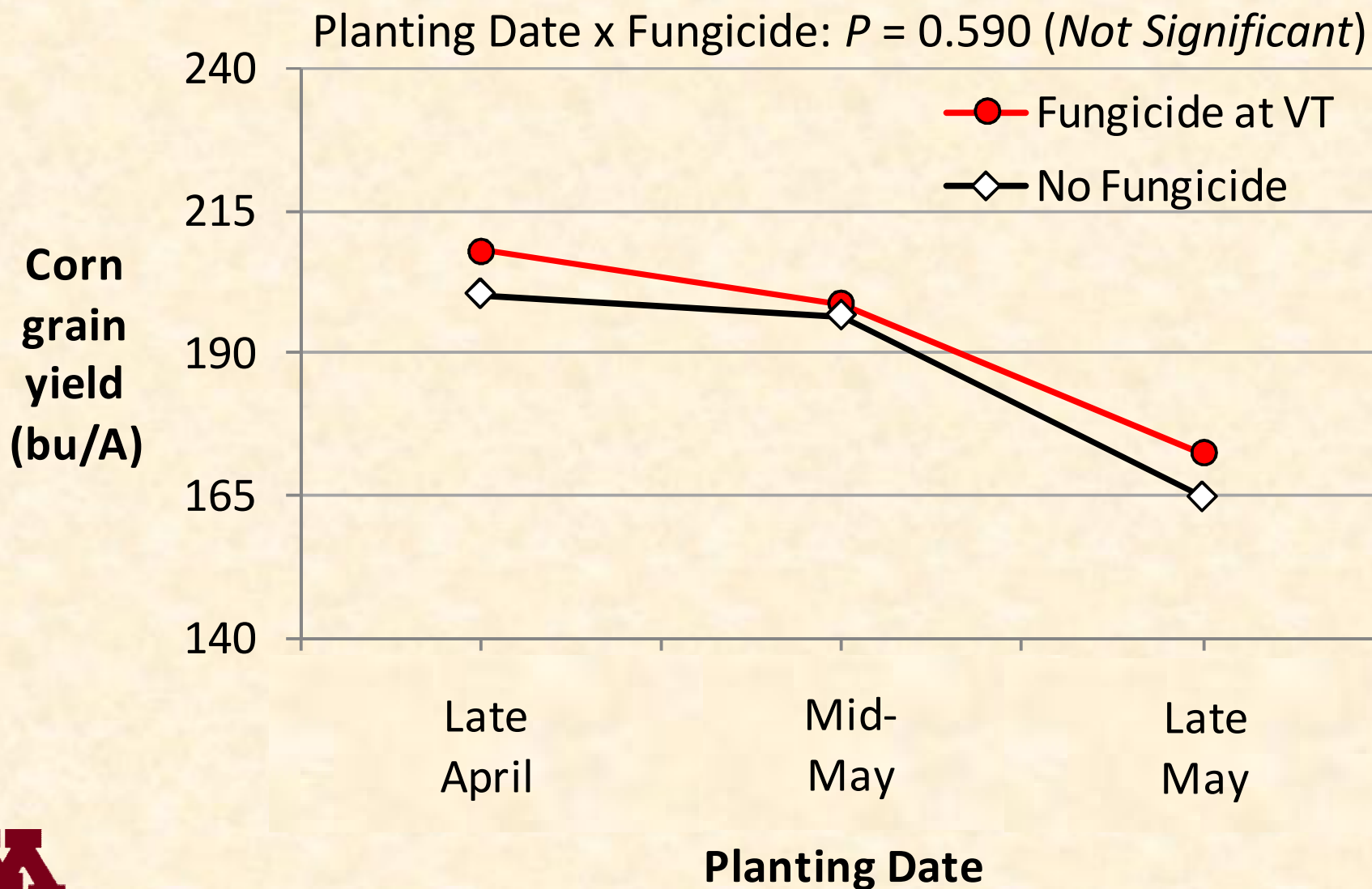
**Seeding rates assume 5% over-planting.*



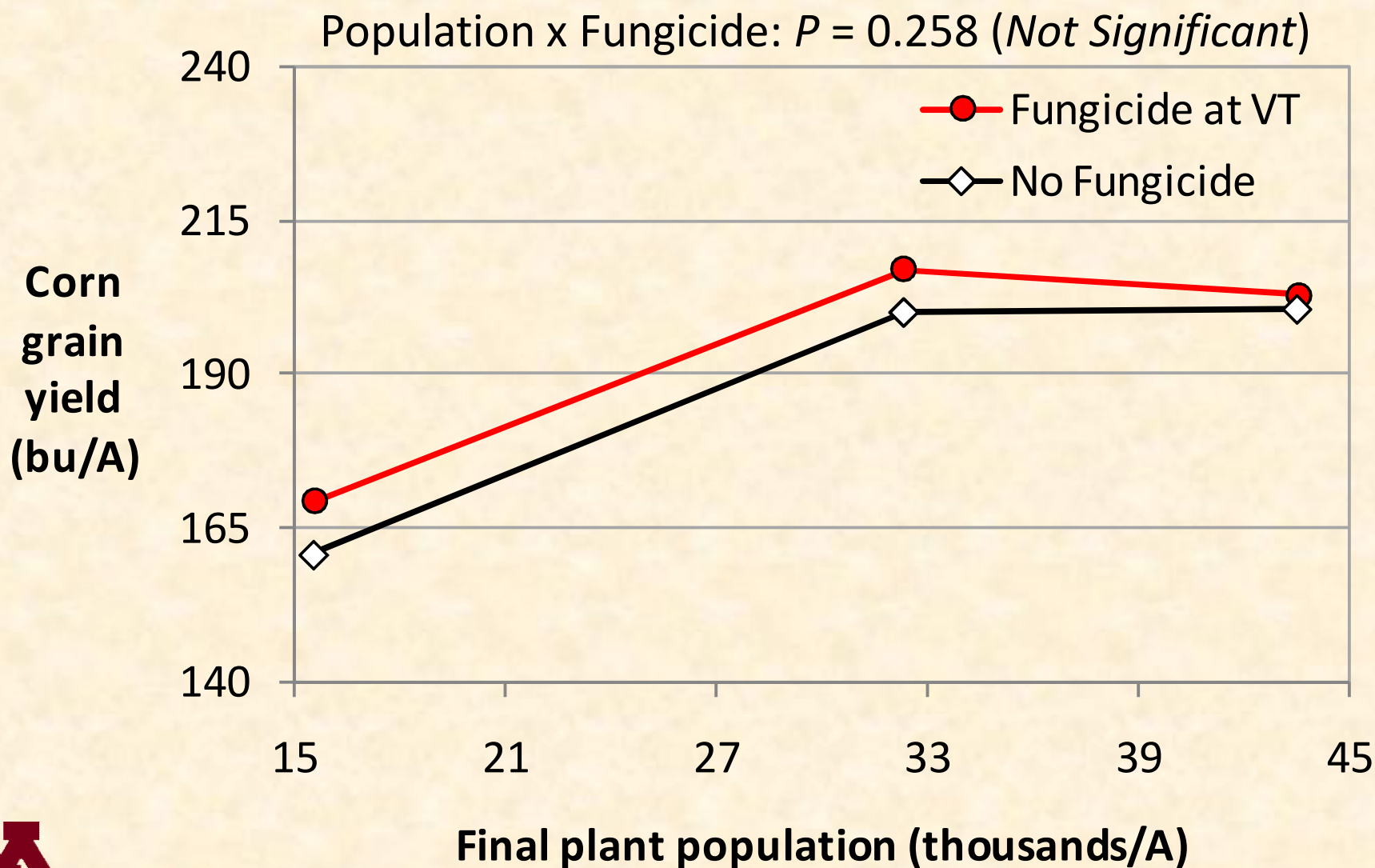
Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Planting Dates)



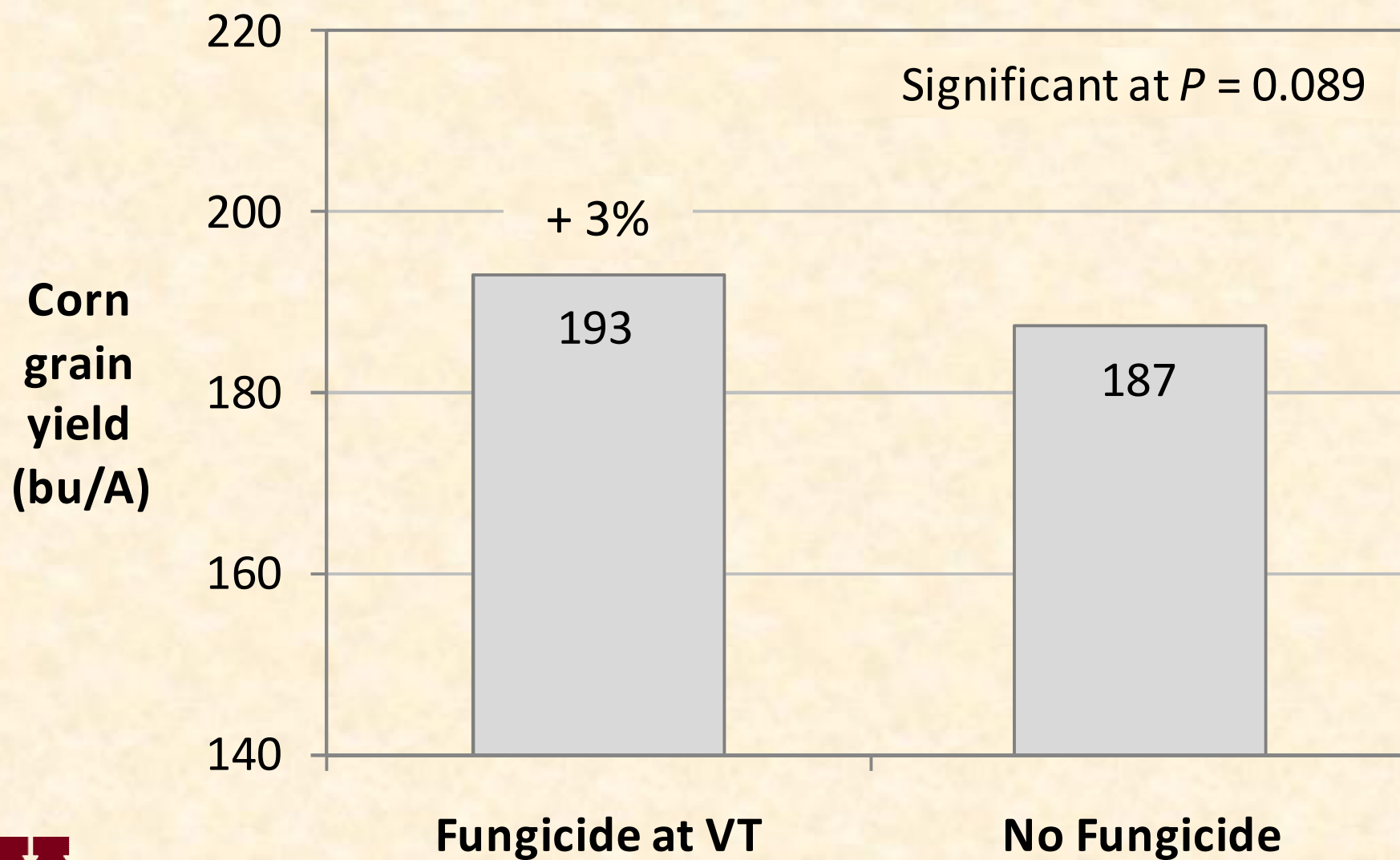
Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Populations)



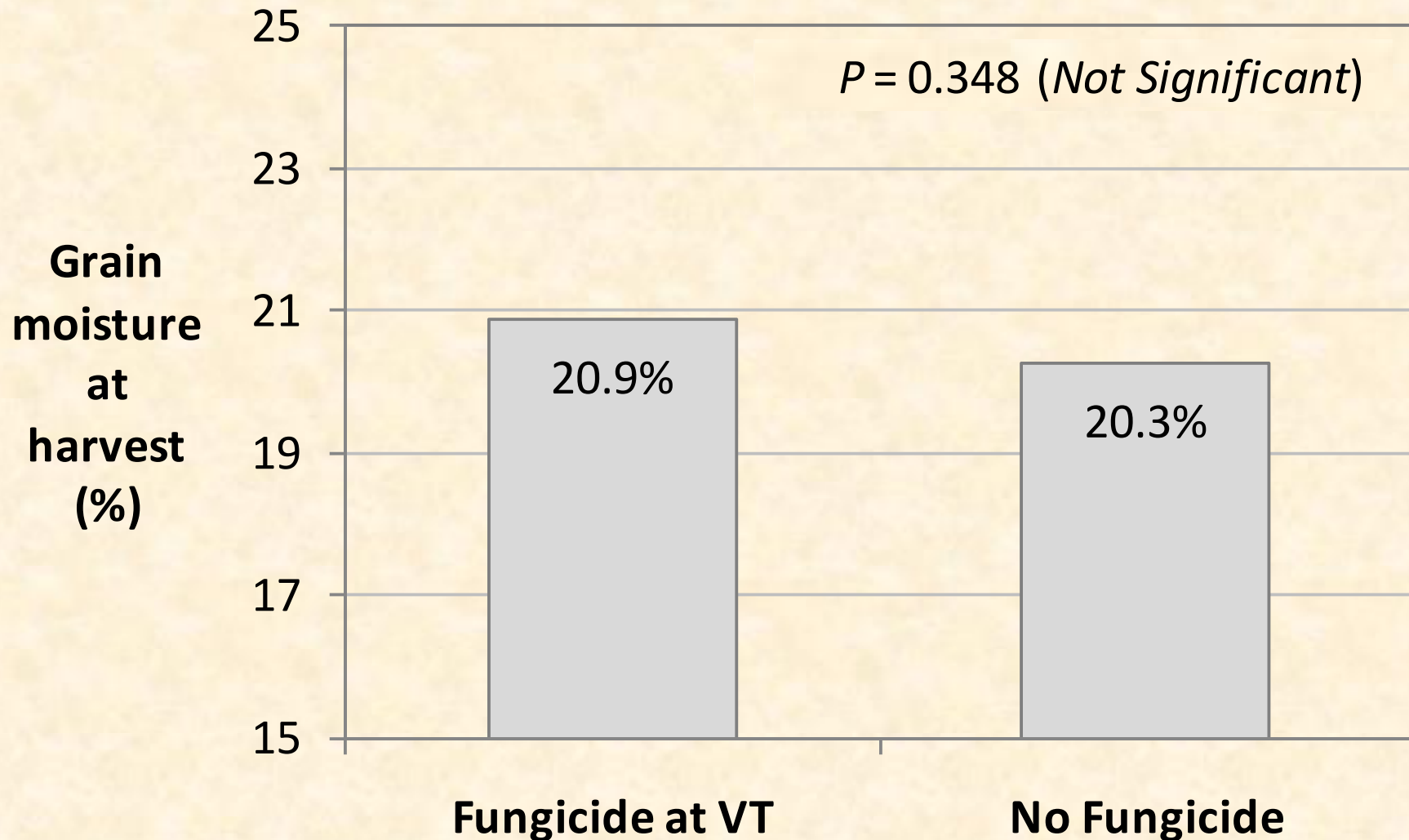
Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Planting Dates)



Lamberton & Waseca, 2008 & 2009 (Avg. Over 3 Planting Dates and 3 Populations)



Lamberton & Waseca, 2008 & 2009 (Avg. Over 3 Planting Dates and 3 Populations)



Conclusions from “High-Yield” Corn Study

- Planting in late April vs. mid-May increased yield 3%
- Optimum final plant population was similar regardless of planting date
- Yield was maximized at 36,800 plants/A
- Optimum seeding rates:
 - 32,800 seeds/A at \$3.25/bu and \$250/bag
 - 35,000 seeds/A at \$4.25/bu and \$200/bag
- Fungicide at tasseling increased yield 3%



Narrow rows may reduce plant-to-plant competition, allowing increased yield with higher populations.

**44,000 plants/A
30-inch rows**



**44,000 plants/A
20-inch rows**



Is this the future?



84,000
TWIN ROWS

Photo by Emerson Nafziger

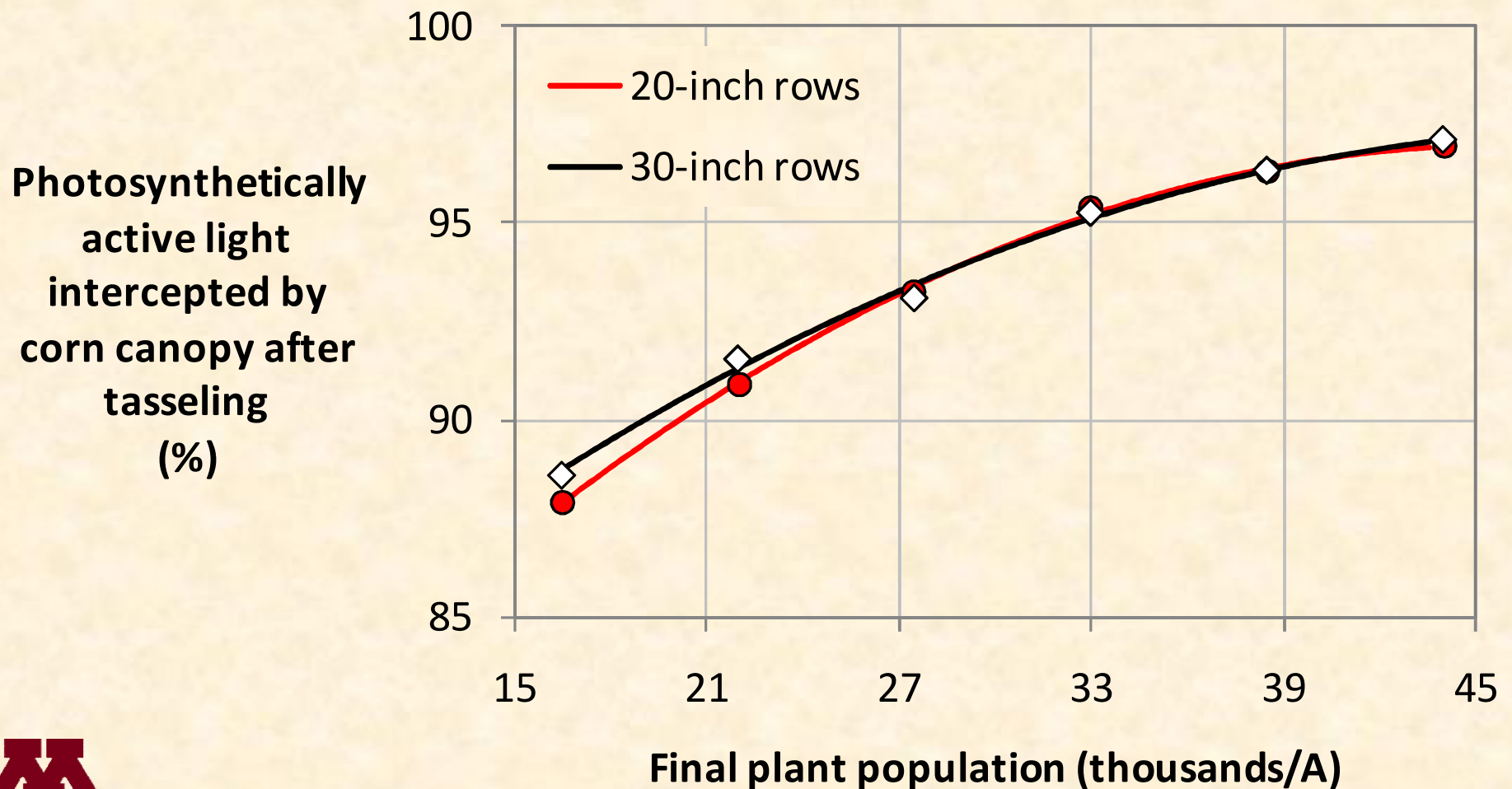
Row Width x Hybrid Maturity Study

- Do narrow rows increase yield or have a different optimum plant population?
 - Is this influenced by hybrid maturity?
- Lamberton and Waseca, 2009 - following corn
- Nicollet-Clarion-Webster clay loam
- 3 maturity groups:
 - i) 95-day RM (Pioneer 38P43)
 - ii) 101-day RM (Pioneer 37N68)
 - iii) 105-day RM (Pioneer 35F44)
- 6 plant populations



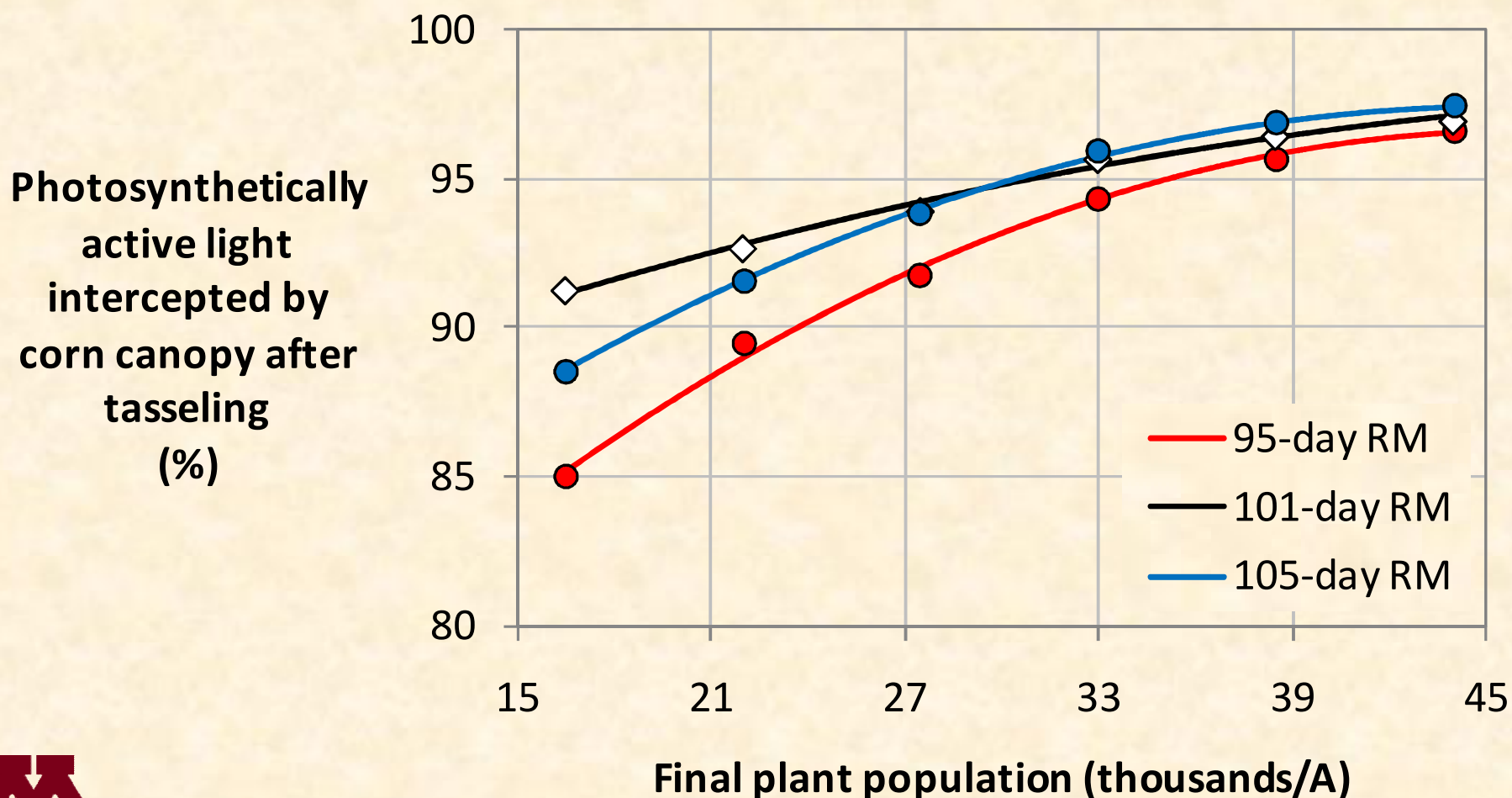
Lamberton & Waseca, 2009 (Averaged Over 3 Hybrids)

Row Width x Population: $P = 0.899$ (Not Significant)



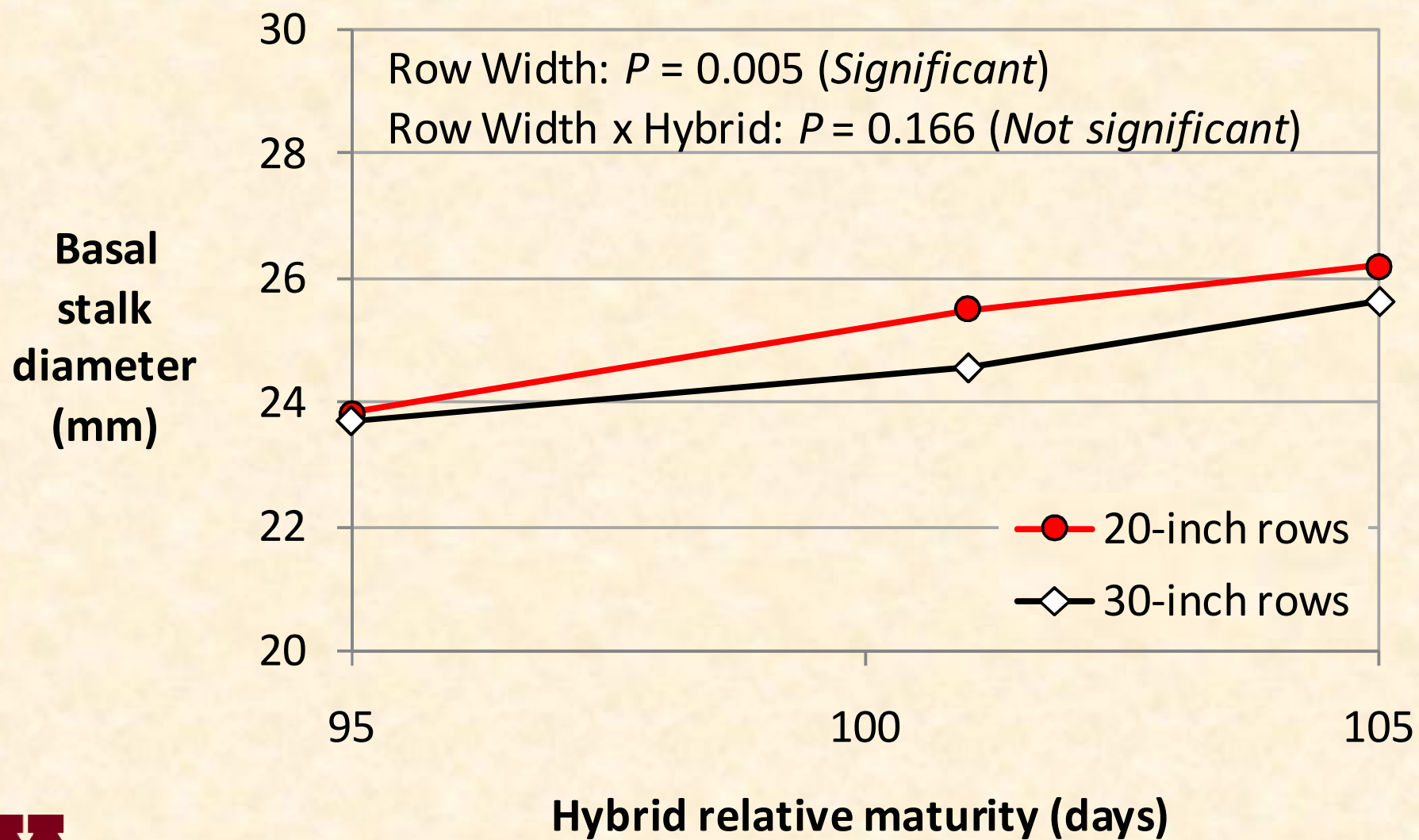
Lamberton & Waseca, 2009 (Averaged Over 2 Row Widths)

Hybrid Maturity x Population: $P = 0.001$ (Significant)

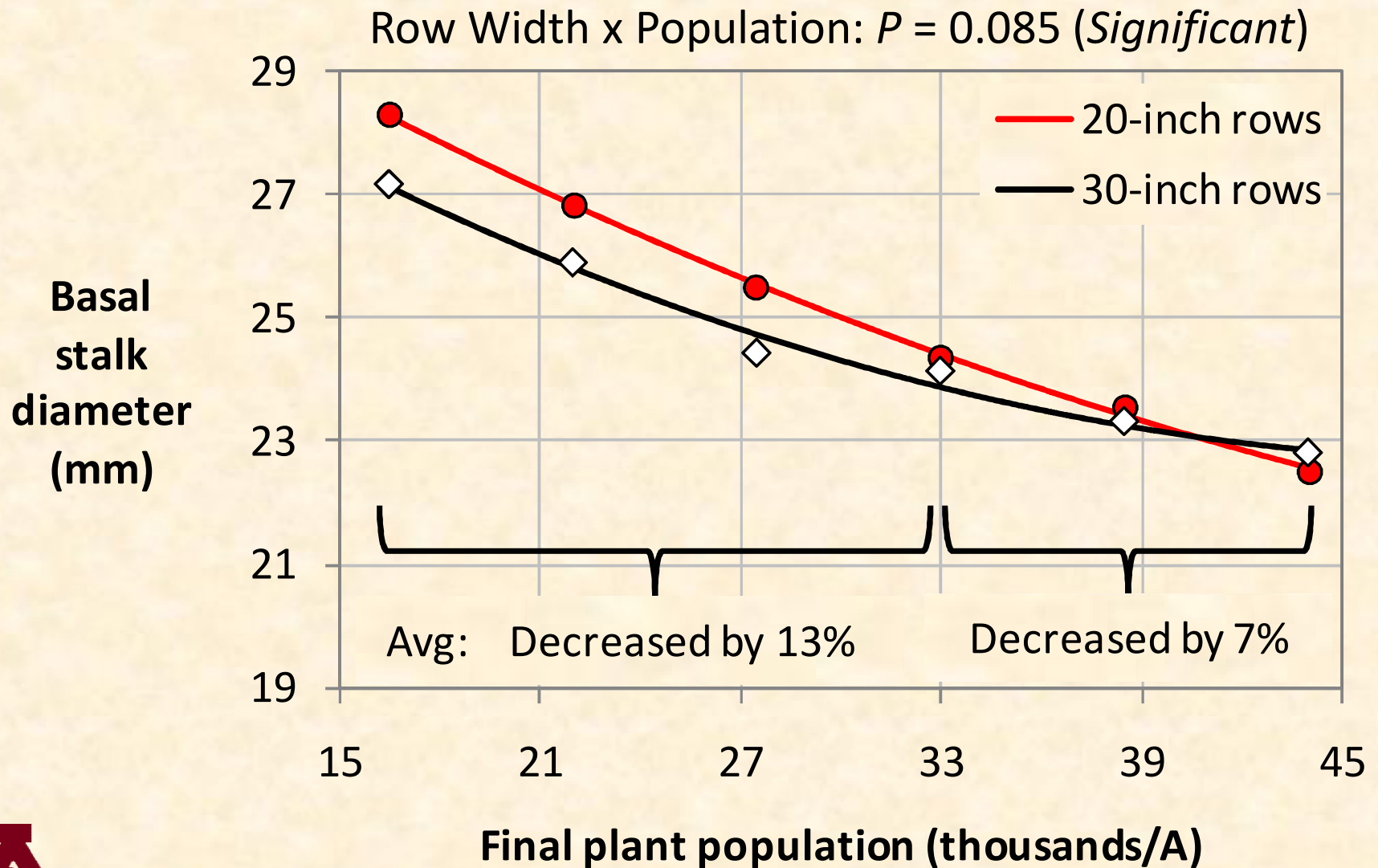


Lamberton & Waseca, 2009

(Averaged Over 6 Populations)



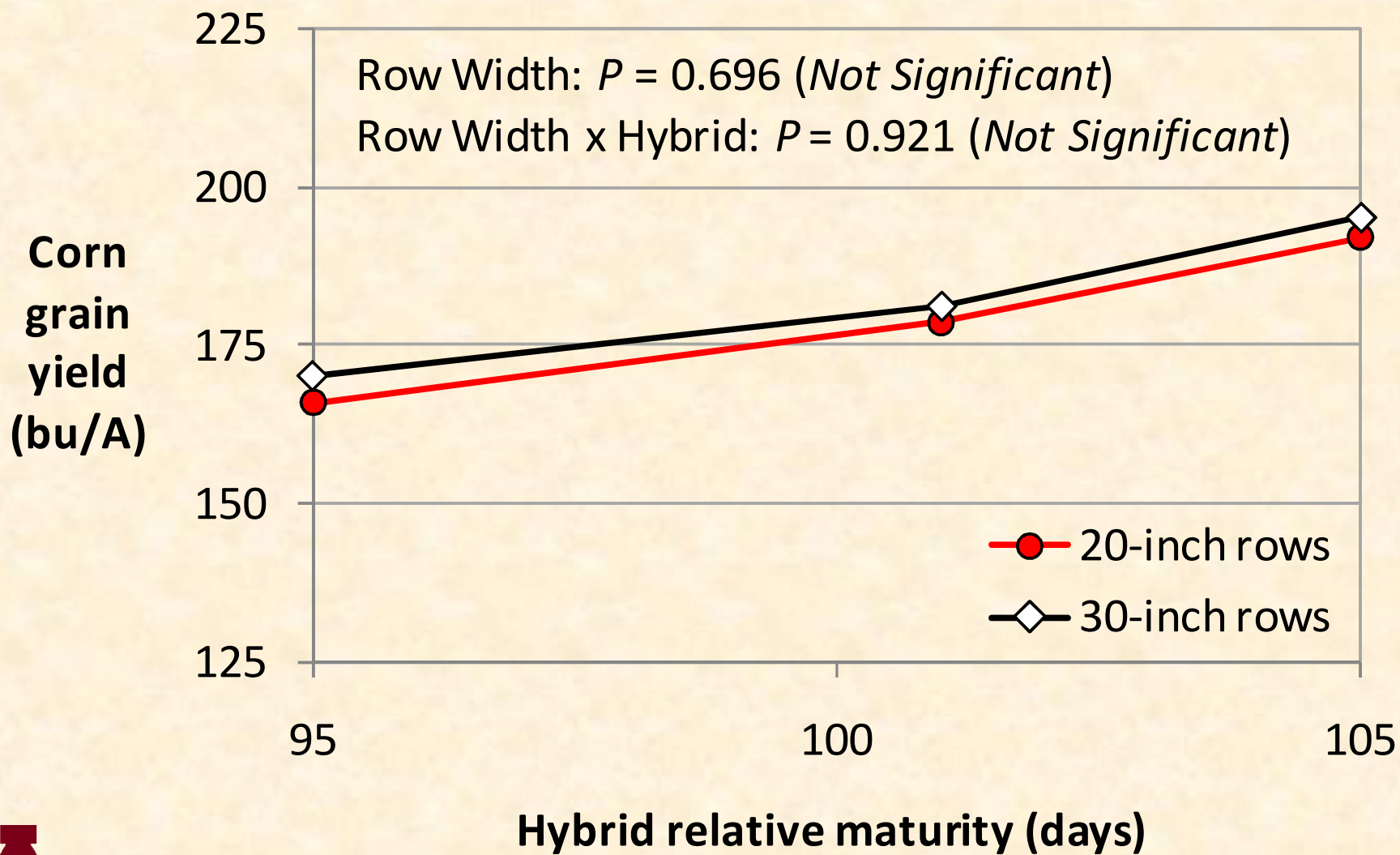
Lamberton & Waseca, 2009 (Averaged Over 3 Hybrids)



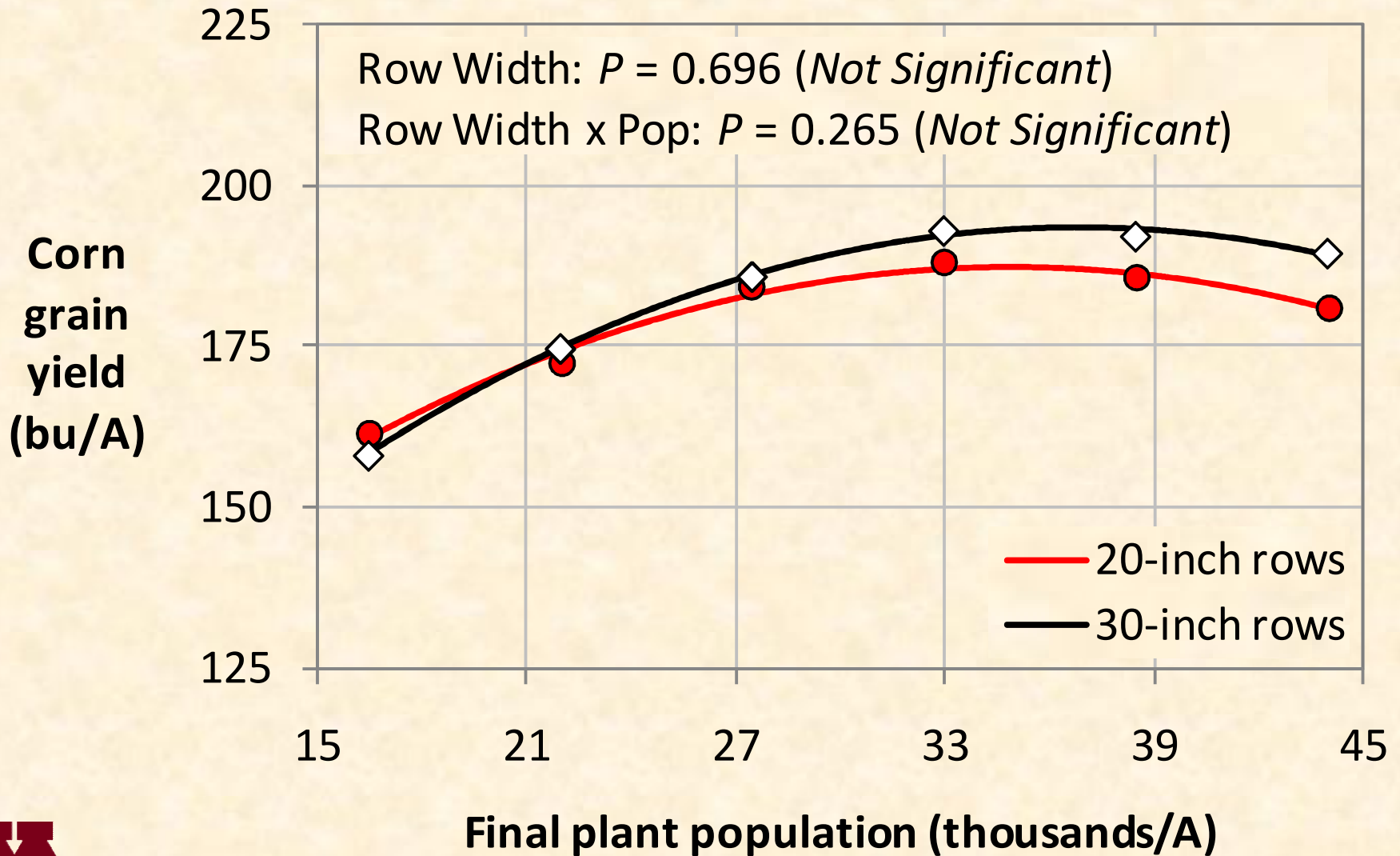
What about the bottom line?



Lamberton & Waseca, 2009 (Averaged Over 6 Populations)

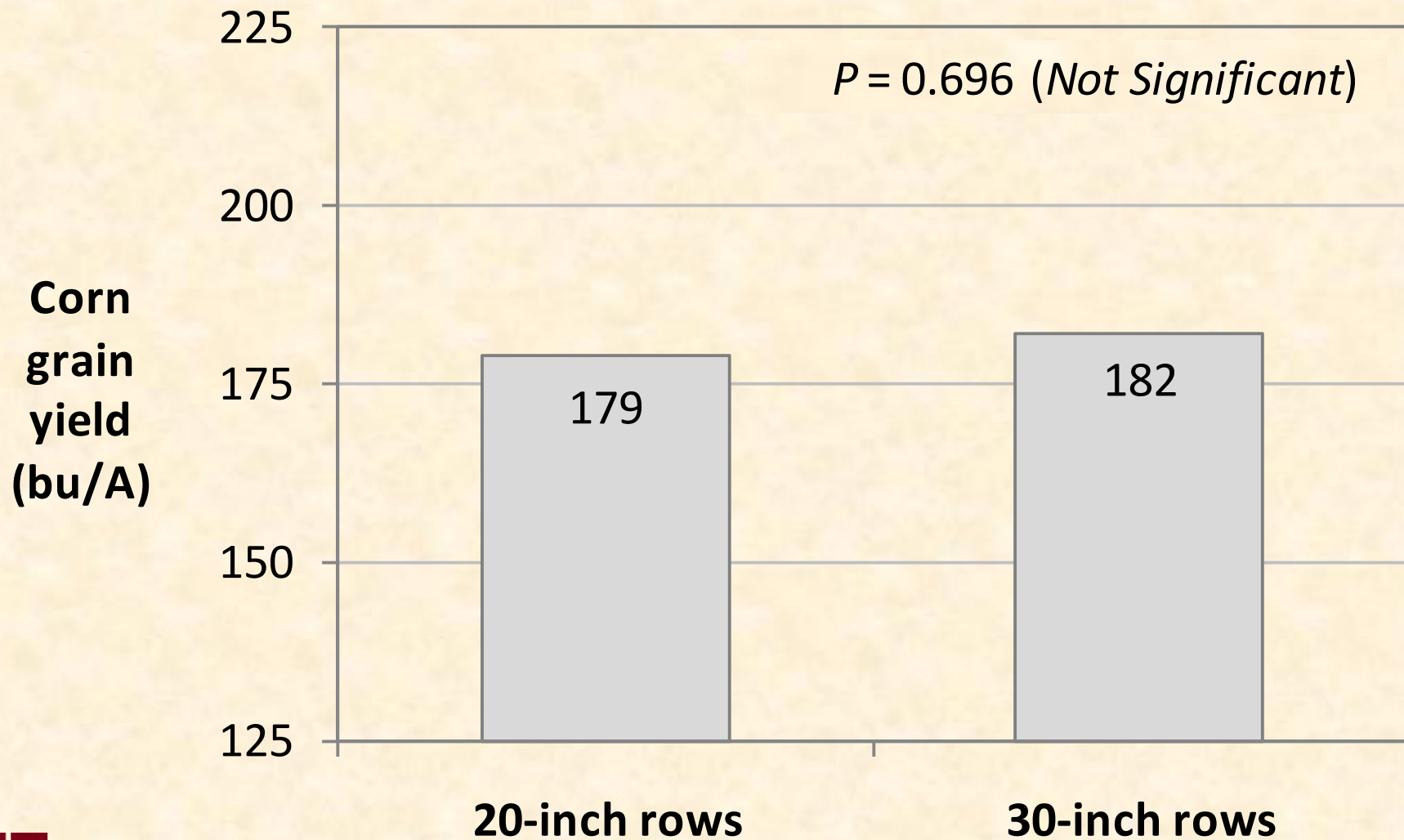


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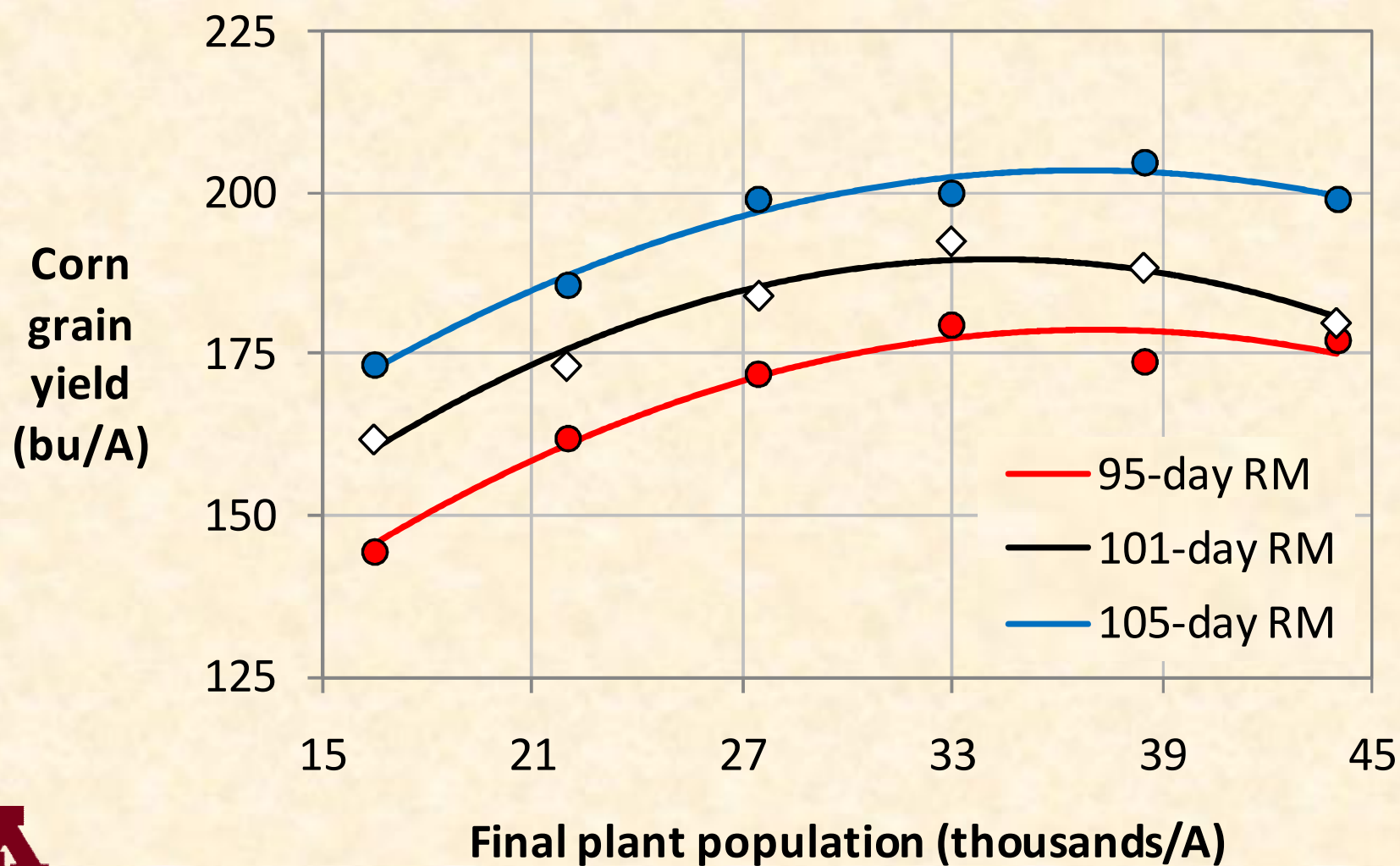
Lamberton & Waseca, 2009

(Avg. Over 3 Hybrids and 6 Populations)



Lamberton & Waseca, 2009 (Averaged Over 2 Row Widths)

Hybrid Maturity x Population: $P = 0.592$ (Not Significant)

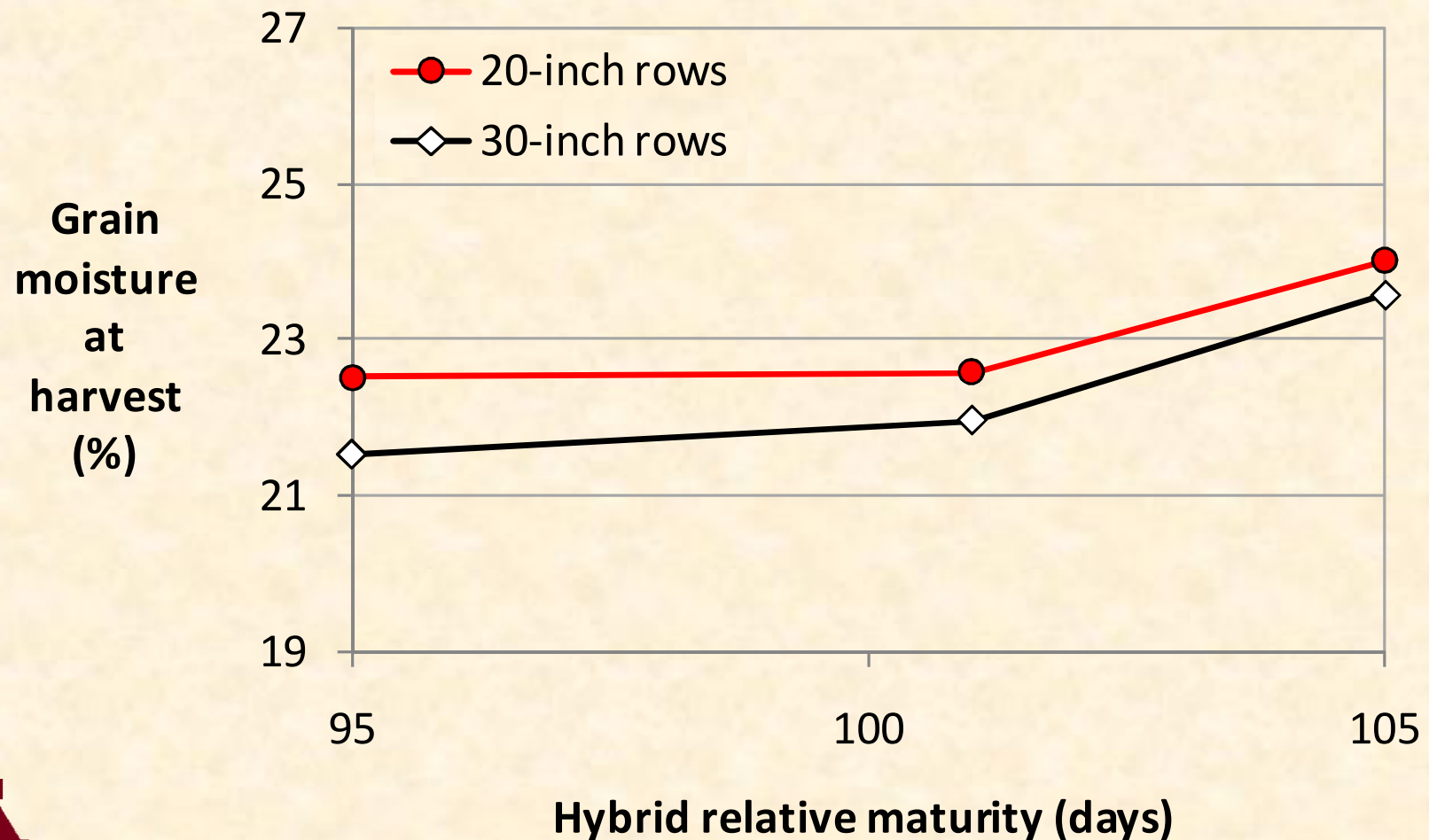


Lamberton & Waseca, 2009

(Averaged Over 6 Populations)

Row Width: $P = 0.646$ (Not Significant)

Row Width x Hybrid Maturity: $P = 0.748$ (Not Significant)



Conclusions from Row Width Study

- Narrow rows did not improve light interception by the crop canopy during grain fill.
- The early-maturing hybrid intercepted less light during grain fill, especially at sub-optimal populations.
- Narrow rows resulted in thicker stalks, but only at sub-optimal populations.
- Row width did not affect yield or harvest moisture.
- The optimum final plant population did not differ with row width or hybrid maturity.





Thanks!



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