

Roundup-ready, Low Lignin and Other New Traits Alfalfa's Future

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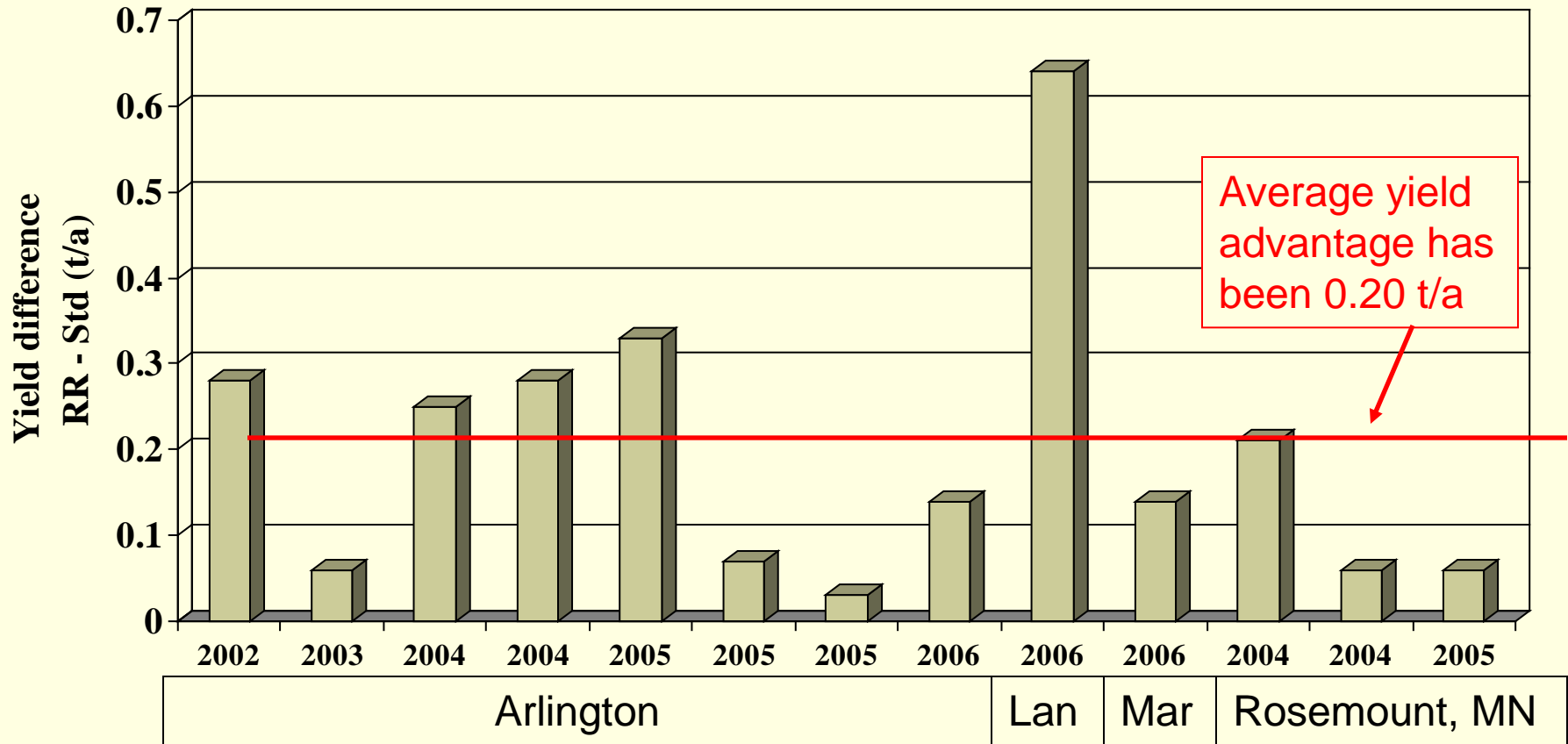
Value of Roundup Ready Alfalfa in Seeding Year

- Less herbicide damage
- Herbicide cost is less
- Ease of herbicide use
- Control winter annuals weeds and other special problems

Performance of Roundup Ready Alfalfa Varieties

Variety	Marshfield 2006		Lancaster 2006	
	Roundup	Conventional	Roundup	Conventional
	-----tons/acre-----			
425RR	1.91	1.68		
4G418RR	2.00	1.76	4.79	4.08
6443RR	2.04	1.61	4.75	4.06
DKA41-18RR	1.82	1.71		
Liberator RR	1.95	1.72		
WL 355 RR	2.02	1.74		
<i>Trial mean</i>		1.68		4.05

Seeding year yield advantage of Roundup Ready Alfalfa



New Potential – establish alfalfa with oats or ryegrass



Procedure:

- Seed alfalfa with oats or ryegrass
- Spray nurse crop with 4 to 6"

Benefits:

- Erosion control benefits of nurse crop
 - weed control
 - soil dry down
- Yield and quality of solo alfalfa

Value of Roundup Ready Alfalfa in Seeding Year

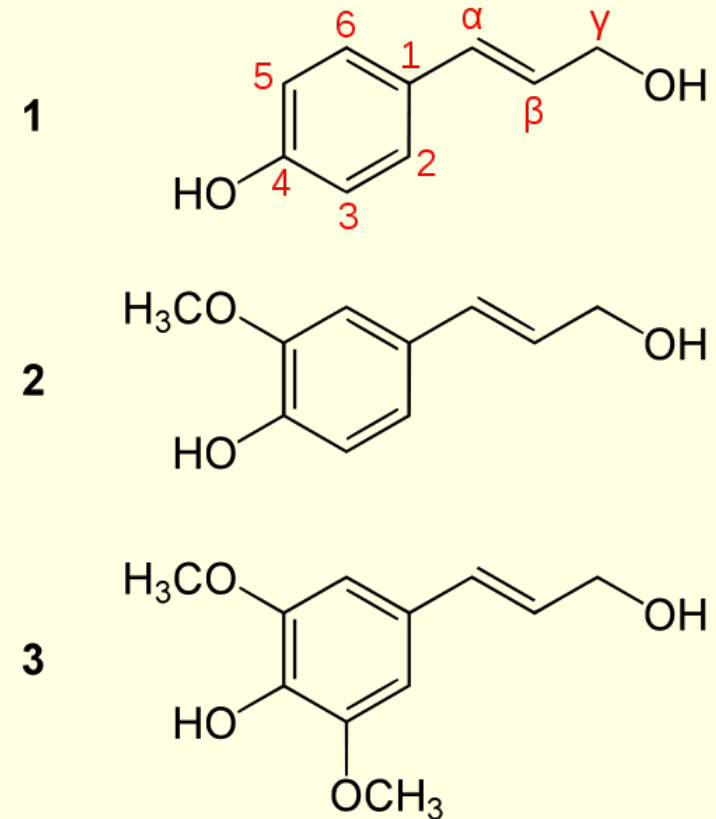
- Less herbicide damage
 - Up to 0.6 t/a yield advantage of RR alfalfa over same varieties treated with Pursuit or Raptor
- Herbicide cost is less
- Ease of herbicide use
 - Using same herbicide as for other crops
 - Broader window of application
- Control winter annuals and other special problems

Concerns about RR Alfalfa and RR resistant weeds

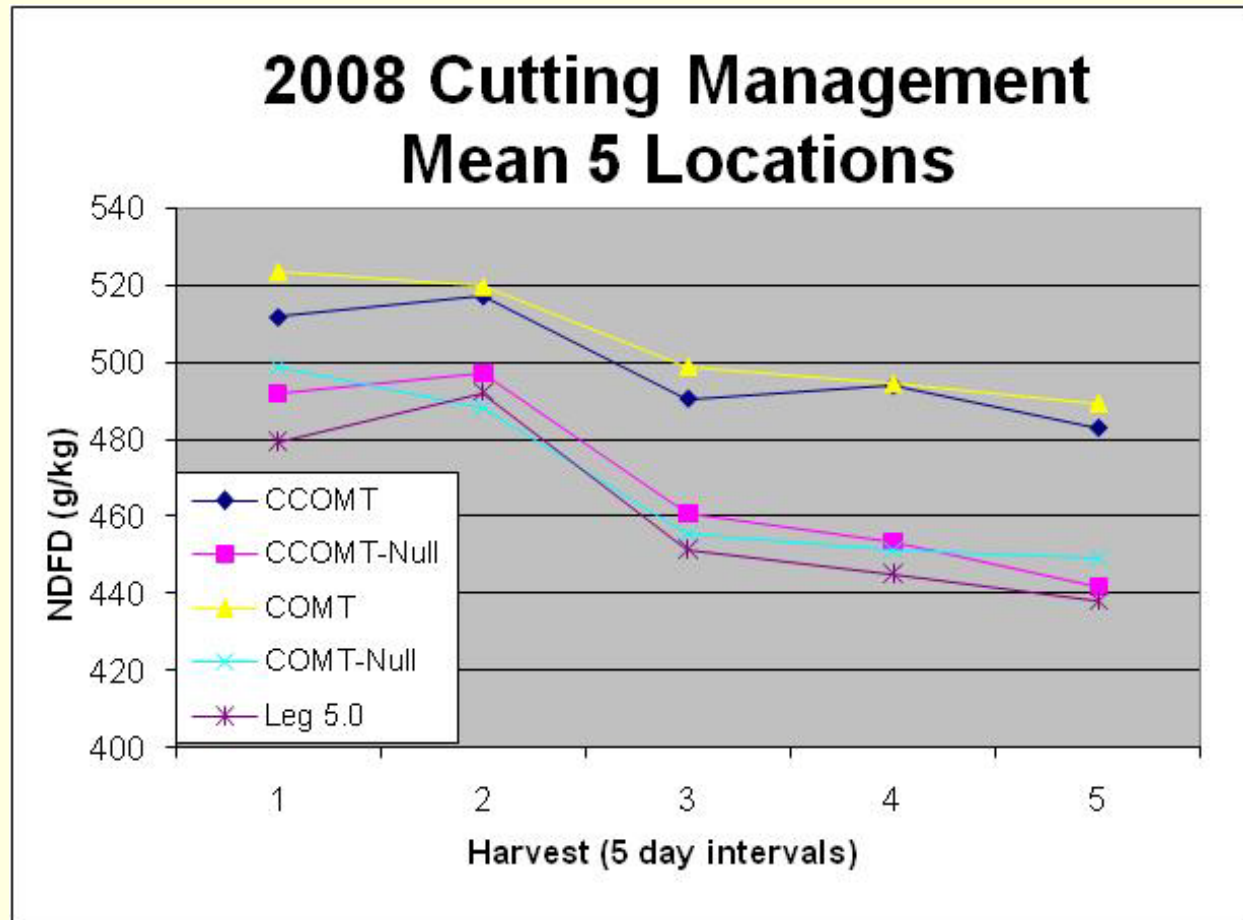
- Glyphosate resistance has been reported in approximately a dozen weeds
- Including RR alfalfa in rotation with row crops will generally enhance weed control because some weeds cannot tolerate the frequent defoliation of a forage crop
- The key to minimizing development of resistant weed populations and weed shifts will be the recommended stewardship:
 - multiple herbicides in rotational systems
 - combined multiple mechanical controls such as preplant tillage and frequent mowing of alfalfa.

Value of Low Lignin

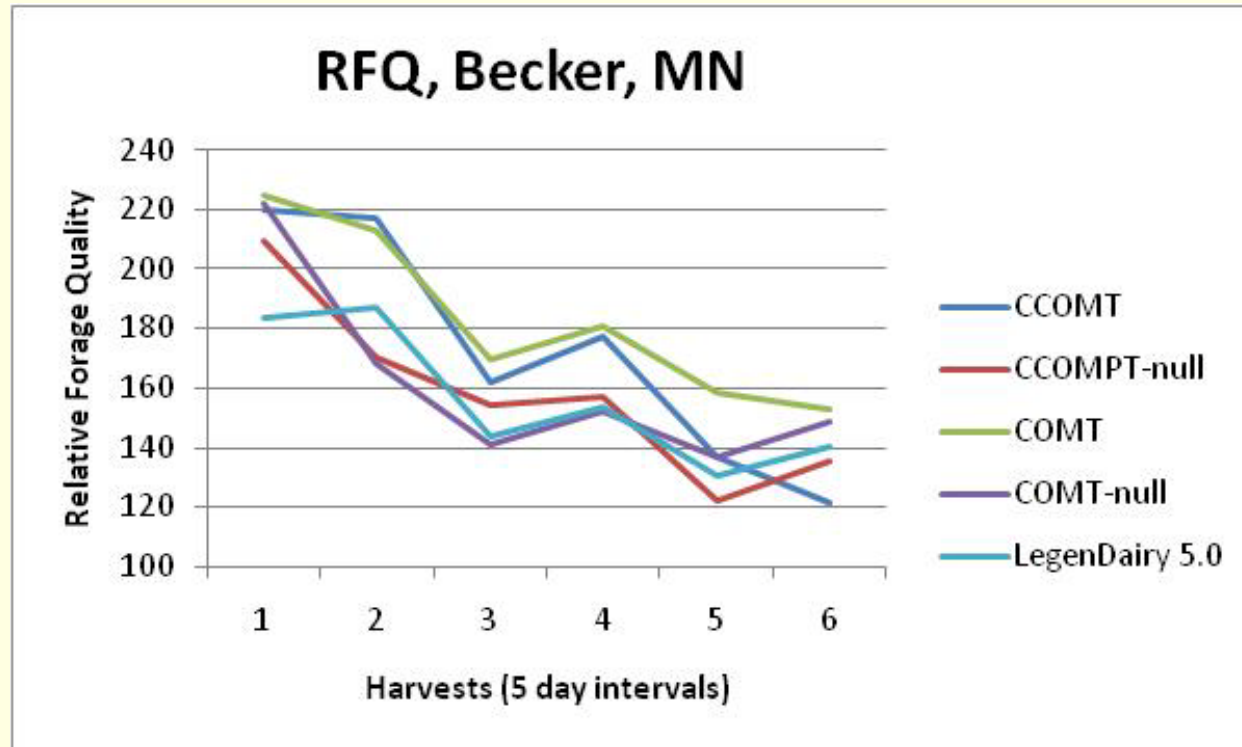
- Provides strength to plants
- Allows the plant vascular system to transport water in the plant without leakage.
- Increases with advanced maturity in alfalfa
- Is indigestible and reduces fiber digestibility



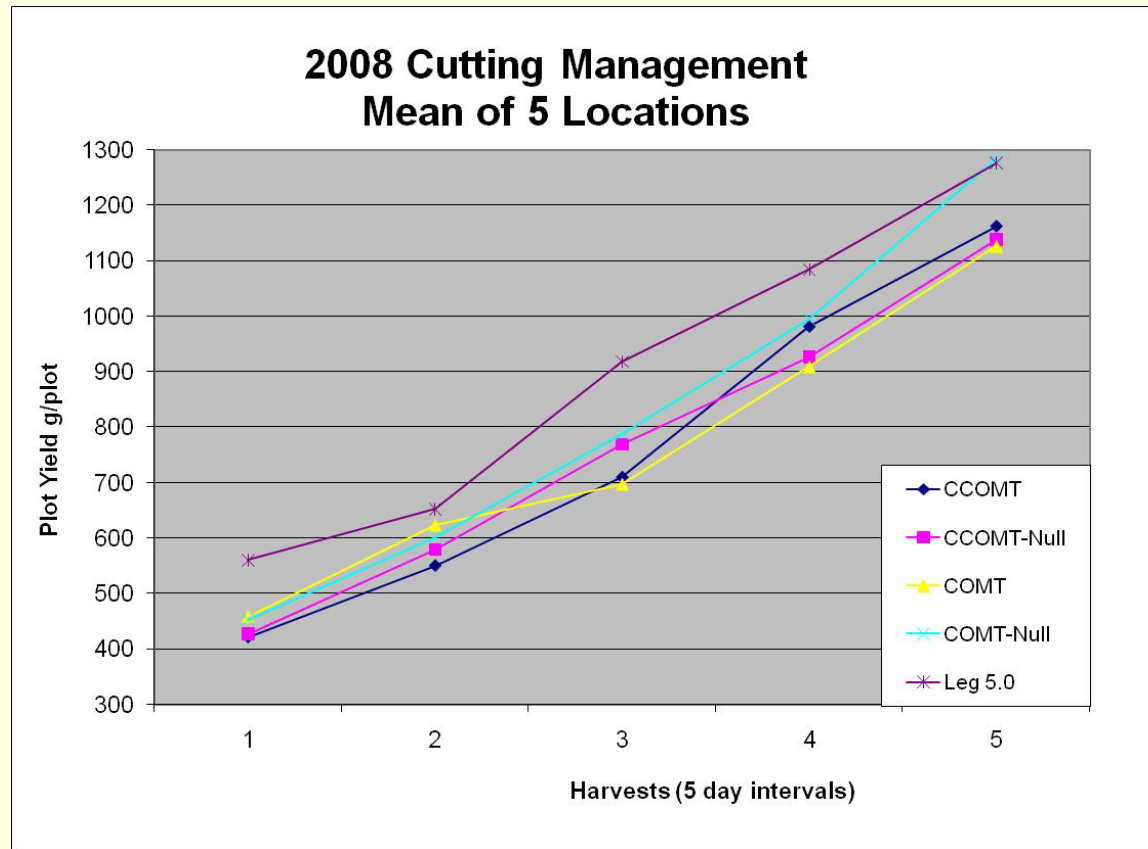
Planted at 5 locations to determine response in harvest system



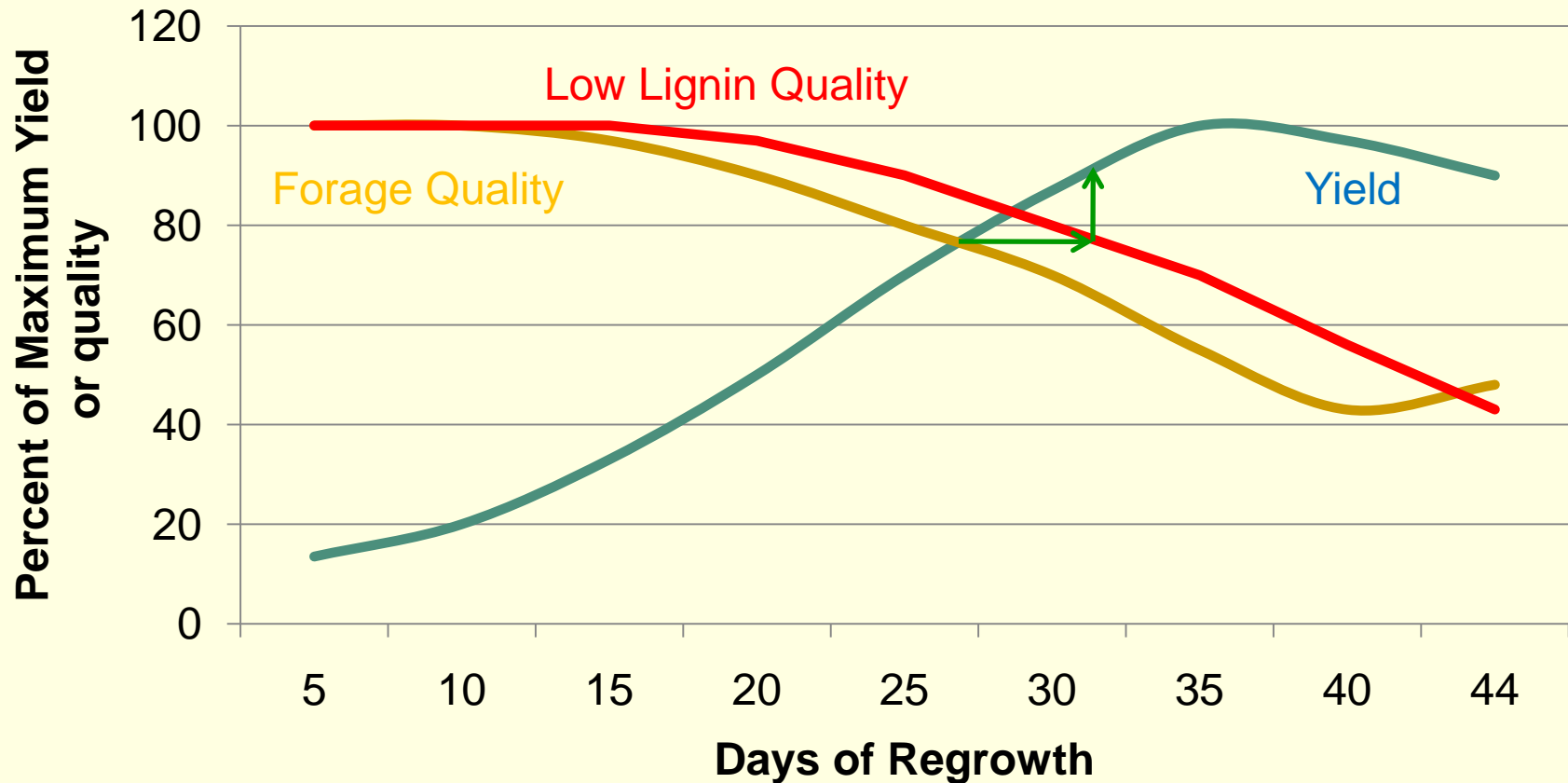
Planted at 5 locations to determine response in harvest system



Planted at 5 locations to determine response in harvest system



Yield and Quality Curve of Alfalfa



3 vs 4 cutting by Sept 1 - effect on alfalfa yield, Arlington, Wisconsin

		1 st cutting	2 nd cutting	3 rd cutting	4 th cutting	Season Total	
2 nd year	3 cut	2.97	2.43	2.15	----	7.55	17%
	4 cut	1.66	1.48	1.71	1.68	6.53	
3 rd year	3 cut	2.32	1.53	1.24	----	5.09	25%
	4 cut	1.31	1.18	0.75	0.83	4.07	

Summary of Low Lignin GMOs

- Low lignin lines had lower lignin and higher fiber digestibility.
- The CCOMT line stood (lack of lodging) as well in space plantings at the commercial alfalfa line.
- Low lignin lines could be harvested later to get the same quality as standard lines but at higher yields.

Other biotech traits for alfalfa

- Elevated bypass protein
 - Tannins
 - Polyphenyl Oxidase
- Drought tolerance
- Leaf retention
- Delayed flowering
- Improved disease resistance