

What's New in Alfalfa February 2007

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Special thanks to:

Dr. Dan Undersander
University of Wisconsin
For providing many of these slides

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New & Emerging Alfalfa Technologies

- Improving production and animal use:
 - Roundup Ready
 - Reduced Lignin Alfalfa
 - Alfalfa with Tannins
- Other uses:
 - Soil Remediation
 - Biofuel including ethanol
 - Paper
 - Transgenic alfalfa for pharmaceuticals & industrial enzymes

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Roundup Ready Alfalfa

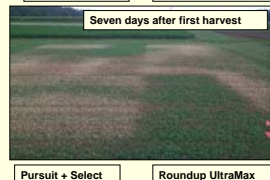
- In 1997 Forage Genetics International and Monsanto began working to develop Roundup Ready® alfalfa.
- Roundup Ready® alfalfa was developed by incorporating the CP4 gene into alfalfa. This is the same gene used to develop all other Roundup Ready® crops.

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2001 WI test

Product concept testing to evaluate efficacy relative to other herbicides.

- Plot area infected with weed seed.
- RR alfalfa seed used to establish plots
- Various herbicide treatments applied
- Only Roundup® gave effective weed control



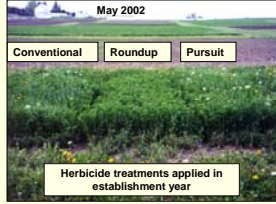
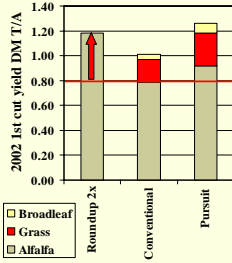
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Performance of Roundup Ready Varieties

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		
Trial mean		1.68		4.05

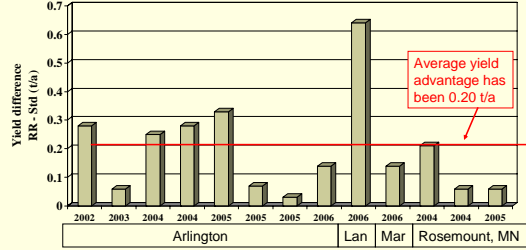
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UW Trials (2000 to 2006)



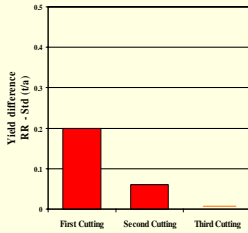
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Seeding year yield advantage of Roundup Ready Alfalfa



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Yield advantage of Roundup Ready in Seeding Year by Cutting



Herbicide injury causes yield loss only to cutting herbicide was applied.

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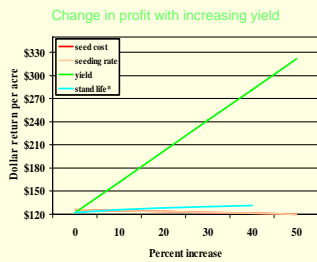
Economics of Roundup Ready Alfalfa in Seeding Year

Put your numbers into columns B or C	Roundup Ready variety	Standard variety
Seed cost/ 50 lb bag (\$)	\$250.00	\$200.00
Pounds of seed per acre	12	12
Technology fee/bag (\$)	\$125.00	\$0.00
Yield in seeding year (t/a DM)	4.00	4.00
Herbicide cost (\$/acre/application)	\$6.00	\$20.00
Herbicide application cost (\$/acre)	\$6.00	\$6.00
Number of herbicide applications	1	1
Value of ease of roundup use (\$/acre)	\$0.00	\$0.00
Yield depression from pursuit/raptor (t/a DM)	0.00	0.30
Expected stand life (yrs including seeding year)	3	3
Value of hay (per ton DM)	\$100.00	\$100.00
Fixed costs per acre per year	\$180.00	\$180.00
Harvesting costs per acre per harvest	\$35.00	\$35.00
Number of harvests	2	2

Seeding Year Production Costs/Results	Roundup Ready variety	Standard variety
Seed cost (prorated + tech fee) per acre	\$30.00	\$16.00
Total seed and herbicide cost per ton of hay	\$10.50	\$11.35
Total cost per ton of hay seeding year (Assuming \$250 fixed and harvesting costs)	\$73.00	\$73.85
Profit per acre - seeding year	\$108.00	\$104.59

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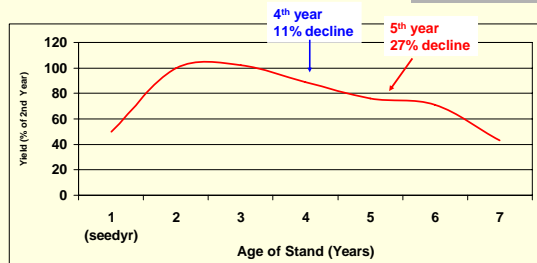
Effect of increase on \$ return/acre



Assumed base is:
 \$4/lb seed cost
 12 lb/acre seeding rate
 3 t/a yield
 \$100/t alfalfa
 3 years stand life

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Yield of alfalfa as stand ages (% of 2nd year)



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Use considerations

- *Benefit in Midwest must come in seeding year.*
 - Little herbicide used after seeding year.
 - Stand life of alfalfa determined by winter survival and disease resistance not weed pressure.
- *One time technology fee per 50-lb bag*
 - East of the Rocky Mountains is \$125 a bag.
 - Total cost is seed cost plus technology fee.
 - If seed 10 lb/acre, the technology fee is \$21.00/acre
 - If seed 12 lb/acre, the technology fee is \$31.25/acre
 - If seed 18 lb/acre, the technology fee is \$45.00/acre

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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



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Use considerations

- The seed is guaranteed to have greater than 90% roundup ready seed.
- Roundup controls a broader array of both grassy and, especially, broadleaf weeds than currently available herbicides.
- Concern about development of Roundup resistant weeds if all three crops in rotation are Roundup resistant.
- Roundup does not cause damage to the seedling alfalfa as observed with most other herbicides.

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Performance of Potato Leafhopper Resistance in Alfalfa

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Potato Leafhoppers

- Adults
 - 1/8 inch long
 - wedge shape
 - florescent green
- Nymphs
 - much smaller
 - yellowish green to florescent green
 - no wings



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Life Cycle

- Do not overwinter in Wisconsin
- Migrate from Gulf States on spring winds, usually arriving mid-May
- Can feed on a wide range of hosts
- Has a very explosive population growth potential
- Survives until late summer or early fall

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Damage

- Symptoms
 - Hopper burn
 - Distinct V-shape discoloration
- Caused by
 - Sucking plant sap and injecting toxin which inhibits water and nutrient transport



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Economic Damage

- Yield and quality losses
- Reduced stand life
 - Slow recovery of regrowth after harvest
 - Increased stand loss due to winter kill
- Greater potential yield loss the following season
- New seedlings can be hit the hardest

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Scouting

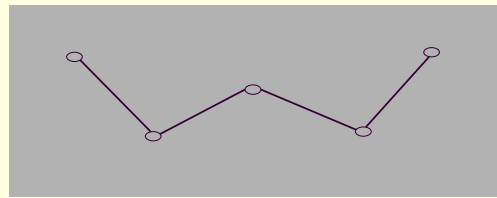
- Use a 15 inch sweep net
 - W shape pattern
 - 20 consecutive sweeps
 - 5 random areas

NOTE: adults seen in bottom of net, nymphs on collar of net!



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Potato Leafhopper Scouting Pattern



20 sweeps in 5 locations

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Economic Threshold

Stem Height (Inches)	Leafhoppers (Average)
3	0.2 Adults
6	0.5 Adults
8 – 11	1.0 Adults or Nymphs
12 – 14	2.0 Adults or Nymphs

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Control Strategies

- If you're within 7 days of cutting, take an early harvest
- Cutting kills nymphs and forces adults to search for other food
- After cutting reassess the regrowth

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Performance of Potato Leafhopper Resistance in Alfalfa

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Facts about PLH and Resistance

- Only a percentage of plants within a variety have resistance
- New seedlings are particularly susceptible to PLH damage
- PLH resistance develops as plant matures, young plants are more susceptible

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Glandular-haired Alfalfa Plots

Schroeder Brothers – Ross (Rocky) and Randy Schroeder

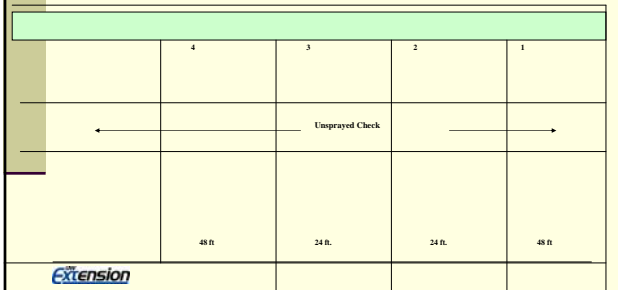
W9324 Orange Mill Rd
Camp Douglas WI 54618

- 1 Dekalb DKA42-15 (susceptible variety)
- 2 Pioneer 54H91-N221 (resistant variety)
- 3 Pioneer 54V54 (susceptible variety)
- 4 Lemke 500LH (resistant variety older generation)

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Glandular-haired Alfalfa Plot

Barke Rd



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Glandular-haired Alfalfa Plots, Pierce, Juneau and Chippewa Counties 2005 & 2006

Treatment	Juneau County Plot			All Locations
	2005 Tons/A*	2006 Tons/A*	Ave Tons/A*	Tons/A*
GH/sprayed	1.33	1.13	1.23	1.49 (a)
GH/unsprayed	1.35	1.21	1.28	1.36 (a,b)
Susceptible/sprayed	1.21	0.91	1.06	1.19 (b)
Susceptible/unsprayed	0.73	1.60	1.17	1.23 (b)
Lemke/sprayed	1.23	1.31	1.27	
Lemke/unsprayed	1.13	1.07	1.10	

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* Dry Matter in tons per acre per cutting

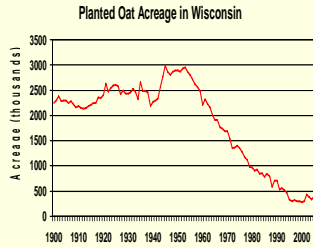
Cover Crops for Alfalfa

- Why cover/nurse crop?
 - Erosion control
 - Weed suppression
 - Drying wet soils
 - Nitrogen management
 - Improving soil quality

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Changes in Alfalfa Establishment Practices

- Prior to 1990, greater than 90% of alfalfa seed with oat cover crop
- Now less than 40% of alfalfa is seeded with oat cover crop



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General Considerations

- Too much competition to the young alfalfa seedlings can stunt their growth and or kill them.
- Alfalfa stressed in the seeding year will never yield as well in future years
- Higher than necessary plant populations of the cover crop add to establishment cost without producing additional return.

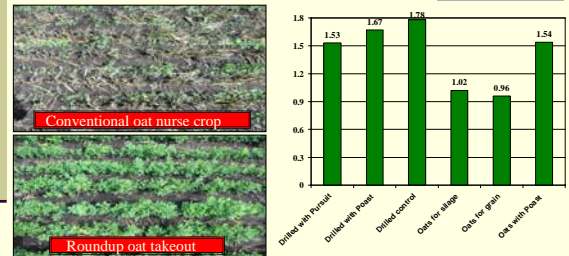
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Cover Crop - Oats

- establishes easily
- grows well under a wide range of conditions
- Avoid high seeding rates to reduce competition to alfalfa
 - recommended seeding rate is 1 bu (32 lb) per acre.
 - This provides about 12 seeds per square foot.
 - Higher seeding rates will increase grain yield (but not forage yield).
 - higher seeding rates will add stress on the alfalfa seedlings and may reduce stands and hurt the alfalfa yield in future years.

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Effect of cover crop competition on alfalfa yield



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Cover crop - Oats sprayed at 6-inch height

- oats seeded at 1 bu/acre
 - will provide good ground cover, early weed control,
 - when sprayed at 6 inches will die leaving alfalfa to yield the same as if no cover crop had been planted
 - The oats has been taken out with Poast+ and Select
 - Can use roundup ready alfalfa



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Forage yield of alfalfa either seeded direct (1), with oats over-seeded and sprayed at 6 inches (2) or oats harvested at boot stage (3).

Treatment	Arlington, WI			Rosemount, MN	
	2003	2004	2005	2004	2005
(1) Alfalfa seeded direct	2.8	2.4	2.3	3.0	3.5
(2) Oats sprayed at 6 inches	3.0	2.3	1.7	3.0	3.1
(3) Alfalfa + Oat haylage	2.7	4.1	3.1	3.6	4.0
Oat	2.0	2.3	2.0	2.2	2.0
Alfalfa	0.7	1.8	1.1	1.4	2.0

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Cover Crop - Barley

- is somewhat more difficult to grow.
- Forage yield is less than oats
- crude protein is slightly higher
- matures a week or more earlier than oats.

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Cover Crop - Small grain/pea mixes

- Improve palatability and forage quality over pure small grain cover crops.
- Peas, seeded alone or with too few small grain, will lodge and smother the alfalfa.
- Pea seed is also much more expensive than oats so must balance the benefit against the cost.
- Peas do not dry as fast after cutting as small grain forage

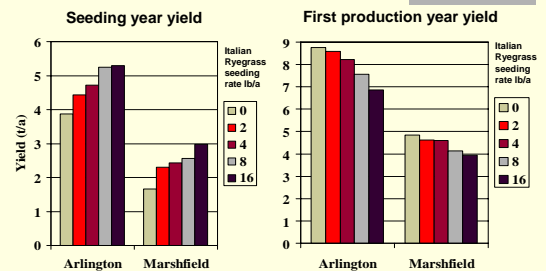
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Cover Crop - Italian ryegrass

- Good rapid ground cover
- High quality and palatable forage
- Choose a variety that does not head in the seeding year
- Plant at a sufficiently low seeding rate to reduce competition with the alfalfa (*4 lb/a of Italian ryegrass*)
- Does not do well on coarse textured soil especially in dry conditions

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Effect of cover crop competition on alfalfa yield



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Cover crop - Buckwheat

- good competitor with weeds
 - germinates rapidly
 - Has dense leaf canopy soon shades the soil.
- It can provide additional income
- hard on the alfalfa stand
- It *should be seeded at about half a normal seeding rate* (8 seeds/ft² – 18 to 36 lb/acre)

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Cover Crop - Sudangrass, sorghum-sudangrass, dry beans and other warm weather crops

- require warm weather for germination and growth
 - Therefore poor early weed competitor
 - not provide early ground cover
 - grow more into the summer
 - competition for the alfalfa seedlings when moisture is short
 - reducing future alfalfa yield potential.

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Grass-Legume Mixtures

- At one time grass-legume mixtures were the norm
- Herbicides and adoption of NIR testing using NDF and ADF reduced grass-legume mixtures
- Grasses don't always reduce quality and yield
- Presently over 80% of alfalfa grown in New York State is grown with a companion crop, Wisconsin is probably closer to? (20%).

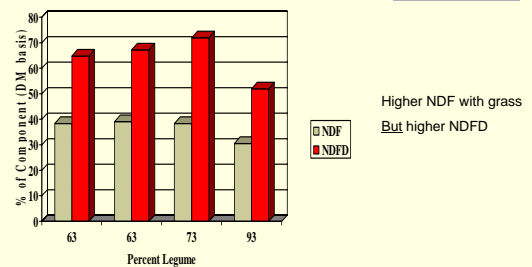
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Why Mix Grasses with Legumes

- More rapid hay drying
- Higher yield potential
- Less weed encroachment
- Insurance against legume winterkill
- Helps to fill in areas of field that are not suited for legumes
- Greater traffic tolerance
- Greater response to manure

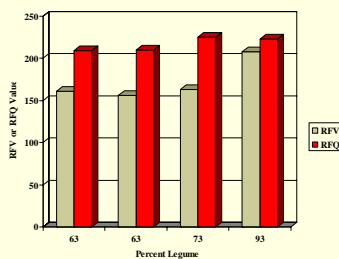
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Forage Quality of Alfalfa Grass Mixes



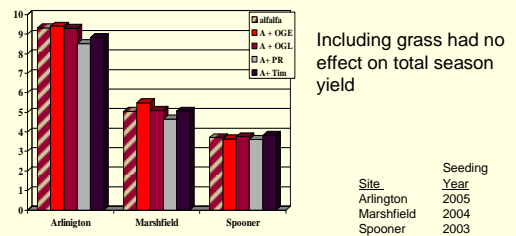
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Forage Quality of Alfalfa Grass Mixes



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Yield of alfalfa-grass mixtures in 2006

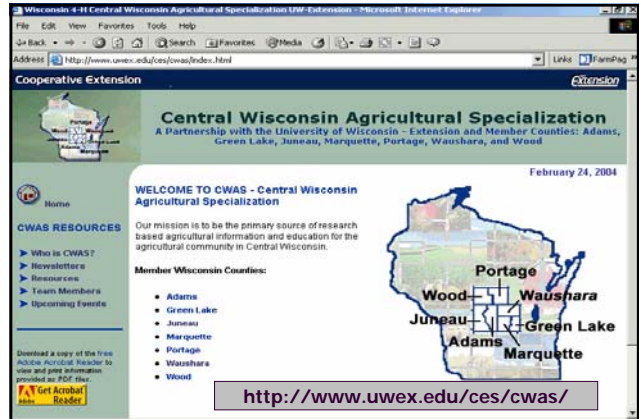


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Issues with grass

- There's great variation among grass species, thus it's difficult to make general statements about grasses
 - Re-growth characteristics, seasonal distribution, response to cutting and fiber digestibility all vary
- Have been limited feeding studies in the USA
- Best suggestion is probably to consider some on-farm research and experiment with grasses on a small scale on your own farm

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Wisconsin 4-11 Central Wisconsin Agricultural Specialization UW-Extension - Microsoft Internet Explorer

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February 24, 2004

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