Roundup Ready Alfalfa

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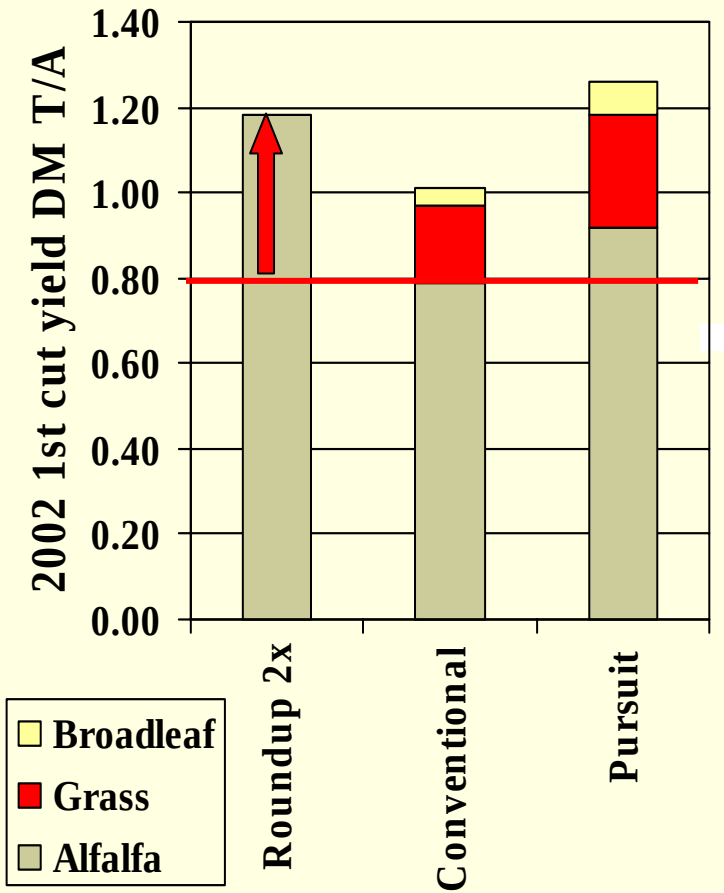
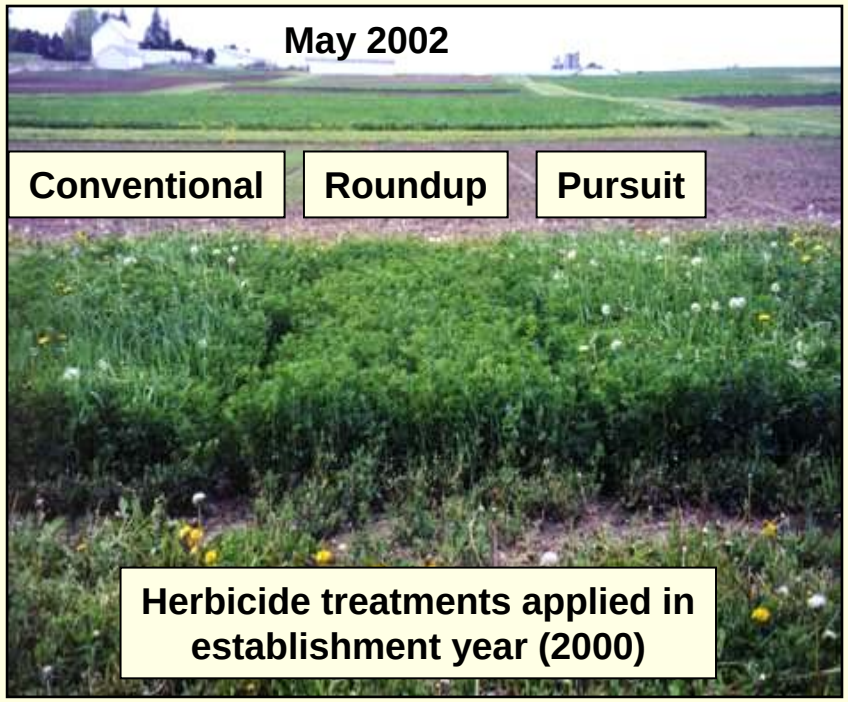
Roundup Ready Alfalfa

- 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.
- Trait integrated into elite germplasm
  - FD3 to FD10 dormancy types

2000 UW Herbicide Study





2001 WI test

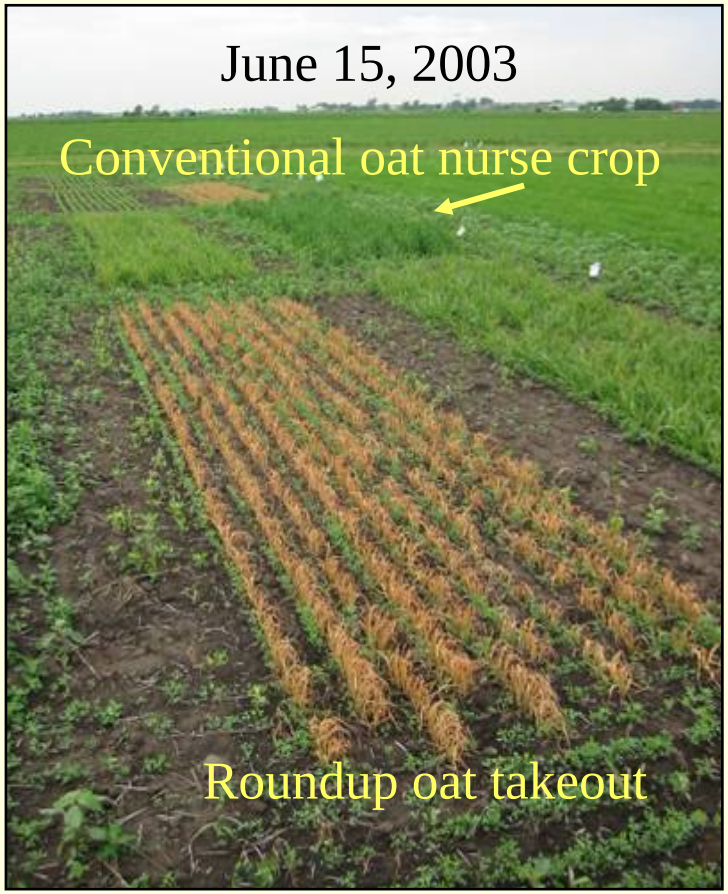
Product concept testing to evaluate efficacy relative to other herbicides.

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

Pursuit + Select | Roundup UltraMax

Pursuit + Select | Roundup UltraMax

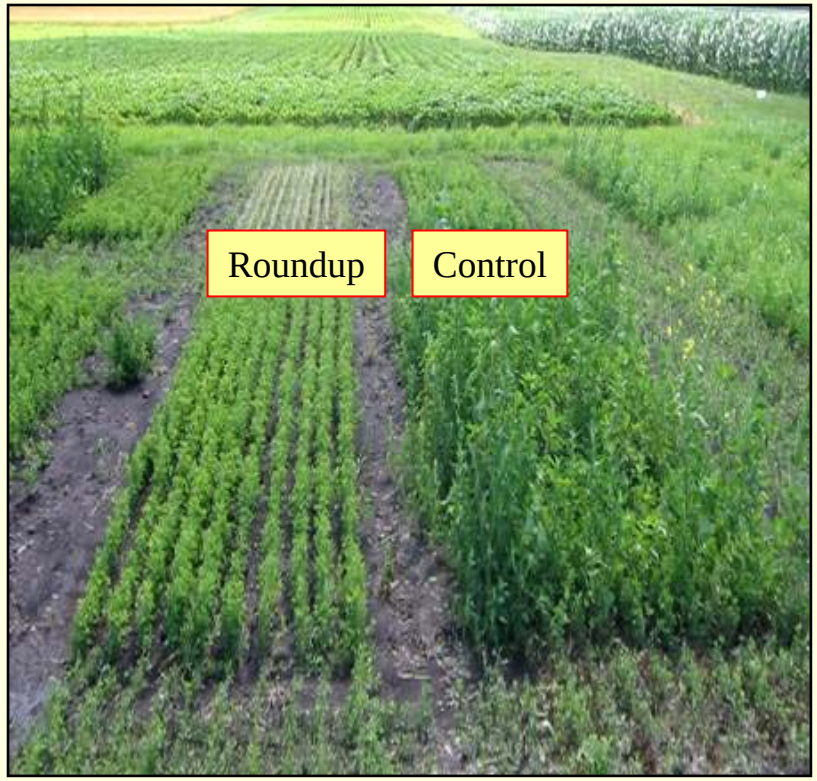
2003 U of Minn Herbicide trial



July 15, 2003

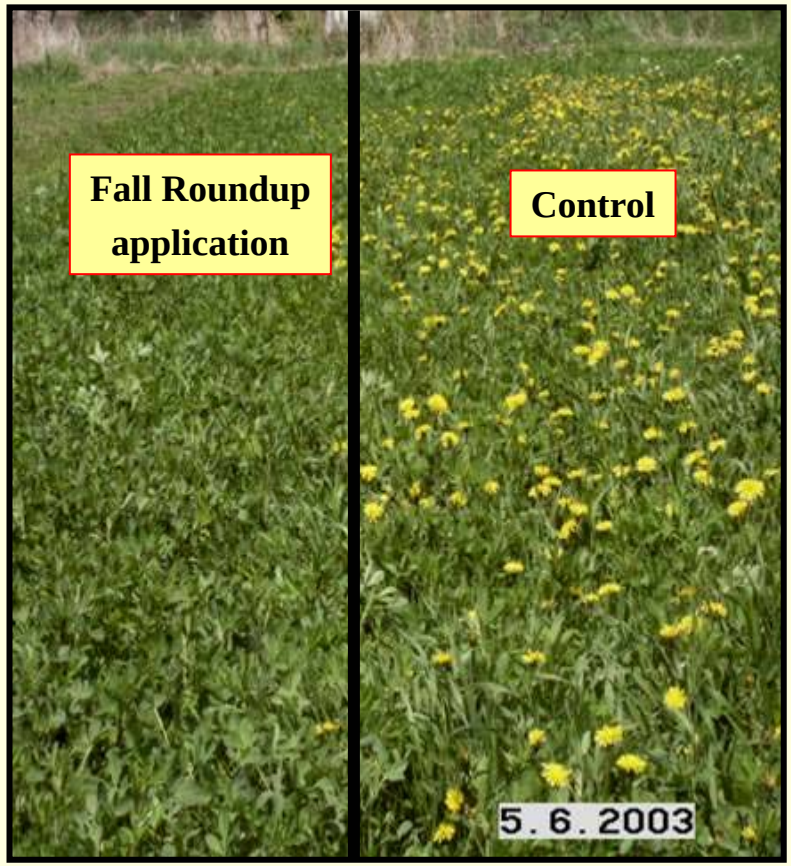
Weed control during establishment

- Weed control at seeding is critical for establishing a healthy stand.
- Preliminary test results indicate:
  - Post emergence Roundup® application at the 3-7 leaf stage results in excellent stands nearly free of weeds.



Weed control in established stands

- Excellent crop safety with respect to forage yield and quality.
- Roundup® applications in spring and/or fall result in excellent season-long control of weeds.



Roundup Ready Alfalfa

- First generation Roundup Ready® alfalfa varieties:
  - Forage yield ≥ commercial checks
  - Competitive forage quality, multiple pest resistance and persistence
  - RR trait purity ≥ 90%

Performance of Roundup Ready Alfalfa Varieties

	Arlington, WI		Rosemount, MN
	2004	2005	2005
Entry	tons/acre^	tons/acre^	tons/acre
WL	**2.60**	**7.20**	**5.28**
CropPlan Genetics	**2.55**	**7.14**	**5.29**
DK FD4	**2.47**	**6.92**	**5.31**
Garst	**2.35**	**7.04**	**5.44**
RR03BD-218	**2.30**	**6.98**	**5.08**
RR03BD-209	**2.32**	**6.76**	**5.07**
RR03BD-257	**2.47**	**6.35**	**5.2**
RR03BD-250	**2.29**	**6.61**	**4.95**
REBOUND 5.0	2.30	6.53	5.32
54V46	2.16	6.18	5.4
Mean	2.38	6.77	5.23
LSD(5%)	0.15	0.72	n.s

Performance of Roundup Ready Alfalfa Varieties

	Rosemount, MN
Entry	RFQ
WL	**199**
CropPlan Genetic	**183**
DK FD4	**188**
Garst	**181**
RR03BD-218	**201**
RR03BD-209	**190**
RR03BD-257	**177**
RR03BD-250	**180**
REBOUND 5.0	181
54V46	177
Mean	186
LSD(5%)	16

Use considerations

- The seed is guaranteed to have greater than 90% roundup ready seed.
  - It is anticipated that the first spraying in the seedling stage will take out the non roundup ready seedlings and their loss will not be noticed as stands thin naturally in the seeding year.
  - This could be an issue if the alfalfa is not sprayed in the seedling stage.
- 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.
  - Problem may be minimized by frequent cutting of alfalfa
- Roundup does not cause damage to the seedling alfalfa as observed with most other herbicides.

Use considerations

- The harvest restriction is much shorter for Roundup applied to alfalfa in the seedling stage than for most other herbicides.

Harvest restrictions for herbicides registered for use in forages	
Buctril	30 days
Butyrac 200	60 days for new seedings 30 days for established stands
Glyphosate **(Weathermax and Ultramax II)**	14 days 36 hours for fields being rotated to another crop **5 trifoliate leaves to 5 days before harvest for Roundup Ready alfalfa**
Poast Plus	7 days for undried forage 14 days for dried hay
Pursuit	30 days
Raptor	20 days

Use considerations

- The contracts will vary slightly among companies in terms of record keeping.
  - Cropplan Genetics is requiring a GPS reading in each field.
  - Others requiring no GPS reading in Wisconsin (one GPS reading per field is required for those states in the West where seed is produced).
- The one time technology fee per 50-lb bag of Roundup Ready alfalfa seed. Add to this the cost of the seed itself to get the total seed cost.
  - West of the Rockies, it is $150 a bag.
  - East of the Rocky Mountains is $125 a bag.
    - If a grower plants 12 lb/acre in Wisconsin, the technology fee is approximately $31/a.
    - If a grower plants 10 lb/acre in Wisconsin, the technology fee is approximately $21/a.

The Future…

- Research is ongoing with biotech traits that enhance forage quality.
  - Reduced lignin alfalfa
    - Increased fiber digestibility
    - Decreased manure solids
  - Tannin alfalfa
    - Increased efficiency of alfalfa protein utilization
    - Decreased protein supplementation
    - Decreased N losses from dairy cows
    - Elimination of bloat risk when grazed