AGRONOMY RESEARCHUPDATE

Glyphosate-Based Weed Management in Alfalfa

2014

Objectives

- Determine glyphosate treatment effects on tonnage, NDF and crude protein of Pioneer® brand alfalfa varieties with Genuity® Roundup Ready® technology.
- Investigate stand longevity, yield, and quality with glyphosate-based weed management.

Study Description

Locations: Chazy, NY, and Ithaca, NY

Plot Layout: 20ft x 50ft plots, 4 replicates

Factors:

Pioneer® Brand Varieties: 54R01 (RR), 54R02 (RR)

Treatments: Non-treated

3-5 Trifoliate (recommended timing)

- Glyphosate was applied in seeding year.
- Due to delayed seeding in 2011, only one cutting was taken.
- Second cutting was not taken at the Ithaca location in 2012.

Weather Conditions

- 2011 (Seeding year) - Prolonged spring rains delayed planting until the third week of May. Continued rains, followed by hot dry weather the remainder of the summer, resulted in one cutting.
- 2012 - Hot and dry most of the growing season; tonnage was reduced with limited moisture.
- 2013 - Adequate rainfall and timely cuttings in established stands.

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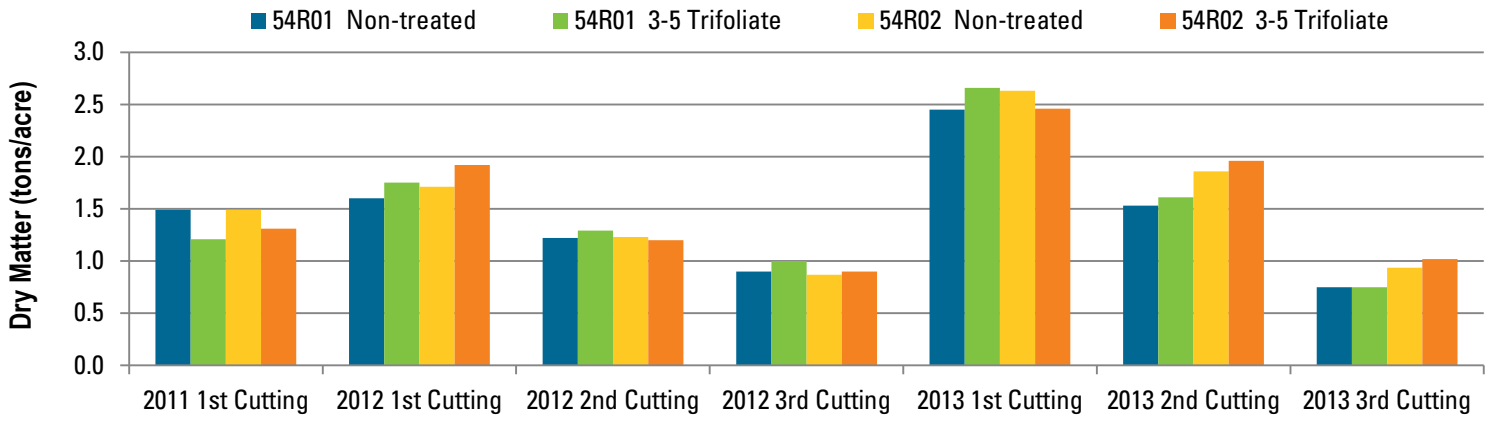
Yield Results

- Weed pressure from unsprayed plots contributed to overall tonnage in the seeding year for both 54R01 and 54R02 (Figure 1).
- Aside from the seeding year, glyphosate-treated plots of 54R01 consistently demonstrated increased dry matter tonnage over unsprayed plots and were at parity in 2013 3rd cutting (Figure 1).
- Total dry matter yield from 2011-2013 (Table 1) was 0.94 ton/acre greater in glyphosate treated plots of 54R01 and similar between treated and non-treated plots of 54R02, despite weed biomass contributing to greater tonnage for first cutting; in some cases accounting for 15% of total dry matter.

Table 1. Total dry matter yield, 2011-2013 all cuttings.

Variety	Non-Treated	3-5 Trifoliate App
	tons/acre	
54R01	9.94	10.88
54R02	10.73	10.77

Figure 1. Dry matter tonnage per cutting of 54R01 and 54R02 with and without glyphosate treatment at 3-5 trifoliate (2011-2013).



Quality Results

- First cutting quality in the seeding year (Table 2) demonstrated a positive response to glyphosate application at 3-5 trifoliate, with a 9% decrease in NDF and 8.6% advantage in crude protein for Pioneer® variety 54R01.
- Likewise, 3-5 trifoliate glyphosate application to Pioneer® variety 54R02 resulted in a 10.9% decrease in NDF and a 5.8% advantage in crude protein when compared to unsprayed (Table 2).

Table 2. Weed control effect on NDF and crude protein; 2011 first cutting.

Treatment	NDF	Crude Protein
	%	
54R01 Non-treated	46.1	15.1
54R01 3-5 Trifoliate	37.1	23.7
Difference	-9	8.6
54R02 Non-treated	44	19.1
54R02 3-5 Trifoliate	33.1	24.9
Difference	-10.9	5.8

- First cuttings over all years demonstrated improved forage quality for both NDF and crude protein when a glyphosate application was applied at 3-5 trifoliate growth stage (Table 3).
- Weed populations in the non-treated plots were suspected to contribute to lower quality forage, as weeds accounted for up to 15% of samples even into the third year (2013).
- Glyphosate-treated 54R01 showed a positive response in quality with 3.9% lower NDF and 3.67% higher crude protein compared to the unsprayed.
- 54R02 treated with glyphosate had a positive response in NDF (5.43% lower) and crude protein (2.73% higher) when all first cuttings were averaged.

Table 3. Weed control effect on NDF and crude protein; first cuttings 2011-2013.

Treatment	NDF	Crude Protein
	%	
54R01 Non-treated	44.60	17.97
54R01 3-5 Trifoliate	40.67	21.63
Difference	-3.93	3.67
54R02 Non-treated	44.00	19.77
54R02 3-5 Trifoliate	38.57	22.50
Difference	-5.43	2.73

Establishment

- One recommendation for glyphosate-tolerant alfalfa has been timing the application (3-5 trifoliate) to ensure null plants are removed early in establishment rather than later, causing gaps or reduced stand.
- Null plants have been reported to be as high as 10%; however, after application and counts in this study, null plant percentages were 2.72% in 54R01 and 2.05% in 54R02 after glyphosate application (Table 4).

Table 4. Null plants during establishment following glyphosate treatment at 3-5 trifoliate and 15-inch height.

Variety	3-5 Trifoliate	15-inch
	%	
54R01	2.72	4.72
54R02	2.05	1.94
Total	2.39	3.33

- Results indicate the primary value of glyphosate-tolerant alfalfa is improved forage quality obtained in seeding year cuttings.
- Table 2 demonstrates these advantages despite tonnage from the seeding year cutting being 0.28 and 0.18 DM tons/acre lower for 54R01 and 54R02, compared to non-treated plots.
- Forage quality of the treated plots was greater for all three first cuttings from 2011-2013.
- Final stand counts in this 3-year trial demonstrated a 2 plant/ft^2 advantage for both 54R01 and 54R02 plots that were maintained with glyphosate, compared to the controls.
- Stand longevity could be greater for glyphosate tolerant alfalfa compared to conventional alfalfa.

Figure 2. Non-treated (left) vs. 3-5 trifoliate spray (right) prior to the first cutting of 2011.