



## **Northern NY Agricultural Development Program 2013-2015 Project Report**

### **Improvement of Quality in Alfalfa-Grass Mixtures in NNY**

#### **Project Leader:**

Jerry H. Cherney, 503 Bradfield Hall, Soil & Crop Sciences, Cornell University, 607-255-0945, [jhc5@cornell.edu](mailto:jhc5@cornell.edu)

#### **Collaborator(s):**

- Michael H. Davis, Willsboro Farm Manager, Willsboro, NY; with trial plots at Willsboro and Chazy, NY.
- Debbie J. Cherney, Department of Animal Science, Cornell University

#### **Background:**

In spite of the introduction of Roundup-Ready (RR) alfalfa, our latest survey of alfalfa acreage indicates that more than 95% of the alfalfa acreage in northern NY is planted as an alfalfa-grass mix. The Midwest seeds less than 15% of its alfalfa acreage with a companion perennial grass, and RR-alfalfa has likely further reduced the amount of alfalfa-grass sown outside the Northeast.

The University of Wisconsin recently conducted a dairy cow trial with alfalfa-grass mixtures, and concluded that alfalfa-grass can produce as much milk as pure alfalfa, the same conclusion that Cornell dairy feeding trials came to more than 10 years ago.

Interest in alfalfa-grass mixtures for dairy cows is increasing outside of New York State (NYS), but there still is very little agronomic research on alfalfa-grass outside of NYS. A 2015 NYS alfalfa-grass survey we conducted showed a range in grass species used, and a very wide range in seeding rates for both alfalfa and grass, well outside the recommended rates.

The majority of alfalfa-grass seedings in NYS still utilize timothy as the grass of choice. Timothy is well adapted to the Northeast, seed is relatively inexpensive with a low seeding rate, and it is very easy to establish. On the negative side, timothy has two major flaws. Timothy regrowth heads out following each cutting, unlike most other cool-season grasses. This makes timothy undesirable from a forage quality standpoint. More

importantly, timothy is consistently about 2 percentage units lower in crude protein at the same stage of growth, compared to most other cool-season grasses. Given the high price of protein supplements, timothy is no longer a good option.

Reed canarygrass is not excessively competitive with alfalfa, but is generally difficult to establish. Orchardgrass and tall fescue tend to be excessively competitive with alfalfa. Even a very low grass seeding rate can result in grass dominating the stands very quickly. A less competitive grass that is persistent in our climate would be more desirable for mixtures.

There are now several potential options to improve quality of alfalfa-grass stands. One possible option is meadow fescue. Meadow fescue is very winter hardy and commonly sown in Canada in pure stands or with other perennial grasses. Two new cultivars were recently developed in Wisconsin, and are being promoted for grazing. The primary reason meadow fescue has not been promoted in the Northeast in the past is because it is lower yielding than other grasses.

### **Methods:**

Experiments were established at both Chazy and Willsboro research farm sites in 2013, representing light vs. more heavy textured soils. Since we have very little information on meadow fescue cultivars or appropriate seeding rates with alfalfa, initial experiments with meadow fescue are more appropriate as small plot experiments on more controlled experimental sites.

Early and late maturing meadow fescue (MF) and tall fescue (TF) cultivars were sown with potato leafhopper (PLH)-resistant alfalfa at grass seeding rates of 2, 4 and 8 lbs/acre. Grass cultivars also were sown in pure seedings, to evaluate yield potential of all available meadow fescue cultivars, in comparison with early and late maturing tall fescue cultivars.

Grass cultivars sown with alfalfa (2, 4, and 8 lb/a grass rates) were:

- Liherold MF (early)
- Pradel MF (late)
- Atlas II TF (early)
- Bariance TF (late)

Grass cultivars sown in pure stands were:

- Atlas II TF
- Bariance TF
- Liherold MF
- Pradel MF
- Preval MF
- Laura MF
- Hidden Valley MF
- Azov MF

For all studies, six replicates of alfalfa-grass treatments were sown per site, and five replicates of pure grass plots were sown.

The Willsboro site was provided with some irrigation initially to aid in establishment. The alfalfa in the alfalfa-grass portion of the Willsboro seeding winterkilled during the 2013-2014 winter, primarily due to ice-sheeting. Alfalfa at Chazy was also severely damaged.

Since the alfalfa stands were unsatisfactory at both sites due to the winter of 2013-14, two more studies were established at Chazy in 2014. One was identical to the study described above. The second experiment focused on alfalfa-orchardgrass. Early (Bounty), medium (Baridana) and late (Intensiv) maturing orchardgrass varieties, along with sparse-heading orchardgrass (DglF47) from Barenbrug, were sown at the rates of 2, 4, 6, 8, and 10 lbs/acre in mixture with alfalfa in May 2014.

Both 2014 seedings resulted in poor stands of alfalfa. The orchardgrass-alfalfa study had good stands of orchardgrass (OG) but not enough alfalfa to warrant harvesting. The alfalfa-meadow fescue experiment did have 3 replicates of reasonable alfalfa and it was harvested once in 2015, but the alfalfa did not recover and was not harvested again.

In 2015, a 4<sup>th</sup> alfalfa-grass study was attempted at Chazy, using reduced lignin Hi-Gest 360 alfalfa, a Pioneer alfalfa check variety, and 10 different grasses: Bariane TF, Kora TF, Pradus MF, Liherold MF, BAR FpF32 MF, Perseus festulolium, Dividend VL OG, Barlegro OG, Command OG, and DflF47 OG.

The 2015 seeding resulted in an even worse stand than the previous attempts, with unsatisfactory alfalfa and grass stands.

Pure grass plots at Willsboro were damaged during the 2014-15 winter. Pure grass plots from the 2014 seeding at Chazy were fertilized with 115 lbs N/acre in the spring of 2015 and with 100 lbs N/acre after first harvest. Pure grass plots at Chazy were harvested 3 times in 2015, on June 3, July 8, and October 15. All samples were analyzed for NDF and NDFD48h.

## **Results:**

### **Spring Alfalfa-Grass Harvest at Chazy**

Although alfalfa plants were present in sufficient numbers throughout the Chazy experiment, they were in a weakened state. Alfalfa-grass yields for cut 1 at Chazy were very low.

Alfalfa quality was not affected by grass variety or grass seeding rate, averaging 38.2% NDF and 46.9% NDFD48h. On the other hand, grass averaged 57.1% NDF, relatively normal for the end of May. Fiber digestibility of grass, however, was high, averaging 81.8%. Grass NDF and NDFD were almost identical to the 2014 harvest.

In general, both alfalfa and grass were marginal stands, and regrowth was minimal, so no additional harvests were collected in 2015.

Meadow fescue averaged 3.5% units higher in NDFD than tall fescue. There was no effect on quality due to grass seeding rates of 2, 4, and 8 lbs/acre.

### **Pure Grass Trial at Chazy**

Three harvests of pure grass at Chazy averaged 4.9 tons/acre for meadow fescue, and 3.0 tons/acre for tall fescue (Table 1). Variety yields were not greatly different, with the exception of lower yields for the organic variety Laura, now discontinued.

**Table 1. Chazy Pure Grass Yield, 3 cuts, NNYADP trial, Chazy, NY, 2015.**

<b><u>Variety</u></b>	<b><u>Species</u></b>	<b><u>tons/acre</u></b>
Atlas II	Tall fescue	3.12
Bariane	Tall fescue	2.97
Liherold	Meadow fescue	4.65
Pradel	Meadow fescue	4.61
Preval	Meadow fescue	5.02
Laura	Meadow fescue	4.50
Hidden Valley	Meadow fescue	4.99
Azov	Meadow fescue	5.39
	<b>MF Average</b>	<b>4.9</b>
	<b>TF Average</b>	<b>3.0</b>

The primary difference between fescue species was the severe winter damage to tall fescue, which did not recover until the second cut. There was no harvestable yield for tall fescue at the spring cut.

Grass forage quality dropped significantly from Cut 1 to Cut 3, with similar NDF and NDFD for the first two harvests (Table 2).

Meadow fescue did not show the typical increase in NDFD over tall fescue, likely due to the poor growth of tall fescue, resulting in higher than normal forage quality for tall fescue.

### **Conclusions/Outcomes/Impacts:**

Grass averaged 35% units higher in NDFD than alfalfa, one of the primary reasons why it is advantageous to plant mixtures.

Meadow fescue tends to be more winter hardy than tall fescue, and this was obvious at Chazy in the spring of 2015, following a stressful winter.

Meadow fescue looks very promising in mixtures with alfalfa, and meadow fescue is probably a better choice for either pure grass or mixed stands in northern NY.

**Table 2. Pure Grass Forage Quality, Chazy, NNYADP trial, 2015.**

			<b>NDF</b>	
<b>Variety</b>	<b>Species</b>	<b>Cut 1</b>	<b>Cut 2</b>	<b>Cut 3</b>
Atlas II	Tall fescue	-	53.3	60.9
Bariane	Tall fescue	-	52.2	61.9
Liherold	Meadow fescue	57.1	56.1	59.6
Pradel	Meadow fescue	53.8	55.5	60.2
Preval	Meadow fescue	56.5	54.9	61.0
Laura	Meadow fescue	55.3	56.2	60.0
Hidden Valley	Meadow fescue	57.0	55.0	59.7
Azov	Meadow fescue	60.1	57.5	62.4
	<b>MF Average</b>	<b>56.6</b>	<b>55.9</b>	<b>60.5</b>
	<b>TF Average</b>	<b>-</b>	<b>52.8</b>	<b>61.4</b>
			<b>NDFD48h</b>	
Atlas II	Tall fescue	-	78.6	59.2
Bariane	Tall fescue	-	74.8	55.0
Liherold	Meadow fescue	75.4	78.0	60.6
Pradel	Meadow fescue	80.0	78.1	59.8
Preval	Meadow fescue	76.6	77.5	56.9
Laura	Meadow fescue	77.6	77.0	49.0
Hidden Valley	Meadow fescue	77.0	77.8	57.5
Azov	Meadow fescue	73.9	78.0	59.2
	<b>MF Average</b>	<b>76.8</b>	<b>76.7</b>	<b>57.2</b>
	<b>TF Average</b>	<b>-</b>	<b>77.7</b>	<b>57.1</b>

**Outreach:**

Project results were presented at Cornell Agricultural Inservice, Nov. 4, 2015; Cornell Field Crop Dealer Meeting, Nov. 11, 2015; and Northeast Regional Certified Crop Advisor Training, Dec. 1, 2015.

**Next Steps:**

The last 5 alfalfa-grass studies established at Chazy and Willsboro were unsatisfactory. Due to the consistent problems with establishment of alfalfa-grass studies at Chazy and Willsboro, we are shifting any future alfalfa-grass trials to farmer's fields. With new higher quality grass options available, and with several new types of high quality alfalfa including GMO reduced-lignin alfalfa, we need to identify the best combinations of alfalfa and grass at optimum seeding rates to maximize forage quality for dairy cattle.

Testing these combinations on dairy farms should increase the rate of farmer implementation of the best management scenarios.

**Acknowledgments:**

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**Reports and/or articles in which results of this project have been published.**

Cherney, J.H., and D.J. Cherney. 2015. Alfalfa-Grass Agronomy: More Pros than Cons. Progressive Forage Grower, Issue 8 (Sept.):21-23.

Cherney, D.J. and J.H. Cherney. 2015. Alfalfa-Grass Nutritional Considerations: Pros & Cons. Progressive Dairyman, Issue 16 (Oct.):111-112.

These publications include data from Willsboro and Chazy studies:

Casler, M.D., G.E. Brink, J.H. Cherney, E. van Santen, M.W. Humphreys, T. Yamada, K. Tamura, N.W. Ellison, and C. Opitz. 2015. Registration of 'Hidden Valley' meadow fescue. J. Plant Registrations 9:294-298.

Casler M.D., G.E. Brink, and J.H. Cherney. 2016. Registration of 'Azov' Meadow Fescue. J. Plant Registrations (accepted).

**For More Information:**

Jerry H. Cherney, Soil & Crop Science Section, School of Integrative Plant Science  
503 Bradfield Hall, Cornell University, Ithaca, NY 14853  
607-255-0945, [jhc5@cornell.edu](mailto:jhc5@cornell.edu)

**Photo:**

Winter-damaged tall fescue in center plot with meadow fescue plots on either side at NNYADP alfalfa-grass Chazy trial, NY, 2015. Photo: J. Cherney.

