Influence of Variety & Seeding Rate on Alfalfa Stem Diameter
(East Central SCIA Regional Partner Grant Project)

Purpose:

To determine if alfalfa stem fineness (diameter) for hay can be improved by variety selection or seeding rate.

Background:

Hay producers want alfalfa that is fine stemmed rather than course stemmed. This is thought to improve palatability (less "sorting" by livestock), intake, forage quality (digestibility) and marketability. Stem fineness is more important when alfalfa is harvested as dry hay rather than haylage. Hay producers are likely willing to sacrifice some yield potential for an improvement in stem fineness, whereas haylage producers are not. Are hay producers inadvertently selecting unsuitable varieties? There are anecdotal differences between varieties with regards to stem fineness. There is also anecdotal evidence that stem fineness can be improved by a high seeding rate.

The side-by-side variety performance trial included the commercially available varieties all together in one plot. This provided an excellent site for Soil & Crop Tours to discuss variety selection as well as alfalfa management. This was a cooperative project shared by the University of Guelph, Ontario Forage Crops Committee (OFCC), and East-Central SCIA.

Methods:

Trial #1 – Variety

Side-by-side alfalfa performance variety trials were seeded in May 2005 near Enniskillen by the University of Guelph. However, without the Ontario Soil and Crop Improvement Association Regional Grant, there would have been no funding to harvest these plots and obtain the data. The trial consists of 49 varieties, in 1x6 m plots that are replicated four times. These plots were harvested and evaluated for yield and stem diameter.

Plot Harvest

East-Central S&C used the Centralia plot harvester was responsible for the transportation and insurance of the machine for the three harvests each year.

Stem Diameter

Two harvests of one square foot were made of each variety. The stems were "staged" and the number of stems/stage counted. These were put in paper bags, dried, and weighed to determine "mean stage by weight" as a measure of physiological maturity. Stems at "Stage 4" (late bud stage, >2 buds with no open flowers) were measured for stem diameter between the first internodes from the base using electronic calipers.

Yield Measurements

The entire plot was then harvested using the plot harvester, with the sample weights being added back in.

Results

Yields of the 49 varieties of alfalfa managed under a standard, three-harvest system were obtained from this trial, as well as a similar trial conducted at Elora. Yield results were incorporated into the Ontario Forage Crops Committee performance database and computations of relative variety performance for Ontario. Maturity and stem diameter measures were also recorded. Stem diameters of Stage 4 (late bud stage, >2 buds with open flowers) were measured to avoid confounding effects due to maturity differences among stems. Variety differences were detected. However, there were no significant variety x environment interactions. This indicated that relative maturity and stem diameter were consistent from test to test, harvest to harvest, and that the data (Enniskillen & Elora) could be pooled.

Combined over trials, nine varieties (53V52, Marquis, Amerigraze 401+Z, Jolt, Dominion, Approved, Macon, Guardsman II, and Reliance) were significantly less mature than the test mean. Five varieties (Enhancer, Stallion, Starbuck, Satellite, and Forecast 1001) were significantly more mature than the test mean.

Five varieties (Affinity+Z, 54V54, Pickseed 2065MF, Reliance and Amerigraze 401+Z) had Stage 4 stems that were significantly smaller in diameter compared to the test mean. Three varieties (Magnum IV, 134 and WinterGold) had Stage 4 stems that were significantly larger in diameter compared to the test mean.

Yield, maturity, and Stage 4 stem diameter were not correlated, so if maturity and/or stem diameter is an issue for producers, then both harvest timing and variety selection are management options. For example, harvesting at an earlier stage of development will result in forage that has a greater proportion of finer stemmed, less mature material. However, varieties differ in their maturity as well as their diameter of Stage 4 stems. Thus, one could leave harvest date unchanged but modify the maturity/diameter by changing the variety. Since there was not a high correlation with yield, this does not necessarily have to be sacrificed. Bi-plots were constructed to assist in identifying varieties with the desired combination of attributes.

Variety yield data was added to the composite index data published in the 2009 OFCC Forage Variety brochure (www.goforages.ca).

Trial #2 – Seeding Rate

Seeding preparation was done by farm co-operator. The Elora forage plot planter was used. It was transported to the site and back by East-Central S&CIA. Weather and soil conditions for successful establishment were good. Growing conditions for yield in 2007 were poor (dry), but excellent in 2008 (wet).

Varieties & Seeding Rates

Five varieties were planted. Seeding rates were 5.5, 11, 16.6 and 22 kg/ha. The plots were replicated four times, similar to Trial #1.

Results:

The data on forage yield by seeding rate is summarized in Table 1.

Table 1. Forage Yield (t/ac) by Seeding Rate

	Forage Yield (t/ac)			
	Seeding Rate (kg/ha)			
	5.5	11	16.6	22
Stage of Maturity (MSW)	3.7	3.4	3.2	3.1
Stem Diameter (mm)	2.7	2.7	2.5	2.6
Yield (tonnes/ha)	9.7	9.8	9.6	9.5

The alfalfa plots seeded at higher rates were less mature than the lower seeding rates. Some varieties were more affected than others. However, there were no differences in stem diameter at the same maturity (Stage 4). In other words, high seeding rates delay maturity, and, therefore, reduces stem diameter on a given date of harvest. At higher seeding rates, the delayed maturity also resulted in reduced yield.

Summary:

A full project report will be posted when available on the East-Central SCIA website: http://www.regionalscia.org/

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