

FINAL REPORT

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Title: Development and assessment of late maturing orchardgrass varieties.

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Executive Summary

Orchardgrass (*Dactylis glomerata*) is a perennial grass native to western and central Europe. Orchardgrass usually establishes a stand more readily than other grasses such as timothy and brome grass. It is shade tolerant, more tolerant to heat and low moisture than timothy, and has an excellent seasonal growth pattern similar to that of alfalfa. Following cutting, orchardgrass is rapid to recover and usually produces good second and third cut forage crops which are all leaves. Orchardgrass is well adapted to grazing due to its excellent regrowth as well as its good tolerance to close grazing. Unlike other perennial forage grasses, it is also very responsive to nitrogen and manure application.

Orchardgrass has excellent feeding quality but rapidly loses quality and palatability with maturity. Since orchardgrass varieties generally flower earlier than other commonly used forage species, the rapid decline in quality as the plant matures has been an ongoing problem for harvest timing and optimum utilization of forage mixtures containing orchardgrass. A recurrent selection breeding program for combining late maturity, forage yield, and seed yield in orchardgrass has been underway at Guelph for a number of years. This breeding program has generated experimental varieties that flower at least one week later than the latest varieties commercially available.

These late maturing orchardgrass experimental varieties may provide alternative options for forage production and forage harvest timing. However, studies of the feeding value of this material in pure stand and its reaction in mixtures with alfalfa are required. Since this technology is new, there have been no studies of the rate of decline in feeding value during maturation. Based on previous studies, the late maturing populations should have higher feeding value than conventional varieties, but this has yet to be confirmed. Assessment of this is necessary to develop optimum recommendations for on farm use of these varieties. The information generated the proposed studies will be used to develop production protocols and assist in the evaluation and adoption of late maturing orchardgrass varieties in production systems involving perennial forages.

The rate of advance in maturity was significantly slower for the UofG experimental compared to Okay and Rapido. Rapido was the earliest maturing variety, Okay was later than Rapido, and the UofG experimental was the latest maturing. Even at the last sampling, 25 June, this variety was

averaging a Mean Stage by Weight (MSW) of 1.6, much below the MSW of Okay (4.8) and Rapido (5.2).

Selection for later maturity did not affect the herbage yield of the alfalfa-orchardgrass mixture. The alfalfa mixture yield of the later maturing UofG experimental was numerically higher than the other two varieties, but the yields were not significantly different among the three varieties. Increasing the seeding rate from 2 to 4 kg/ha resulted in a 2.7% decrease in yield performance. This decline is likely a result of a reduced alfalfa:grass biomass ratio. Assessment of the quality components is in progress

Trials were established in 2003 at Elora and New Liskeard to determine the response to nitrogen application of five orchardgrass varieties, including the late experimental variety. This study will involve nitrogen response to herbage yield in pure stands and in binary mixture with alfalfa. An additional trial at the Elora site will be used to assess seed yield response to nitrogen application. These studies will reveal if adjustments to the current recommendations are necessary for the later maturing orchardgrass populations.

Project Results and Milestones

1. Establish additional field trials of orchardgrass-alfalfa and pure orchardgrass experiments	Jun 2003	Met
2. Year 1 analysis of competitive ability, feeding quality and decline during maturation	Dec 2003	Yield analysis met Quality in progress
3. Year 2 analysis of feeding quality and decline during maturation.	Nov 2004	For summer 2004

In 2002 replicated trials were seeded at Elora and New Liskeard involving three orchardgrass varieties (Okay, Rapido, and a UofG experimental) in binary combination with two alfalfa varieties (5312 and Magnum IV). Included in the test was two seeding rates, the recommended rate of 2 kg/ha orchard, 11 kg/ha alfalfa, and a rate of 4 kg/ha orchard, 11 kg/ha alfalfa. In order to enable sampling over time, three repeated seedings were made of each test. In 2003, a three harvest management was superimposed on the trials. In one trial, herbage yields were recorded using a three harvest management. In the second test, weekly samples were taken to determine stage of development and feeding value for the first growth cycle. In the third test, weekly samples were taken to determine stage of development and feeding value for the second growth cycle. Quality samples were dried at 50C and ground in a hammer mill.

The rate of advance in maturity was significantly slower for the UofG experimental compared to Okay and Rapido. Figure 1 illustrates the Mean Stage by Weight over the period 30 May to 25 June 2003. Rapido was the earliest maturing variety, Okay later than Rapido, and the UofG experimental was the latest maturing. Even at the last sampling, 25 June, this variety was averaging a MSW of 1.6, much below the MSW of Okay (4.8) and Rapido (5.2).

Yield performance of the varieties in mixture with alfalfa is presented in Table 1. The alfalfa mixture yield of the later maturing UofG experimental was numerically higher than the other two varieties, but the yields were not significantly different among the three varieties. Increasing the seeding rate from 2 to 4 kg/ha resulted in a 2.7% decrease in yield performance. This decline is

likely a result of a reduced alfalfa:grass biomass ratio. Assessment of the quality components is in progress.

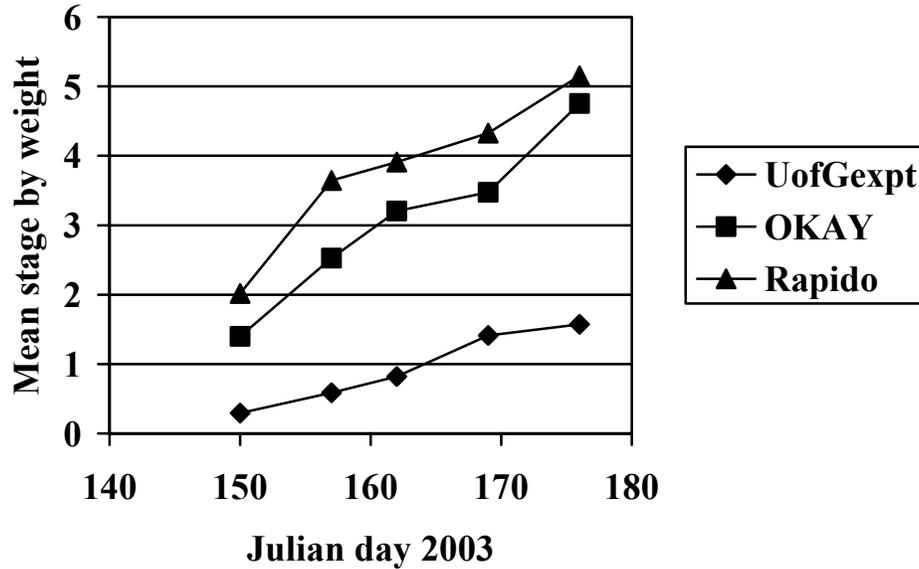


Figure 1 Mean stage by weight of three varieties of orchardgrass over the period 30 May and 25 June 2003. Trial design was a randomized complete block, with four replicates, se=0.53.

Table 1. Yield of three orchardgrass varieties in binary mixtures with two alfalfa varieties (5312 and Magnum IV) at two seeding rates (2:11 kg/ha and 4:11 kg/ha), Elora, ON. Test established 2002, yield data collected 2003.

Orchardgrass varieties	Yield (kg/ha)			
	Cut 1	Cut 2	Cut 3	Season total
Okay	4670	3200	2283	10153
Rapido	4703	3234	2417	10353
UofG Expt	4833	3250	2307	10391
LSD (0.05)	160.0	113.7	125.6	290.1
Seeding rate effects				
2 kg orchard	4799	3271	2369	10439
4 kg orchard	4672	3185	2302	10159
LSD (0.05)	130.5	92.7	102.4	236.7
CV	5.6	5.9	9.0	4.7

In 2003, a set of replicated trials were seeded at Elora and New Liskeard involving five orchardgrass varieties in pure stand and binary mixtures with alfalfa. A total of 16 replicates were established in order to superimpose a differential nitrogen management. Normally, 0 nitrogen is recommended with 50% or more alfalfa and about 75 to 50 kg N/ha for pure stands depending on harvest and fertilizer. This study, which will be conducted in 2004, reveal if adjustments to this recommendation are necessary.

Based on trials conducted in the 1950's and 1960's, a rate of 90 kg N/ha is the recommended level for seed production of grasses in Ontario. A breeder seed plot of a late maturing variety at the Elora Research Station will be subdivided into a randomized complete block design to assess whether the nitrogen application rate for seed production of late maturing varieties may need to be adjusted.

Promotional Activities

Bowley, S.R. 2003 Forage research update. Ontario Forage Council, Elora, ON.

Bowley, S.R. 2004 Summary of OFC sponsored research. Annual Meeting, Ontario Forage Council, Guelph, ON.