EFFECTS OF LONGER TERM STORAGE ON SEED GERMINATION FROM GRASS SEED HARVESTED AT DIFFERENT SEED MOISTURE CONTENTS

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Seed moisture content is probably the best indicator of the physiological maturity in grass seed crops for determining when swathing (windrowing) is to be done for harvesting seed. Since grass seed crops do not pollinate and mature over a uniform time period, there is a wide range of seed maturity within a crop stand. In order to optimize the time to swath grass seed crops, there is a balance between cutting too early and too late. Cutting too early at high moisture content shortens the seed fill period and can cause reduced seed size and increase the number of immature seed. Cutting too late at low moisture content can decrease yield through losses due to seed shattering (Klein and Harmond, 1971; Andersen and Andersen, 1980). Both of these extremes can have an impact on seed quality as well as seed yield. Research was also done in the Willamette Valley of Oregon for tall fescue (Andrade et al., 1994) as well as perennial ryegrass, orchardgrass, and fine fescues (Klein and Harmond, 1971).

Studies conducted between 2004 and 2008 provided updated recommendations on how wide a range of seed moisture the grass seed crops can be swathed at and still maintain maximum yields. These trials were designed to compare harvest at different seed moisture contents and verify recommendations previously available. Results of these studies are reported in the Seed Production Research Report series (2004, 2005, 2007, and 2008) and brought together in the OSU Extension Publication EM 9012-E *Using Seed Moisture as a Harvest Management Tool*. In addition to determining the harvest seed moisture range, sub-samples of cleaned seed from some of these trials were put into storage to determine longer term effects on germination. These samples were stored for at least one year (depending on trial) and retested for germination.

Materials and Methods

Seed samples from all plots in each of the trials listed in Table 1 had initial germination tests conducted in December following harvest (except the Aruba 2007 trials – no initial germination tests were done). Seed samples were stored in an office building where temperature ranged from 65-75º F for the duration of the study. Initial seed samples were sub-sampled and replications were bulked by treatment (for cost savings) for preliminary germination screening in December, 2009. Trials that had a range of germination close to 5% (2007 Aruba creeping red fescue – 4% and 2008 Manhattan perennial ryegass – 4.75%) were re-tested using all plots in the particular trial (4 replications and 3 treatments in a randomized complete block) to provide data for statistical analysis.

Table 1. Germination test dates.

Species Variety	Harvest year	Germination test date		
		----- (month/years) ---		
Tall fescue				
Avenger	2008	12/08	12/09	---
Tarheel II	2008	12/08	12/09	---
Perennial ryegrass				
Chaparral	2008	12/08	12/09	---
Caddieshack	2008	12/08	12/09	5/10
Chewings fescue				
Ambrose	2008	12/08	12/09	---
Creeping red fescue				
Aruba	2006	12/06	12/09	---
Aruba	2007	---	12/09	5/10
Wendy Jean	2008	12/08	12/09	---

Results and Discussion

Tall fescue

Both sites retested for germination were within germination requirements (85%) at all harvest timings (Table 2). The germination levels even improved at all harvest timings with seed from the cv. *Tarheel* site. There may have been some post harvest dormancy still affecting the initial germinations following harvest. These data indicate that seed storage for an additional year did not negatively affect seed germination in tall fescue.

Perennial ryegrass

Germination in the perennial ryegrass trials had a little more variability than other trials. The cv. *Chaparral* site started with lower germination values that were probably caused by moisture stress conditions during seed fill (Table 3). Initial retesting of the seed from this site indicated small differences in germination, but the earliest swathing time did drop below 85%. If funding becomes available further germination tests of this site would be warranted. The cv. *Manhattan* site still maintained germination levels above 90% and were above the minimum germination requirements (85%) for this certified seed.

Fine fescue

Fine fescue seed was tested from 2006, 2007 and 2008

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providing a good range of aged seed. Screening tests done in December 2009 identified the 2007 crop as the most affected by storage. A complete germination screening (all treatments in all replications) was done in May-June 2010 for the 2007 harvest. Though there were no germination differences with the differing harvest timings, all treatments were below the 85% threshold for seed to be certification eligible (Table 4). Generally, across all the years of different swathing timings ranging from 38% seed moisture down to 16% seed moisture, germination levels were not significantly affected.

Conclusions

Storage of seed for at least one year does not appear to be affected by the harvest timing and range of seed moisture that was evaluated by these studies. The direct causes of germination differences in a couple of the sites (cv. *Chaparral* perennial ryegrass and *Tarheel* tall fescue) seem to be more in relation to soil moisture at seed filling and weather conditions than the seed moisture content at swathing. If resources become available, seed from these trials will be retested more thoroughly to identify the potential for harvest timings to affect long-term storage of the seed.

References

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Table 2. Seed germination of short-term (~1 year) stored seed from different harvest timings in tall fescue.

Swath date	Seed moist.	Seed yield	Germination Dec. 08	Dec. 09	Jun. 10
	(%)	(lb/a)	---------(%)---------		
2008 Avenger tall fescue					
July 9	46	2994	91.9	91.0	---
July 12	38	2853	92.9	92.5	---
July 14	31	3075	94.1	92.0	---
LSD 0.05		NS	NS	---	---
P value		0.520	0.620		
2008 Tarheel II tall fescue					
July 10	48	3376 b	88.8 b	92.5	---
July 13	35	3779 a	89.9 b	91.8	---
July 14	31	3791 a	93.4 a	95.5	---
LSD 0.05		283	3.1	---	---
P value		0.019	0.027		

Table 3. Seed germination of short-term (~1 year) stored seed from different harvest timings in perennial ryegrass.

Swath date	Seed moist.	Seed yield	Germination Dec. 08	Dec. 09	Jun. 10
	(%)	(lb/a)	---------(%)---------		
2008 Chaparral perennial ryegrass					
July 11	45	1167	87.0	84.0	---
July 13	43	1173	86.1	86.5	---
July 15	25	1172	88.5	86.3	---
LSD 0.05		NS	NS	---	
P value		0.987	0.508		
2008 Manhattan perennial ryegrass					
July 13	44	2308 a	93.3	91.3	91.7
July 16	34	2203 b	93.4	96.0	93.5
July 18	23	2240 b	93.0	94.5	92.9
LSD 0.05		66	NS	---	NS
P value		0.022	0.889		0.158

Table 4. Seed germination of short-term (~1 year) and longer-term (~2-3 years) stored seed from different harvest timings in fine fescue.

Swath date	Seed moist.	Seed yield	Germination Dec. 08	Dec. 09	Jun. 10
	(%)	(lb/a)	-------- (%) ---------		
2006 Aruba creeping red fescue					
July 07	34	1610	96.2[1]	86.0	---
July 10	24	1622	96.2	88.5	---
July 12	19	1616	97.3	88.0	---
[1]germination Dec 2006					
LSD 0.05		NS	NS	---	---
P value		0.943	0.604		
2007 Aruba creeping red fescue					
July 7	38	1388	---	83.3	81.8
July 10	24	1380	---	87.3	84.9
July 12	20	1408	---	87.0	82.2
LSD 0.05		NS	---	---	NS
P value		0.914			0.372
2008 Ambrose Chewings fescue					
July 11	39	1760 a	92.6	92.5	---
July 12	30	1654 b	94.0	91.3	---
July 13	23	1638 b	92.8	93.5	---
LSD 0.05(0.1)		(95)	NS	---	---
P value		0.091	0.637		---
2008 Wendy Jean creeping red fescue					
July 9	36	2128	94.0	91.3	---
July 11	31	2144	94.4	92.3	---
July 12	16	2105	94.2	90.3	---
LSD 0.05		NS	NS	---	---
P value		0.360	0.904		---

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