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Coffeeville, MS

Vol. 11, No. 4 Technical Note November 1995

SEED GERMINATION OF ALAMO SWITCHGRASS AS INFLUENCED BY AGE OF SEED AND PRECHILL

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INTRODUCTION

Switchgrass (*Panicum virgatum* L.) is a native, warm season perennial grass with yield and quality characteristics suitable for summer forage in Mississippi (Edwards et al., 1991). Despite its forage attributes, switchgrass is often slow to make an acceptable stand the first year. Poor seedbed preparation, weed competition, unfavorable environmental conditions at planting time, and insufficient management during the establishment year have contributed to stand failures. Seed dormancy in switchgrass has also been accused of hindering establishment. Moist prechilling (PC; stratification) and storage (after-ripening) have shown to reduce seed dormancy in switchgrass (Zhang and Maun, 1989; Aho et al., 1989; Zarnstorff et al., 1994).

Prechilling two and four year-old-seeds of 'Cave-in-Rock' and 'Blackwell' switchgrass increased early and final germination, but germination response varied among seed lots and storage environments (Zarnstorff et al., 1994). Early germination was increased 36% and final germination 16% in a two-year-old seed lot of Cave-in-Rock stored at 5° C. Prechilling did not increase early or final germination in a two-year-old seed lot of Blackwell, or final germination in a two and four-year-old seed lot of Cave-in-Rock stored at 5° C. Shaidaee et al. (1969) reported that seven-year-old seeds of 'Grenville' switchgrass germinated and emerged earlier and gave a higher final germination than one and two-year-old seeds.

There is limited or no data available on seed germination characteristics of 'Alamo' switchgrass, a cultivar well suited for the southeastern U.S. Therefore, the objective of this study was to determine the effect of age of seed and PC on early (7 days) and final germination (28 days) of Alamo switchgrass seed.

MATERIALS AND METHODS

Seed lots of Alamo switchgrass used in this experiment were harvested in 1991, 1992, and 1994 (4, 3, and 1 year-old-seeds) from fertilized and irrigated seed production fields. Seeds harvested in 1991 and 1992 were produced at the James E. "Bud" Smith Plant Materials Center (PMC) near Knox City, Texas, and the 1994 seeds were obtained from a midwestern commercial seed supplier. To insure only the highest quality seed was used in the experiment, each seed lot was separated with a South Dakota Seed Blower (Seedburo Equipment, Chicago, IL) into light and heavy seed lots. Only the heavy seed lots were used in this experiment. Seeds were stored in a controlled environment at 7° C with 55% humidity until the experiment began in August, 1995. Seed treatments included soaking the seeds for 24 hours in cold water (SS); moistening the seeds (SM); and no seed treatment (control). Seeds of SS and SM treatments were exposed to 21 days PC at 5° C with no humidity control. Seeds used as the control remained in storage until the experiment began. Treatments were arranged in a factorial experiment in a randomized complete block with 10 replications. A replication consisted of 100 seeds placed on a moistened filter paper in a petri dish. Petri dishes were placed in a germination chamber (Hoffman Manufacturing Co., Albany, OR) for 28 days with alternating day/night temperature (30/15° C) and light (8 hours day/16 hour night) as outlined by the Association of Official Seed Analysts (AOSA, 1993). Petri dishes were moistened as needed with distilled water to insure adequate moisture for seed germination. Seed was considered germinated if radicle was visible. Germinated seeds were counted and discarded at 7, 14 and 28 day intervals. Seven and 28 day seed counts will only be reported in this paper. Data was subjected to the analysis of variance procedures in MSTAT-C (Michigan State University, 1988) and mean separation was performed at the 5% level of probability.

RESULTS AND DISCUSSION

There was a significant age of seed by seed treatment interaction for early germination. Soaking and PC one-year-old seeds increased early germination from 37 to 62% (Fig 1.). An increase in early germination due to PC is in agreement with Zarnstroff et al. (1994). In the three and four-year-old seeds, no significant differences were found between seed treatments for early germination (data not shown). This suggests that some degree of seed dormancy may have been present in the one-year-old seeds and PC enhanced germination. These results indicate that PC one-year-old seeds may be advantageous for rapid germination; however, since the one-year-old seeds were produced in the Midwest, this response to PC could have been due to location of seed production. Panciera et al. (1987) found that both seed treatment and geographical location of seed production affected germination of 'KY 1625' switchgrass.

Final germination of Alamo switchgrass as influenced by age of seed and seed treatment is given in Table 1. As age of seed increased, final germination increased. Four-year-old seeds had significantly higher (8%) germination than one-year-old seeds, but the magnitude of this difference was small. Shaidaee et al. (1969) reported higher germination for seven-year-old seeds of Grenville switchgrass than two or three-year-old seeds. There were significant differences between the control and SM and PC treatment for final germination with the control having 11% more germination. A negative response from PC is in agreement with Zarnstorff et al. (1994).

CONCLUSIONS

Age of seed and seed treatment influenced early and final germination of Alamo switchgrass. Early germination of one-year-old seeds was greatly increased by PC whereas the three and four-year-old seeds showed no significant response to PC. Location of seed production and seed dormancy may have affected early germination in the one-year-old seeds. As age of seed increased, final germination increased. Prechilling the seeds did not increase final germination in this study.

Results from this study indicate that PC one-year-old seeds may be important for early germination, especially if weed competition is a major concern. Giving switchgrass seeds a 7-10 day start on weeds could be the difference between a successful pasture planting or a failure. However, since the one-year-old seeds of Alamo was produced in the Midwest, it would be inconclusive to say that switchgrass seed grown in the southern region would respond similar. Although PC seeds is a viable method for improving germination, there is one disadvantage. If PC seeds are planted in a dry seedbed or the seedbed dries out before germination, the seeds become susceptible to a secondary dormancy and may not germinate until next spring (Martin et al., 1976). District conservationists should advise landowners to purchase Alamo switchgrass seed grown in the southern states that is one-year-old or older.

Future research will focus on length of seed dormancy in freshly harvested seeds of Alamo and an upland type of switchgrass produced in the Mississippi, and what influence storage environments and PC have on germination.

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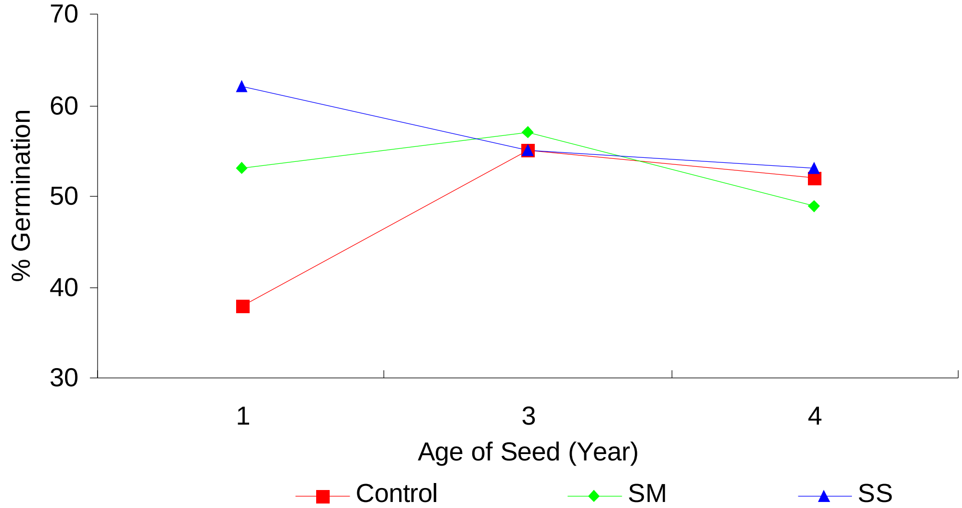

Fig. 1. Age of seed by seed treatment interaction in early germination of Alamo switchgrass.

Table 1. Final germination of Alamo switchgrass as influenced by age of seed and seed treatment.

	% Germination			
Age of seed (Year)	Control	SM[1]	SS[2]	Mean
1	70	59	62	64a*
3	73	62	66	67ab
4	76	66	75	72b
Mean	73A	62B	68AB	68

* Main effect means in rows and in columns followed by the same case letters are not significantly different at the 5% level of probability.

1 = Seed moistened and prechilled for 21 days.
2 = Seed soaked and prechilled for 21 days.

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