Effectiveness of Seed Matriconditioning on Germination and Storability Parameters of Creeping Bentgrass

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Creeping bentgrass (Agrostis stolonifera) is a commonly used cool-season grass for lawns and golf courses worldwide. One of the most important challenges of creeping bentgrass is the speed and uniformity of germination and seedling establishment. It has been known that matriconditioning (MC), a controlled hydration seed treatment, can enhance the parameters of germination and soil emergence. The primary objective of this study was to determine the effectiveness of optimum MC on non-aged and aged creeping bentgrass seeds. Seeds were matriconditioned with Micro-Cel E carrier and water at 25 °C for 7 days. Optimum seed, carrier, and water proportions were 1 g, 0.5 g, and 2 mL, respectively. Accelerated aging was induced by storing nonprime and primed seeds for 0, 10, and 20 d at 42 °C and 95% relative humidity (RH). Creeping bentgrass seeds treated with MC germinated quicker and with higher final germination percentage than nontreated control seeds. Matriconditioned and aged creeping bentgrass seeds showed no substantial losses in germination compared with nontreated control seeds.

One of the most beautiful of the cool-season grass species is creeping bentgrass due to its thick density, dark green color, and very fine texture. Creeping bentgrass thrives in cold winter and warm summer climates and is generally used for golf course greens (Dernoeden, 2000). Therefore, non-uniform germination of creeping bentgrass can cause limitations to golf green establishments around the world.

Seed enhancements such as matriconditioning (MC) have been used to improve germination and seedling establishment parameters for many vegetable and grass seeds (Khan, 1992). Furthermore, MC has also been used to improve seed performance under various abiotic stress conditions, including high humidity and high temperatures. For example, matriconditioned and aged switchgrass seeds had significantly higher final germination rates than nonprimed and aged seeds (Hacisalihoglu, 2008).

While MC techniques have been used more than a decade, very little work has been reported on cool-season grasses, and there are no reports of matriconditioning of creeping bentgrass. The objective of this study was to examine the effectiveness of MC on germination and storability of creeping bentgrass seeds.

Materials and Methods

SEED MATERIAL AND MATRICONDITONING. Creeping bentgrass (Agrostis stolonifera) seeds were obtained from Seeds West (Yuma, AR), stored at 6 °C (33% RH), and small batches were removed as needed. The protocol for MC was described previously (Hacisalihoglu, 2008). Briefly, MC treatment included mixing 1 g seeds with 0.5 g MicroCel E and 1.5 mL distilled water at 25 °C for 7 d in glass jars (500 mL). Jars were shaken once daily to maintain aeration during MC. After MC, seeds were rinsed thoroughly (20 s, distilled water) and dried by air for 2.5 h at 25 °C.

Germination test. Three replications of 50 seeds each were placed in 9-cm petri dishes containing Whatman #1 filter paper and 3 mL distilled water at 15/25 °C (16 h dark/8 h light) in a growth chamber as recommended by the Association of Seed Analysts (2002). The mean germination time (MGT) was determined using the following equation:

\[ \text{MGT} = \frac{\sum (n_i \times t_i)}{\sum n} \]

where \( n_i \) was the number of newly germinated seeds at the time of ti after imbibing, and \( n = \) total number seeds germinated (Hacisalihoglu, 2008).

ACCELERATED AGING TEST. The accelerated aging test was adapted from Hacisalihoglu (2008) with some modifications. Nontreated control and matriconditioned seeds were aged for 0, 10, or 20 d at 42 °C in small magenta boxes with polycarbonate stands and mesh top. All seeds were placed above the solution (100 mL) with ~95% RH. After aging treatment, seeds were removed from boxes to be used in germination tests.

EXPERIMENTAL DESIGN AND ANALYSIS OF DATA. The experimental design was a completely randomized design with three replicates. Analysis of variance (ANOVA) was used to test the effect of treatment. The means were separated using least significant differences (LSD) at \( P < 0.05 \) level (SPSS Inc., Chicago, IL).

Results and Discussion

Overall, MC improved all germination parameters tested. Final germination percentage (GP) increased 3% (from 97% to 100%) in matriconditioned seeds compared with nontreated control (Fig. 1A). Moreover, MC significantly reduced MGT (~25%) compared with control seeds (Fig. 2A). This pattern was in agreement with previous findings in switchgrass (Hacisalihoglu, 2008), lettuce (Hacisalihoglu et al., 1999), and several vegetable seeds (Khan et al., 1992).

All aging treatments significantly decreased germination parameters tested. The 10-d aged matriconditioned seeds had
42% (64% to 91%) higher final GP compared with control (Fig. 1B). The 10-d aged matriconditioned seeds also had 13% (8 to 10.5 d) reduced MGT compared with control (Figs. 1B and 2B). There was no significant difference between matriconditioned and control seeds in final GP or MGT after 20-d aging (Fig. 1C). Similarly, this pattern of MC improved germination under aging was reported in switchgrass (Hacisalihoglu, 2008) and amaranth seeds (Tiryaki, 2006).

In conclusion, our results showed that a 7-d MC treatment can be an effective method for enhancing germination parameters of creeping bentgrass seeds. Furthermore, matriconditioned creeping bentgrass seeds were able to be stored in accelerated aging conditions for 10 d without a significant loss in GP.

**Literature Cited**


