Breaking Seed Dormancy in Buffalograss

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1. Buffalograss seed dormancy can be overcome with a potassium nitrate treatment
2. Water may be as effective as potassium nitrate for breaking seed dormancy
3. Potassium nitrate seed treatment alters the seed coat allowing for rapid water uptake

Buffalograss seed is different compared to seed of other grass species commonly used for turf. Typically 1-5 caryopses are encapsulated in a bur-like structure, and these burs are sold as seed (Figure 1). Buffalograss burs have a strong seed dormancy response, common for many native grass species. Following harvest and seed cleaning, seed germination is often less than 30% even when viability is near 100%. Seeds are soaked in a potassium nitrate solution followed by wet storage at low temperature to break seed dormancy. The germination percentage of treated seeds increases to near 90%. A green dye is used by seed producers to indicate the seed has been treated to break dormancy (Figure 1). Another method for overcoming seed dormancy in buffalograss is to remove the caryopses from the bur. The caryopses readily germinate in the absence of a seed treatment. This method is not practical since isolated caryopses have poor shelf life and isolating them adds to post-harvest seed production costs. Since the caryopses readily germinate, the mechanisms conferring dormancy are believed to be in the seed coat, or the bur structure, but no research has been done to understand these mechanisms in buffalograss. This project is focused on understanding mechanisms of seed dormancy in buffalograss, characterizing molecular and physiological changes at germination, and testing alternative seed treatments to break dormancy.

Dormancy in many species is controlled by the endogenous hormones gibberellic acid (GA) and abscisic acid (ABA), where increased levels or sensitivity to ABA promotes dormancy and increased GA signaling or sensitivity promotes germination. A preliminary hormone profiling study was done to compare changes in ABA and GA among untreated, water soaked, and potassium nitrate treated buffalograss seeds. Concentrations of ABA did not change but levels of GA increased, supporting the idea that increased GA levels promote buffalograss seed germination. Subsequent experiments had variable results and GA levels in treated seeds were not consistently greater than in untreated seeds. For the above treatments, percent germination was also collected for 28 days following treatments (Figure 2). Germination percentage was the same between the water soaked and potassium nitrate treatments, suggesting water soaking may be as effective for breaking dormancy as the potassium nitrate treatment. Long term studies are needed to determine if the promotion of germination by the water treatment is short-lived or sustained.

In addition to the germination tests, water imbibition rates were measured. Similar to a soil hydrophobicity test, 10 seeds from each treatment were affixed to paper towel and a drop of water was placed on each seed (Figure 3). The length of time for the water droplet to be absorbed by the seed was measured. The potassium nitrate treatment caused more rapid water absorption by the seed than either the untreated or water soaked seeds. The potassium nitrate treatment is altering the seed coat

and allowing for the water to be taken up, impacting imbibition and ultimately promoting germination. The mechanisms for seed dormancy are still not understood and additional seed hormone profiling, genetic studies, and plant breeding approaches to remove seed dormancy are underway.

Figure 1. Buffalograss exposed caryopses (left), bur-like structure (middle), green-dyed potassium nitrate treated burs (right).

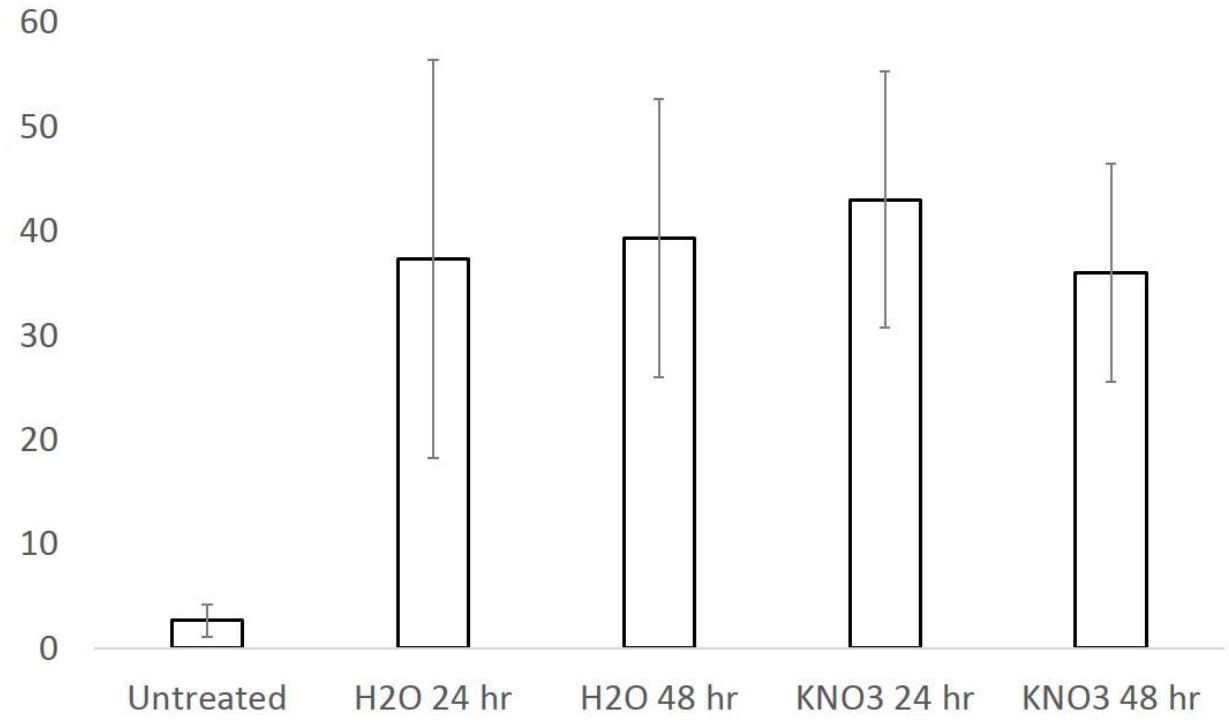

Figure 2. Twenty-eight day germination percentage of untreated, 24 h or 48 h water treated, or 24 h or 48 h potassium nitrate treated buffalograss burs.

Figure 3. Test for water droplet infiltration of buffalograss burs.