Cool Season Grass Seed Germination as Affected by Storage Time in Fertilizer

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Highlight: Investigations were carried out with a blended starter fertilizer (20-20-0) mixed with seed of 'Kentucky 31' tall fescue (*Festuca arundinacea* Schreb.), Jose tall wheatgrass (*Agropyron elongatum* (Host) Beauv.), and Vinall Russian wildrye (*Elymus junceus*, Fish.). The mixture was stored for a period of time in which the fertilizer had attracted some hygroscopic moisture. After 9 days in storage during which the fertilizer solidified, seed germination was not significantly affected. However, after 63 days in storage the germination was significantly reduced from 91 to 64%.

A pasture establishment system developed in the Missouri Ozarks by Crawford and Bjugstad (1967) involved aerial herbicide application in late spring for brush control, followed by burning in September, and then aerial seeding with tall fescue (*Festuca arundinacea* Schreb.). This same system is presently being used in eastern Oklahoma (Rommann et al., 1974). However, very poor soil fertility levels necessitate the application of fertilizers at the time of seeding to ensure some degree of success of the operation. Airplane seeding of rangeland with pelleted seed has been tried in parts of the western United States, but the pelleting process used a pressed clay pellet which reduced seed germination, and few grass stands were successfully established by this method (Hull, 1963). Using a different technique, Boyle (1969) in Australia commonly practices aerial application of a mixture of seed with fertilizer.

It is commonly known that seed and fertilizer can be mixed and applied immediately without causing a decrease in seed germination. However, the logistics of dealing with commercial fertilizer and seed companies, aerial applicators, and adverse weather, can cause a delay in

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Fig. 1. Seed germination as affected by storage time in fertilizer.

application after the seed and fertilizer have been mixed.

Therefore, the objective of this study was to determine the effect of storage time on the viability of seeds from cool season grass species mixed with fertilizer and stored for a prolonged period prior to planting.

Materials and Methods

Study No. 1 (dry conditions)

Kentucky 31 tall fescue (*Festuca arundinacea* Schreb.) seeds were mixed with two different commercial fertilizers, 12-12-12 and 33.5-0-0 (ammonium nitrate), and stored in open containers in the laboratory. Seed which was not mixed with fertilizer served as a check standard. Samples were taken at weekly intervals for seed germination. The laboratory humidity was low enough that the fertilizer-seed mixture remained dry during this test.

Germination tests were conducted in accordance with the Rules for Testing Seeds (Association of Official Seed Analysts, 1970) for substrate, temperature regime, and test duration. Covered plastic germinator dishes were used with a substratum of Kimpac tissue saturated with 8 ml of distilled water. In each test, the germinated seeds were counted and removed 6 and 15 days consecutively after the seeds were placed in the germinator. Each germination dish contained 50 seeds and was replicated 4 times in a randomized block design on the germinator shelves.

Study No. 2 (humid conditions)

Kentucky 31 tall fescue, Jose tall

wheatgrass (*Agropyron elongatum* (Host) Beauv.), and Vinall Russian wildrye (*Elymus junceus* Fish.) seeds were mixed with a blended commercial fertilizer, 20-20-0, placed in waterproof plastic lined fertilizer bags and stored outdoors on wooden pallets with a plastic cover for 9 humid rainy days before aerial application was possible. On the day of the mixing a light rain was falling all day and the ammonium nitrate had absorbed moisture from the high humidity. On the 9th day, when field aerial application was made, the fertilizer had solidified in the bags, but it was dry and crumbled readily.

The blended fertilizer (20-20-0) was composed of 57% ammonium nitrate (33.5-0-0), 38% super phosphate (0-46-0), and 5% ammonium phosphate (18-46-0). Ammonium nitrate is much more hygroscopic than the super phosphate, and the effect of blending the dry super phosphate with ammonium nitrate was possibly beneficial to the seed by absorbing some of the moisture from the ammonium nitrate.

Each species was separately mixed at the rate of 150 lb of seed with one ton of blended fertilizer. Seed germination tests were run following the 9, 63, and 150 day storage times. After the 9th day the fertilizer-seed mixtures were stored in an open container in a storeroom. The mixture remained dry throughout the test.

Germination tests were conducted as described above and seed from the fertilizer mixture was compared with seed which had not been mixed with fertilizer.

Results and Discussion

Study No. 1

The dry fertilizers had no effect on germination of tall fescue seed after 24 days of storage. Mean germination was 96% with a 1.5% coefficient of variation. The NH_4 part of ammonium nitrate would ordinarily be expected to be very toxic to seed and thus cause rapid deterioration. Therefore one would assume the most rapid decline in seed quality to occur with the 33.5-0-0 fertilizer rather than the 12-12-12 fertilizer. This expected pattern of decline was not detected.

In this study the weather conditions remained dry during the time of storage prior to aerial application and also following the

period of storage in the laboratory after the samples were taken. This may have accounted for the nonsignificant results.

Study No. 2

Seed mixed with wet fertilizer still had excellent germination at 9 days, but by 63 days the germination was significantly reduced (Fig. 1). After 63 days, no further reductions in germination occurred on tall fescue and Russian wildrye; however, tall wheatgrass germination continued to decline.

Blending of grass seed with a hygroscopic fertilizer under humid conditions reduced germination, but in this situation several days of storage was necessary for the effect to become

pronounced.

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