VIABILITY OF NATIVE WARM-SEASON GRASS SEED STORED UNDER TWO DIFFERENT ENVIRONMENTS FOLLOWING 35 YEARS OF STORAGE

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INTRODUCTION

Long-term storage facilities can provide a source of valuable seed stocks without maintaining large numbers of plants for seed production. The importance of maintaining small samples of many kinds of seeds, indefinitely, for breeding purposes has been identified. Seeds stored in environmentally uncontrolled warehouses (EUW) are, however, subject to wide fluctuations in temperature and humidity in eastern Kansas, where the average annual humidity ranges from 51 to 81% and average annual temperatures range from 17 to 92°F. Such conditions are detrimental to the longevity of grass seeds in storage.

Seeds of native perennial warm-season grasses were tested under two storage environments, a long-term environmentally controlled seed storage facility (ECSSF) and a EUW at Manhattan, Kansas. Although the storage requirements for many plant species are known, there was little information available documenting the benefits of storing seeds of native grasses in a controlled environment.

Environmentally Controlled Seed Storage Facility

Environmentally Uncontrolled Warehouse

METHODS AND MATERIALS

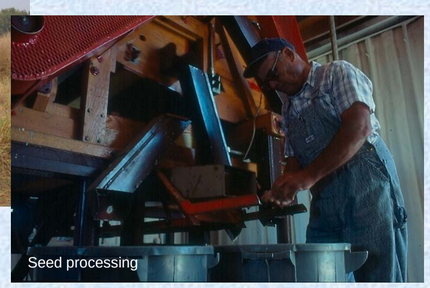
The rodent-proof ECSSF was environmentally controlled (temperature and humidity) and the EUW was without environmental control. The storage room itself was sealed to exclude outside air and humidity. The EUW was wood frame on a concrete slab with clapboard siding. It was subject to wide fluctuations in temperature and humidity. Temperature and humidity in the ECSSF were controlled by a two tower, desiccant bed dehumidifier and a standard air-conditioning unit. Temperature controls were set to maintain 64°F summer, 55°F fall-spring, and 30 to 45°F in the winter. Relative humidity was maintained between 10 to 20%. Temperature and humidity were monitored with a hygrothermograph.

Seeds of nine native warm-season grass species were harvested and processed. Each seed lot was divided into two portions and placed in burlap or cloth bags for storage. One sack of each lot was placed in the warehouse in a steel drum to prevent rodent damage. Pest strips containing 2-2 dichlorovynyl dimethyl phosphate (Vapona) (20% active ingredient) were placed in each barrel for insect control. The second sack of each seed lot was placed on shelves inside the seed storage building with no insect control.

Seeds were tested initially for purity and germination once each seed lot was processed and prior to implementation of specific storage parameters. Tests were conducted in accordance with the Association of Official Seed Analysts Rules for Seed Testing. Samples (100 g) of all lots were taken annually and tested for germination. Seed lots were removed from the study when germination test results dropped below 10% of the original test.

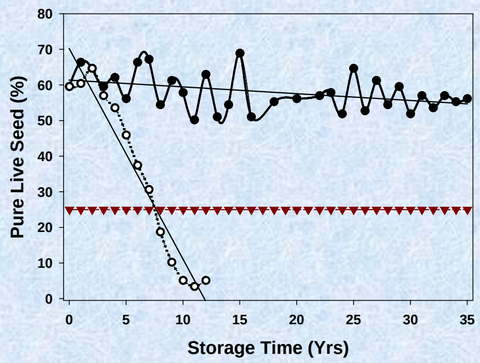
The percent pure live seed (PLS) was plotted for each chaffy grass species in the study along with the Kansas minimum standard for PLS (red dashed line). The germination percent was plotted for the non-chaffy grasses along with the Kansas minimum standard germination (green dashed line). A linear regression was plotted for each treatment and each entry at the 95% confidence level.

Native Grass Seed Production

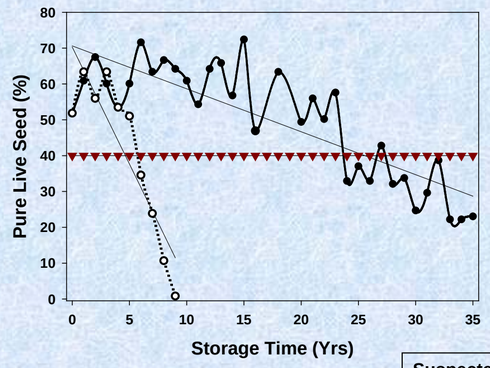


RESULTS

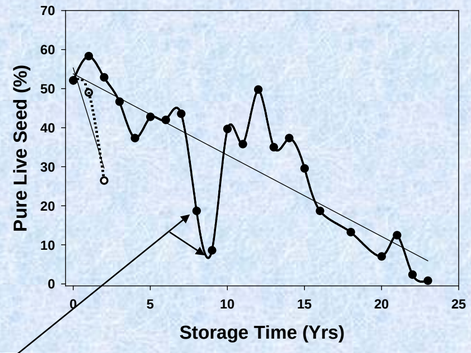
Little bluestem



Big bluestem

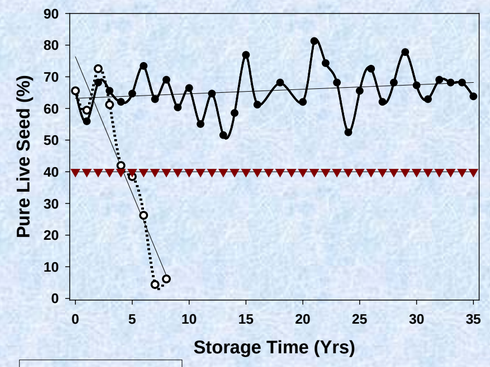


Prairie cordgrass

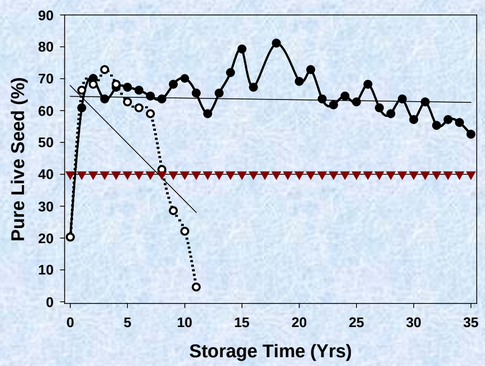


Suspected error in seed sampling or testing

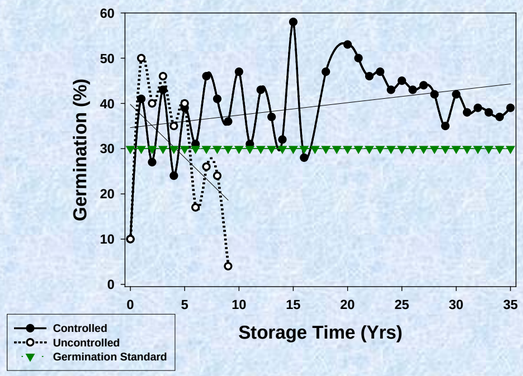
Indian grass



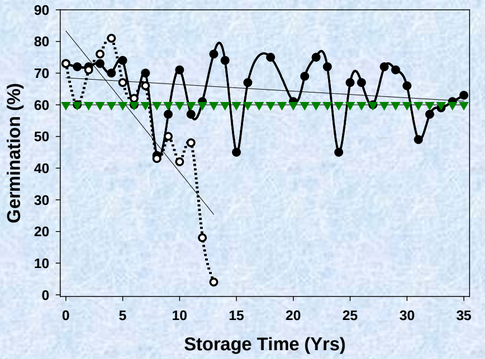
Sideoats grama



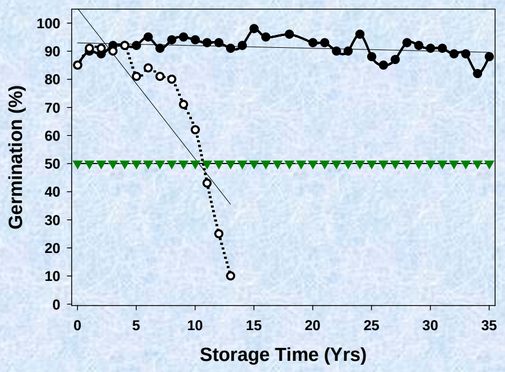
Eastern gamagrass



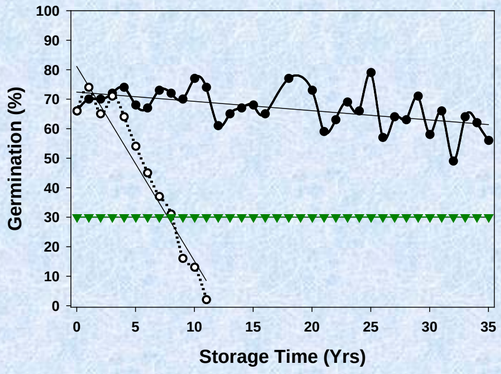
Buffalograss



Upland ecotype switchgrass



Lowland ecotype switchgrass



DISCUSSION

The greatest increase in germination was observed in eastern gamagrass (40%) and sideoats grama (50%) seeds, after storage 12 and 6 months, respectively. Harvested in summer, these crops require an afterripening period. Switchgrass stored the best of any entry. The viability of big bluestem fell below the minimum standard for Pure Live Seed (PLS) for the first time following 24 years of storage. Seeds of prairie cordgrass, for which no minimum standards exist, had the shortest shelf life of all entries in the study under both storage conditions. Negatively sigmoid curves indicate seed deterioration over time.

Variables that could affect the results may be attributed to any of the following or a combination of things:

<u>Storage</u>: fluctuations in year-to-year germination test results due to the set of storage conditions: temperature, humidity, and moisture content of the seed, at the time of the test

<u>Sampling</u>: lack of uniformity in seed lot, especially a problem in non-flowable seed stocks (chaffy seeds), and inconsistency in sampling

<u>Testing</u>: variation in germinator environment, inconsistency in handling the sample, and reading the test create opportunities for variation

CONCLUSIONS

1.) All seed lots stored under controlled conditions remained viable after 35 years of storage except for prairie cordgrass which lost viability following 22 years of storage.

2.) Under uncontrolled storage conditions, all seed lots lost their viability with the last seed lots being dropped from the study after 13 years of storage.

3.) Seeds of upland ecotype switchgrass, the most consistent from year-to-year, had the best viability of any entry in the study.

4.) Seeds of prairie cordgrass had the shortest shelf life of all entries in the study.

5.) It is possible to extend the storage life of native warm-season grass seeds under specific environmental conditions for many years.

6.) Seed stored in uncontrolled environments should not be held more than 1 to 4 years (depending on the species) because of a rapid decline in viability.

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