



AGRICULTURAL SCIENCES

TITLE: Effect of Cold Storage on Seeds, by Terry Coffelt and Dave Dierig, U.S. Water Conservation Laboratory

SUBJECT: Science

GRADE LEVEL: 7-12. Various factors can be made more complicated for older students.

MATERIAL(S): Seed of two different types of plants (popcorn and beans, for example). Any seed commonly available at a garden supply store such as vegetables and flowers also will work. Cost of the seed is less than \$5. Access to a home refrigerator and/or freezer is needed. Paper towels or germination papers are needed for seed evaluation. If the experiment is to be conducted to evaluate the differences in plant growth, pots or two-liter bottles will be needed to grow the plants plus some potting soil.

OBJECTIVE(S): To demonstrate the effect of temperature during storage on seed germination and plant growth

TIME NEEDED: The experimental time can be varied from 30-120 days, depending on the time available. The longer the time, the more results that can be obtained.

OVERVIEW:

Background

The effects of cold storage (temperature) vary from genera to genera and sometimes even between species and varieties. The three most important factors affecting the length of seed viability under storage are temperature, humidity and gaseous exchange. Several seeds can have their viability prolonged by storage at below freezing temperatures. Generally, for every decrease in seed temperature of ten degrees between 32 and 120 degrees Fahrenheit, the life of the seed is doubled.

Procedures

Place 100 seeds each of two (or more) different plants in a refrigerator in a zipper-style resealable bag or other container. Do the same in a freezer, being sure to place the seeds in the same type of container. Leave another set of seeds in the same type of container at room temperature. Use a thermometer to check the temperatures in the room, refrigerator and freezer at least once a day. Record temperatures in a log book so they can be plotted or put in a table for your report. At the end of 30 days, put the seeds on moist paper towels or germination papers, being sure to keep track of which place they were stored. Put 25 seed on each towel. Loosely roll the towel, put a rubber band around it to keep it rolled up, and put the towels in a container at room temperature. Check the towels daily to be sure they are moist but not soaking wet. Count the number of seeds germinated for each group at the end of one week and two weeks. Compare the results for seed stored at different temperatures.

Additional Exercises

If more time is available, extra containers of seed can be added so that germination can be checked at 30, 60 and 120 days. Other evaluation methods besides germination also can be used, such as measuring the root and shoot portions of the germinated seed and planting the germinated seeds and taking weekly measurements of the plants. Students can then determine whether the different storage temperatures affected growth rates of the seedlings and plants from different storage temperatures even if the germination percentage was the same.

Discussion Questions

Why would some seeds behave differently under different storage conditions? (Temperature, seed moisture content at storage, humidity during storage, initial quality of seed, type of natural environment where seed is normally found, etc.) What are the advantages of prolonging the viability of seed under cold storage? (Preservation for future generations of seed from plants that are becoming extinct, ability to store high quality seed from one growing season to the next, etc.) What are some other factors that might affect seed in storage? (Seed size, dormancy, oil content, hard seed coats, etc.).

References

- Barton, L.V. 1943. Effect of moisture fluctuation on the viability of seed in storage. Contributions of the Boyce Thompson Institute 13: 35-45.
- Haferkamp, M.E., L. Smith, and R.A. Nilan. 1953. Studies of aged seeds I. Relation of age of seed to germination and longevity. Agronomy Journal 45(9): 434-437.
- Harrington, J.F. 1971. Drying, storing, and packaging seed. Present status and future needs. Seed World 108: 2-5.