

STORAGE OF SEEDS FOR EXPERIMENTAL USE

The main reasons experimentalists store seed are;

- To have it available and in a suitable condition for future use.
- To have alternative batches of species important to an experimental series readily available, in case the germination of one batch declines.
- To permit dormancy to decline.

The main questions on seed storage relevant to experimentalists are 'how should I store seed for my experiments?' and 'how long will it remain viable?'

PRINCIPLES OF SEED STORAGE

The most important factor in weed and crop seed storage is to maintain a constant, low moisture content. This is secured by initially drying the seed thoroughly, then ensuring that it is not in contact with moist air thereafter. A constant moisture content is crucial, because if the moisture content of the seed fluctuates, metabolism accelerates in the moist periods and declines in the dry periods, with the result that the seed may enter enforced dormancy or lose viability.

Required moisture content

For storage of up to one year, seed moistures of 10%-14% are acceptable for conventional seeds, but for long term storage, 2%-5% is preferable. At these very low moisture contents, the seed is almost totally quiescent but may become secondarily dormant. In contrast, at 10%-14% moisture, metabolism continues slowly so that post harvest dormancy may decline and the seed can commence germination more rapidly than a seed taken directly out of storage at a very low moisture content.

For very long storage periods, seed can be dried to as low as 2% moisture, hermetically sealed to keep out moist air and stored in a deep freeze at -14C. This is a method used in many seed banks. Rehydration of seed which has been stored at 2-5% moisture needs to be a controlled, gradual process to prevent tissue damage by too rapid rehydration.

PRACTICAL SUGGESTIONS

With a few exceptions, most experimentalists are concerned to have available a supply of viable seed of their required species at the time they need to start the experiment.

The simplest approach is to leave Herbiseed to the store the seed and provide you with a viable batch. Order your seed in good time, and Herbiseed will deliver seed of the batch which was giving the best germination in its last germination test. Before dispatch, the seed will have been conditioned at a relative humidity of 30% and have a moisture content typically around 10%.

Seed storage in the laboratory

On receipt, leave the seed in its sealed plastic bags and store in a dry place out of direct sunlight. The dry seed is not strongly sensitive to temperature, but direct sunlight, extreme fluctuations of temperature and, above all, moisture should be avoided.

Generally, to store a few kilograms of seed for up to a year, a secure dry cupboard out of direct sunlight and not exposed to chemical fumes will be adequate. The Herbiseed self-seal plastic bag is effective and convenient, but any airtight container is acceptable. Always reseal the container immediately after removing seed to ensure that it does not pick up moisture from the atmosphere.

Stored in this manner, virtually all conventional seeds can retain viability for at least one year after delivery. Therefore you could order a full year's requirement at one time, and the seed will be ready to use whenever it is needed.

However, the germinability of some species tends to fluctuate with time (*Lamium purpureum*, *Sinapis arvensis* and *Galium aparine* are typical examples). This presents problems if a key species fails to germinate half way through a series of experiments. It can therefore be advantageous to have alternative batches of each species available. If the germination percent of one batch declines, another batch of the same species and of the same genetic population can immediately be available to substitute for it. This multiple batch strategy is a favourite among agrochemical screeners. An occasional check on the alternative batches' percentage germination, under the same conditions as the real experiment, will enable their performance to be monitored.

HOW LONG DOES THE SEED REMAIN VIABLE?

If stored at 10% moisture in an even temperature and low light, virtually all seeds will retain viability for more than one year. Plants of the family Apiaceae (Umbelliferae) such as *Daucus* and *Pastinacea* have a relatively short storage life of about 2 years. *Galium aparine* also appears to become non-viable after about two years of normal storage. However most dicotyledons will remain viable for more than two years and most grasses for several years of normal storage. *Avena*, *Festuca* and *Lolium* can be stored for up to 5 years without loss of viability.

A pragmatic approach adopted by some organisations is to retain a batch of seed for up to a year for use in glasshouse and laboratory experiments, and to use up any quantity remaining after this period in field trials, where larger quantities of seed tend to be used.

SEED STORAGE BY HERBISEED.

The principle of seed storage at Herbiseed is to ensure that the customer receives seed of high viability which has been conditioned at 10%-12% moisture content so that it is ready to germinate as soon as possible after sowing. Where storage conditions can remove post-harvest dormancy, this will have been achieved by appropriate storage.

All seed produced by Herbiseed is initially dried by the sun, in polytunnels at our English farm, and in the open air in Serbia and the Philippines. Before it is stored, its moisture content is checked and if necessary reduced by an electrically heated hot-air dryer.

'Bulk seed' of high sales volumes per year is dried to 12% moisture and stored in a store room which is sealed, insulated but not temperature controlled. Also seed which is known to have an extended post-harvest dormancy is stored here until its dormancy has declined, before being fully dried and removed to long-term storage.

Herbiseed brief weed guide No. 11

Seed which is expected to be sold within a year (except 'bulk seed' and seed with an extended post harvest dormancy) is dried to 10% moisture and stored in steel filing cabinets in our 'sales store' which is maintained at 30% humidity, and is insulated but not directly temperature controlled. Its temperature fluctuates by less than 2C within the day, and varies from 16C-20C from winter to summer.

Seed which is to be stored for more than one year is dried to 5% moisture and stored in sealed 200 litre steel drums containing anhydrous calcium chloride. Seed is removed as required, to condition at 30% Relative Humidity in the sales store.

Seeds of 'minor species' for which sales cannot be predicted are dried to 3% moisture, double sealed and stored in a deep freeze at -14C.

In Spring and Autumn of each year, a sample of each batch of seed in all stores except the freezer is taken for germination testing. At the same time each batch is inspected for storage pests and visible signs of moisture. Germination tests are carried out in pots of soilless compost in a cool greenhouse, where soil temperatures fluctuate from 10-25C. The batches of each species that show the best germination percentage under these conditions are moved into the sales store.

SEED DORMANCY

Many species of seeds exhibit a post-harvest dormancy which declines spontaneously with dry storage. The length of this period differs between species and different batches of seed within a species. As far as possible, Herbiseed stores each batch until post-harvest dormancy has declined. However, the requirements of some species for specific dormancy breaking treatments such as cold stratification or heat treatment are not usually alleviated by simple dry storage. Thus it will be necessary for the experimentalist to apply these treatments before sowing the seed. (Herbiseed Brief Weed Guide No. 2 describes some of these treatments)

SUMMARY

Weed seed for use in experiments can be stored for at least a year in simple facilities. There are advantages in storing more than one batch of important species to act as insurance against cyclic germination behaviour. Herbiseed uses a range of purpose-built storage regimes to ensure that the seed it sends customers is of high germinability.

Seed and further information on seed storage and germination may be obtained from:

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