

Technical information sheet_4

The effort put into collecting high quality seeds may be wasted if you don't handle collections carefully afterwards. By following the practical guidelines in this technical information sheet you will be able to avoid unacceptable loss of viability during collecting trips and ensure that seeds arrive at the seed bank in good conditions.

Seed moisture status

Even though seeds are fully ripe, their moisture status at the time of collection may be as high as 85% eRH (15-20% mc depending on oil content). Seeds age rapidly at such high moisture levels (fig 1). A "safe" moisture level for collections in the field is around 50% eRH, or ~12 mc depending on seed oil content. Collectors need to take measures to promote drying of damp collections and ensure that moisture levels of drier collections do not rise.

Even if you do not have access to a digital hygrometer to measure seed moisture status you can still make informed decisions about post harvest handling. Take note of the prevailing weather conditions. Estimate stage of seed development by observing seed- and fruit morphological indicators. Seeds enclosed within indehiscent fruits, or those having only just reached the stage of natural dispersal may be at a high moisture level, even if ambient conditions are dry and warm. If it has recently rained, seeds may be wetter than expected.

"Dry" seeds (< 50% eRH)

Seeds within dehiscent fruits, collected in dry climatic conditions, may have already dried down to a safe level. If ambient conditions are

favourable, dry seeds can simply be loosely packed in labelled bags and kept in a cool, well ventilated place. Spread bags out so that air circulates freely and place them in the shade - under the vehicle may be a good place – until all other fieldwork is complete.



"Damp" seeds (50-85%eRH)

Seeds which have recently reached natural dispersal, or seeds collected during the rainy season may be within this moisture range. Damp seeds need to be dried as soon as possible. If ambient conditions are suitable (RH < 50%) spread the seeds out in a thin layer on newspaper in partial shade, raised

night and place them within the vehicle to minimise moisture

What is Relative Humidity?

Water is held in the air as water vapour. The amount of water vapour in the air at a given temperature is expressed as relative humidity (RH):

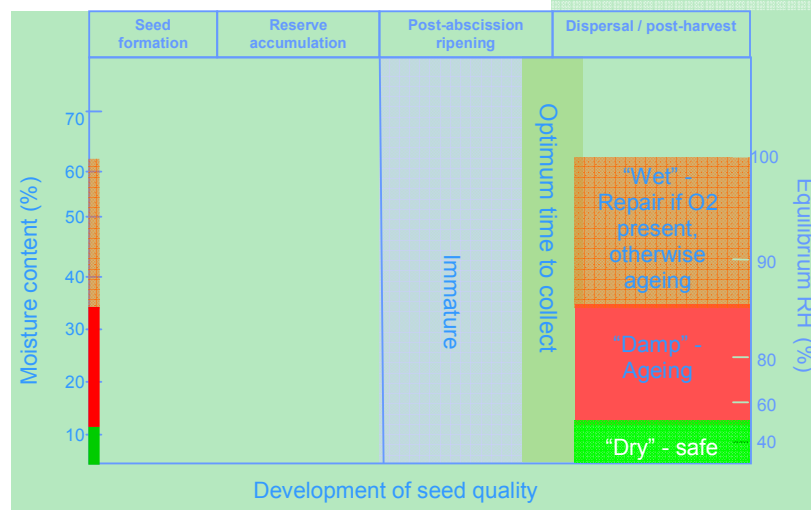
$$\frac{\text{water in a given mass of air}}{\text{max. amount of water that could be held}} \times 100$$

What is moisture content?

Seeds are weighed before and after oven drying. Moisture content (mc) is expressed as weight of water removed divided by either the fresh weight or the dry weight of seeds $\times 100$. The main disadvantage of this method is its destructive nature.

What is equilibrium Relative Humidity (eRH)?

Seeds will gain or lose moisture depending on the RH of the surrounding air, eventually reaching equilibrium. eRH is a measurement of the RH of the air at this equilibrium point. The measurement of eRH is faster than the traditional gravimetric moisture content (mc) method and is non-destructive. See [Non destructive measurement of seed moisture](#) (no 5 in this series) for more information.



off the ground if possible to allow air circulation. Re-pack the seeds at

absorption as ambient RH rises. Make sure that the correct label

remains with the collection during drying and re-packing.

If ambient conditions are not suitable for drying, use a desiccant such as silica gel (see box overleaf).

Alternatively, spread collections in a thin layer in an air-conditioned room (maybe a hotel room).

If none of these options are possible get the seeds back to the seed bank as soon as possible, where they can be dried to safe moisture levels.

“Wet” seeds 85-100% eRH,

eRH at natural dispersal may be as high as this, especially if seeds are tightly enclosed within indehiscent fruits, creating a humid microclimate. If oxygen is present, fully ripe, wet seeds will not be at risk of ageing. However, due to the high risk of mould in such conditions, it is better to find a way to dry them as soon as possible.

Follow the advice given for Damp seeds (above).

Immature or mixed collections

Despite best efforts, collections often contain a range of seed maturities, from seeds that have not yet reached mass maturity to those at natural dispersal. These collections need to be handled particularly carefully. Seeds may not be fully desiccation tolerant and rapid drying and/or high temperatures may kill them. If your collection contains more than 10% immature seeds follow the guidelines below (if time permits, divide mixed collections and handle ripe fruits/seeds separately to avoid undue ageing).



Seeds with an eRH of 85-100% are likely to be in the post abscission phase. If they look close to natural dispersal – changes in colour, fruits dehiscing etc – it is probably safe to dry them rapidly using one of the methods described above. If the

seeds don't appear close to natural dispersal it is safer to dry them slowly, under natural conditions. Don't remove seeds from fruits, or fruits from branches or stems. If ambient conditions are particularly dry or hot you may need to slow the drying rate down, for example by enclosing the seeds in a ventilated box.

Very immature-looking seeds with an eRH around 100 % may still be in the reserve accumulation or early post-abscission phase. Keep these seeds at high RH in a loosely tied plastic bag or ventilated box to allow immature seeds to ripen. To avoid unduly ageing the ripe seeds in a mixed collection keep the temperature around 20-25°C.



Open daily to allow entry of O₂, check for mould and remove any surface moisture.

Once seeds have reached full ripeness treat them as other collections and dry them fully as soon as possible. It is especially important to process fleshy fruits as soon as they are ripe as seeds left within ripe fleshy fruits may begin to age.

Fleshy fruits

Fleshy fruits are best kept in aerated plastic bags until they can be processed. Aerate the bags daily to avoid mould and possible fermentation. Over-ripe fleshy fruits, or those that have been damaged or crushed during collecting may require partial or full cleaning. Remove as much flesh as possible from the fruits using a sieve and cool running water. Leave the seeds to air-dry on a fine wire mesh or thick filter paper before packing them into cloth bags.

Additional notes

Park the collecting vehicle in the shade, or at the very least, shade the windscreen.

- Never leave collections inside a closed vehicle in strong sunlight or high temperatures.
- Never freeze collections until fully dry.

Ensure that seeds are not physically damaged during post harvest operations as this reduces long-term storability.

Once transferred to the seed bank, collections can then be dried to around 15%eRH (15% eRH (4-7% mc depending on seed oil content), the recommended moisture level for long term conservation of orthodox seeds.

Planning ahead

Look up the long term climatic data for a particular region when planning a collecting trip. If conditions are likely to be humid and/or hot at the time of collection you will need to plan carefully how you will handle seeds, especially during longer trips. It may be better to arrange to ship collections back on a daily basis if this is possible. If not, you will need to pack silica gel or some other kind of desiccant in order to dry seeds during the trip.

International, Wallingford, U.K, pp. 419-456.

Drying with desiccants

Any hygroscopic substance (silica gel, dried rice, charcoal, clay etc.) can be used to remove moisture from seeds providing that the eRH of the desiccant is lower than the eRH of the seeds. If seeds are very wet it is better to dry them for 2-3 days under ambient conditions before using silica gel. This can be done even if the daytime ambient RH is relatively high (70-80%). Once the bulk water has been removed transfer the seeds to a sealed container with a desiccant to then reduce seed moisture to a safe level (~30% eRH). Use a silica gel:seed weight ratio of 1:1 To dry seeds to the same level using charcoal use a weight ratio of 1:3. Change the drying agent regularly to speed up drying time. Regenerate desiccants in the sun during the day and then use them to maintain seed drying at night in sealed containers.

Further reading

Probert, RJ (2003). Seed viability under ambient conditions and the importance of drying, pp.337-365. In: RD Smith, JD Dickie, SH Linington, HW Pritchard & RJ Probert (eds) Seed conservation: turning science into practice. Royal Botanic Gardens, Kew, UK.

Smith, R.D. (1995) Collecting and handling seeds in the field. In *Collecting Plant Genetic Diversity. Technical Guidelines* (eds L Guarino, RV Rao and R Reid), CAB

Summary of recommendations for post-harvest handling of seed collections

Seed development stage	Seed moisture status	Ambient conditions	
		Dry (RH < 50%)	Humid (RH > 50%)
Reserve accumulation	~ 100% eRH	Delay drying to enable ripening. Hold at high RH in loosely tied plastic bag or ventilated box. Open daily to allow entry of O ₂ , check for mould and remove any surface moisture	
Post-abscission/ripening	85-100% eRH	Slow drying (ventilated box?)*	Hold under ambient conditions 1-2 weeks*
Natural dispersal	“dry” <50% eRH	Hold in loosely packed bags in a well ventilated, shady location. Seal at night to prevent moisture uptake.	Transfer to seed bank as soon as possible.
	“damp” 50-85% eRH	Dry in thin layer, in well ventilated location. Seal at night to prevent moisture uptake.	OR
	“wet” 85-100% eRH		Dry with desiccant.
			OR
			Place in air-conditioned room.
* Remove seeds from fleshy fruits as soon as morphological signs (eg fruit colour) indicate that they are fully ripe			