DEPARTMENT OF AGRICULTURE

Seed Storage and Handling Guidelines

Proper seed storage is essential for maintaining seed viability, vigor, and long-term quality. Follow these guidelines to keep seeds healthy from purchase to planting.

Core Principles

- **Cool:** Maintain stable temperatures between 40–50°F.
- **Dry:** Keep humidity low to prevent mold and deterioration.
- **Dark:** Avoid direct sunlight.
- **Consistent:** Prevent temperature swings (avoid garages or sheds).
- **Airtight containers:** Use sealed jars or heavy-duty bags with desiccant packets.
- **Gentle handling:** Keep packages sealed until use and avoid crushing or dropping seeds. Rough handling can significantly decrease germination or reduce vigor of germinating seedlings.
- **Start with quality seeds:** Most seeds store best when they begin as healthy, fully mature seeds dried to low moisture levels and stored in airtight containers at cold temperatures.

Seed Types and Anatomy

- **Orthodox seeds:** Desiccation-tolerant; includes most agricultural seeds.
- **Recalcitrant seeds:** Sensitive to drying; often found in tropical species.
- **Intermediate seeds:** Tolerate partial drying (e.g., beans, brassicas).
- Seeds are hygroscopic, meaning they absorb or release moisture depending on surrounding humidity.
- Seed longevity depends on genetics and environment, so start with healthy, mature seeds.

Drying Guidelines and How to Dry Seeds

Seeds harvested before full maturity or of high moisture content should be dried slowly before storage.

Drying is common practice after seed harvest and should be done before seeds are sold or stored. Seeds should be dried to appropriate moisture levels prior to storage, especially for storage longer than 6-12 months.

Most agricultural seeds are desiccation tolerant and can safely be dried to low moisture levels.

Seed moisture levels can be monitored by placing humidity indicator strips in sealed containers with the seeds or by using a hygrometer.

Most seeds are difficult to over dry but drying them too quickly can damage seed quality.

Options for Drying Seeds:

- Spread seeds in shade on a dry, breezy day (<50% RH).
- Hang in mesh bags in a cool, dry area.
- Use desiccants (such as silica beads) in sealed containers.
- Oven-dry seeds at 100°F for 1 hour with the oven door open.
- Monitor moisture with humidity cards or a hygrometer.

Moisture and Temperature Targets

Storage Type	Moisture Content	Temperature
Short-Term (≤2 years)	~12% (≈50% RH)	32–41°F (Refrigerator)
Long-Term (2+ years)	3–8% (≤20% RH)	0 to –5°F (Freezer)

Storage Recommendations

- Short-term storage: Dry seeds to about12% moisture and store at 32–41°F.
- Long-term storage: Dry seeds to 3–8% moisture and store at 0 to –5°F.
- Avoid high heat (>70°F), high humidity (>60% RH), direct sunlight, unsealed containers, or storing damp seeds.
- Never freeze seeds with high moisture content.

Special Cases

- **Agricultural seeds** are generally stored from one year to the next at 3-10% moisture.
- Some species, like **beans,** do not perform as well at low moisture content levels and should be dried to 12% moisture.

Oilseeds (canola, soybeans, sunflowers)

- Dry to 7–8% moisture
- Require stricter storage management than cereals due to higher oil and protein content.
- Rigorous aeration is needed to prevent heating and faster turnover to avoid mold.
- These seeds are highly susceptible to pests, mold, and quality degradation, requiring specialized cone-bottom silos.

Cereals

- Typical storage moisture: 13–14%

Lettuce Seeds

- Lettuce seeds can remain viable for 2–6 years when stored in cool, dark, and dry environments and when they are not pelleted or primed.

Pelleted/Primed Seeds

- Pelleted or primed seeds generally do not last more than one year.
- Primed seeds are pre-germinated to speed growth by up to 50%. Pelleted and primed seeds have a shorter shelf life and should generally be used within one growing season. Common primed seeds include **lettuce, carrots, onions, peppers, tomatoes, celery, spinach, and seedless watermelons.**

Freezing primed seeds may negatively affect germination and vigor.

Wild/Native Seeds

- If seeds are harvested before full maturity their moisture content will be high, and they may benefit from delayed or slow drying.
- If moisture content is low, immediate storage in a controlled environment is the best course of action.
- Variable maturity within seed collections is likely to be more of an issue for wild species as they have not been bred for uniform maturation or improved seed health traits.
- A post-harvest treatment, such as holding seeds at elevated humidity before drying can help reduce variation and produce a more uniform population of seeds.

Key Takeaways

- Cold plus dry conditions equal longer-lasting seeds.
- Ensure seeds reach appropriate moisture levels before storage.
- Dry seeds thoroughly before freezing.
- Store seeds in airtight containers with desiccants.
- Keep seeds in unopened, sealed packages until use to prevent moisture absorption.
- Handle seeds gently to avoid physical damage.
- Monitor moisture and temperature consistently.

Avoid

- Uncontrolled or fluctuating temperature or moisture.
- Storage of seeds in areas above70°F or 60% relative humidity
- Areas like sheds, greenhouses, or near heat sources
- Storing in direct sunlight
- Storing in unsealed containers
- Storing damp seeds.

Ideal Storage Spaces

1. Freezer
2. Refrigerator
3. Root cellar
4. Basement

Any location should be dry, cold, and dark.

Seed Packaging

Seed packaging helps protect seeds from moisture, light, and physical damage, ensuring that seeds remain viable and healthy until they are ready to be planted. Proper seed packaging is crucial for maintaining seed quality and preventing germination issues. Paper, plastic, foil or custom packaging with proper labeling is designed to help with handling and have proper labeling if the surrounding environment is appropriate.

For **longer term storage**, place seed packets inside canning jars or other sealed containers. Plastic bags can also be used but offer less physical protection.

Place desiccant packs in containers with the seed to help them dry.

Sometimes **purchased seeds** may have been exposed to humidity and temperature fluctuations during shipping or distribution at a retail location. This seed likely came in packaging that does not protect the seed from these variable conditions.

Resources and References

- Collection and Production of Native Seeds for Ecological Restoration
- GenBank Standards for Plant Genetic Resources for Food and Agriculture
- International Network for Seed-Based Restoration Seed Information Database
- Johnny's Selected Seeds Seed Viability and Seed Storage Guidelines
- Longterm Seed Storage
- Seed Storage: Maintaining Seed Viability and Vigor for Restoration Use
- Seed Savers Exchange - Storing Seeds
- Testing Wild Seeds